



# CHAPTER 9:

## South and South-West Asia

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The South and South-West Asia subregion covers Afghanistan, Bangladesh, Bhutan, India, the Islamic Republic of Iran, the Maldives, Nepal, Pakistan, Sri Lanka and Turkey. While agriculture remains the mainstay of the economies in many of these countries, there has been rapid industrialization, and India has become one of the fastest-growing large economies in the world. India, Turkey, Bangladesh, Sri Lanka and Nepal more than doubled their exports during the period 1990 to 2002. At the same time, poverty and hunger continue to affect a large proportion of the subregion's population, and children and mothers are at higher levels of risk here, than in other parts of the region.

Also in contrast to other subregions, population growth has shown no significant signs of slowing down; South and South-West Asia could well become the epicentre of the global urbanization phenomenon. Meeting waste-management, sanitation, water, transportation, energy and housing needs will require substantial new investment and flows of raw materials, energy and water. Meeting all of these future needs, based on the current economic growth patterns, and in the context of an already-stressed natural resource base, spells almost certain environmental, and by consequence, economic and social disaster. Already, unsustainable agricultural practices, water scarcity and land degradation have been identified as major threats to the sustainability of the rural sector. Poor water quality, low water availability per person, high dependence on water use for agriculture and the impacts of climate change, imply that many of these countries are among the most vulnerable to long-term water scarcity and climate change, as shown by population displacements caused by severe multi-year drought, that began in the late 1990s. While total forest cover loss has been slowed by afforestation and reforestation activity, natural forests are rapidly declining in Afghanistan, India, Nepal, Pakistan and Sri Lanka, representing a sizeable loss of natural capital, including a globally-significant loss of biodiversity.

The subregion has one of the most established environmental cooperation programmes in the region. Several bilateral agreements address transboundary environmental issues. These programmes and agreements require greater focus on reducing future environmental pressures and promoting equitable access to resources. The current unmet needs, rather than being viewed as a disadvantage, could be turned into an opportunity to create new, more environmentally sustainable economic growth patterns based on traditional and cultural values, that maximize human welfare and well-being, while simultaneously minimizing environmental pressure. Progress made on the use of renewable energy is promising, and is one example of a step in the right direction for this subregion.

## 9.1 The economy

The economic performance of the countries of this subregion showed considerable variation throughout the 1990s. However, a resurgent agricultural sector supported by monetary and fiscal incentives, a surge in aggregate demand, a sustained external account surplus, and improvements in macroeconomic fundamentals combined with good weather conditions have contributed to a broad-based acceleration in GDP growth, starting in 2002. The fastest-growing economies are Bhutan and India (Table 9.1), as well as Afghanistan which is developing fast through new investments and development assistance. However, the countries of the subregion continue to struggle with the economic consequences of natural disasters, armed conflict, debt-servicing and an uncertain geopolitical environment. Common to most countries is the emphasis on economic, political, social and legal reform. This reform is supported by bilateral aid from

many sources with ODA per capita reaching a high of 10 per cent of GDP in Bhutan.<sup>1</sup> Foreign direct investment is high in India and Turkey and has supported trade expansion, but is on the decline in some other subregional countries. India, Turkey, Bangladesh, Sri Lanka and Nepal more than doubled their exports during the period 1990 to 2002.

The contribution of environmentally-sensitive commodities to the industrial base of South and South-West Asia has been significant. The subregion is endowed with offshore reserves of fossil fuels and a diverse range of valuable metals and precious stones. India is also the largest producer of mica in the world, and ores and metals make up some five per cent of the total value of merchandise exports.<sup>2</sup> The exports of forest products from these countries increased by over 80 per cent between 1990 and 2001.<sup>3</sup> The exploitation of forests for trade in wood products, as well as a source of fuel, has impacted heavily on

Table 9.1 Economic indicators: South and South-West Asia

	Afghanistan	Bangladesh	Bhutan	India	Iran (Islamic Republic of)	Maldives	Nepal	Pakistan	Sri Lanka	Turkey
GDP growth rate, % per annum (1999-2003)	22.1 <sup>o</sup>	5.2	6.4	5.3	5.7	5.8	3.5	3.7	3.5	1.8
GNI per capita, US\$ (2003)	171	403	282	551	2 069	2 131	245	521	898	3 386
Consumer price index change, % per annum (1999-2003)	-	3.32	2.86	1.92	12.90	-0.62	3.49	3.62	9.00	49.67
Unemployment rate, % (2003)	3.3	-	-	-	-	-	-	8.3	8.4	10.5
Merchandise trade, billion US\$ (2003)										
Exports	-	4.79	-	63.03	-	0.11	0.65	12.7	4.87	47.25
Imports	-	7.07	-	77.2	-	0.47	1.8	15.55	6.51	69.34
Total debt/GNI (2003)	-	0.29	0.64	0.19	-	0.40	0.48	0.42	0.62	-
ODA received, million US\$ (2003)	1 532.99	1393.44	76.99	942.24	133.07	17.96	466.68	1 068.37	671.9	165.83
Foreign direct investment, net inflows, million US\$ (2003)	-	376	2	3 420	120	12	12	771	171	1 562
Structure of GDP, % of GDP (2003)										
Agriculture	49	22	33	22	11	9	41	23	19	13
Industry	20	26	39	27	41	15	22	23	26	22
Services	31	52	27	51	48	76	38	53	55	65

Sources: See Annex V.

Note:  
<sup>o</sup> (2001-2003).

natural forests in Afghanistan, India, Nepal, Pakistan and Sri Lanka which have lost significant natural forest cover.

Bhutan's rapid economic growth is driven by its developing hydroelectricity capacity, the major revenue earner for the country. While South and South-West Asian countries are, with the exception of Bhutan, most dependent on the services sector in terms of share of GDP, the agricultural sector remains the largest employer. Significant weather events (such as the drought which started in the late 1990s and affected Afghanistan, the Islamic Republic of Iran, and parts of Pakistan and India) have consequently affected overall economic performance through the negative impact on domestic consumption. The significant economic potential of this subregion may, therefore, be limited by persistent water shortages, by damaging economic crops, and by raising the demand for fuel oil to generate electricity.<sup>4</sup>

The cost of environmental degradation to the South and South-West Asian economies is difficult to quantify, but manifests itself in many ways, including the cost of mitigating environmental impact, medical expenses, lost productivity due to disease, lost jobs due to resource depletion, and loss of ecosystem services.

## 9.2 Social development

The South and South-West Asian region has one of the largest and fastest-growing populations of any subregion in the world. Excluding Turkey and the Islamic Republic of Iran, the population in South and South-West Asia has been growing at the rate of 1.8 per cent per annum, putting tremendous pressure on financial resources and the already over-exploited natural resource base.

In contrast to other subregions, population growth continues unabated. The subregion's total population is projected to swell by some 130 million persons between 2005 and 2010. The subregion may well be the epicentre of the global urbanization phenomenon, but despite the rapid growth of its cities, South and South-West Asia is the only subregion projected to remain predominantly

rural in 2030. With the exception of Bhutan, all countries of the region increased agricultural production by 18 to 60 per cent between 1990 and 2002. Already, unsustainable agricultural practices, water scarcity and land degradation have been identified as major threats to the sustainability of the rural sector in most countries.

High poverty rates still characterize much of the subregion, but improvements have been made in all major indicators of human development.<sup>5</sup> Despite these improvements, South and South West Asia has more than 550 million people living below the "dollar a day" poverty line, equivalent to over 35 per cent of the population.<sup>6</sup> As measured by the UNDP Human Poverty Index, Bangladesh and Nepal are the poorest countries in the subregion, followed by Pakistan and India. Afghanistan is also one of the poorest countries in the region, as well as the subregion. With the exception of Bhutan, the average GDP per capita for the subregion is lower than the global average for developing countries.<sup>7</sup> In some countries, gender inequality has exacerbated problems associated with poverty. According to the Gender-related Development Index (GDI), Sri Lanka has a higher ranking by 23 places than India (103<sup>rd</sup>), which is the second highest ranking country in the subregion. Sri Lanka is also 40 places higher than lowest ranking Pakistan (120<sup>th</sup>) (Table 9.2).<sup>8</sup> The subregion has one of the highest rates of maternal mortality in the world.<sup>9</sup> The lack of data for Afghanistan prevents comparison with other subregional countries but the situation of women continues to be particularly inequitable in this country.

Low levels of investment in social services have worsened the effects of poverty. Investments in social services range from 0.6 per cent of GDP in Afghanistan to 6.3 per cent of GDP in Maldives. Public expenditure on education and health in these countries is lower than the expenditure on debt servicing, even though expenditures on debt servicing have fallen in most countries. In the countries where military budgets are known, military spending is also higher than spending on health and education. Underdeveloped urban water, transport and energy infrastructure, have also

imposed high opportunity costs on rural families, causing high health burdens and time losses. The view that economic growth does not necessarily assure a good quality of life has prompted the King of Bhutan to identify 'Gross National Happiness' as a holistic measure of development intended to guide the country's decision-making towards human-centred development in that Himalayan nation.<sup>10</sup>

### 9.3 Environment and sustainable development conditions and trends

The South and South-West Asia subregion faces many sustainable development challenges; a fast-growing population on a limited resource base, rapid urbanization rates, and substantial unmet needs for services and infrastructure for waste management, sanitation, water, energy, transportation, and

Table 9.2 Social indicators: South and South-West Asia

	Afghanistan	Bangladesh	Bhutan	India	Iran (Islamic Republic of)	Maldives	Nepal	Pakistan	Sri Lanka	Turkey	
Population	Total population, thousands (2005 estimate)	29 863	141 822	2 163	1 103 371	69 515	329	27 133	157 935	20 743	73 193
	Population growth, % (2004-2005)	4.1	1.8	2.2	1.5	1.1	1.9	2.2	2.1	1.1	1.3
	Urban population, % of total (2003)	23.3	24.2	8.5	28.3	66.7	28.8	15.0	34.1	21.0	66.3
	Slum population, % of urban (2001)	98.5	84.7	44.1	55.5	44.2	0.0	92.4	73.6	13.6	42.6
Human Development Index (2002)	-	0.51	0.54	0.60	0.73	0.75	0.50	0.50	0.74	0.75	
Primary school enrollment rate, % (2001)	-	86.6	82.8	86.5	96.2	-	-	-	87.9	-	
Population below US\$1 (1993 PPP) per day consumption, % (1995-2000)	-	36 <sup>d</sup>	-	35 <sup>c</sup>	2 <sup>b</sup>	-	39 <sup>a</sup>	13 <sup>b</sup>	8 <sup>d</sup>	2 <sup>d</sup>	
Life expectancy at birth, years (2002)	-	61.1	63	63.7	70.1	67.2	59.6	60.8	72.5	70.4	
Under-five mortality rate, per 1,000 live births (2003)	257	69	85	87	39	72	82	98	15	39	
Population with dietary energy supply below minimum requirement, % (2000-2002)	-	30	-	21	4	-	17	20	22	3	
Access to an improved water source, % of population (2002)	13	75	62	86	93	84	84	90	78	93	
Gender-related Development Index (2002)	-	0.50	-	0.57	0.71	-	0.48	0.47	0.74	0.75	
Digital Access Index (2002)	-	0.18	0.13	0	0.43	0.43	0.19	0.24	0.38	0.48	

Sources: See Annex V.

Note:

- <sup>a</sup> 1995
- <sup>b</sup> 1998
- <sup>c</sup> 1999
- <sup>d</sup> 2000

housing. Meeting these needs will require substantial new flows of investment, raw materials, energy and water. The central role played by agriculture in sustaining the livelihoods of the rural poor magnify the impacts of unsustainable agricultural practices, water scarcity and land degradation. Poor water quality, low water availability per person, high dependence on water use for agriculture and the impacts of climate change implies that many of these countries are among the most vulnerable in the world to long-term water scarcity and climate change. While total forest cover loss has been slowed by afforestation and reforestation, natural forests are rapidly declining, representing a significant loss of natural capital, including a globally-significant loss of biodiversity.

South and South-West Asian countries have all developed a comprehensive range of environmental conservation laws and regulations. In addition, all South and South-West Asian countries have adopted legislation requiring environmental impact assessments (EIAs) for extractive industries such as mining, oil and gas. EIAs are also required for large infrastructure projects. Few countries require them for small and medium-scale industries, or for the construction industry, even though these are often the worst polluters. EIAs as part of the industrial licensing procedure have only recently been initiated in Sri Lanka. Under the subregional South Asian Seas Programme, national contingency plans to combat marine pollution have been prepared by all South Asian governments.

Table 9.3 Environmental indicators: South and South-West Asia

		Afghanistan	Bangladesh	Bhutan	India	Iran (Islamic Republic of)	Maldives	Nepal	Pakistan	Sri Lanka	Turkey
Protected areas, % of land area	2004	0	1	26	5	7	-	17	9	15	4
Forest area, % of land area	1990	2.1	9	64.2	21.4	4.5	3.3	32.7	3.6	35.4	13
	2000	2.1	10.2	64.2	21.6	4.5	3.3	27.3	3.1	30	13.3
Land use, % (2002)	Arable and permanent crops	12	65	4	57	10	40	23	29	30	37
	Permanent pasture	46	5	9	4	27	3	12	6	7	17
Renewable water resources, 2003-2007	m <sup>3</sup> /capita/year	2 608	8 089	40 860	1 754	1 970	91	8 171	1 415	2 602	2 953
Water withdrawal, 1998-2002	m <sup>3</sup> /capita/year	1 014	552	194	615	1 071	-	414	1 130	667	534
Threatened species, number (2004)	Animals	32	73	41	306	68	12	70	70	114	89
	Plants	1	12	7	246	1	0	7	2	280	3
Access to improved sanitation, % of population	1990	-	23	-	12	83	-	12	38	70	84
	2002	8	48	70	30	84	58	27	54	91	83
Energy intensity, energy supply (kg of oil equivalent) per US\$1,000 (PPP) GDP	2002	-	95	-	200	326	-	265	234	126	176

Sources: See Annex V.

### 9.3.1 Energy resources

Increasing populations combined with economic growth have resulted in increased energy consumption across South and South-West Asia. Primary energy consumption (composed of oil, coal, gas, and hydroelectric power, but excluding animal waste, wood and other biomass) increased by 59 per cent over the last decade. Biomass sources are estimated to make up half the total energy needs of the subregion and 80 per cent of residential energy consumption.<sup>11</sup> Electricity consumption per capita has increased dramatically in all countries of the subregion (Table 9.4).

The high dependence of biomass fuels is linked to the depletion of forests, significant across the subregion with the exception of Bhutan, as well as loss of fertile topsoil, flash floods and reduced recharge of groundwater. The burning of biomass for fuel also has serious health consequences due to indoor air pollution caused by noxious emissions. As a result of the traditional division of labour, women and children are more susceptible to indoor air pollution from the burning of biomass fuels, and are prone to much higher mortality rates and respiratory disease.

Table 9.4 Electricity consumption per capita: South and South-West Asia

	kWh	
	1980	2000
Afghanistan	60 <sup>a</sup>	25 <sup>a</sup> (2001)
Bangladesh	16	96
Bhutan	-	-
India	130	355
Iran (Islamic Republic of)	495	1 474
Maldives	-	-
Nepal	11	56
Pakistan	125	352
Sri Lanka	96	293
Turkey	-	-

Source: World Bank (2003). *World Development Indicators 2003* (Washington DC, World Bank).

Note:

<sup>a</sup> UNDP (2004). *Human Development Report 2004* (New York, UNDP).

Coal accounts for about 43 per cent of South Asia's energy consumption, 90 per cent in India. South Asia's oil reserves make up only 0.5 per cent of the world's supply and are found mainly in India and Pakistan, and its proven natural gas reserves comprise about one per cent of the world's reserves. Much of the hydropower development and potential lies in the Himalayan regions of Nepal, Bhutan and Pakistan.<sup>12</sup> Emissions of greenhouse gases (GHGs) linked to global warming are associated with the combustion of fossil and biomass fuels. High levels of poverty in the subregion limit access to fossil fuels, and South and South-West Asian countries have a low level of per capita GHG emissions.

Securing energy supplies to meet the needs of growing populations and growing economies has become increasingly important to these economies, and significant work has been undertaken to improve access of rural populations to energy. India is now one of the world's largest and fastest-growing markets for wind energy. Biogas and solar photovoltaic applications in rural areas have been targeted by government policy and microfinance in India, Nepal and Sri Lanka.

### 9.3.2 Urban environments

In only 10 years (i.e. between 2005 and 2015), some 159 million persons will swell the ranks of urban residents of this subregion. Dhaka, Karachi, Delhi and Mumbai are among the fastest-growing cities in the world. Colombo already houses about half the total population of Sri Lanka and India's urban population grew by five times in the last fifty years. In 1996, the urban population in Bangladesh was 23 million; by 2020, it is projected to increase to 58 million. Projected urban populations for Nepal and Sri Lanka are 7.7 million (up from 2.6 million in 1996) and 8 million respectively, double the 1996 figure.

Meeting waste-management, sanitation, water, transportation, energy and housing needs will require substantial new investment. This is made all the more urgent by the high vulnerability of these countries to environmental health threats as well as the changing climate and weather patterns. Despite

the rapid population growth, the percentage of people living in urban areas is still the lowest among the subregions at 31.2 per cent. However, the percentage of urban population living in slums is the highest, at 57.5 per cent, almost twice as high as other subregions.

In recent years, attempts have been made to tackle sanitation issues in both urban and rural areas. Access to sanitation in urban areas, however, is still the lowest of all subregions, with India home to the most underserved of populations. Access to improved drinking water sources is significantly better, but still low in Afghanistan, Bangladesh and Bhutan (Table 9.5).

Motorcycle ownership is on the rise throughout the subregion (Table 9.6) and two-stroke motorcycle and other vehicle engines are a significant source of urban air pollution. In Kathmandu, banned two-stroke vehicles have been replaced by diesel

powered minibuses and other vehicles. Concentrations of nitrogen and sulphur dioxide in several large cities of the subregion have declined from 1995 to below the annual mean concentration guideline values set by the WHO.<sup>13</sup> More dramatic declines in concentrations of suspended particulate matter and PM10 have been achieved by cities in India such as Kolkata, New Delhi and Mumbai, but average annual PM10 concentrations are still several times more than WHO guideline values (see chapter 2, section 2.6).

Emissions from leaded gasoline continue to pose a health threat in many cities. Tests of children under the age of three in Delhi and Mumbai found that nearly half had unsafe levels of lead.<sup>14</sup> Projects promoting cleaner fuel such as the use of compressed natural gas in Dhaka (Box 9.1) are being considered or implemented in other cities to combat rising air pollution.

Table 9.5 Access to water and sanitation, rural and urban areas: South and South-West Asia, 2002

	% of population with access to improved sanitation			% of population with access to an improved drinking water source		
	Rural	Urban	Total	Rural	Urban	Total
Afghanistan	5	16	7	11	19	13
Bangladesh*	39	75	47	72	82	74
Bhutan	70	65	70	60	86	62
India	18	58	30	82	96	86
Iran (Islamic Republic of)	78	86	83	83	98	93
Maldives**	42	100	59	78	99	84
Nepal	20	68	27	82	93	84
Pakistan	35	92	54	87	95	90
Sri Lanka*	89	98	91	72	99	78
Turkey	62	94	83	87	96	93
Subregion	25	68	39	80	94	85
Subregion excluding India	42	86	58	76	92	82

Source: World Health Organization and United Nations Children's Fund. Water Supply and Sanitation Collaborative Council. Global Water Supply and Sanitation Assessment, 2000 Report, Geneva and New York. Updated data available at <[www.childinfo.org](http://www.childinfo.org)>.

\* Data for 2001

\*\* Data for 2003

Table 9.6 Number of motorcycles: selected countries, South and South-West Asia, 1991-2000

	1991	1995	2000
Bangladesh	-	178 157	246 395
India	14 200 000	20 831 000	31 328 000
Nepal	37 700	71 546	1 147 185
Pakistan	2 068 730 <sup>a</sup>	-	-
Sri Lanka	320 452	480 395	576 424

Source: Clean Air Initiative Asia (CAI Asia) (2003). Clean Air Initiative Asia website, accessed in February 2004 from <[http://www.cleanairnet.org/caiasia/1412\\_channel.html](http://www.cleanairnet.org/caiasia/1412_channel.html)>.

Note: <sup>a</sup> Data for 1990

#### Box 9.1 Clean air initiative in Bangladesh

In Delhi, India, a 1999 Supreme Court Order has resulted in substantial improvements in air quality. Diesel buses have been converted to CNG-fuel use and Delhi now claims to be home to the world's largest fleet of CNG-fuelled vehicles.

Inspired by this action, UNDP in partnership with Rupantarita Prakritik Gas Company Ltd. is bringing hope for cleaner air to the inhabitants of Dhaka, Bangladesh, by promoting the use of compressed natural gas (CNG) as an alternative transportation fuel. The central focus of the US\$1.2 million project is to strengthen the gas company's skill in providing cleaner fuel for the city's fleet of privately owned vehicles.

Recent studies show that auto-rickshaws with two-stroke engines, along with diesel-driven trucks and buses, are responsible for most of the air and noise pollution in Dhaka. The city's 60,000 auto-rickshaws alone emit 25 per cent of the particulate matter and 60 per cent of the toxic and smog-forming hydrocarbons originating from motor vehicles. This level of pollution is a serious health hazard, particularly for the very young and the elderly.

The CNG initiative not only promises to alleviate air pollution, but also supports the national policy of making Bangladesh more energy self-sufficient. Bangladesh has large reserves of natural gas, and compressed natural gas can be made available to domestic consumers at prices significantly lower than imported oil. The goal is to create a win-win scenario as drivers benefit from lower fuel costs and residents enjoy better air quality.

### 9.3.3 Pollution and waste

As South and South-West Asian cities grow and lifestyles and consumption patterns change, the municipal waste generated is increasingly challenging waste collection and processing capacity. In New Delhi and Mumbai, India, more than 1.5 metric tons of garbage are left rotting on the streets or in improperly maintained pits, every day, and waste collection services (both formal and informal) are often not able to keep up with the waste collection needs. In the Pakistani city of Karachi, 30 per cent of the solid waste is collected and disposed of by the Karachi Metropolitan Corporation, the remaining waste is dumped in storm drains, nearby rivers and empty land plots. The Karachi Water and Sewerage Board spends 40 per cent of the municipal budgetary allocation on solid waste. The piles of garbage that clog street drains in South and South-West Asian cities contribute to floods during the rainy season, which seriously jeopardize the health of nearby residents. In most cities, with the notable exception of Lahore, Pakistan, the majority of solid waste is disposed of in open dumps.<sup>15</sup>

While municipal waste continues to be predominantly biodegradable, the proportion of non-biodegradable waste such as polyethylene bags, PET bottles and other plastic waste, is growing. Some solid wastes contain hazardous chemicals from the recycling industry such as lead-acid batteries, waste oil and e-waste.

Throughout much of the subregion, an increase in per capita income and a relatively young population has led to a huge increase in the purchase and, therefore, disposal of electronic appliances. Consequently, the subregion is generating growing quantities of electronic waste or e-waste. The informal e-waste recycling and dumping operations in India and Pakistan are extremely polluting, and a cause for grave concern due to their adverse effects on human health. Particularly dangerous practices include burning plastic wastes, exposure to toxic solders and dumping of acid containing waste into rivers. Biomedical waste can also be found mixed with municipal waste. Even when hazardous waste is collected, it continues to pose a health hazard to people whose livelihood is

earned by the sale of garbage picked out of municipal waste dumps. In addition, leaching of toxic chemicals from landfill sites is a potential source of groundwater contamination.

Another challenge is the long distances between dump sites and the growing metropolises. For expanding cities like Dhaka and Kathmandu, the dump sites have to be moved to increasingly remote locations. This increases fuel costs incurred from transport of municipal solid wastes. The subregion's growing municipal waste problems require innovative strategies to decrease the volume of waste collected and transported outside urban centres. Sri Lanka and Bangladesh have developed innovative waste management initiatives that include turning biodegradable waste into agricultural quality compost, and methane capture from landfills as a source of energy. In India, in an effort to reduce plastic bag waste, central government rules require that plastic bags be a minimum of 20 microns thick and at least 12 inches by 8 inches in size. In Calcutta these restrictions have been tightened, but have been met with resistance from consumers.

#### 9.3.4 Water resources

Poor water quality, low water availability per person, high dependence on water use for agriculture and the impacts of climate change implies that many of these countries are among the most vulnerable to long-term water scarcity in the world.

The contamination and depletion of water resources in South and South-West Asia have far reaching implications for human health and the viability of the agricultural and industrial sectors. Infrastructure for water treatment and regulations concerning water use are inadequate in many parts of the region. Poorly integrated water use policies create severe shortages in some communities, while overuse and waste of water are endemic in adjacent ones. Salinization and depletion of aquifers along with soil salinization and water logging are often the consequences of unsustainable irrigation practices.

Without proper technical and regulatory intervention burgeoning populations will continue to exacerbate these problems. Water resources

availability per capita vary throughout the subregion, with a high 40,860 m<sup>3</sup> per year available per capita in Bhutan and a low 1,754 m<sup>3</sup> per capita in India. In Pakistan, Sri Lanka and Maldives, the depletion of groundwater resources has reached critical levels. Groundwater is often used for irrigation, drinking and domestic purposes, without consideration for aquifer recharge rates. In addition, a large portion of rainwater is lost to the ocean in the form of runoff, and therefore does not recharge the aquifer. The fact that cities such as Dhaka in Bangladesh, along with Quetta, and Lahore, in Pakistan, rely almost entirely on groundwater, underscores the importance of finding alternative water supplies, and establishing sustainable practices for groundwater use. Groundwater depletion has reached grave levels in some cities like Jodhpur and Ahmedabad in Western India and Chennai in Southern India.

Apart from posing a threat to human security, depletion of groundwater has other deleterious effects. Lower water tables can contribute to the leaching of harmful contaminants from the exposed substrata. Due to sub-soil characteristics, groundwater in some areas of South and South-West Asia has endemic high levels of fluoride (India), nitrate (Nepal and India), chromium (Sri Lanka), arsenic (Bangladesh) and iron (Bangladesh and India). The deltaic regions of Bangladesh and India have been severely affected by arsenic contamination in groundwater due to the leaching of arsenic from the soil. In Bangladesh alone, around 35 million people have been exposed to high levels of arsenic in drinking water. A recent study suggests that the country is grappling with the largest "mass poisoning" in history, potentially affecting between 35 and 77 million of the country's 130 million inhabitants.<sup>16,17</sup> Long-term consumption of arsenic-polluted water leads to chronic ailments. The most visible sign of arsenic pollution appears as wart like lesions on the hands, feet and torso. This condition can lead to skin cancer. Enlargement of the liver, kidneys and bladder are less visible, but equally dangerous. The enlarged organs can become cancerous or gangrenous with high mortality rates.<sup>18</sup>

Lack of potable water, toilet facilities and adequate sewage systems are a major problem

facing the subregion's urban populations, especially the poor. With pollution levels in the Ganges River among the highest in the world, it no longer serves as a source of clean water. The same is true for rivers in Nepal's urban areas. Limited access to improved sanitation is the cause of surface and groundwater pollution that along with inadequate wastewater treatment infrastructure, further reduces access to water of adequate quality. Lahore, Pakistan is home to six million people, and does not have a municipal wastewater treatment plant. In Karachi, Pakistan, less than a third of the wastewater is treated, before being discharged into the sea. In India, existing capacity only allows for the treatment of 10 per cent of generated effluents.

One factor in the slow development of water treatment regimes has been the South and South-West Asian notions of purity that consider recycled and treated water to be "unclean." The lack of political will to institute recycling, reuse and treatment plants have also hampered work in this direction.

It is important to note that in some areas, many polluting firms are in compliance with environmental regulations. The continuing high levels of industrial pollutants indicates that the cumulative pollution load is beyond the assimilative capacity of the recipient water bodies. Improving water quality may therefore require strengthening of existing effluent standards. Innovative approaches to financing urban

development to improve wastewater capture and treatment, and improve the quality of life in the city, hold much promise for other cities (Box 9.2).

Leaching of contaminants into groundwater supplies, along with effluent discharge into rivers, lakes and storm water drains, has in many cases rendered freshwater supplies unfit for human consumption. Sources of contamination include domestic sewage and industrial effluents, improperly disposed of garbage, run-off from agriculture and mining activities, and the use of rivers and lakes for bathing. Contaminants include a variety of organic and inorganic pollutants including heavy metals. Discharge of organic water pollution from distilleries, paper manufacturers and tannery operations also contribute to declining water quality. The level of contamination is so great in some areas that eutrophication is a common occurrence in small lakes throughout the region. These contaminants pose major dangers to human health and contribute to the incidence of water-borne diseases such as cholera, typhoid, jaundice and enteric diseases. The Government of Pakistan has instituted a National Integrated Pest Management programme to minimize the use of pesticides to reduce the risks to health.

As described in chapter 2, evidence of decrease in snow cover and retreat of glaciers due to global warming has been reported from various parts of the Hindu-Kush-Himalayan region.<sup>19</sup> The glaciers

#### Box 9.2 Wastewater capture and treatment using the build-operate-transfer model

The city of Coimbatore in Tamil Nadu, India has found an innovative solution to simultaneously address the need for open space for recreation, and the need for wastewater treatment. The city had very few open spaces for recreation, while release of untreated wastewater had degraded most of the city's water bodies. In an attempt to address these problems, the Municipal Corporation decided to invite private participation to establish the city's lake as a natural drainage channel and a water harvesting structure. The Municipal Corporation also showed interest in developing the lake as a tourist spot. Through a combination of conservation and recreational activities, they transformed the location from a heavily polluted water body to a clean public area.

The conservation component included treatment for wastewater, removing litter, silting and weeds. This resulted in an improvement in water quality. Investments were also made in recreational facilities such as a boathouse, a restaurant, and a play area for children. The cost of construction for the children's play area and the boathouse was totally funded by a contractor. In exchange the contractor was licensed to operate 38 pedal boats, three mechanized boats and six row boats. The result of the project is a highly popular recreational area for local residents.

Source: Good Governance India, Bi-monthly Magazine on Public Services, Development & Administration, Vol. 2. Jan-Feb 2004, pp 64.

that feed the Ganges, Indus, Brahmaputra, Mekong, Thanwin, Yangtze and Yellow rivers are likely to experience significant changes in hydrological flows with a period of accelerated melt and a likely increased frequency of glacial lake outbursts,<sup>20</sup> and increased river flows followed by reduced flows as the glaciers retreat signalling a long term depletion of the affected river systems. The countries likely to be most affected in South and South-West Asia are India, Bangladesh, Bhutan and Nepal, with significant impacts expected in only a few decades.

Where land degradation coincides with water scarcity and poor water quality, the effects on rural communities are devastating. Multi-year drought that started in the late 1990s has destroyed livelihoods in Afghanistan, Islamic Republic of Iran and Pakistan and caused significant cross-border population displacements.

### 9.3.5 Land resources

Despite the rapid growth of its cities, South and South-West Asia is the only subregion projected to remain predominantly rural in 2030. The subregion's progress in meeting the massive food requirements

of the burgeoning population has been predicated on the intensification of agriculture, and its expansion to marginal lands. Unsustainable agricultural practices include the deployment of extensive and inefficient irrigation systems (Table 9.7).

Pakistan, Sri Lanka and Bangladesh have steadily intensified the use of agro-chemicals.<sup>21</sup> Agriculture and deforestation are the most frequently cited causes of land degradation. A comparison of South and South-West Asian countries shows that Afghanistan, Pakistan and India suffer most from land degradation and desertification. In India, a total of about 175 million hectares are considered degraded, of which about 141 million hectares are subject to water and wind erosion and another 34 million hectares are degraded through water logging and salinity.<sup>22</sup> In Bangladesh, an area of 1.3 million hectares is affected by soil salinity. An estimated 1.2 million hectares of land in Pakistan is eroded, while salt-affected lands cover an area of 10-12 million hectares. As a result, average yields of wheat, rice, cotton and sugarcane have decreased by between 50 and 75 per cent.<sup>23</sup>

Soil erosion has led to high sediment loads in rivers. This sediment settles behind dams, reducing their capacity to retain water, control floods and generate electricity. In Pakistan the average sediment loads at Tarbela and Mangla Dams are 316 and 144 million metric tons per year, respectively. Some 3,831 million metric tons of soil enter the Indus River Basin annually. The Indus River carries the fifth-largest sediment load in the world, estimated over the whole basin of 16 million hectares at 4.5 metric tons of silt per hectare.<sup>24</sup>

### 9.3.6 Forests and biodiversity

Loss of forest cover is a major concern for most countries of the subregion, but especially for India, Nepal, Pakistan and Sri Lanka (Table 9.8). Although not reflected by the data presented, Afghanistan continues to suffer from deforestation processes that accelerated during the years of conflict. Forests are subject to high levels of exploitation both as a basis for rural livelihoods and subsistence, and as a basis for trade, with India as a substantial trading partner in wood (Figure 9.1) and non-wood forest products.

Table 9.7 Agricultural land use in South Asian countries

	Arable land % of land area (2000)	Permanent crop land % of land area (2000)	Irrigated land, % of cropland, (1998-2000)
Afghanistan	12	0.2	6.0
Bangladesh	62	2.7	47.6
Bhutan	-	-	-
India	54	2.7	32.2
Maldives	-	-	-
Nepal	20	0.5	38.2
Pakistan	28	0.9	81.7
Sri Lanka	14	15.8	34.7
South Asia weighted average (excluding Afghanistan)	51	2.7	38.9

Source: The Mahbub Ul Haq human Development Centre (2003). *Human Development in South Asia 2003* (New York, UNDP).

Natural forests are rapidly declining in India and Pakistan which lost up to one third of their natural forests during 1990-2000, and in Sri Lanka which lost almost 20 per cent, representing a substantial loss of natural capital, including a globally significant loss in biodiversity. Total forest cover loss has however been slowed by the rapid expansion of plantation forests in most countries except Sri Lanka and the Maldives. More recent data show that Sri Lanka's rapid loss of natural forest continues.<sup>25</sup> According to one estimate, if absolute annual losses continue at the current rates, the forests of Pakistan will be lost by 2015.<sup>26</sup>

Forest cover losses in other countries such as India have been slowed or reversed by afforestation and reforestation. In India, forest cover (including both natural and plantation forests) increased marginally between 1990 and 2000, though falling well below the National Forest Policy target of 33.3 per cent. An increase in forest cover was also observed in the Islamic Republic of Iran.

Of Conservation International's 25 "biodiversity hotspots", nine are found in South and South-West Asia. These include the Eastern

Himalayas, the Western Ghats in India, mangroves in Bangladesh, untouched forests of Bhutan, the coral reefs of Maldives, the wet tropical southwestern zone of Sri Lanka (Sinharaja), the Hindu-Kush region of Pakistan, Mt. Everest in Nepal and the Indo-Burma region, covering part of Nepal, far Eastern India and parts of South-East Asia.

The subregion also boasts abundant and diverse wetlands. These include floodplains, marshes, estuaries, lagoons, tidal mudflats, reservoirs, rice paddies, marshes and swamps. Wetlands cover an area of up to 134,161 km<sup>2</sup> in South and South-West Asia. Ten of these areas have been designated as Ramsar sites of international importance as waterfowl habitats. The subregion's biodiversity includes a wide variety of species with anthropogenic uses, such as timber trees, crops, medicinal plants and natural dyes.

Habitats, and by consequence, biodiversity are under increasing population pressures, and illegal activity. The Western Ghats and Sri Lanka have been dramatically impacted by the demands for timber and agricultural land, with the original area covered by this hotspot reduced by over 93 per cent.<sup>27</sup>

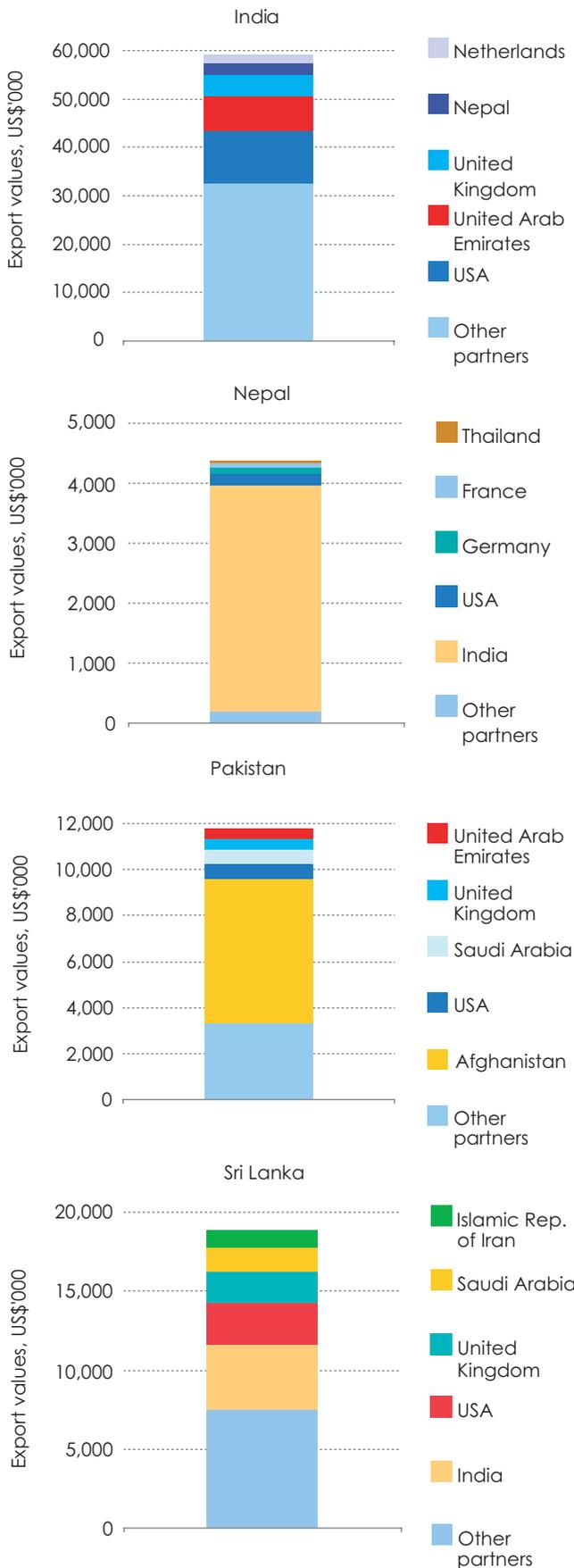
Table 9.8 Forest area change: South and South-West Asia, 1990 to 2000

	Total forest area change, thousands of hectares	% change	Change as a % of land area	Plantation forest change, %	Natural forest change, %
Afghanistan	0	0.0	0.0	-	-
Bangladesh	165	14.1	1.3	54.7	-7.32
Bhutan	0	0.0	0.0	59.7	-0.26
India	381	0.6	0.1	86.3	-31.81
Iran (Islamic Republic of)	0	0.0	0.0	38.2	-11.18
Maldives	0	0.0	0.0	-	-
Nepal	-783	-16.7	-5.5	66.3	-18.16
Pakistan	-394	-14.3	-0.5	44.1	-33.44
Sri Lanka	-348	-15.2	-5.4	15.8	-19.41
Turkey	220	2.2	0.3	-	-
Total South and South-West Asia	-759	-0.8	-0.1	-	-

Source: Based on data from FAO (2001). *Global Forest Resources Assessment 2000* (Rome, FAO).

Notes: FAO's more recent estimates of global forest resources (FAO (2006). *Global Forest Resources Assessment 2005* (Rome, FAO)) "are revised to take into account new and better information provided to the FRA 2005 [Global Forest Resources Assessment 2005], and are about 3 per cent higher than those estimated in FRA 2000." See the FAO website, accessed on 6 March 2006 from <[www.fao.org/forestry/fra2005](http://www.fao.org/forestry/fra2005)>.

Figure 9.1 Wood product exports – major trading partners, India, Nepal, Pakistan and Sri Lanka, 2003



The rich natural ecosystems of the Sundarbans mangrove forest prompted UNESCO to declare it a world heritage site in 1997. There is considerable population pressure in the swamps in both India and Bangladesh, and upstream diversion of water is increasing salinity and water-flows to this swamp. Weak enforcement of conservation laws have caused a fall in Bengal tiger numbers. Increased efforts to halt poaching have given tigers a reprieve from extinction; tiger numbers have risen to about 400 after a drop to 362 reported in 1993;<sup>28</sup> this reprieve may yet prove short-lived without sustained vigilance.

The ratio of protected lands to the surface area in Afghanistan, Bangladesh, India and Turkey fall well below the 10 per cent recommended by the IUCN. There is an immediate need to expand protected areas in these countries, while striving to maintain a balance between economic, population and environmental pressures.

### 9.3.7 Coastal and marine resources

The marine environment is also affected by increasing industrialization and population growth. Untreated effluents from industries and urban centres have contaminated large areas of the Indian Ocean and the Bay of Bengal. An estimated 1,800 metric tons of pesticides enter the Bay of Bengal annually, severely damaging fish and mollusc species.

Further environmental pressure is exerted by the approximately five million metric tons of oil deposited in the Arabian Sea each year, and the 400,000 metric tons deposited in the Bay of Bengal.<sup>29</sup> The subregion is particularly vulnerable to oil spills because one quarter of the world's sea borne oil trade passes through the subregion with many tankers travelling unregulated routes. Another factor adding to the risk of disaster related to oil spills is the subregion's high levels of oil consumption and the large proportion of oil tankers in port traffic. With the exception of India, the South and South-West Asian countries do not have the capability to deal effectively with spills of more than 100 metric tons

Source: UN Commodity Trade Statistics Database (COMTRADE), downloaded on 10 November 2005 from <<http://unstats.un.org/unsd/comtrade/>>.

in sheltered waters. A summary of the major tanker spills occurring in the South and South-West Asian seas region is given in table 9.9.

South and South-West Asia is home to around 14 per cent of the world's remaining mangroves, mostly along the coasts of Pakistan, Sri Lanka and Bangladesh. The forests are severely threatened, particularly in Pakistan and Sri Lanka, but are expanding in Bangladesh (Table 9.10). The subregion also has a very high per cent of threatened wetlands, 82 per cent of which are in Bangladesh.

Table 9.10 Mangrove area, selected South-Asian countries

	1996	2000
	(hectares)	
Bangladesh	622 487	622 600
India	487 000	479 000
Pakistan	207 000	176 000
Sri Lanka	8 688	7 600

FAO (2003). *State of the World's Forests* (Rome, FAO).

Table 9.9 Major tanker spills in the South and South-West Asian Seas Region, 1974-2003

Name of vessel	Quantity (metric tons)	Type	Country	Year	Cause
Tasman Spirit	30 000	Crude	Pakistan	2003	Grounding
Cretan Star	29 000	Crude	India	1976	Hull Failure
Cherry Vinstra	16 000	Crude	India	1974	Hull Defect
Aviles	11 000	White product	India	1979	Fire/Explosion
Transhuron	5 200	Crude	India, Laccadives	1974	Grounding

Source: International Tanker Owners Pollution Federation (2004). *Regional Profiles: A summary of the Risk of Oil Spills & State of Preparedness in UNEP Regional Seas* (London, International Tanker Owners Pollution Federation).

Sea grass beds, coral reefs, and associated mangrove swamps have also been degraded. Unsustainable fishing activities in Maldives and Sri Lanka have resulted in the decline of sea cucumbers and lobsters. Coastal development for tourism has also adversely affected coastal ecosystems.

### 9.3.8 Impacts of disasters

The topography and monsoonal weather patterns of the subregion makes the South and South-West Asian countries prone to natural disasters. Vulnerability is often exacerbated by environmental degradation; landslides, droughts and urban flooding are made more severe because of human activities. In addition, growing populations leave no choice but to settle in disaster prone areas. The poor are the most vulnerable to disasters.

Table 9.11 indicates that many cities lack basic hazard mapping in preparation for natural disasters. Most cities also lack long-term strategic planning for disaster mitigation and response. The few cities in the subregion that have made plans for

disaster preparedness have not made sustainable development an integral part of these plans.

In the last five years, devastating floods inundated 66 per cent of Bangladesh, affecting 30 million people. As many as 80 million people are vulnerable to flooding each year in Bangladesh. India also suffers from floods with about 40 million hectares prone to flooding each year. Economic losses ranging from US\$240 million to US\$1.5 billion have been recorded; the widespread human suffering that often follows floods is not valued in monetary terms. Flash floods caused by bursts of heavy rainfall and dam failures are experienced in the hilly areas.

Earthquakes on the Indian sub-continent also result in devastating disasters such as the one that struck Bhuj in Gujarat (India) on 26 January 2001. Much of the rest of the subregion is also prone to earthquakes. An earthquake in Bam, Islamic Republic of Iran on 26 December 2003 killed close to 40,000 people, and the death toll from Pakistan's earthquake of October 2005 was over 79,000 persons, with additional deaths from exposure to the elements in

subsequent winter months. The National Disaster Management Authority of Pakistan was established in the wake of this disaster. Sri Lanka's coastal communities were devastated by the 26 December 2004 tsunami.

The dramatic impact of floods, earthquakes and the rare tsunami gains the most attention, but drought affecting several parts of India, Afghanistan, Pakistan and Islamic Republic of Iran has been responsible for the majority of persons affected by natural disaster, and has negatively impacted food security in several areas.

#### 9.4 Subregional cooperation

##### *The South Asia Co-operative Environment Programme (SACEP)*

The South Asia Co-operative Environment Programme (SACEP) encompasses Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. It was established in 1982 under the aegis of the United Nations, and its activities focus on conservation and sustainable use of biological diversity, ecosystem management, information gathering and environmental risk

Table 9.11 Urban disaster preparedness and environmental planning in selected South and South-West Asian cities

Country	City	Disaster prevention and mitigation measures*			Local environmental planning**		
		A	B	C	A	B	C
Bangladesh	Dhaka	Yes	Yes	No	Yes	Yes	Yes
	Chittagong	Yes	Yes	No	Yes	Yes	Yes
	Sylhet	Yes	Yes	No	Yes	Yes	Yes
	Tangail	Yes	Yes	No	Yes	Yes	No
India	Alwar	No	No	No	No	No	No
	Delhi	No	No	No	No	No	No
	Chennai	Yes	No	No	Yes	No	Yes
	Bangalore	Yes	Yes	No	Yes	No	Yes
	Mysore	Yes	No	No	No	No	No
Nepal	Pokhara	Yes	Yes	No	Yes	No	Yes
	Butwal	No	Yes	No	Yes	Yes	No
Pakistan	Karachi	Yes	No	No	No	No	No
	Lahore	Yes	No	No	No	No	No
Sri Lanka	Colombo	Yes	No	Yes	Yes	Yes	Yes
Turkey	Ankara	Yes	Yes	No	No	Yes	No

Source: UN-HABITAT (2002). Global Urban Indicators Database 2 (1998 data) <[www.unhabitat.org/programmes/guo/urban\\_indicators.asp](http://www.unhabitat.org/programmes/guo/urban_indicators.asp)>.

\* Responses (Yes/No) to the following questions: In the city, are there: A) building codes? B) hazard mapping? C) natural disaster insurance for public and private buildings.

\*\* Responses (Yes/No) to the following questions: A) Has the city established a long-term strategic planning initiative for sustainable development, involving key partners? B) Is this process institutionalized and/or has there been any legislative change to support cities to engage in sustainable development planning processes? C) Is the city implementing local environmental action plans involving key partners?

assessment; modalities include capacity-building, institution strengthening, education and awareness raising. SACEP has initiated a number of projects which are aimed at building national capacity to manage environmental issues, such as the project to strengthen legal frameworks at the national level and to promote public-private sector cooperation.

One such project, the 1998 *Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia*, opened the way for serious work on subregional air quality issues. Phase I has already been completed and consisted of baseline studies and drawing up national action plans. Phase II is in progress and entails putting expertise and monitoring equipment in place. Phase III is expected to provide meaningful information to policymakers and strengthen the Malé Declaration (see below).

In addition to the Malé programme, SACEP has implemented the *Regional Seas Programme*, one of the few major transboundary environmental programmes covering the South Asia subregion. Under this programme, a South and South-West Asian Seas Action Plan was prepared along with national and regional overviews and action plans. The implementation activities relate to integrated coastal zone management; development of national and regional oil and chemical contingency plans; and protection of the marine environment from the impacts of land-based activities. The *Regional Oil and Chemical Marine Pollution Contingency Plan* was accepted by Member States in the form of a Memorandum of Understanding, pending the adoption of a Regional Plan.

### *South Asian Association for Regional Cooperation (SAARC)*

SAARC was established in 1983, and its Charter formally adopted in 1985 by the Heads of State of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. With its headquarters in Kathmandu, SAARC provides a platform for the peoples of South Asia to work together “in a spirit of friendship, trust and understanding.”<sup>30</sup> SAARC focuses on economic cooperation, but also covers many aspects of regional

cooperation, including the environment. The SAARC committee on environment was set up in 1992. In 1997, SAARC environment ministers agreed to an Environment Action Plan and a common SAARC position on climate change.<sup>31</sup> In the more recent Islamabad Declaration<sup>32</sup> of January 2004, the Heads of State agreed to “undertake and reinforce regional cooperation for the conservation of ... water resources and environment, pollution prevention, control of, as well as ... preparedness to deal with natural calamities.” They also expressed strong support for the “early and effective implementation of the SAARC Environment Action Plan” and the preparation of a SAARC state of environment report, as well as the commissioning of the work on drafting a Regional Environment Treaty.

### *Global Water Partnership South Asia and Country Water Partnerships*

The South Asia Chapter of the Global Water Partnership (GWP-SAS) is a stakeholder forum with members from several countries of South and South-West Asia. It works as a regional body to influence laws, policies and programmes in member countries with a focus on addressing environmental issues relating to water. The Vision and Framework for Action (SASTAC, 2000) documents, outline major environmental issues faced by the subregion and call for action. A number of country level water partnerships also operate with their own Vision and Framework for Action documents.

### *Bilateral Agreements and Arrangements*

A number of bilateral agreements address transboundary environmental issues. Most of these agreements deal with water resources and include the Indus Water Treaty, the Indus Commission of India and Pakistan and a water sharing commission between India and Bangladesh. In addition, the *Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia* is an intergovernmental agreement to tackle regional air pollution problems. The declaration was made in 1998 at a meeting of the SACEP Governing Council.

## 9.5 Conclusion

The subregion has a well-established environmental cooperation programme and each country has its own substantial legislative basis for environmental protection. Several bilateral agreements address transboundary environmental issues. However, the environmental carrying capacity of the South and South-Western subregion continues to be eroded by high, and fast-growing environmental pressures related to population growth and urbanization. Action to create economic incentives for the protection of the natural resource base to ensure the continued flow of environmental goods and services is perhaps the most urgent in this subregion, of all subregions in Asia and the Pacific. In this subregion, this necessarily includes ensuring equity of access to natural resources, between and within countries.

One of the most important areas in which more environmentally sustainable growth patterns should be developed is in meeting food security requirements and in alleviating rural poverty. There is a wide range of challenges that have to be overcome before such goals can be achieved. These would require reforming the trade and market sectors, diversifying of agriculture, establishing proper coordination between farms, manufacturing units and consumers, in addition to strong support for sustainable agricultural practices and drought mitigation policy.

At the same time, a greater focus on reducing future environmental pressures, including the demand for energy and water, through urban planning and infrastructure development are needed. The current underdeveloped infrastructure and unmet needs, rather than being viewed as a disadvantage, could be turned into an opportunity to create new, more environmentally sustainable economic growth patterns based on traditional and cultural values that maximize human welfare and well-being while, at the same time, minimizing environmental pressure.

## End notes

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- 6 UNDP (2002), *ibid.*
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- 20 Glacial lakes are formed when debris covered glaciers retreat, leaving closed water bodies dammed by debris that are fragile to basin erosion and seismic tremors. In 2002, a study by UNEP and the International Centre for Integrated Mountain Development found that 24 glacial lakes in Bhutan could burst their natural enclosures.
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<sup>31</sup> SAARC (1997). “Malé Declaration of SAARC Environment Ministers”, Annex XIII of the report of the October 1997 SAARC Environment Ministers’ Conference Report (Malé, SAARC).

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