



CHAPTER 10:

South-East Asia

- 10.1 The economy
- 10.2 Social development
- 10.3 Environment and sustainable development conditions and trends
 - 10.3.1 Cleaner production and sustainable energy
 - 10.3.2 Urban environments
 - 10.3.3 Forests and biodiversity
 - 10.3.4 Coastal and marine resources
 - 10.3.5 Impacts of natural disasters
- 10.4 Subregional cooperation
- 10.5 Conclusion

The South-East Asian subregion comprises the ten member countries of the Association of Southeast Asian Nations (ASEAN), together with the newly independent country of Timor-Leste. These are now some of the most dynamic economies in the region, despite the impact of the 1997 financial crisis. Key sources of environmental pressure include a relatively high level of industrial activity based on natural resource exploitation and rising consumption. The expanding tourism sector and related infrastructure are also a driving force in changing land use, particularly in coastal areas. Access to improved water and sanitation, as well as the issues of transportation and related air pollution, and of solid waste management, are all urgent challenges, while hunger still affects a significant proportion of South-East Asian populations.

South-East Asia's societies are changing as dynamically as their economies. The total urban population is expected to grow by more than one third in the next 10 years. South-East Asia has experienced the fastest growth rates in per capita energy use in the region. The value of exports of agricultural products from South-East Asia has grown by more than 50 per cent over the past decade, a growth largely achieved by massive agricultural intensification. All of the countries in the subregion are experiencing land degradation from improper agro-chemical use, which also affects farmer health and water quality. Periodic transboundary haze events, in part related to oil palm planting activity still continue. Illegal forest resource exploitation, including illegal logging, encroachment for development, and conversion to agriculture, continues to be a problem. Natural forest losses have accelerated dramatically recently and the subregion is also recognized as a hotspot for illegal trade in biodiversity. After North-East Asia, the subregion is one of the most important producers of aquaculture products in the world, the production of which are associated with land degradation, soil and water contamination from antibiotics and loss of mangrove forests. Overfishing has led to a reduction in fish stocks in many waters. Mangrove forests and coral reefs, which are essential breeding grounds for marine fish stocks, have suffered globally-significant losses. The distinction between natural and human-made disasters is becoming increasingly difficult to make in South-East Asia, as the loss of protective natural features increases vulnerability to natural disaster (as shown by the December 2004 tsunami).

Transboundary environmental issues such as haze pollution, the development of the Mekong River basin, crossborder deforestation, wildlife trade and the exploitation of coastal and marine resources require joint action by countries. ASEAN's frameworks for environmental cooperation fulfill this function. These initiatives enjoy a high degree of political support. Subregional cooperation has resulted in some positive initiatives, including several legal instruments and policy statements. In order to improve the long-term outlook for South-East Asia, more effective action at the national level to address the root causes of environmental pressures and to change the patterns of growth that are becoming increasingly environmentally unsustainable, particularly with respect to the environmental impact of rapidly rising consumption, will be necessary to improve the long-term outlook for South-East Asia.

10.1 The economy

South-East Asia is home to some of the most dynamic economies in Asia and the Pacific region. Malaysia, Singapore and Thailand have shown the fastest sustained growth in recent years, based on significant inflows of foreign direct investment (FDI) which are reviving as the South-East Asian potential as a consumer market grows. While Singapore is aggressively building a knowledge-based society, other countries are transforming from largely agriculture-based economies into powerhouses of the information and communication technology and both heavy and light industry. At the same time, intensification of agricultural production and increased focus on cash-crop production and agricultural commodities, such as rubber and palm oil, are driving agricultural exports. The transportation, tourism and financial sectors that support the increase in production and economic growth, are themselves rapidly asserting their importance as income earners.

Four of the eleven countries of this subregion are classified as least developed countries (LDCs). They are Cambodia, Lao People's Democratic Republic, Myanmar and Timor-Leste. These countries are severely constrained by limited human resources, institutional capacity and financial resources, but their economies are all among the fastest-growing in the region. Timor-Leste faces the additional challenges of building a new nation in a post-conflict situation (Box 10.1). Recovery from the 1997 financial crisis has been strong but is under threat of rising oil prices. The high fiscal burden of oil subsidies required many countries to start phasing them out; individual country policy responses to rising oil prices influenced the magnitude of their fiscal deficit, inflationary pressures and consumer demand in 2005. In July 2005, Thailand became the first South-East Asian economy to eliminate subsidies on petroleum products, combining this policy intervention with an economic stimulus package to achieve an overall neutral budget impact.¹

Total debt in the subregion has continued to increase, following a stagnant period during the beginning of the new millennium. Some South-East

Asian countries still receive substantial ODA (Table 10.1); Japan has been the largest donor, but countries such as Thailand are also significant ODA providers.

South-East Asia is well known for its production of environmentally-sensitive commodities such as timber. The subregion has been the main exporter of forestry products, accounting for 50 per cent of the total exports from Asia and the Pacific. In 2001, exports totalled over US\$9 billion.² Production related to paper and paper-board manufacturing has been expanding throughout the subregion. Indonesia and the Philippines have recently expanded their hydrocarbon exports. The fossil fuel industry has traditionally contributed to a sizeable portion of GDP in Brunei Darussalam and Indonesia. With the exception of Myanmar and Viet Nam, most South-East Asian countries export most of their fossil fuel production.

The value of agricultural exports has grown by more than 50 per cent over the past decade, with Indonesia, Malaysia and Thailand becoming the main exporters. Land resources have been further pressured by agricultural production. The area of arable and permanent cropland increased by some eight per cent between 1992 and 2002, with the most important increases occurring in Indonesia, Lao People's Democratic Republic and Viet Nam.³ Palm oil has become the basis of a highly profitable chemical production industry in Malaysia, while rubber production has transformed agricultural landscapes in the south of Thailand. In addition to being significant producers of forest and agricultural products, South-East Asia has become the second largest exporter and consumer of fish products. Total fish catch grew in all countries in the subregion, spearheaded by growth in Indonesia (Figure 10.1). The region has been engaged in significant aquaculture production and export, with the fastest growth in Lao People's Democratic Republic, Myanmar and Viet Nam (Figure 10.2). Fish species of lower value have mostly been consumed locally, while higher-valued species have generally been produced for export markets. While Indonesia is the largest producer overall, Thailand is by far the largest exporter in terms of volume and value.

Table 10.1 Economic indicators: South-East Asia

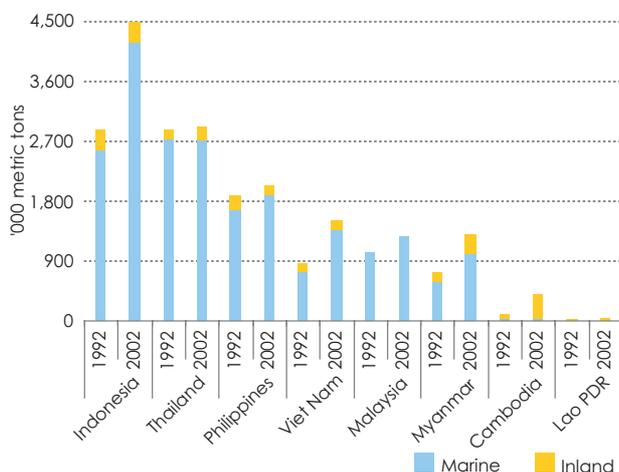
		Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Timor-Leste	Viet Nam
GDP growth rate, % per annum (1999-2003)		2.9	5.8	4.5	5.7	4.6	12.7	3.8	3.0	4.8	7.3	7.0
GNI per capita, US\$ (2003)		20 361	245	902	349	3 984	1 173	1 081	21 383	2 224	474	400
Consumer Price Index change, % per annum (1999-2003)		-0.05	0.75	8.36	-	1.46	26.93	4.10	0.60	1.41	-	1.31
Unemployment rate, %(2003)		-	3.5	9.1	-	3.6	-	11.4	4.7	2.2	-	5.8
Merchandise Trade, billion US\$ (2003)	Exports	4.14	2	61.06	0.4	104.97	2.48	36.23	144.19	80.33	-	20
	Imports	1.24	2	32.55	0.5	82.74	2.09	39.54	127.94	75.8	-	25
Total debt/GNI (2003)		-	0.86	0.68	0.70	0.50	-	0.66	1.91	0.37	-	0.43
ODA received, million US\$ (2003)		0.47	508.04	1 743.49	298.63	109.14	125.82	737.23	7.14	966.25	151	1 768.58
Foreign direct investment, net inflows, million US\$ (2003)		-	77	-597	20	1 104	128	150	5 625	1 466	-	1 222
Structure of GDP, % of GDP (2003) ^a	Agriculture	3.4	34	17	49	10	52	14	0	10	25	22
	Industry	45	30	44	26	49	14	32	35	44	26	40
	Services	51.6	36	40	25	42	35	53	65	46	49	38

Sources: See Annex V.

Notes:

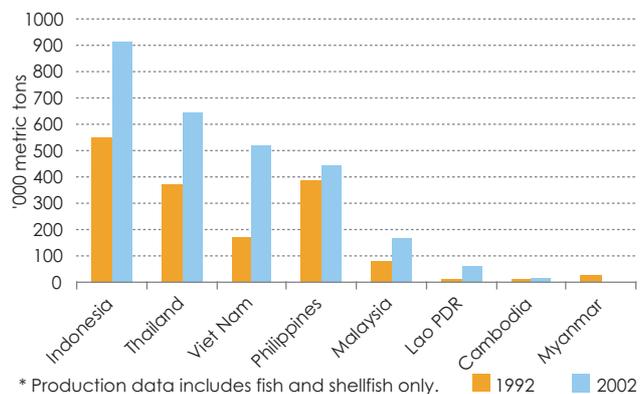
^a Data for Brunei Darussalam for 2002, provided by the Environment Unit, Ministry of Development, Brunei Darussalam.

Figure 10. 1 Total production of marine and inland capture fisheries, South-East Asia



Source: FAO (2004). Selected Indicators of Food and Agriculture Development in Asia-Pacific Region: 1993-2003 (Bangkok, FAO Regional Office for Asia and the Pacific).

Figure 10. 2 Aquaculture production, South-East Asia*



* Production data includes fish and shellfish only.

Source: FAO (2004). Selected Indicators of Food and Agriculture Development in Asia-Pacific Region: 1993-2003 (Bangkok, FAO Regional Office for Asia and the Pacific).

Box 10.1 Sustainable development challenges for newly-independent countries: the case of Timor-Leste

Timor-Leste gained its independence on 20 May 2002, became the 191st member state of the United Nations on 27 September 2002, and a member of the United Nations Economic and Social Commission for Asia and the Pacific on 25 April 2003. A poor country with a fragile economic base, Timor-Leste's economy was shaped by both the Portuguese administration, when income came mainly from plantations, and the Indonesian administration, when the economy underwent a structural change – relying less on agriculture and expanding into urban-based services. The outbreak of violence on 30 August 1999 further impoverished the country, causing enormous human suffering, forcing more than half of the population to leave their homes and cutting deep into the country's economic and social infrastructure. Around 80 per cent of schools and clinics were destroyed; agriculture was disrupted, and a significant proportion of livestock was lost. Approximately 58 per cent of goats, 48 per cent of cattle, and 47 per cent of pigs were killed. In addition, one third of the capital's electricity-generating capacity and 50 to 90 per cent of the districts capacity were lost. Most of the 12,000 telephone landlines were damaged, markets collapsed and severe shortages of transportation ensued. Loss of government archives and documentation combined with looting and destruction of the regional office of the central bank and other banks, further compounded the situation.

On 25 October 1999, the United Nations Security Council established the United Nations Transitional Administration in East Timor (UNTAET) with a budget of US\$700 million per year. In December 1999, donors meeting in Tokyo pledged a total of US\$523 million for three years to rebuild Timor-Leste. The restoration of law and order, and the provision of external resources helped stimulate an economic revival.

Economic activity: The agricultural sector employs almost three-quarters of the workforce and covers upland corn growers, wetland rice growers, and coffee growers. Coffee is the most economically significant cash and export crop. There is little manufacturing, accounting for a mere 3.5 per cent of GDP, most of which is generated by small-scale activities. Some 4,000 enterprises employ around 10,000 people in weaving traditional cloth (tais) and making furniture. The larger and more productive enterprises are those related to coffee processing and sandalwood. The tourism sector faces a number of obstacles including lack of suitable accommodation, lack of skilled people to operate tourist facilities, and a general weakness in infrastructure, including water supply, sewerage, and international air links.

Natural resources: There is a sizeable fishery potential with many valuable species, including tuna, skipjack, snapper and prawns. Harvest rates are estimated at less than one per cent of the potential output. Around 10,000 families depend on fishing. In the past, considerable income came from forestry, but widespread clearing of land for cultivation, or for rearing of livestock, has reduced most of the former territory to scrub and grasslands. Large deposits of oil and gas are found offshore between Timor-Leste and Australia. Two decades after 2004, oil and gas revenues are expected to generate around US\$7 billion.

Geographical setting and ecology: Timor-Leste occupies the eastern end of the island of Timor, the enclave of Oecussi, and the islands of Atauro and Jaco. The Ramelau mountain range occupies the central part of the country, giving much of the land a steep slope. Timor-Leste has six types of zones: marine and coastal zone, arid lowland areas (the northern coast), moist lowland areas (the southern coast), mountainous areas, high-land plains, and urban areas. Information on biodiversity and terrestrial ecosystems is very scarce. The land area is composed of 207,654 hectares of dense forest; 246,196 hectares of sparse forest; and 816,796 hectares with no forest cover. Marine and coastal ecosystems are typical of the tropical western Pacific Ocean and similar to those of the tropical Indian Ocean to the west. The highest biodiversity is observed in the coral reefs. Mangrove forests appear relatively intact. However, the region is home to several endangered species including turtles, sea cucumbers, and giant clams.

Social development: Some 41 per cent of the population lives below the national poverty line of US\$0.55 per person per day. Forty-six per cent of the population in rural areas and 26 per cent in the urban areas officially live in poverty. The poorest are in households that have many children, those that have small landholdings and little livestock, and those that live in areas that are prone to flooding and soil erosion. With the population growing at around 2.5 per cent annually, around 20,000 young people join the labour force each year, most seeking livelihoods in agriculture and in the informal economy. Poverty particularly affects women who bear the brunt of the impact of polluted water and poor sanitation, and have to spend time looking after children and other family members. Women have less economic and social power, and gender-based violence is a serious and under-reported issue. Food security, health and education remain critical challenges. Most households are engaged in subsistence agriculture. Productivity is low and basic foods are imported. Around 45 per cent of children under five are underweight. Standards of health are low: overall life expectancy is only 57 years. Many people die of malaria and diarrhoea. Maternal mortality is high - some 420 women die for every 100,000 live births. Education is grossly inadequate and more than half of the population is illiterate.

(continued on page 284)

Box 10.1 (continued)

Challenges for sustainable development: Many difficult challenges face the country. These include the following: (a) establishing a competent, transparent, lean and cost-effective government that is aligned with the country's absorptive capacity; (b) maintaining a good economic and regulatory environment conducive to efficient private sector activities; (c) strengthening traditional agriculture by using appropriate technology inputs to increase crop yields; (d) providing adequate access to rural banking and microcredit facilities to serve as a sound basis for sustained economic growth and poverty alleviation through export-oriented primary activities; (e) actively engaging in trade to attain sustained economic growth to fight unemployment and poverty effectively; and (f) attaining robust economic growth without further damaging its environment.

Sources: United Nations Development Programme (2002). *East Timor Human Development Report 2002* (Tokyo, UNDP).
United Nations Development Programme (2001). *Final Report: Assessing Environmental Needs and Priorities in East Timor* (Dili, UNDP).
ESCAP (2003). *Economic and Social Survey of Asia and the Pacific 2003* (Bangkok, ESCAP).

10.2 Social development

South-East Asia's societies are changing almost as dynamically as their economies. Increasing incomes have allowed for higher public sector investment in providing basic social services and rising household consumption levels. South-East Asia is home to 543 million people, 42 per cent of them living in cities.⁴ Despite efforts to reduce rural-urban migration through various measures such as integrated rural development, agrarian reform along with the development of satellite towns, new growth areas and special industrial zones, rural-urban migration has continued. The flow of people to the subregion's cities has been fuelled by the changing agricultural sector, and in many cases, declining rural incomes as the natural resource base continues to erode, and government and business interests compete for their exploitation.

These push-factors, coupled with the promise of employment in industry and the services sector, means that the populations of the two mega-cities in the subregion, namely, Jakarta and Metro Manila, are expected to increase by more than five and two million respectively by 2015. Rural-urban migration has spawned the growth of slums and squatter settlements in urban centres, expanding demand for housing, transportation, water and energy services. Air pollution and solid waste collection and disposal have been a problem for many years. Where water is susceptible to pollution and access to improved drinking water and sanitation is limited, the risk of disease has multiplied. Indonesia has been faced with multiple health threats in recent years, including the resurgence of polio and Avian influenza.

Until the financial crisis of 1997 and the subsequent economic slowdown, national surveys showed a general trend of declining poverty and improving social development indicators. The effects of the financial crisis, along with the subsequent global economic slowdown, resulted in worsening social and environmental conditions, as critical resources had been diverted to address pressing economic problems.

Human development as measured by the UNDP's Human Development Index (HDI) values vary widely in the subregion (Table 10.2). Social equity continues to be an elusive goal, with income inequities just one manifestation of this. While poverty (defined as income under US\$2 per day) declined from 63 per cent in 1987 to 45 per cent in 1998, the richest 10 per cent still accounted for 26 per cent of the subregion's share of household income, and the poorest 10 per cent for only 2.2 per cent.⁵ The proportion of people who are under-nourished is still high in Cambodia, Lao People's Democratic Republic, the Philippines, Thailand and Viet Nam. The Gender-related Development Index value showed improvement from 1990 to 2000 for all countries. Cambodia and Lao People's Democratic Republic ranked the lowest; Singapore and Brunei Darussalam were among the highest (see table 10.2).

Poor law enforcement procedures with regard to the illegal trade of natural resources has resulted in an enormous loss of revenue for government and for local communities that depend on such resources, and has become a source of local conflict. There is evidence of increased environmental awareness and local community action to protect

Table 10.2 Social indicators: South-East Asia

	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Timor-Leste	Viet Nam
Population											
Total population, thousands (2005 estimate)	374	14 071	222 781	5 924	25 347	50 519	83 054	4 326	64 233	947	84 238
Population growth, % (2004-2005)	2.2	1.9	1.2	2.2	1.8	1.0	1.9	1.3	0.6	5.4	1.3
Urban population, % of total (2003)	76.2	18.6	45.6	20.7	63.9	29.4	61.0	100	31.9	7.6	25.7
Slum population, % of total urban (2001)	2.0	72.2	23.1	66.1	2.0	26.4	44	0.0	2.0	12.0	47.4
Human Development Index (2002)	0.87	0.57	0.69	0.53	0.79	0.55	0.75	0.90	0.77	0.44	0.69
Primary school enrollment rate, % (2001)	-	86.2	92.1	82.8	95.2	81.9	93	-	86.3	-	94
Population below US\$1 (1993 PPP) per day consumption, % (1997-2002)	-	34 ^a	8 ^c	26 ^a	2 ^a	-	15 ^b	-	2 ^b	-	2 ^d
Life expectancy at birth, years (2003)	76.2	57.4	66.6	54.3	73.0	57.2	69.8	78.0	69.1	49.3	69.0
Under-five mortality rate, per 1,000 live births (2003)	6	140	41	91	7	107	36	3	26	124	23
Population with dietary energy supply below minimum requirement, % (2000-2002)	-	33	6	22	<2.5	6	22	-	20	-	19
Access to an improved water source, % of population (2002)	-	34	78	43	95	80	85	100	85	52	73
Gender-related Development Index (2002)	-	0.56	0.69	0.53	0.79	-	0.75	0.88	0.77	-	0.69
Digital Access Index (2002)	0.55	0.17	0.34	0.15	0.57	0.17	0.43	0.75	0.48	-	0.31

Sources: See Annex V.

Notes:

- ^a 1997
- ^b 2000
- ^c 2001
- ^d 2002

natural resources, particularly where institutional failure places the burden of action on communities. The frequency of natural-resource related conflict between business interests and local communities in Thailand, often marked by violence, has been highlighted by non-governmental organizations. Access to information and communication has improved in recent years, but is still lagging in many countries (Table 10.2). The number of Internet users per 1,000 people varied from a low of 0.5 (2002) in Myanmar (where there are policy and infrastructure restrictions on internet use) to a high of 504.4 (2002) in Singapore.⁶

10.3 Environment and sustainable development conditions and trends

As a result of the pressures of environmentally unsustainable economic growth patterns, barring a few exceptions, the environmental indicators in the South-East Asia subregion show a declining environmental quality and sustainability. Environmental indicators that are in obvious decline include altered habitats, diminishing biodiversity, land degradation and degradation of marine and coastal resources.

As markets continued to integrate, and South-East Asia became gradually more dependent upon income derived from trade, some countries have found it difficult to improve environmental sustainability. Illegal forest resource exploitation, including illegal logging, encroachment for development, and conversion to agriculture continues to be a problem. The subregion is also recognized as a hotspot for illegal trade in biodiversity. The Mekong River Basin is increasingly the focus of development plans to exploit its considerable hydropower energy potential and capacity to meet freshwater needs for both irrigation and growing urban centres. This river system is the basis for substantial subsistence fisheries as well as increasing commercial fishing activity. Rice and fish production are the basis for food security and are under threat from dams and weirs as well as changes to the river course to improve navigation in the Upper Mekong River.⁷

10.3.1 Cleaner production and sustainable energy

South-East Asia's endowment of energy resources is significant. Large oil reserves are found in Indonesia and Brunei Darussalam, and considerable potential for oil production exists in Malaysia, Myanmar, Timor-Leste and Viet Nam. In addition, sizeable gas and coal reserves are available in Indonesia and Malaysia. The Philippines produces geothermal energy, while Indonesia, Lao People's Democratic Republic and Myanmar have significant hydropower potential. Most countries have good potential for harnessing wind and biomass energy.

Final energy consumption is projected to grow at a rate of over 4 per cent annually over the period 2000 to 2020, with the fastest growth in the Philippines.⁸ Electricity demand alone is expected to more than quadruple between 2000 and 2020.⁹ Overall, Indonesia is the subregion's largest producer and consumer of energy, and its economic dependence on energy is increasing. Along with the Philippines, Malaysia and Thailand, Indonesia's economy used more energy to produce one unit of GDP in 2002, than it did in 1990. Per capita energy use by these countries is also increasing at among the fastest rates in the region. Residential use accounts for 41 per cent of national energy consumption, followed by industry (26 per cent) and transport (25 per cent).¹⁰

Brunei Darussalam, Indonesia, Malaysia and Viet Nam are net energy exporters, while Thailand and the Philippines depend heavily on imports for their energy needs. Oil remains the primary source of energy in South-East Asia but its share is expected to gradually decline, while the shares of coal, natural gas and renewable energy sources increase (Table 10.4). In 2000, the share of renewable energy (which included hydropower and geothermal energy) in the primary energy mix of Lao People's Democratic Republic, Myanmar, the Philippines and Viet Nam was significant, accounting for 56, 27, 22 and 23 per cent, respectively. However, for the subregion as a whole, renewable energy accounted for only 8.2 per cent of the total primary energy mix.¹¹

Table 10.3 Environmental indicators: South-East Asia

		Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Timor-Leste	Viet Nam
Protected areas, % of land area	2004	38	22	9	16	24	5	4(37 ^a)	2	19	-	3
Forest area, % of land area	1990 2000	86 84	56 52.9	65 58	57 54	66 59	60 52	22 19(50 ^b)	3.3 3.3	31.1 28.9	36.6 34.3	28.6 30.2
Land use, % (2002)	Arable and permanent crops	2	22	19	4	23	16	36	3	38	-	27
	Permanent pasture	1	8	6	4	1	0	5	-	2	-	2
Renewable water resources, m ³ /capita/year	2003-2007	23 224	32 876	12 749	57 638	23 316	20 870	5 884	139	6 459	-	10 805
Water withdrawal, m ³ /capita/year	1998-2002	-	295	381	543	376	680	363	-	1 400	-	886
Threatened species, numbers (2004)	Animals	49	72	450	72	209	109	244	31	137	11(36 ^c)	144
	Plants	99	31	383	19	683	38	212	54	84	0	145
Access to improved sanitation, % of population	1990 2002	- -	- 16	46 52	- 24	96 -	21 73	54 73	- -	80 99	- 33	22 41
Energy intensity, energy supply (kg of oil equivalent) per US\$1,000 (PPP) GDP	2002	-	-	241	-	242	-	131	263	201	-	239

Sources: See Annex V.

Notes:

- ^a Data for 2003, Protected Areas and Wildlife Bureau, Philippines, as provided by the Department of Environment and Natural Resources, Government of the Philippines.
- ^b Philippines Forestry Statistics, 2002, as provided by the Department of Environment and Natural Resources, Government of the Philippines.
- ^c Birdlife International, "A preliminary list of important bird areas in East Timor", Birdlife International (August 2004), as provided by the Government of Timor-Leste.

Table 10.4 Projected primary energy mix in South-East Asia

Fuel Type	2000		2005		2010	
	ktoe	%	ktoe	%	ktoe	%
Natural Gas	62 949	26.5	108 111	30.9	166 162	32.0
Coal	26 524	11.2	43 255	12.4	75 404	14.5
Oil	128 460	54.1	170 798	48.9	230 098	44.4
Renewable	19 521	8.2	27 277	7.8	46 936	9.1
Total	237 454	100.0	349 441	100.0	518 600	100.0

Source: ASEAN Centre for Energy statistics, accessed from <http://www.aseanenergy.org/publications_statistics/statistic/supply-demand/page_01.htm> on 12 March 2006.

Cleaner production does not only depend on the shift to cleaner fuels, but also on adopting cleaner production technologies. Reluctance to invest in new machinery often keeps countries from using the most advanced technologies. Box 10.2 shows the complexities of applying charge-based regulations for pollution control. Another critical determinant for cleaner production is the availability, affordability and training of the workforce to use and maintain clean technologies.

There is considerable potential for cleaner production and sustainable energy use in South-East Asia. The ASEAN Centre for Energy estimates that the sustainable and clean energy goals of ASEAN Vision 2020 would require an investment of over US\$180 billion between 2000 and 2010. This would

include US\$46 billion for improved energy efficiency, which would pay handsomely, saving US\$87 billion or nearly US\$2 for every dollar invested, and US\$3.6 billion for new and renewable energy. Most countries in the subregion have also introduced energy conservation and demand side management measures in the power sector.

The ASEAN Energy Awards for Energy Efficient Buildings recognize excellence in energy-efficient building design,¹² and Singapore's Green Mark ratings system for buildings seek to promote the considerable potential existing in improving building design to reduce both energy and water use (see chapter 2, section 2.3). The ten member countries of ASEAN have also implemented a

Box 10.2 Industrial wastewater management in Viet Nam: carrots and sticks

Viet Nam is currently experiencing rapid economic growth. Industrial estates are mushrooming, fully equipped with the infrastructure to support the operations of factories and companies. Such estates take advantage of efficiency gains from geographical clustering, to reduce the costs to, and provide opportunities for synergistic relationships between tenant enterprises. Often, these state-run industrial parks, export processing zones, and hi-tech industrial zones, offer companies incentives in the form of tax reductions.

Despite the economic advantages, clustering industrial enterprises also concentrates waste generation. The emissions and effluents discharged from Viet Nam's industrial estates have become a serious environmental burden. Many of the industrial estates lack sufficient wastewater treatment (WWT) plants, and wastewater pollution has consequently become a serious issue.

The majority of the companies in Viet Nam's industrial estates are small and medium enterprises for which individual wastewater treatment plants are not affordable. Even when costs are shared among several factories in the estate, such an investment is still regarded as being too expensive. A recent study found that companies with more capital at their disposal are more likely to comply with environmental laws.

Legislation on environmental protection is in force, as are environmental standards and guidelines for environmental protection. A framework for the organization of industrial estates has been established, to aid these estates in controlling pollution. However, many industrial estates are still not using common wastewater treatment facilities. Fines for non-compliance with discharge standards are not high enough to outweigh the cost of constructing a WWT plant. Financially, it is more attractive to pay an occasional penalty, than to invest in constructing and operating a plant. Furthermore, checks on compliance are not conducted on a regular basis. Some estates only operate their WWT plants during inspections.

Industrial estates often charge companies for the quantity of incoming water used but not for the quantity of wastewater produced. This implies that one litre used for people washing their hands can be just as expensive as discharging one litre of highly concentrated hazardous wastewater. In short, while providing incentives to reduce the industrial use of water, this charging approach does not give incentives to reduce pollution. Financial barriers are the most important obstruction to effective compliance with environmental standards in Viet Nam. Hence "carrots" may constitute the initiation of financial support programmes for the establishment and operation of WWT plants, in combination with revised estate costing practices. The weight of the "sticks", or the penalties for non-compliance, should be raised to a more effective level, and monitoring practices should be improved.

Sources: Le Quang Thong and Nguyen Anh Ngoc (2004). *Incentives for Wastewater Management in Industrial Estates in Viet Nam*, EEPSEA Research Report No. 2004-RR1, (Singapore, Economy and Environment Program for Southeast Asia); Economy and Environment Program for Southeast Asia (2004). "Industrial Estates and the Environment: A Study of Water Pollution in Viet Nam", Policy Brief No. 2004-PB1 (Singapore, EEPSEA).

number of activities promoting cleaner production. For example, the Wastewater Treatment Technology Transfer and Cleaner Production Demonstration Project was implemented to promote the use of cleaner production technologies and improved wastewater treatment in various industries such as textiles, food processing and distilling industries.¹³

10.3.2 Urban environments

It is estimated that by 2020, more people in South-East Asia will live in urban than in rural areas (Figure 10.3). The subregion's urban population is expected to increase by more than one third from approximately 231 million in 2005 to about 302 million in 2015. With increasing urbanization, air and water pollution, solid waste management, noise pollution, traffic congestion, proliferation of slums, overburdened infrastructures and social services have become common problems in the major urban centres of South-East Asia. Vehicles are the largest source of air pollution in urban areas, and therefore are major contributors to respiratory disease.

Industrialization is not only driving urbanization; it is also a major contributor to urban pollution. Food processing plants, electroplating plants, textile mills and tanneries are the major sources of industrial wastewater effluents in urban rivers. In addition, untreated or partially treated domestic sewage is a growing source of water

pollution as most cities have grossly inadequate or no sewage collection and treatment systems.

A mere 6 per cent of water use can be attributed to domestic use.¹⁴ Population growth and industrial development have caused water demand to soar in the cities of South-East Asia. While urban centres generally have a better access to improved drinking water sources, there has, however, been difficulty in providing equitable water access in many cities with the rapid growth of these urban centres. User fees are often too low to represent the true value of the water consumed in the face of growing scarcity. Privatization has long been promoted as a way to address this issue. However, countries that have allowed private sector management of water supplies, have not achieved the expected gains in efficiency, autonomy and investment. Furthermore leakage and illegal use of water has lowered the revenue collected by water providers.^{15,16,17}

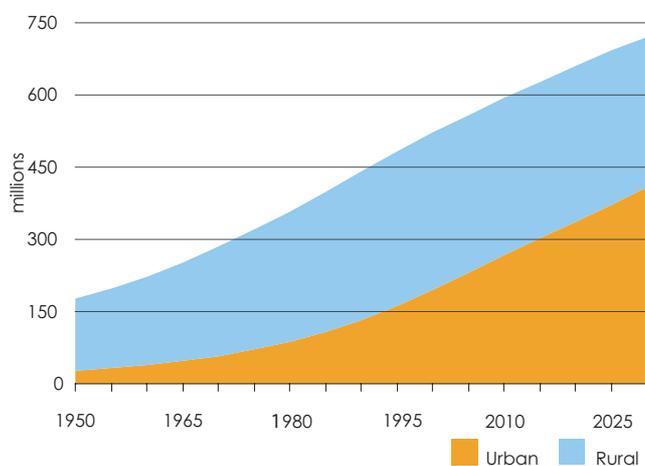
Collection, treatment and disposal of municipal solid waste has become another serious challenge. Incineration and open burning have a serious impact on municipal air quality. While sanitary landfills handle a major proportion of waste generated, open dumps also receive a significant share (Table 10.5). All these concerns are exacerbated by the increase in the generation of waste, fuelled by urban lifestyles and rising incomes. Charges for waste collection, such as piloted in the Philippines (Box 10.3) are not prevalent.¹⁸

South-East Asian countries import hazardous waste from other countries. Some countries in South-East Asia, are importers or trans-shippers of e-waste. Table 10.6 does not reflect illegal trade in hazardous waste.

10.3.3 Forests and biodiversity

South-East Asia is among the most biologically diverse and heavily forested areas in the world. However, the subregion's land resources and terrestrial ecosystems are under mounting pressure from growing populations, increasing agricultural production, uncontrolled logging and illegal trade in endangered species. Shared threats to biodiversity include transboundary forest fires and deforestation, the

Figure 10.3 Projected population of urban and rural areas, South-East Asia



Source: FAO (2004). *Selected Indicators of Food and Agriculture Development in Asia-Pacific Region: 1993-2003* (Bangkok, FAO Regional Office for Asia and the Pacific).

Table 10.5 Solid waste disposal in selected South-East Asian cities, by disposal method

Country	City	Incinerated	Sanitary landfill	Open dump	Recycled	Burned openly	Other
Cambodia	Phnom Penh	-	-	74.0	15.0	5.0	6.0
Indonesia	Jakarta	-	77.7	-	-	-	22.3
	Bandung	-	78.6	-	-	16.3	5.1
	Semarang	-	74.3	-	-	-	25.7
	Surabaya	-	70.0	-	30.0	-	-
Malaysia	Penang	10	-	80.0	10.0	-	-
Myanmar	Yangon	-	-	86.0	14.0	-	-
Philippines	Cebu	-	100.0	-	-	-	-
Singapore		66.3	33.7	-	-	-	-
Thailand	Bangkok	-	99.0	-	-	-	1.0
	Chiang Mai	2.0	98.0	-	-	-	-
Viet Nam	Hanoi	-	65.0	-	15.0	-	20.0

Source: UN-HABITAT (2002). Global Urban Indicators Database 2, available online at <www.unhabitat.org/programmes/guo/documents/1998.zip>. Data for 1998.

Box 10.3 Quantity-based pricing system for solid waste in the Philippines

The increase in solid waste generated by the growing population in urban areas has become a mounting problem. As in most of South-East Asia, fees are not usually charged for the collection and disposal of domestic waste in the Philippines. Solid waste management falls under the jurisdiction of local governments. In a few instances, a fee system was applied to the business sector. However, domestic waste constitutes 60 to 70 per cent of the generated waste. When applied, collection and disposal fees for domestic waste are generally charged as a monthly flat rate, which does not provide an incentive to reduce waste, because one pays the monthly fee, regardless of the quantity or volume of garbage one discards. Quantity-based pricing systems which would provide a financial incentive to reduce waste were tested in the Filipino City of Olongapo.

During a period of eight weeks over which the pilot pricing structure was in force, the garbage disposal practices of a sample of households were monitored. Colour-coded disposal bags were used to distinguish 1) food and kitchen wastes; 2) recyclables; 3) garden wastes; and 4) non-recyclables. A financial incentive was offered for each bag of waste that the participating households could reduce. The study found that:

- A reduction of 0.21 kg/day/household (i.e. 24 per cent) in non-recyclable wastes, against an increase in recyclable wastes of 0.12 kg/day was achieved. A small part of the resulting waste reduction was unaccounted for;
- Savings on the cost of collection and disposal, due to reduction in domestic waste, were significant; and
- Such a pricing system would allow increased incomes for local government.

Sources: Bennagen, E.C. and V. Altez (2004). "Impacts of Unit Pricing of Solid Waste Collection and Disposal in Olongapo City, Philippines," Research Report No. 2004 -PR4 (Singapore, EEPSEA) and Economy and the Environment Programme, South-East Asia (2004). "Pay to Throw: a new way to charge for waste disposal in the Philippines," Policy Brief No. 2004 -PB4 (Singapore, EEPSEA).

Table 10.6 Imports and exports of hazardous and other wastes in selected South-East Asian countries, 2000

	Imports (metric tons)	Exports (metric tons)
Indonesia	61 069	240
Malaysia	125 875	4 947
Singapore	-	19 549
Thailand	-	193

Source: Secretariat of the Basel Convention (2004). "National Reporting Compilation Part II - 2001" (Geneva, Secretariat of the Basel Convention).

development of the Mekong River basin and illegal wildlife trade.

During 1990-2000, the rate of deforestation averaged about 1.04 per cent annually,¹⁹ resulting in an annual decrease in forest cover of over 23,000 km² (Table 10.7). As of 2000, forests covered approximately 49 per cent of South-East Asia's total land surface, and many of the world's biological hotspots were found within them. South-East Asian forests are under mounting pressures. The forest product industry is shifting from roundwood for construction and industrial use, to production of paper and related products. Total roundwood production from the subregion declined from 1992 to 2002, with Malaysia accounting for most of the decline (and Myanmar almost doubling production). Subregional production of wood pulp more than quadrupled in that period, with the fastest growth

in Indonesia and Viet Nam.²⁰ Indonesia, the largest producer of paper and paper-board, is now taking a critical look at the accelerating loss of its natural forests. Indonesia and Viet Nam more than doubled production in this subsector between 1992 and 2002, and Myanmar almost tripled production over that period. Illegal logging and timber laundering remain a serious problem in the subregion. In Indonesia, estimates showed that around 73 per cent of log production was illegal.²¹ Illegal logging was also reported in Myanmar, the Philippines and Thailand, and continued to be a source of social tension. Among the most promising approaches for dealing with timber poachers would be to discourage the timber processing industry from purchasing illegally harvested logs. This approach has not been broadly pursued.²²

While Indonesia has been in the spotlight for illegal logging, natural forests in Thailand could be under the greatest pressure of all. Thailand lost an estimated 25 per cent of the 1990 natural forest area between 1990 and 2000, and the Philippines almost 20 per cent during the same period. Data recently released by the FAO shows that natural forest losses have accelerated dramatically, with severe natural forest loss in Viet Nam and Cambodia during the years 2000 to 2005. The growth of plantation forests has slowed the total loss of forest cover and in 2000, plantation forests made up just over 9 per cent of the total forest area in South-East Asia. Plantation forests are expanding fastest in Brunei Darussalam, Thailand, Myanmar and Viet Nam.

Human settlements, agricultural lands, and large infrastructure projects encroach on to forest lands and other fragile and ecologically sensitive areas. Loss of forest cover makes land resources vulnerable to water erosion, a major cause of land degradation in all South-East Asian countries (Figure 10.4).

Over the past twenty years, drought conditions accompanying the El Niño-Southern Oscillation (ENSO) as well as human actions related to agricultural activity have triggered recurring fires in Indonesia. These fires have contributed to loss of biodiversity and land degradation. The resulting smoke and haze has

Table 10.7 Forest cover: South-East Asia

Country	Forest area, km ²	
	1990	2000
Brunei Darussalam	4 520	4 442
Cambodia	98 960	93 350
Indonesia	1 181 100	1 049 860
Lao PDR	130 880	125 610
Malaysia	216 610	192 920
Myanmar	395 880	344 190
Philippines	66 760	57 980 (71 684 ^a)
Singapore	20	20
Thailand	158 860	147 620
Timor-Leste	-	14 000 ^b
Viet Nam	93 030	98 190
Total	2 346 620 ^c	2 114 070 ^c

Sources: ASEAN (2001). *Second ASEAN State of the Environment Report 2000* (Jakarta, ASEAN).

Notes:

^a Data for 2003. National Mapping and Resource Authority of the Philippines (2003). Forest Cover Statistics of the Philippines <www.namria.gov.ph/data_geo.asp>, as provided by the Department of Environment and Natural Resources, Government of the Philippines.

^b Nunes, Mario (2003). *Forest Conservation and Fauna Protection in East Timor* (Dili, Timor Agri), as provided by the Government of Timor-Leste.

^c Excluding Timor-Leste.

crossed boundaries, affecting Brunei Darussalam, Indonesia, Malaysia, Singapore and Thailand in particular. The problem was particularly severe in 1997-1998, inflicting massive damage on forests and their ecology, as well as endangering human and economic well-being. The total economic cost of the 1997-1998 fire was estimated at US\$9.3 billion in crop damage, destruction of forests, health impacts, disruption of transportation, loss of tourism dollars and other economic activities.²³

Conservation policy which excludes local communities from these resources has been shown to be largely ineffective without opportunities being provided for developing alternative livelihoods.

10.3.4 Coastal and marine resources

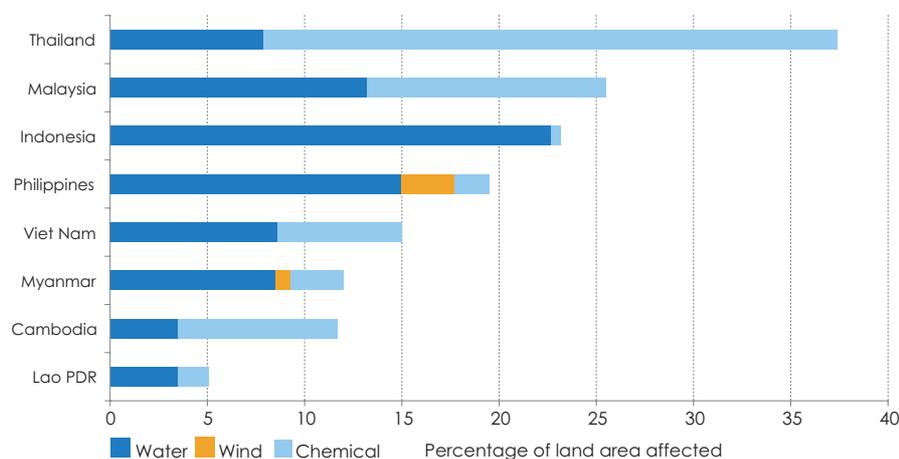
With an estimated coastline of approximately 173,000 km and a territorial sea area of over 4.4 million km², coastal and marine resources are essential for sustainable development in South-East Asia. Its mangrove forests and coral reefs are the most diverse in the world, representing over 35 per cent and 25 per cent of the world's total, respectively. Of the approximately 70 species of mangroves, at least 45 are found in Indonesia, and twenty or more in Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam. Most coral reefs in the subregion are in Indonesia with a total area of approximately 70,000 km², but they can also be found in the waters of Malaysia, Myanmar, the Philippines, and Thailand. Like mangroves and coral

reefs, sea grass beds are an important ecosystem. Of the world's 58 species of sea grass, about 20 species are found in South-East Asia, the most diverse sea grass flora in the world.²⁴

Coastal erosion along with the conversion of mangrove forests and wetlands for agriculture or aquaculture are the primary threats to marine biodiversity. In Viet Nam, at least 20 per cent of the coastline is subject to erosion, with some coastal areas experiencing erosion of about 50 metres annually. This has led to the loss of agricultural lands and human settlements. Some 23 per cent of Thailand's coastline is subject to erosion, and more than half of the eroded coasts face erosion rates of over five metres per year.

Aquaculture, and in some areas, use of mangrove for fuel, has been a major threat to the subregion's mangroves. In addition to serving as valuable coastal defences, mangroves are critical habitat for numerous aquatic species, and destruction of this habitat has greatly damaged the marine ecology. The conversion of mangrove forests into agricultural lands, has led to soil salinization, eventually rendering the new agricultural area unproductive. Some 47 per cent of global mangrove forest losses occurred between 1990 and 2000 in South-East Asia alone, with Indonesia accounting for some 35 per cent of global mangrove area loss during that period (Table 10.8).²⁵ The reefs of South-East Asia are the most threatened in the world, with more than 80 per cent at risk, including 55 per

Figure 10.4 Land degradation, South-East Asia



Source: Adapted from ASEAN (2001). Second ASEAN State of the Environment Report 2000 (Jakarta, ASEAN).

cent at high or very high risk. Impacts on water quality and turbidity, caused by run-off water and industrial wastewater, along with changing water temperature due to climate change, have been cited as major threats to the subregion's reefs.²⁶ Table 10.9 shows the estimated values of the benefits and losses to society of various types of coastal environmental pressure over a twenty year period, and indicates that the total losses to society far exceeded the benefits to

individuals. In Indonesia about 30 to 40 per cent of sea grass beds had been lost during the past 50 years, with as much as 60 per cent destroyed around Java. In Thailand, about 20 to 30 per cent of sea grass beds have already been lost, while between 30 to 50 per cent had been lost in the Philippines.²⁷ Many endangered species such as dugongs depend upon sea grass beds for survival, and these ecosystems are important nurseries.

Table 10.8 Mangrove area: South-East Asia, 1990-2000

	Area, thousand ha			Change, 1990 to 2000	
	1990	2000	% of 1990 area	Area, ha	% of global loss
Brunei Darussalam	17.3	16.3	-6	-1	0%
Cambodia	74.6	63.7	-15	-10.9	1%
Indonesia	3 530.7	2 930	-17	-600.7	35%
Lao PDR	-	-	-	-	-
Malaysia	620.5	572.1	-8	-48.4	3%
Myanmar	480	432.3	-10	47.7	3%
Philippines	123.4	109.7 (155 ^a)	-11	13.7	1%
Singapore	0.5	0.5	0	0	0%
Thailand	262	244 (245.3 ^b)	-7	-18	1%
Timor-Leste	3.6	3	-16	-0.57	0%
Viet Nam	165	104	-37	-61	4%
Subregion	5 277.6	4 475.6	-15	801.97	47%

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

Note:

^a Data for 2003. Coastal and Marine Management Office (2004). *Accomplishment Report*, (Manila, Coastal and Marine Management Office of the Philippines), as provided by the Department of Environment and Natural Resources, Government of the Philippines, September 2004.

^b Data provided by the Ministry of Environment and Natural Resources, Thailand, September 2004.

Table 10.9 South-East Asian coral reefs: Valuation of net benefits and losses, by activity

Activity	Net benefits to individuals	Losses to society (US\$'000 per km ² over a 20-year period)				Total losses (quantifiable)
		Fishery	Coastal protection	Sustainable tourism	Others (biodiversity)	
Poison fishing	33	37	N.Q.	3 400	N.Q.	40 445
Blast fishing	15	90	8 170	3 450	N.Q.	91 700
Coral mining	121	87	10 226	3 450	>67	169 830
Sedimentation from upland activities	98	81	N.Q.	192	N.Q.	273
Overfishing	39	102	N.Q.	N.Q.	N.Q.	102

Source: World Resources Institute (2001). *Reefs at risk in South-East Asia* (Cambridge, World Resources Institute).

Notes: N.Q. - not quantified.

It has been widely acknowledged that over-fishing has been depleting South-East Asia's fish stocks. The most dramatic declines in marine fish stocks have been experienced in South-East Asia, which doubled its marine fisheries production since 1970. In some areas, a decline of over 40 per cent had been observed. Stocks of more commercially valuable fish, higher up the food chain, showed major decreases.²⁸ This could be attributed to the sheer increase in commercial fishing activity, but may also be due to the increase in other types of pressure, including damaging fishing practices and sedimentation.

Aquaculture, for which mangrove areas are converted into ponds, lowers water tables in coastal areas, causes soil degradation and is a source of both surface and groundwater pollution. When mangrove forests are cleared for the cultivation of shrimp or

commercial fish species, the areas become vulnerable to floods, erosion, saltwater intrusion into aquifers, and biodiversity loss. Disposal of excrement from aquaculture ponds can lead to eutrophication of surrounding waters. Many sites have already encountered these limits, and communities need further support in identifying sustainable solutions (Box 10.4). Despite these problems, aquaculture production has been the fastest-growing food producing activity over the past decade and demand is expected to increase with the decline in capture fisheries.²⁹

Water pollution from coastal communities, industry, agriculture and oil spills has also threatened the marine environment. Mercury pollution is on the rise in the Gulf of Thailand, which includes coastal areas of Cambodia, Malaysia, Thailand and Viet Nam. Most mercury originates from coal fired

Box 10.4 Natural methods in aquaculture reap sustainable benefits

In the pursuit of short-term economic benefits, the long-term effects on the environment have often been ignored. The alteration of ecosystems for human activities could lead to severe environmental degradation. In many countries in Asia and the Pacific region, aquaculture has become an important source of income for small producers, but can lead to severe environmental damage and declining profits. Some small aquaculture producers, however, have reversed the damage done to their sites and are moving toward sustainable harvests. The case of aquaculture farms in Ban Pred Nai, Thailand illustrates how sustainable aquaculture may be achieved, and how optimum environmental quality can enhance long-term economic benefits.

In the mid-1980s, the Ministry of Agriculture and Cooperatives began promoting aquaculture. Farmers were advised to invest in new technologies for raising tiger prawns for the lucrative export market. After a few years of considerable benefit, environmental degradation caused by this activity began to afflict small aquaculture producers. The soil around the ponds quickly turned saline, and the intensive use of chemicals and antibiotics required to maintain the profitability of tiger prawn production, polluted the groundwater. Profits and production capacity declined along with the deterioration of the natural environment. Farmers moved away in search of new livelihoods, or ended up indebted and dominated by wealthy outside "moneymen."

The villagers only then realized the necessity of restoring these marshlands to their natural state. First, they had to regain control over their lands from outside moneylenders. After seven years of effort they finally succeeded. The villagers began taking action to curb further depletion of the mangrove forests, which served as essential nursery grounds for aquatic species, and they established codes of conduct to protect these areas. One day a year was reserved for communal mangrove reforestation, and a voluntary ban instituted on the use of chemicals. Outside critical periods during the reproductive season, baby crabs and fish were gathered communally, with each night's catch going to a different household, until all households were supplied.

Such practices improved the productivity of village ponds. In their joint struggle for the recovery of their natural environment and livelihoods, individuals shared newly discovered methods with the other villagers. At the advice of one villager, they all improved feeding methods. At the advice of another, all the villagers began growing vegetation inside the ponds, which enhanced the quality and productivity of their ponds. The ponds began to resemble natural water bodies, and villagers livelihoods showed improvements, with lower debt levels. A village cooperative, begun in 1995 with an initial investment of 9,000 Thai baht per person, became a strong institution with more than 4 million Thai baht at its disposal.

Sources: Suthon Sukphisit (2004). "Nurturing Nature," Bangkok Post, Outlook, Saturday July 17, 2004; FAO (1997). *Report of the Bangkok FAO technical consultation on policies for sustainable shrimp culture*, accessed in December 2004 from <www.fao.org/docrep/meeting/008/J1937e.htm>.

power plants and other industrial activities. Once airborne, it enters the marine environment through the atmosphere. Some mercury also enters the marine environment from oil platforms. Mercury becomes hazardous to humans, when it enters the food chain and is stored in the tissues of commercially exploited fish. Fish containing mercury levels exceeding those considered safe for human consumption have been found close to oil rigs.

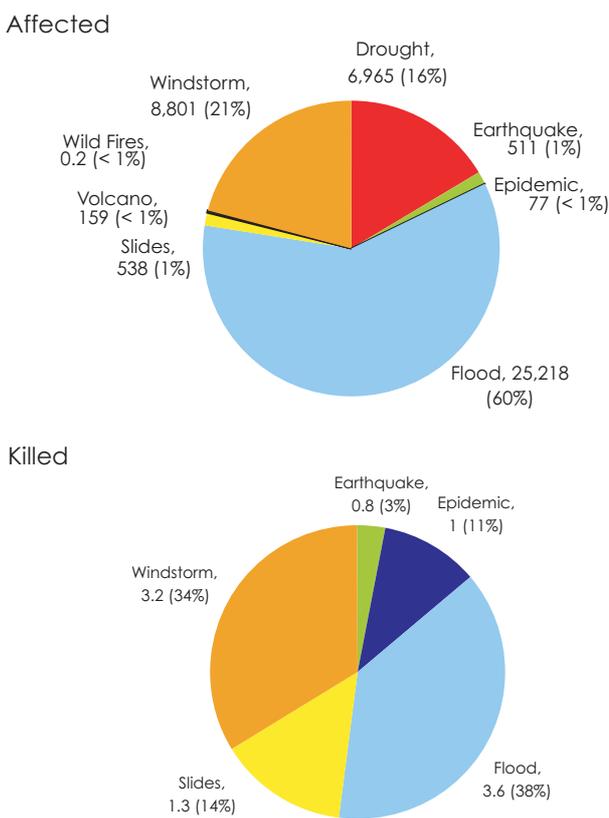
10.3.5 Impacts of natural disasters

It is increasingly difficult to distinguish between natural and human-made disasters as the

two are often interlinked. Unsustainable human activities such as deforestation of hillsides, destruction of coral reefs and settlement of disaster-prone areas has put communities at increased risk. The type and frequency of natural disasters varies widely among the South-East Asian countries. The total numbers of persons affected and killed by natural disasters between 2000 and 2004 are shown in figures 10.5 and 10.6. Figure 10.6 indicates that the numbers of affected by natural disaster have declined from the latter half of the 1990s. Floods are the most frequent natural disaster in the subregion, causing massive loss of crops, especially in rice producing areas.

The Philippines is one of the most disaster-prone countries in the world (Box 10.5). Earthquakes and floods are frequent occurrences in Indonesia,³⁰ and seasonal flooding in Cambodia, Lao People's Democratic Republic, Thailand and Viet Nam, occurs along the Mekong River. The most deadly natural disaster in human history occurred in South-East Asia on 26 December 2004. Following an earthquake that registered nine on the Richter scale, off the coast of Indonesia, a massive tsunami struck low-lying coastal areas throughout the Indian Ocean. Over 200,000 people were killed and many more were displaced.

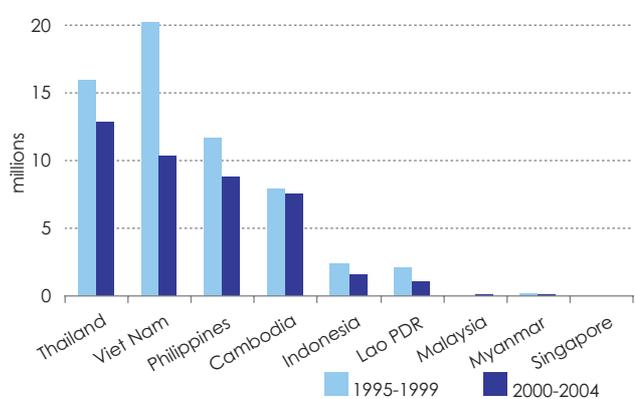
Figure 10.5 People affected and killed by natural disasters, South-East Asia, 2000-2004 (thousands)



Source: Université Catholique de Louvain - Brussels - Belgium. Downloaded from the EM-DAT: The OFDA/CRED International Disaster Database <www.em-dat.net> on 30 June 2005. Data version: v05.06.

- Notes:
1. Numbers are given in thousands.
 2. Not including those affected by waves and surges such as the December 2004 tsunami.
 3. "Affected" refers to people injured, requiring immediate assistance, affected by an infectious disease in a region that is usually free from that disease and left homeless after a disaster. Does not include those killed.

Figure 10.6 People affected by natural disasters, South-East Asia



Source: Université Catholique de Louvain - Brussels - Belgium. Downloaded from the EM-DAT: The OFDA/CRED International Disaster Database <www.em-dat.net> on 30 June 2005. Data version: v05.06.

Note: Does not include people affected by waves and surges, including the December 2004 tsunami.

While tsunamis are rare events, their destructive power is enormous and governments of the subregion are establishing an early warning system to prepare for the next catastrophic wave. Governments could further safeguard coastal populations by protecting and restoring natural barriers such as mangroves, coastal forests, sand-dunes and coral reefs. Restoration of these barriers would not only provide protection against tsunamis, but would also enable the restoration of a wide range of ecosystem services such as erosion control, biodiversity protection and fisheries rehabilitation, as well as enhance coastal protection in the face of rising sea levels and increasing frequency of extreme weather events associated with climate change.

10.4 Subregional cooperation

Within the framework of ASEAN, South-East Asian countries have collaborated in establishing subregional cooperation for promoting economic growth, increasing social equity, and enhancing environmental integrity. These countries have committed themselves to economic liberalization, increasingly promoting integrated trade and investment regimes, as well as closer economic cooperation, which have had a significant impact on changing production patterns. These efforts are summarized in box 10.6. Nonetheless, ASEAN economies remain vulnerable to global economic fluctuations and oil prices. While healthy economic

Box 10.5 Disasters in the Philippines

The Philippines is the most disaster-prone country in the world. Each year, an average of 19 typhoons hit the Philippines and around five of these are highly destructive. The country has more than 220 volcanoes, of which at least 21 are considered active. The eruption of Mount Pinatubo in 1991 was among the most destructive eruptions in history. At least five earthquakes occur in the Philippines daily. The country's National Disaster Coordinating Council monitored over 100 disasters during the last ten years while the Philippine National Red Cross recorded 2,000 deaths each year, and more than 3.6 million people displaced within the last decade. The Citizens' Disaster Response Centre and its network of Regional Centres, registered 335 disasters in 1999 alone.

The typhoon season in the Philippines is from June to December, although occasionally, typhoons occur outside this period. During the early part of the season, typhoons tend to cross the northern part of the country, but from October to December, the south and central parts are generally affected. The areas most prone to typhoons are the provinces of northern and central Luzon, Bicol province in southern Luzon, and the islands of eastern Visayas in central Philippines. Since half of the towns and cities are situated on floodplains, they are often affected by the flooding that usually accompanies typhoons. In December 2004, a series of catastrophic storms struck, leaving more than 1,200 dead and missing. Widespread logging was blamed for the landslides and also contributed to massive flooding and flash floods which prompted the government to ban commercial logging. The events of November-December 2004 left more than 12,000 homes destroyed and severely damaged infrastructure.³¹

The country is subject to two types of earthquakes: tectonic and volcanic. A tectonic earthquake is a sudden shift of the earth's crust along active faults. A volcanic earthquake happens near volcanoes when hot rocks and magma move from deep within the earth. The most destructive earthquake occurred on 16 July 1990, affecting 23 provinces in six regions of Luzon. The areas most prone to earthquakes, with an average of 16 perceptible tremors annually, are the eastern portion of Mindanao in the south of the country and the islands of Samar and Leyte in central Philippines. When earthquakes occur under the sea, they can generate a tsunami. The worst tsunami to hit the Philippines struck Mindanao on 16 August 1976: 3,000 people died, 1,000 people were listed as missing, and 12,000 people lost their homes. Southern Mindanao is prone to tsunamis because of its proximity to the Celebes Sea, a site of frequent undersea earthquakes.

The most active volcanoes in the Philippines are: Mayon in Albay with about 46 eruptions since 1616, last eruption in 2000; Taal in Batangas — 33 eruptions since 1572, last eruption in 1977; Hibok-hibok in Camiguin — last eruption in 1957; Bulusan in Sorsogon — last eruption in 1916; Canlaon in Negros — 13 eruptions since 1866, last eruption in 1985; and Pinatubo in Zambales — dormant for 600 years, last eruption in 1991. Lahars, i.e. flows of volcanic debris and mud often triggered by intense rainfalls during or after an eruption, flow from the slopes of Mt. Pinatubo burying agricultural land and villages in three provinces.

Sources: Asian Disaster Preparedness Center website(2003), <www.adpc.net/>. Philippine Institute of Volcanology and Seismology website (2003), <www.phivolcs.dost.gov.ph/>.

growth rates are viewed as being important for sustainable development, they have nonetheless, created substantial environmental pressures. Since 1999, the “ASEAN Surveillance Process” has been closely monitoring economic developments in key sectors. Emerging vulnerabilities have been addressed through policy discussions at the ASEAN Finance Ministers’ semi-annual peer reviews.

In addition to ASEAN-wide projects, there are initiatives at the river basin level. The Greater Mekong Subregion (GMS) hosts a business forum

for business development and cooperation. Ambitious infrastructure projects have been planned to facilitate trade, including trade in energy and water, and economic development. In light of the economic and social impacts of these projects there has been some debate on how to make the “East-West corridor” as it will be called, sustainable.

The following ASEAN programmes are geared towards reducing poverty and enhancing social equity:

Box 10.6 ASEAN economic initiatives for sustainable development

ASEAN Free Trade Area (AFTA)

The AFTA agreement requires the elimination of tariff barriers among the countries of South-East Asia in an attempt to integrate the South-East Asian economies into a single production base, and to create a market of over 500 million people. One of the desired outcomes of AFTA is the rationalization of industrial production in the subregion. Regional clustering of industries is expected to result in better management of scarce resources, and fewer negative impacts on the environment from uneconomical and uncontrolled industrial activities.

ASEAN Framework Agreement on Services (AFAS)

Liberalization of trade in services is carried out on the GATS-Plus principle, in which member countries are expected to schedule commitments, that would be better than their commitments under the General Agreement on Trade in Services (GATS) of the World Trade Organization (WTO), or schedule commitments in new service sectors yet to be made under their GATS commitments.

ASEAN Investment Area (AIA)

Under this agreement, South-East Asian countries are to open their industrial sectors to ASEAN investors. Such investments are to be treated no differently than those made by nationals of the country where the investment takes place. Any exceptions are to be phased out according to a short and definitive schedule.

ASEAN Industrial Cooperation (AICO)

The AICO scheme calls for companies operating in two or more South-East Asian countries to receive full AFTA treatment immediately. With AFTA now being fully realized, work is being done to make the AICO rate more attractive than the AFTA-CEPT rate.

ASEAN Integrated Infrastructure Network (AIIN)

This programme aims at integrating infrastructure facilities in the region, such as regional networks of highways, railways, telecommunications, power grids, and water and gas pipelines. Much work has been done on the ASEAN Power Grid and Trans-ASEAN Gas Pipeline, and to promote cooperation in energy efficiency and conservation and in new and renewable energy sources.

e-ASEAN

This programme aims at developing a broad-based and comprehensive framework, including physical, legal, logistical, social and economic infrastructure, to promote an ASEAN e-space, as part of the ASEAN positioning and branding strategy.

Initiative for ASEAN Integration (IAI)

This initiative is aimed at narrowing the development gap within ASEAN member countries by assisting the newer members, namely, Cambodia, Lao People’s Democratic Republic, Myanmar and Viet Nam (the CLMV countries). The main goal is to expedite greater regional economic integration, promote equitable economic development, and help alleviate poverty in CLMV.

Source: ASEAN (2002). “ASEAN Report to the World Summit on Sustainable Development” (Jakarta, ASEAN).

- Framework Plan of Action on Rural Development and Poverty Eradication
- ASEAN Action Plan on Social Safety Nets, 1998
- Healthy ASEAN 2020 Declaration, 2000
- Regional Action Plan of the Framework for Promoting Healthy ASEAN lifestyles
- ASEAN Healthy Cities Initiative, 2002
- ASEAN Work Programme on HIV/AIDS II (2002-2005)
- ASEAN Work Programme on Social Welfare, Family and Population (2003-2006)

Since there is a clear necessity to protect biodiversity, conserve natural resources, and maintain environmental integrity, environment and sustainable development are among the most important ASEAN areas of cooperation. This is illustrated by the legal instruments and policy statements adopted by the countries of the subregion (Box 10.7).

The institutional framework of environmental cooperation is given in figure 10.7. The ASEAN Strategic Plan of Action guides subregional cooperative programmes and projects on the environment. At the national level, countries have prepared their National Agenda 21 and have designated or established relevant institutions or interagency committees for implementation.

In October 2000, the countries of South-East Asia adopted a Framework for ASEAN Regional

Criteria and Indicators for Sustainable Management of Natural Tropical Forests, to protect forest ecosystems and conserve biological diversity. The ASEAN Regional Center for Biodiversity Conservation was established in 1999 to support national efforts on the conservation of biological diversity. The Strategic Plan of Action on ASEAN Cooperation in Food, Agriculture and Forestry (1999-2004) was implemented to support regional cooperation on the harmonization of standards for forest products and to support the certification process. Regrettably, more resources will be required and capacities will need to be strengthened, in order to tackle the current problems related to poaching, illegal logging and illegal trade in animals and timber.

Thus far, the subregion has focused on the protection of individual species, their populations and their habitats. Relevant legislation and guidelines have been enforced, conservation plans developed, and protected areas have been designated for conservation. Twenty-seven ASEAN Heritage Parks have been set up and the subregion has over 1,000 protected areas covering nearly 41.8 million hectares or nearly 10 per cent of its total land area (Table 10.5). Indonesia has the most protected areas and largest total area under legal protection, followed by Thailand and the Philippines.

The South-East Asian countries continued to fulfil their commitments to a number of

Box 10.7 Major legal instruments and policy statements adopted by ASEAN

Major Legal Instruments

- ASEAN Agreement on Transboundary Haze Pollution (2002)
- Agreement on the Conservation of Nature and Natural Resources (1985)
- ASEAN Declaration on Heritage Parks and Reserves (1984) amended in 2003, now called the ASEAN Declaration on Heritage Parks (2003)

Policy statements

- Yangon Resolution on Sustainable Development (2002)
- The Kota Kinabalu Resolution on the Environment (2000)
- Jakarta Declaration on Environment and Development (1997)
- Bandar Seri Begawan Resolution on Environment and Development (1994)
- Singapore Resolution on Environment and Development (1992)
- The Kuala Lumpur Accord on Environment and Development (1990)
- Jakarta Resolution on Sustainable Development (1987)
- Bangkok Declaration on the ASEAN Environment (1984)
- Manila Declaration on the ASEAN Environment (1981)

Source: ASEAN secretariat.

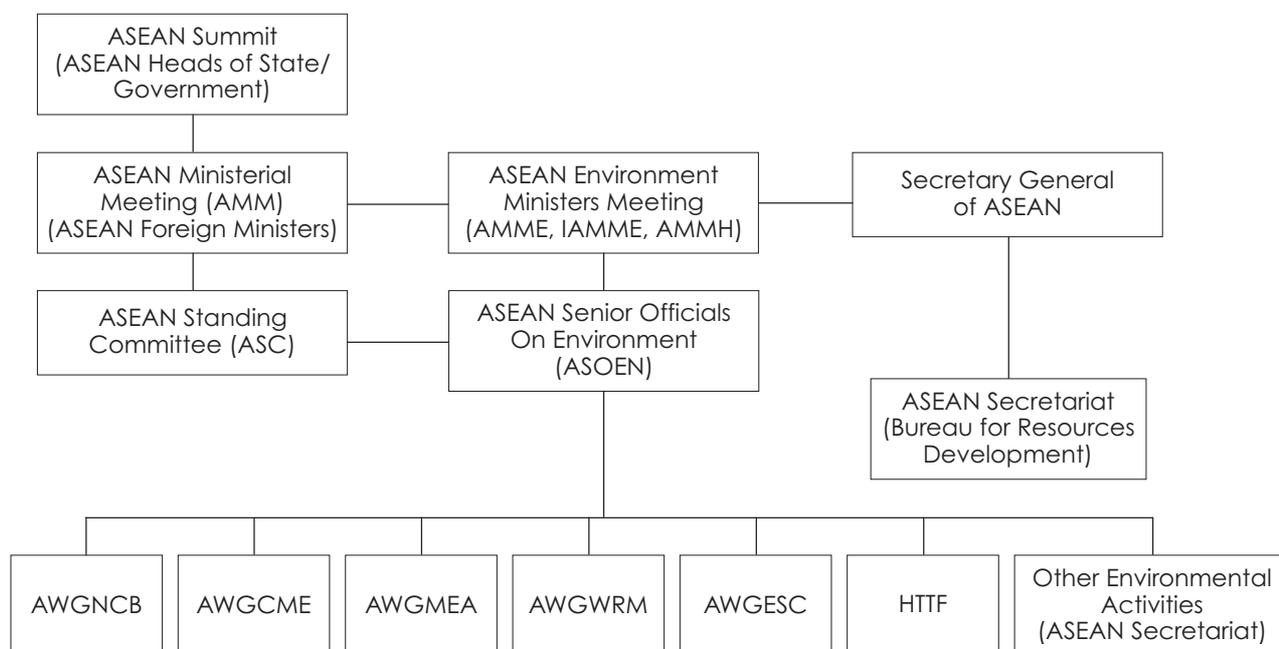
multilateral environmental agreements, including the 1972 *World Cultural and Natural Heritage Convention*, the 1973 *Convention on International Trade in Endangered Species*, and the 1992 *Convention on Biological Diversity*. They also actively participated in the UNESCO Man and Biosphere Programme establishing seven biosphere reserves in the subregion.

The response of South-East Asia to forest fires that cause transboundary haze has been both swift and substantial (Box 10.8). A Regional Haze Action Plan (RHAP) was adopted identifying concrete measures to be taken by specific parties at the regional, subregional, and national levels. The RHAP contains three major components, namely, prevention, to be coordinated by Malaysia, mitigation, to be coordinated by Indonesia, and monitoring, to be coordinated by Singapore. Two working groups were established under a Haze Technical Task Force for Sumatra and Borneo. These working groups were charged with developing and implementing

mechanisms for coordination, lines of communication, and simplifying customs and immigration procedures for immediate deployment of people and goods across borders.

The Marine Water Quality Criteria for the ASEAN Region, the ASEAN Criteria for National Marine Protected Areas, and the ASEAN Criteria for Marine Heritage Areas were adopted to facilitate the management of coastal and marine ecosystems in a sustainable manner.³² By establishing criteria and parameters that are recognized by ASEAN member states, such initiatives also build capacity for joint action. An information exchange mechanism on coral reefs, sea grass beds and mangroves, tanker sludge and ballast water, solid, liquid and hazardous waste management, coastal erosion, eco-tourism, and coastal wetlands, was established. In addition, a framework for the improvement of regional coordination for the integrated protection and management of coastal zones and a regional action plan for the protection

Figure 10.7 ASEAN institutional framework for environmental cooperation



AWGNCB: ASEAN Working Group on Nature Conservation and Biodiversity
 AWGCME: ASEAN Working Group on Coastal and Marine Environment
 AWGMEA: ASEAN Working Group on Multilateral Environmental Agreements
 AWGWRM: ASEAN Working Group on Water Resources Management
 AWGESC: ASEAN Working Group on Environmentally Sustainable Cities
 HTTF: Haze Technical Task Force

Source: ASEAN secretariat, 2005.

of the marine environment from land-based and sea-based activities were developed. Seventeen sites were designated as wetlands of international importance under the Ramsar Convention, and 98 marine and coastal protected areas covering nearly 100,000 km² were established. Indonesia has 30 marine parks; Malaysia, 21; the Philippines, 19; Thailand, 18; Brunei Darussalam, four; Myanmar, four; and Viet Nam, two. In Thailand, the marine protected areas cover 60 per cent of the country's coral reef areas and other important marine habitats such as sea grass beds, marine turtle nesting sites, and mangrove forests. Yet full commitment is required not only of the authorities, planners and local communities, but just as urgently from companies that send their tankers and shipments through the waters, the international fishing industry, and other parties involved in practices that are harmful to the marine environment.

To ensure the sustainability of fishery resources, measures for upgrading the traditional

fish industry, promoting mangrove-friendly aquaculture, conserving sea turtles, and developing fish disease diagnostic inspections for captive bred fry, have been undertaken by countries of the subregion with assistance from the South-East Asian Fisheries Development Centre. A Resolution on Sustainable Fisheries for Food Security has been adopted to help achieve a sustainable supply of fish and fishery products, and a special five-year Programme on the Contribution of Sustainable Fisheries for Food Security has been formulated as a follow up action.

In response to the serious contamination of freshwater resources by industry and scarcity of fresh water in urban areas, the countries of South-East Asia established the ASEAN Working Group on Water Resources Management. The working group addresses the most pressing issues by coordinating programmes on integrated water resources management, facilitating exchange of information, expertise and technology, and

Box 10.8 Highlights of ASEAN's initiatives on transboundary haze pollution

Policy initiatives

- Regional Haze Action Plan (1997)
- ASEAN Agreement on Transboundary Haze Pollution (signed on 10 June 2002 and came into force on 25 November 2003)
- Zero-Burn and Controlled Burning Policy (April 1999)

Institutional arrangements

- ASEAN Ministerial Meeting on Haze
- Haze Technical Task Force (established in September 1995)
- RHAP Coordination and Support Unit within the ASEAN Secretariat
- Subregional Fire-fighting Arrangements (SRFAs) for Borneo and Sumatra
- Subregional Climate Review Group
- SRFA Legal Group on Law and Enforcement (June 2000)
- Intergovernmental Negotiating Group for the ASEAN Agreement on Transboundary Haze Pollution

Projects/Activities

- ASEAN Haze Action Online (www.haze-online.or.id)
- Fire Suppression Mobilization Plans, and Immediate Action Plans
- GIS Database for Sumatra, Borneo and Peninsular Malaysia
- Video-Conferencing for the ASEAN Secretariat and SRFA member countries
- ASEAN-ADB Publication on "Fire, Smoke and Haze - the ASEAN Response Strategy"
- Dialogue sessions with plantation companies
- Community Awareness Programmes
- Establishment of the Coordination and Support Unit (RHAP-CSU) in the ASEAN Secretariat
- Strengthening the ASEAN Specialized Meteorological Center
- World Conference and Exhibition on Land and Forest Fire Hazards
- Training Programme for Prosecutors and Investigators
- Guidelines for implementation of Zero Burning and Controlled Burning Policy

Source: ASEAN (2002), ASEAN Report to the World Summit on Sustainable Development.

promoting relevant education and training. The working group prepared the Long-term Strategic Plan for Water Resource Management along with a framework for achieving long-term river water quality.

The ASEAN Environmental Education Action Plan (2000-2005) outlined activities in four target areas: formal education; non-formal education; human resource capacity-building and networking, collaboration and communication. Under the plan, training and environmental camps were held, and recently with support of UNEP and the Hans Seidel Foundation, an ASEAN Environmental Education Inventory Database has been developed as an on-line tool for collaboration, networking and sharing of experiences. The ASEAN Environment Year is observed every three years.

The ASEAN Regional Programme on Disaster Management was adopted in 2002 to strengthen subregional cooperation on disaster management through capacity-building, sharing of information and resources, and public education, awareness and advocacy. On cleaner production, a feasibility study was conducted for the establishment of a centre or network for environmentally sound technologies.

The development of environmentally sustainable cities in the ASEAN region is being spearheaded by an ASEAN Working Group on Environmentally Sustainable Cities, with Singapore as its Chair. A Framework for Environmentally Sustainable Cities has been developed and will be implemented by nominated cities, which in May 2005 numbered 23.³³

10.5 Conclusion

The South-East Asia subregion is experiencing the highest levels of environmental pressure exerted by rapidly changing production and consumption patterns, as well as societal change. South-East Asia needs to reduce or decelerate the growth of environmental pressure while maintaining its bright economic outlook, by focusing greater attention on defining win-win strategies towards this end.

Increased eco-efficiency, in particular of consumption, is one way of moving in the direction of economic growth that maximizes energy security and reduces waste and human health costs. However stronger incentives for increasing eco-efficiency and finding win-win solutions need to be provided by improving environmental governance processes and the values assigned to the multiple functions of natural resources. The rich endowment of natural resources for which these countries are known is at risk from over-exploitation by those directly dependent on them, such as business interests and governments which seek to boost economic growth within a short time-frame.

Whether South-East Asian institutions have the capacity to resolve these issues in an equitable and environmentally sustainable manner has been called into question. However, there is evidence that things are beginning to change at the level of national policy. At the same time, stakeholders, in particular local communities are increasingly lobbying for more responsible attitudes to the natural resource endowment and are taking their own actions. National and local government actions to institutionalize incentives for environmental protection and more eco-efficient consumption through public policy are critical for maintaining growth within environmental carrying capacity in this subregion.

Similarly, subregional cooperation institutions such as that of ASEAN and the Mekong River Commission will be increasingly challenged to address the issues that define growth of environmental sustainability such as foreign direct investment, ODA and infrastructure development with a focus on reducing the future impact of growing consumption.

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