



# Second ASEAN State of the Environment Report 2000



**Our Heritage Our Future**



# Second ASEAN State of the Environment Report 2000

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## Foreword



I am pleased to present the ASEAN State of the Environment Report 2000 (SoER2), the second in the series. The first ASEAN State of the Environment Report was released in 1997.

SoER2 presents a portrait of the condition of the environment and natural resources in ASEAN. It discusses the socio-economic factors and external pressures affecting the environment and its management. It takes an integrated approach in presenting the facts in line with the concept of sustainable development.

The Report highlights what ASEAN has done to protect the environment and to promote sustainable development. It offers a glimpse of the prospects and challenges facing the region. At the same time, SoER2 serves as an authoritative factual manual for all who are engaged in environmental planning and intervention. It should help them to review these initiatives in terms of their impact and the lessons learnt.

ASEAN is fully committed to the goals of sustainable development. In ASEAN Vision 2020, the association's heads of state and government called for a "clean and green ASEAN with fully established mechanisms for sustainable development to ensure the protection of the region's environment, the sustainability of its natural resources and the high quality of life of its people." Strategies and actions have been laid out in the medium-term Ha Noi Plan of Action and the Strategic Plan of Action on the Environment to implement that vision. As described in this Report, the ASEAN Environment Ministers and their officials meet regularly to formulate, implement, monitor and continuously review the implementation of those action plans.



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Increasingly, however, national and regional environmental problems cannot be set apart from the global environment. This is why ASEAN is fully committed to the international effort to address global environmental issues.

We sincerely hope this Report will help to enlighten people around the world about the state of the environment in our region, its unique geographical setting, the pressing socio-economic conditions that affect the environment, and the opportunities and means that are available for collaborating with ASEAN. In this respect, SoER2 serves as an invitation for collaboration with us, based on the principle of common but differentiated responsibility, in our effort to keep our environment clean and healthy for the present and future generations.

I wish to congratulate all those involved in producing this excellent report. My appreciation goes especially to the United Nations Environment Programme for its generous financial support.



**Rodolfo C. Severino, Jr.**  
*Secretary-General of ASEAN*

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# ASEAN Member Countries



## Chapter 1

# Introduction



***“The Association of Southeast Asian Nations represents the collective will of the nations of Southeast Asia to bind themselves together in friendship and cooperation and, through joint efforts and sacrifices, secure for their peoples and for posterity the blessings of peace, freedom and prosperity”***

***The ASEAN Declaration  
8 August 1967***

## The Challenges

Since its inception in August 1967, the Association of Southeast Asian Nations (ASEAN) has consistently maintained and fostered close collaboration among its member countries in addressing environmental issues at the national, regional, and global levels. Despite considerable differences in geographical, demographic, social, economic, and environmental conditions – and different systems of government – the ten ASEAN Member Countries (AMCs) have identified and collaborated in various environmental issues of common interest. AMCs have established mutually consistent understanding in international fora regarding global environmental issues and share a common aspiration for continued socio-economic progress while maintaining balanced development based on the principle of environmentally sound sustainable development.

ASEAN has entered the 21<sup>st</sup> century with a number of environmental challenges.

- A major challenge is ameliorating the effect of the economic crisis that hit most AMCs in mid 1997. Although the worst has passed, the economies of Indonesia, Lao PDR, the Philippines, and Thailand are recovering slowly amid uncertainties. Slow recovery could result in insufficient budget allocation and attention to environmental management, thus increasing pressure on environmental resources<sup>1</sup>, some of which are already under stress.

- The second major challenge is the management of an increasing number of regional and global environmental agreements, international codes of conduct, and

environmental management certification schemes which will require consideration – and in some cases compliance by AMCs – for ASEAN economies to continue to prosper.

- The third challenge is ensuring adequate responses to emerging regional environmental problems, such as emissions from land and forest fires, which have affected a number of AMCs. Other potential regional issues with environmental implications include the cooperative development of the Mekong River basin, cross-border deforestation and wildlife trade, and the exploitation of marine resources.

- The fourth challenge is achieving the aspirations of *ASEAN Vision 2020* and the *Ha Noi Plan of Action* (HPA) adopted by the ASEAN Heads of State/Government in December 1997 and December 1998 respectively. Vision 2020 clearly reflects the desire of ASEAN to pursue more sustainable paths to development. The HPA outlines the initial course of strategies and action plans for the period 1999 to 2004 to help realise the Vision.

These challenges are interlinked and will require mechanisms to ensure effective popular participation in socio-economic development and environmental management<sup>2</sup>. Approaches for more widespread public participation may differ among the AMCs depending on political, cultural and social factors. Improved environmental management will require new policy responses and initiatives from individual ASEAN member countries and closer cooperation and collaboration among the countries in ASEAN.

## The Second ASEAN State of the Environment Report

In September 1997, the ASEAN Secretariat published the *First ASEAN State of the Environment Report* (SoER1). SoER1 was the result of collaborative efforts among the AMCs

especially their national environmental agencies, the United Nations Environment Programme (UNEP) and individual experts. The ASEAN Secretariat supervised and coordinated preparation of the report.



*The First ASEAN State of the Environment Report*

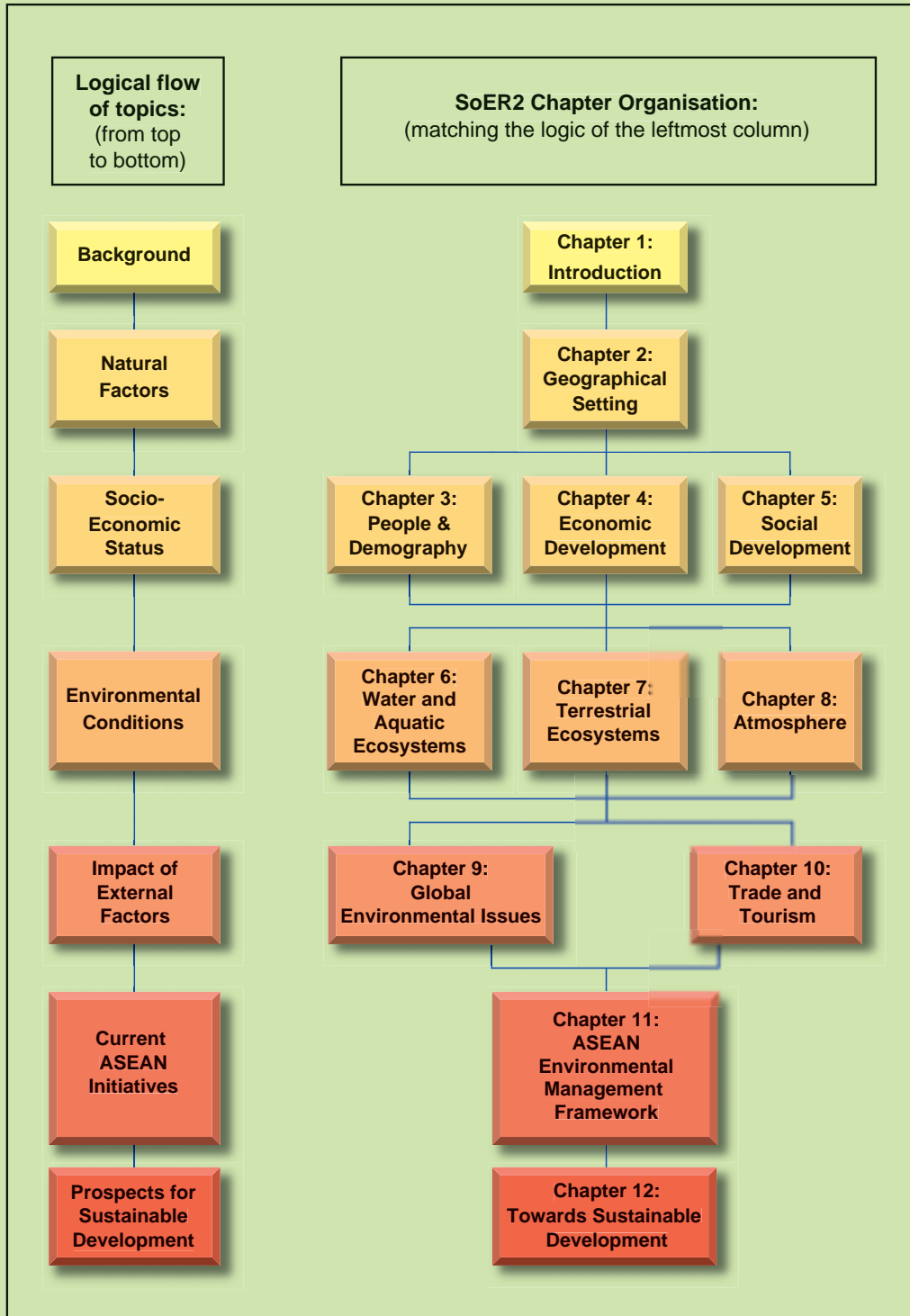
SoER1 helped, among others, in the design and implementation of several environmental initiatives among AMCs. Inspired by its success, the ASEAN Secretariat, with the mandate of the ASEAN Senior Officials on the Environment (ASOEN), is now publishing the *Second*

*ASEAN State of the Environment Report 2000* (SoER2), again in collaboration with UNEP. SoER1 covered the seven countries which were then member countries of ASEAN. SoER2 coverage has expanded to ten countries as three new members – Myanmar, Lao PDR, and Cambodia – joined ASEAN between 1997 and 1999.

The *Second State of the Environment Report* was prepared with the full participation of and inputs from the AMCs. The Report should be of interest to a wide range of stakeholders, namely the AMCs, governments outside the region, UN organizations, other international organizations and non-governmental organizations, researchers, and the public in general who are involved in environmental issues and sustainable development. SoER2 aims to achieve the following objectives:

- To present the status of the environmental conditions in the AMCs and the region as a whole, including developments in related sectors. It provides key statistical data on the various environmental and socio-economic sectors. SoER2 highlights developments since the publication of SoER1 in 1997, and therefore essentially covers the period 1998 to 2000.

**Figure 1.1 – The Organisation of SoER2**



- Recognizing the dynamics of environmental issues which transcends national borders, SoER2 also presents developments in key emerging issues particularly global environmental issues and developments in socio-economic sectors. It highlights the increasing vulnerability of most AMCs to such developments beyond their national borders and region, and the need to foster positive and mutually advantageous relationship in the increasingly globalized world.

- To highlight ASEAN initiatives in environmental management, its achievements and constraints, goals for the future, and opportunities for collaboration. SoER2 therefore invites interested governments, international organizations and other stakeholders to join in ASEAN efforts to help promote environmental protection and sustainable development, in the belief that a good environment benefits not only the member countries but the world as a whole.

## The Organisation of SoER2

SoER2 covers similar subject matter as SoER1 with an extended coverage of socio-economic issues. It is organised into twelve chapters as illustrated in Figure 1.1. Chapter coverage in the right-hand side of Figure 1.1 corresponds to the logical sequence of topics in the same row of the left-hand portion of the figure. Chapters 1–5 establish the socio-economic setting, chapters 6–8 cover the status of the physical environment, and chapters 9–12 discuss issues external to ASEAN, and ASEAN's response to shift toward more sustainable development paths.

**Introduction** (Chapter 1) introduces the report and key environmental issues.

**Geographical Setting** (Chapter 2) briefly reviews the geographical setting of ASEAN member countries and the geographical influence on the nature and characteristics of



environmental issues in each country. Despite considerable geographical diversity within AMCs, the chapter concludes that a wide range of national, subregional and regional environmental issues have region-wide dimensions which are best addressed at the regional level.

**People and Demography** (Chapter 3) covers



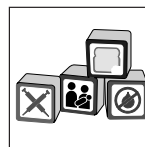
demographic trends in AMCs. It concludes that continued population growth and rapid urbanisation, despite a trend in declining rates of population growth regionally, could have significant environmental impacts unless more effectively addressed through appropriate policy responses. It notes that increased population densities will not necessarily exacerbate environmental degradation if appropriate measures are adopted.

**Economic Development** (Chapter 4) reviews



recent patterns of economic growth and development in AMCs, briefly summarising the key sectors of agriculture, industry, and energy. ASEAN is recovering from the economic crisis of the late 1990s but environmental spending has yet to recover to pre-crisis levels. ASEAN's rapid economic development will require a correspondingly high degree of effective environmental management initiatives.

**Social Development** (Chapter 5) considers



social trends, emphasising the links between environment and poverty, the impact of poverty on environmental health, and the high degree of vulnerability of the

poor to natural disasters including those exacerbated by human activity. Various indices of development in ASEAN – such as UNDP's Human Development Index, the percentage of people living in poverty, and male and female literacy rates – all show encouraging trends of improvement over the past decade.

**Water and Aquatic Ecosystems** (Chapter 6)

reviews conditions and issues regarding water resources and aquatic ecosystems, including freshwater wetlands, coastal and marine resources, and fishery resources. Some of these are being exploited unsustainably, an issue which AMCs will need to address urgently. Compared to most regions of the world, ASEAN has adequate renewable water resources but seasonal and other pressures are increasing. The ASEAN region is a major global producer and exporter of fish products, but the resources on which they depend – clean waters, mangroves and coral reefs – are deteriorating. ASEAN has established over 90 marine and coastal Protected Areas covering nearly 100,000 sq km to protect these resources.

**Terrestrial Ecosystems** (Chapter 7) discusses

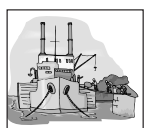
land/soil resources and terrestrial ecosystems in AMCs. Waste management is also covered as many wastes are returned to the environment through land disposal. Of the world's seventeen 'megadiversity' countries which account for about 80% of global biodiversity, ASEAN contains three of them, namely Indonesia, the Philippines and Malaysia. In recognition of this fact, AMCs have established over 1,000 terrestrial 'protected areas' covering 418,000 sq km, or nearly 10% of total land area of AMCs. Nonetheless, ASEAN remains a recognised biodiversity 'hotspot', i.e. biologically important yet under serious threat. This is exemplified by growing rates of deforestation, of over 23,000 sq km per year during the 1990s compared to about 16,000 sq km annually from 1970–1990. However, deforestation in ASEAN should be viewed in its proper perspective. ASEAN remains one of the most heavily forested regions of the world. Over 48% of land area in ASEAN is forest-covered compared to only 18% for Asia overall, and less than 30% globally.

**Atmosphere** (Chapter 8) reviews air quality in

ASEAN. In the larger cities, total suspended particulates, which can cause respiratory illnesses, are sometimes more than double the WHO guidelines. However, nitrogen and sulphur dioxides are well within the guidelines, and dramatic progress has been made in reducing lead concentrations in ambient air, most notably in Malaysia, Singapore, and Thailand. Transboundary haze from land and forest fires was a serious problem, particularly in 1997–1998, over much of Southeast Asia. An estimated 70 million people were affected, 9 million hectares of land and forest in Indonesia were damaged, and total cost was estimated at US\$9 billion. ASEAN has taken the lead role in addressing this problem through a substantive regional programme of monitoring, prevention and mitigation.

**Global Environmental Issues** (Chapter 9)

describes various global environmental issues that require attention from ASEAN member countries. It notes, for example, that AMCs are relatively low emitters of the greenhouse gas – carbon dioxide (emitting 30% less per capita than the developing world on average) – but are highly vulnerable to the projected effects of climate change, including severe flooding, forest fires, sea level rise, and more severe economic disruption than ever before. Issues on biodiversity and biosafety are of high concern to AMCs considering their potential impact on the rich and extensive natural forests and other ecosystems. ASEAN member countries have ratified, or acceded to, the major multilateral environmental agreements at a higher rate than the Asia-Pacific region in general.

**Trade and Tourism** (Chapter 10) discusses the

environmental dimensions of trade and tourism both of which are areas of considerable importance to economies in the



region. The AMCs are increasingly dependent on trade. Merchandise exports grew from US\$144 billion in 1990 (4.3% of world total) to nearly US\$360 billion in 1999 (6.6%). In the future, environmental implications of trade agreements are expected to become increasingly important. In 1999 AMCs received 33 million tourist visitors, with tourism receipts reaching US\$20 billion. Ecotourism has the potential to attract even more visitors to the region but AMCs must intensify their efforts to better protect these ecotourism attractions.

### **ASEAN Environmental Management Framework** (Chapter 11)



summarises the institutional framework, programmes and activities which ASEAN has initiated to assist its member countries to more effectively address the environmental issues and linkages described in earlier chapters. Based on the aspirations of *ASEAN Vision 2020* and the objectives of the *Ha Noi Plan of Action*, ASEAN has developed a Strategic Plan of Action on the Environment (SPAEE) for 1999–2004. More recently, the Environment Ministers articulated their current concerns on environmental issues when they issued the Kota Kinabalu Resolution on the Environment in October 2000.

### **Towards Sustainable Development** (Chapter



12) concludes the report by discussing ASEAN's approach to shift towards more sustainable development, highlighting critical emerging issues, and strategies and interventions for addressing them. ASEAN recognizes that sustainable development represents a moving target that is further complicated by developments not only nationally but also regionally and globally. The path towards sustainable development could be thwarted, if not set back a few years as witnessed during the recent economic crisis, if the global community

does not recognize the intrinsic relationship among economic development, social development especially poverty, and environmental management. In this respect, ASEAN remains committed to fostering a positive and mutually reinforcing relationship with the rest of the world in promoting sustainable development based on the principle of common but differentiated responsibility.

## **Data and Information**

In the preparation of the SoER2 every attempt was made to source primary data from the AMCs. However in some cases, especially for environmental data, it was difficult to obtain comparable data in terms of measurement, time and parameters specified. To ensure consistency and comparability, data from reputable organizations and other reliable sources were used.

SoER2 is therefore based on recent information and data from a large number of sources: the AMCs, several centres and projects linked to ASEAN, published documents, and numerous files downloaded from the Internet

The report synthesises existing information, preferring national or ASEAN sources where available including national environmental reports, and data tables which were provided by most countries specifically for SoER2. Other important sources included the Asian Development Bank, United Nations bodies (ESCAP, FAO, UNEP, UNDESA etc.), the World Bank, professional and private associations, and several NGOs and other environmental organisations (such as IISD, IUCN, WRI and WWF). During the preparation of SoER2, inconsistencies among various sources of data were often found, particularly regarding population, social and economic data. In such cases, data provided by the governments were normally adopted as reference data. A reference

noting 'data provided by government' refers to the respective AMC, generally the ministry responsible for environment. Where such data is not available, other sources judged to be reliable were used. Explanatory notes are provided to clarify the sources used. In data sets, the notation 'N/A' is used to refer to cases where data is not available, not reliable, not consistent

or could not be obtained in time for the publication of this report.

A detailed list of sources follows the main report. This includes a list of Internet websites used, as the Internet is a far more valuable and comprehensive source of information now than it was only three years ago when SoER1 was published.

- 
- <sup>1</sup> "Environmental resources" refers to renewable natural resources such as water, land/soil, air, and flora and fauna. Non renewable natural resources such as minerals are not usually considered as environmental resources, although their extraction, use or disposal may have significant environmental implications.
  - <sup>2</sup> "Environmental management" means acting within the overall aim of sustainability – to prevent, avoid, mitigate or remedy damage to the environmental impacts through techniques such as land use planning, legal instruments, choice of technologies, and economic instruments.







## Chapter 2

# Geographical Setting



**G**eographical conditions determine a country's ecological systems, its environmental resources, and patterns of life and socio-economic development. Widely varying geography, land area, and industrial structure suggest that each ASEAN member country may have very different environmental problems and differing priorities for addressing these issues. For example, marine pollution is not directly relevant to land-locked Lao PDR, and land and soil resource degradation are of relatively limited concern to the urban city-state of Singapore. Nonetheless, most AMCs share common environmental problems such as industrial pollution, air pollution, adverse effects of rapid urban growth, and degradation of their environmental resources. Despite their geographical diversity, the AMCs share a considerable number of common environmental concerns, many of which can best be addressed on a regional basis. This chapter summarises the geographical conditions in ASEAN member countries and briefly discusses their environmental implications.

## ASEAN FACTS AND FIGURES

ASEAN membership	Ten Southeast Asian countries: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam
Extent	3,300 km N to S; 5,600 km E to W
Land area	4.4 million square kilometres
Climate	Tropical, monsoon influenced
Relative humidity	Typically 70 – 90 %
Temperature	Annual range typically 25 – 30°C
Volume of rainfall per year	A cube, each side measuring 16 km, of which 2/3 falls in Indonesia



### Geographical Location

Between 1997 and 1999, ASEAN membership increased from seven to ten countries with the addition of Cambodia, Lao PDR and Myanmar. Accordingly, the ASEAN region now covers all of Southeast Asia, extending from latitude 30° North to 11° South and longitudes 92° East to 142° East. Of the ten countries, only Lao PDR is landlocked, all others having direct access to the sea.

### Country Sizes, Land Features and Topography

The ten AMCs have a combined land area of about 4.4 million sq km, varying widely from Singapore (683 sq km) to Indonesia (1.812 million sq km), the latter accounting for over 40% of total area as indicated in Table 2.1. Indonesia is nearly triple the size of Myanmar, the second largest ASEAN member country.

Southeast Asia consists of those continental margins and offshore archipelagos of Asia lying south of China and east of India. Continental Southeast Asia includes Myanmar, Thailand, the

Lao PDR, Cambodia, and Viet Nam. Archipelagic Southeast Asia consists of Singapore at the tip of Peninsular Malaysia and the two sprawling archipelagic states of Indonesia and the Philippines. It also includes Malaysia, comprising West Malaysia (the Malay Peninsula) and East Malaysia (northern portion of the island of Borneo). The Sultanate of Brunei Darussalam is on the northern coast of Borneo. Overall, Southeast Asia extends more than 3,300 km from north to south and 5,600 km from east to west.

Four extensive, southward-flowing river systems shape continental Southeast Asia's physical geography and major settlement patterns. These are the Ayeyarwady and Thanlwin (Myanmar), the Chao Phraya (Thailand) and the Mekong (marking much of the Thailand-Lao PDR border and traversing Cambodia and Viet Nam). The shorter, eastward-flowing Red River (Song Hong) reaches the Gulf of Tonkin farther north, near the Chinese border. All except the Thanlwin flow through broad alluvial plains and fertile deltas, where intensive rice agriculture sustains dense populations and

large cities. No comparably large river systems exist in the islands. Closest in length are the large meandering rivers of Borneo, the world's third largest island. The other major Indonesian and the Philippine islands are, unlike the mainland, volcanic. Their topsoils support an intensive rice-dominated agriculture.

### Climate

#### Overview

The AMCs share a tropical climate greatly influenced by

Figure 2.1 – The ASEAN Region



ASEAN Secretariat

**Table 2.1** – Land Area of ASEAN Countries

Country	Land Area (sq km)	% of Total
Brunei Darussalam	5,765	0.13
Cambodia	184,800	4.21
Indonesia	1,812,000	41.25
Lao PDR	236,800	5.39
Malaysia	332,665	7.57
Myanmar	676,553	15.40
Philippines	299,404	6.82
Singapore	683	0.02
Thailand	513,115	11.68
Vietnam	331,042	7.54
<b>Total</b>	<b>4,392,827</b>	<b>100</b>

**Source:** Data obtained from AMCs

**Note:** Percentages may not tally due to rounding errors

tropical monsoons mostly originating in the South China Sea. Southern Thailand, Peninsular Malaysia and Indonesia are influenced by the Andaman Sea and the Indian Ocean. In addition, parts of continental Asia are subject to cold fronts from China. Semi-temperate climate prevail in the continental high plateau and mountains. Consequently, ASEAN member countries have a diverse range of ecosystems with rich pools of genetic resources. The relative humidity in the region is high, ranging from 70% to 90% with average annual temperatures for most locations ranging from 25°C to 30°C. Temperature inversions are common; when air is stable and sources of air pollutants are present, concentrations of pollutants may increase because of poor dispersion, causing hazy mornings which normally clear by mid-afternoon.

There are two distinct monsoon seasons, the Northeast and Southwest:

- The October to February Northeast monsoon brings steady north-easterly winds from the interior of Asia. It is cool and dry in the northern parts of Thailand, Lao PDR, Cambodia, and Myanmar, and as the wind blows over the South China Sea, it picks up moisture from the sea and deposits it as rain on the east coast of Viet Nam and Peninsular Malaysia, bringing about the wettest season for this area. The monsoon, also affects much of Java, Kalimantan, Sabah, Sarawak, Brunei Darussalam and the Philippines, bringing considerable rain, especially early in the season.

- The Southwest monsoon begins in May and ends in September or October. During this period, most rain falls over Thailand, Cambodia, Lao PDR, Myanmar, Viet Nam and parts of the western coastal districts of Sumatra and Peninsular Malaysia and the central and northern islands of the Philippines.

During the monsoon, strong winds and rain



*Volcanic topsoils support intensive rice agriculture*

Nguyen Dinh Na



help dilute and remove air pollutants from the atmosphere. However, winds also carry pollutants and deposit them as 'acid rain' or particulate matter in soil and water bodies, often a considerable distance from the sources. These geographical conditions help explain why transboundary haze pollution from land and forest fires can be so severe in the region: winds can quickly transport them over much of the populated areas of ASEAN member countries and beyond.



Nguyen Trong Tamh

Monsoon rains cause occasional flooding

### Rainfall and Temperature

ASEAN is predominantly wet equatorial, characterised by substantial rainfall, estimated at about 3,800 cu km annually, equivalent to a huge cube measuring nearly 16 km per side. Indonesia receives about two thirds of the total. Considerable spatial and seasonal variations occur particularly in river flows, with distribution strongly affected by the northeast and southwest monsoons and typhoons. For example, typhoons bring 25–35 % of the Philippines' annual rainfall. There is considerable spatial variation too as southern islands receive fairly uniform rain year-round whereas central and northern islands rely on monsoons. Brunei Darussalam, Indonesia, the southern Philippines, Singapore and Malaysia experience rainfall all year although spatial distribution is often uneven. For instance, in the drier parts of central Sabah, annual rainfall is about 1,730 mm, whereas rainfall in the mountains of Sarawak can exceed 5,000 mm. Table 2.2 presents average annual rainfall and temperatures in a number of cities within ASEAN.

### Oceanography

The coastlines of AMC's border the Andaman Sea, the Gulf of Thailand and the South China Sea.

### The Andaman Sea

The boundary of the Andaman Sea to the north is the Ayeyarwady River delta; to the east Peninsular Myanmar, Thailand and Malaysia; to the west the Andaman and Nicobar Islands; and to the south Sumatra and the Straits of Malacca. It is the most important sea link between Myanmar and other nations. The sea has an area of 798,000 sq km, is 1,200 km long, and is 645 km wide. Less than 5% is deeper than 3,000 m, but depths can exceed 4,400 m east of the Andaman-Nicobar Ridge. The northern and eastern third is less than 180 m deep, in part because of silt deposited at the Ayeyarwady delta. The western and central half of the sea ranges from 1,000 to 3,000 m deep.

Southeast Asia's monsoons govern the sea's climate and waters. In the winter when relative humidity is low, the sea receives little rainfall or runoff and hence surface salinities are high. Huge volumes of runoff water from Myanmar flow into the Andaman Sea during the summer monsoon, resulting in low surface salinity in its northern third. Neither the Andaman's surface waters nor bottoms are rich in marine life. Its waters along Peninsular Malaysia, however, favour mollusc growth, and there are about 250 edible species of fish in those intensively-fished coastal waters. The sea's mineral resources are

**Table 2.2** – Rainfall and Temperature in Cities of ASEAN Member Countries

Country	City	Average Rainfall		Temperature Range (annual minimum & maximum °C)
		(mm / year)	(days / year)	
Brunei Darussalam	Bandar Seri Begawan	2,909	171	23 - 32
Cambodia	Phnom Penh	1,403	130	21 - 35
Indonesia	Jakarta	1,800	129	23 - 31
	Medan	2,030	147	22 - 32
	Padang	4,175	190	23 - 31
	Balikpapan	2,239	152	21 - 30
	Ujung Pandang	2,861	138	21 - 31
Lao PDR	Vientiane	1,720	115	11 - 34
	Luang Prabang	1,405	115	15 - 35
Malaysia	Kuala Lumpur	2,366	157	22 - 33
	Kuching	4,155	212	22 - 33
	Kota Kinabalu	2,547	143	23 - 32
Myanmar	Yangon	2,681	129	18 - 37
	Mandalay	915	56	13 - 38
Philippines	Manila	1,875	157	21 - 34
	Zamboanga	1,082	109	22 - 32
Singapore <sup>a/</sup>	Singapore	2,344	176	24 - 31
Thailand	Bangkok	1,498	100	21 - 35
	Songkhla	2,035	124	24 - 33
	Chiang Mai	1,185	91	14 - 36
Viet Nam <sup>a/</sup>	Ha Noi	1,676	145	21 - 27
	Ho Chi Minh City	1,931	159	23 - 32

Source: JICA

Note: <sup>a/</sup>Data obtained from respective governments

also limited but include tin deposits off the coasts of Malaysia and Thailand. The two largest modern ports are George Town (Malaysia) and Yangon (Myanmar).

### The South China Sea

The South China Sea is partly enclosed on the east by the Philippines and Borneo; in the southwest it merges with the Gulf of Thailand; and on the west it is separated from the Gulf of Tonkin by Hainan Island. It increases in depth from the south, where much is under 300 metres deep, to the north where it can reach 4,600 m. The total sea area is 2.32 million sq km. Major ports on or near the South China Sea include Manila, Singapore, Bangkok, Ho Chi Minh City,

and Hai Phong. The principal rivers draining into it are the Mekong and the Xi Jiang. Shipping and fishing are economically important and can be severely affected by the weather, including violent monsoons and typhoons.

### The Gulf of Thailand

The Gulf of Thailand – with an area of about 320,000 sq km – is an inlet of the South China Sea lying between Peninsular Malaysia on the west and the Southeast Asian mainland to the north and east. It is bounded mainly by Thailand (southwest through north), Cambodia, and southern Viet Nam (to the northeast). Main harbours include Bangkok and Chanthaburi (Thailand), Kompong Som (Cambodia) and





Rach Gia (Viet Nam). The four major rivers of Thailand (Mae Klong, Tha Chin, Chao Phraya and Bang Pakong) drain into the Upper Gulf which is approximately 100 km by 100 km in extent with an average depth of 15 m. The bottom slopes gradually down to a mean depth of 25 m at its mouth between Sattahip and Hua Hin. The average depth of the entire gulf is about 45 m with a maximum of 70 m to 85 m. The bottom of the upper gulf is characterized by clay-sand with a patch of sandy clay near the Phetchaburi coast. The shallow coastal waters provide economically important fishing grounds.

## Environmental Implications of Geographical Conditions

Each ASEAN member country has particular environmental concerns due to its individual geographical and socio-economic conditions. However, some concerns are common among most members and other issues, often cross-border in nature, are shared because of proximity. A range of environmental concerns in AMCs is summarised in Table 2.3. Although not all of these are geographical in nature, regional geography plays a role in many of these concerns.

**Table 2.3 – Key Environmental Issues and Causes in ASEAN Member Countries**

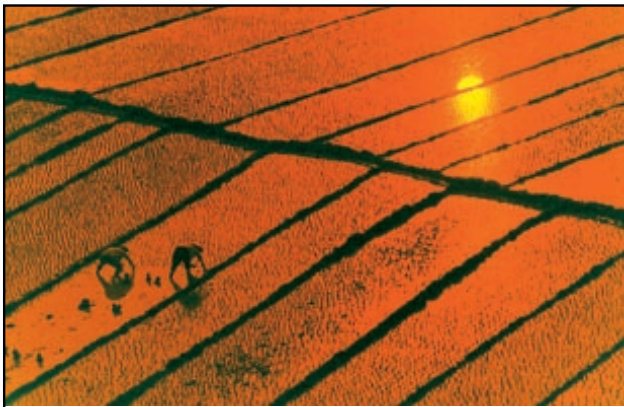
Country	Shared Issue	Key Causes
Brunei Darussalam	Seasonal smoke and haze; solid wastes	Transboundary pollution from land and forest fires.
Cambodia	Soil erosion; sedimentation; water pollution; deforestation; loss of biodiversity; threats to natural fisheries.	Unmanaged waste & effluent discharge into Tonle Sap lake; destruction of mangrove wetlands through extensive industrial & aquaculture development.
Indonesia	Deforestation; loss of biodiversity; water pollution; air pollution in urban areas; national and transboundary seasonal smoke and haze; land degradation; pollution of Malacca straits.	Deficiencies in urban infrastructure - unmanaged industrial wastes and municipal effluents and waste; vehicular congestion and emissions; extensive land clearance and forest fires for pulp wood and oil palm production; extensive and unmanaged mining activities; national and transboundary industrial pollution; tourist developments in coastal regions beyond carrying capacity.
Lao PDR	Deforestation; loss of biodiversity; soil erosion; limited access to potable water; water-borne diseases.	Land clearance; shifting cultivation; inadequate water supply & sanitation infrastructure.
Malaysia	Urban air pollution; water pollution; deforestation; loss of biodiversity; loss of mangrove habitats; national and transboundary smoke/haze.	Vehicular congestion and emissions; deficiencies in urban infrastructure - industrial and municipal effluents; extensive land clearance and forest fires for pulp wood and oil palm production; unmanaged coastal developments; tourist developments in coastal regions beyond existing carrying capacity
Myanmar	Deforestation; loss of biodiversity; urban air pollution; soil erosion; water contamination and water-borne diseases.	Land clearance; excessive mineral extraction; vehicular congestion and emissions; deficiencies in urban infrastructure – unmanaged industrial and municipal effluents.
Philippines	Deforestation in watershed areas; loss of biodiversity; soil erosion; air and water pollution in Manila leading to waterborne disease; pollution of coastal mangrove habitats; natural disasters (earthquakes, floods).	Illegal forest cutting; land clearance; rapid urbanization and deficiencies in urban infrastructure - unmanaged industrial and municipal effluents, inadequate water supply and sanitation; tourist developments in coastal regions beyond existing carrying capacity;
Singapore	Industrial pollution; limited natural fresh water resources; waste disposal problems.	Seasonal smoke/haze; limited land available for waste disposal.
Thailand	Deforestation; loss of biodiversity; land degradation and soil erosion; shortage of water resources in dry season and flooding in rainy season; conflict of water users; coastal degradation and loss of mangrove habitat; urban air pollution; pollution from solid waste, hazardous materials and hazardous waste.	Sporadic development and destruction of watersheds; unmanaged aquaculture; tourist growth exceeding growth in carrying capacity; deficiencies in urban & rural infrastructure; freshwater resources polluted by domestic / industrial wastes & sewage runoff.
Viet Nam	Deforestation and soil degradation; loss of biodiversity; loss of mangrove habitat; water pollution and threats to marine life; groundwater contamination; limited potable water supply; natural disasters (e.g. floods).	Land clearance for industry; extensive aquaculture & overfishing; growing urbanisation and infrastructure deficiencies; inadequate water supply & sanitation (particularly in Hanoi & Ho Chi Minh City).

Source: Adapted ESCAP & ADB, 2000



As this chapter in general (and Table 2.3 specifically) indicates, environmental issues in AMCs can be grouped into:

- *Regional issues of common interest to most or all members.* Common regional issues suggest the desirability of some degree of political and technical cooperation among all ASEAN member countries. Examples include addressing global environmental issues such as climate change, biodiversity and biosafety, transboundary movement of toxic wastes, and perhaps natural disasters.
- *Sub-regional issues which involve a smaller group of ASEAN members.* These include transboundary atmospheric pollution caused by land and forest fires in the region (e.g. affecting Indonesia, Malaysia, Brunei Darussalam, Singapore, Thailand and the Philippines); oil spills affecting coastal environments and marine life; cross border movements of hazardous wastes; development of the Mekong river (Thailand, Lao PDR, Cambodia and Viet Nam); and marine resource management in the South China Sea (Thailand, Viet Nam, Cambodia and Malaysia).
- *Country-specific issues which may have no direct bearing on other AMCs.* Issues include



The golden crop

waste management, deforestation and forest fire prevention, mangrove degradation, tourism impacts which exceed local carrying capacities, degradation of watersheds and soil erosion, river water quality, air quality, protection of habitats containing endangered species, managing urban growth, and the development of national institutional frameworks for improved environmental management.

However, some ostensibly subregional issues can have region-wide impacts and many apparently country-specific issues can affect other nearby countries. For example, the environmental problems which inevitably accompany rapid economic growth (or its slowdown) in specific AMCs may call for similar policy responses, institutional measures and safeguards across the region. The degradation of watersheds, coral reefs or mangrove habitats in one country can affect water quality, marine resource production and/or tourism in neighbouring countries. Areas of rich biodiversity of fauna or flora in border regions of a specific country can be irreparably destroyed by habitat destruction within adjacent countries. In any case, national issues can best be addressed through regional efforts by sharing experiences, expertise and limited resources. ASEAN's environmental management framework therefore deals not only with the global, regional and sub regional issues, but provides coordination and enhances synergy in addressing national environmental problems.

The remaining chapters will consider these issues in more detail, describe the ways in which ASEAN is assisting its member countries to address them, and suggest opportunities for further action.





## Chapter 3

# People and Demography



**T**he impact of people on the environment depends upon their general level of affluence, the technologies used to produce goods and services, the economic structure and demographic characteristics. A large or growing population does not in itself necessarily result in environmental degradation. However, where the other factors are constant, growth in population will cause a corresponding increase in natural resource consumption and may result in increased environmental degradation. Total population can indicate the magnitude of the overall demand on environmental resources, and population density can indicate the local pressures being exerted on these resources. For example, urban areas, with large population and high density, typically discharge a large amount of waste into the local environment relative to rural areas, causing environmental pollution. This chapter discusses the demographic trends of ASEAN member countries and their environmental implications.

## ASEAN FACTS AND FIGURES

Population in ASEAN (2000)	522 million (Indonesia: 41%)
ASEAN as % of Global Population (2000)	8.6%
Projected population in ASEAN (2050)	799 million (Indonesia: 39%)
Megacities (approaching 10 million people)	Bangkok, Metro Manila, Jakarta
Urbanisation	<b>low: under 25%</b> Cambodia, Lao PDR, Viet Nam <b>medium: 25-50%</b> Indonesia, Myanmar, Thailand <b>high: 50-75%</b> Malaysia, Philippines <b>very high: over 75%</b> Brunei Darussalam, Singapore



## Total Population

ASEAN member countries have a total population of about 522 million (2000). Individual country populations vary from 0.33 million (Brunei Darussalam) to 212 million (Indonesia) as shown in Table 3.1. Indonesia ranks fifth in world population, accounting for nearly 41% of total ASEAN population. Viet Nam, the Philippines and Thailand have a combined population of nearly 217 million, or 42 % of the ASEAN total. In general, countries with large population and high urban densities, coupled with low affluence levels, tend to face severe environmental conditions.

## Population Growth Trends

The population of the ten ASEAN member countries was 177.7 million in 1950 (UNDESA, 2000) and is expected to increase to about 799 million by 2050, at an average annual growth rate

of 2.18% from 1950–2000, declining to an estimated 0.85% from 2000–2050. Figure 3.1 shows more clearly the influence of Indonesia on the total ASEAN population and the recent trend in declining rates of population growth.

Household incomes, education levels, religious beliefs and the family planning policies of governments influence population growth rates. These factors differ considerably among AMCs. Table 3.2 shows total fertility rates<sup>1</sup> and percentages of women adopting family planning practices.

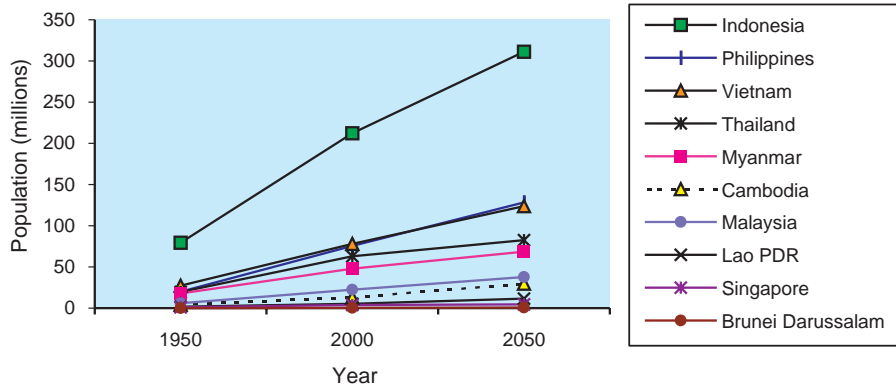
Figure 3.2 compares the ASEAN fertility data of Table 3.2 with national income levels as reported by the World Bank (*World Development Report, 2000*). As in other countries, fertility tends to be lower with higher incomes. Although not shown, the rate of natural increase reflects the same broad declining trend with increasing income levels.

**Table 3.1** – Population Estimates of ASEAN Member Countries: 2000–2050

Country	Land Area (sq km)	Population in 2000			Population Projections ('000)		
		Thousands	% of ASEAN	Persons per sq km	2015	2025	2050
Brunei Darussalam	5,765	330	0.1	57	420	470	570
Cambodia	184,800	13,100	2.5	72	18,590	22,310	29,880
Indonesia	1,812,000	212,090	40.7	117	250,070	272,900	311,300
Lao PDR	236,800	5,280	1.0	23	7,330	8,720	11,440
Malaysia	332,665	22,220	4.3	67	27,910	31,330	37,850
Myanmar	676,553	48,123 <sup>a/</sup>	9.2	71	55,260	60,240	68,550
Philippines	299,404	75,650	14.5	252	95,880	107,070	128,380
Singapore <sup>a/</sup>	683 <sup>a/</sup>	4,018 <sup>a/</sup>	0.8 <sup>a/</sup>	5,885 <sup>a/</sup>	4,760	5,000	4,620
Thailand	513,115	62,810	12.0	122	72,490	77,480	82,490
Viet Nam	331,042	78,140	15.0	236	94,410	105,490	123,780
<b>ASEAN</b>	<b>4,392,827</b>	<b>521,761</b>	<b>100</b>	<b>119</b>	<b>679,930</b>	<b>691,010</b>	<b>798,860</b>

**Source:** *World Population Prospects 2000* (WPP, UNDESA, 2000) assuming median projection variants.

**Note:** <sup>a/</sup> Data from respective governments


**Figure 3.1 – Population Trends in ASEAN Member Countries**


Source: World Population Prospects 2000 (UNDESA, 2000)

### Population Densities

In 2000, population densities in ASEAN member countries ranged from a high of 6,700 people/sq km in the city state of Singapore to 2 people /sq km in the largely rural Lao PDR. (see Table 3.1). Excluding Singapore, the highest densities (over 230 people/sq km) were in the Philippines and Viet Nam. This suggests greater pressures on environmental resources than the other AMCs which typically have 60–120 people per sq km (comparatively, about 133 people/sq km in China). These overall densities provide only a crude national snapshot. Densities in some islands of Indonesia and the Philippines are much higher. Java, the most populous island in Indonesia, had over 800 people/sq km in 1995 and Bali, the second most populous, had 521 people/sq km.

Pressure on environmental resources in rural areas can be gauged from rural population per sq km of *arable* land. Data shown in Table 3.3 suggest that in 1977 there was considerable

environmental pressure in Viet Nam (1,071 people/sq km of arable land), Indonesia (696 people/sq km) and the Philippines (634 people/sq km) compared to other AMCs. Despite rapid urbanisation, the majority of people in ASEAN member countries still live in rural areas and will do so for many years to come. From 1995–97, arable land per capita ranged from less than 0.09 ha in Indonesia and Viet Nam to 0.33 ha or more in Cambodia and Myanmar.

**Table 3.2 – Family Planning in ASEAN Member countries**

Country	Total fertility rate	Natural increase (annual, %)	Male Life expectancy at birth (years)	% of Married Women Using Contraception	
				All Methods	Modern Methods
Brunei Darussalam	3.4	2.2	70	–	–
Cambodia	5.2	2.4	52	N/A	N/A
Indonesia	2.8	1.6	61	57	55
Lao PDR	5.6	2.6	50	25	21
Malaysia	3.2	2.1	70	48	31
Myanmar <sup>a/</sup>	3.4	1.8	60	32	N/A
Philippines	3.7	2.3	66	46	28
Singapore <sup>a/</sup>	1.5	0.8	76	62*	–
Thailand	2.0	1.1	70	72	70
Viet Nam	2.7	1.5	63	75	56

Source: 1999 World Population Data Sheet, Demographic Data and Estimates for the Countries and Regions of the World

Note: <sup>a/</sup> Data from respective governments \* Data for 1997



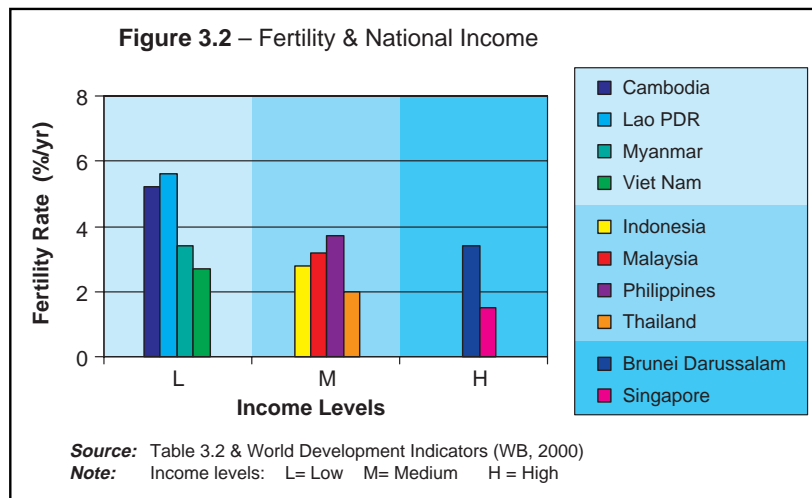
Growth in permanent crop lands between 1980 and 1997 had largely been at the expense of forested land.

### Urbanisation

As shown in Table 3.4, ASEAN Member Countries are urbanised to varying degrees. Singapore, a city state, is fully urbanised. For other ASEAN member countries, urbanisation in 1999 ranged from about 23% for each of three countries (Cambodia, Lao PDR and Viet Nam) to over 70% for Brunei Darussalam.

Urban population growth is the net result of natural increase, migration from rural areas, re-classification, and annexation or boundary

expansions. Annual growth rates of urban population (1998 figures) of AMC's range from 2.1% for Viet Nam to 5.6% for the Lao PDR. As shown in Table 3.5, ASEAN's urban population is expected to increase from about 185 million in 1999 to about 249 million in 2010, an increase of 64 million or an annual average growth rate of over 2.7%.



**Table 3.3 – Rural Population Density and Arable Land**

Country	Rural Population			Rural population density (See note *)	Land area (thousand sq km)	Permanent crop land (% of land area)		Arable land			
	% of Total		Average annual growth (%)			1980	1997	% of land area		Hectares per capita	
	1980	1998	1980-98	1997	1980			1997	1980	1997	1979-81
Brunei Darussalam <sup>a/</sup>		30	–	–	6	–	<0.1	–	–	–	–
Cambodia	88	85	2.9	259	184	0.4	0.6	11.3	21	0.29	0.34
Indonesia	78	61	0.4	696	1812	4.4	7.2	9.9	9.9	0.12	0.09
Lao PDR	87	78	1.9	474	237	0.1	0.2	2.9	3.5	0.21	0.17
Malaysia	58	44	1.2	534	332	11.6	17.6	3	5.5	0.07	0.09
Myanmar <sup>a/</sup>	76('83)	–	–	–	677	12.4	13.4	27.4	26.6	0.55	0.40
Philippines	63	43	0.4	634	299	14.8	14.8	14.5	17.2	0.09	0.07
Singapore <sup>a/</sup>	N/A	N/A	N/A	N/A	0.68	13.1	1.7	–	–	–	–
Thailand	83	79	1.3	281	513	3.5	6.6	32.3	33.4	0.35	0.28
Viet Nam	81	80	2.1	1071	331	1.9	4.7	18.2	17.4	0.11	0.08

**Sources:** World Bank, World Development Indicators, 2000

**Note:** <sup>a/</sup> Data from respective governments

\* Density in people/sq km of arable land





Harvest festivities

With the exception of Brunei Darussalam and Singapore, population growth in major urban centres in AMCs is largely driven by rural-urban migration. Table 3.6 indicates a significant increase in urbanisation from 1980 to 1998, and this trend is expected to continue. During the same period, the percentage of urban population in the most populous city (i.e. the national capital except for Viet Nam) decreased

**Table 3.4** – Extent of Urbanisation in ASEAN (1999)

Category	Urbanisation	Extent of urbanisation	
Low	Under 25%	Cambodia	23 %
		Lao PDR	23 %
		Viet Nam	23 % <sup>a/</sup>
Medium	25–50%	Myanmar	27 %
		Thailand	34 %
		Indonesia	39 %
High	50–75%	Malaysia	57 %
		Philippines	58 %
Very High	75% and above	Brunei Darussalam	72 %
		Singapore	100 %

Source: ADB &amp; ESCAP, 2000

Note: <sup>a/</sup>Data from Viet Nam**Table 3.5** – Urbanisation Projections in ASEAN Member Countries

Country	Total Population (thousands)		Urban Population (%)					Urban Population (thousands)	
	1999	2010	1996	1999	2000	2005	2010	1999	2010
Brunei Darussalam	326	400	70	72	72.2	74.8	76.9	235	308
Cambodia	11,939	15,500	21	23	23.5	26.6	29.7	2,746	4,604
Indonesia	209,255	247,500	36	39	40.2	44.7	48.9	81,609	121,028
Lao PDR	5,297	6,400	21	23	23.5	26.4	29.5	1,218	1,888
Malaysia	22,706	28,400	54	57	57.3	60.6	63.6	12,942	18,062
Myanmar	48,123	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Philippines	74,454	91,900	55	58	58.6	62.4	65.5	43,183	60,195
Singapore	3,951 <sup>a/</sup>	4,400	100	100	100	100	100	3,894	4,400
Thailand	61,806	67,300	20	34	21.6	23.7	26.2	21,014	17,633
Viet Nam	76,328	94,200	21.1	23	19.7	20.6	22.1	17,918	20,818
<b>ASEAN</b>	<b>514,128</b>	<b>556,000</b>						<b>184,759</b>	<b>248,936</b>

Source: ADB & ESCAP, 2000 except <sup>a/</sup> from Singapore



ASEAN Secretariat

Rural-urban migration?

Although their percentage in the capital cities was lower in 1995 than in 1980, urban populations continue to dominate the economic, cultural, social, political, educational and administrative life of the nations concerned. Cities will continue to attract large numbers of migrants from rural areas. ASEAN has three mega-cities with populations approaching 10 million people—Bangkok, Jakarta and Metro Manila.

somewhat. Most AMCs exhibited a reasonable degree of urban balance with less than 25% of their population in the largest city. Thailand was a clear exception with over 55% of the urban population concentrated in Bangkok.

Rural-urban migration is also associated with the proliferation of low-income settlements in the urban centres of most ASEAN cities. The Asian Development Bank argues (*Sustainable Development in Asia*, ADB, 2000) that most urban environmental problems are political and economic, manifesting as environmental hazards

**Table 3.6** – Urbanised Population in selected ASEAN Member Countries

Country	Urban Population				Population in urban agglomerations exceeding one million (% of total population)			Population in largest city (% of urban population)	
	Millions		Percent of total population		1980	1995	2015	1980	1995
	1980	1998	1980	1998					
Cambodia	0.8	1.7	12	15	N/A	N/A	N/A	N/A	< 10
Indonesia	32.9	79	22	39	7	13	16	18	12
Lao PDR	0.4	1.1	13	22	0	0	0	N/A	N/A
Malaysia	5.8	12.4	42	56	7	6	7	16	11
Myanmar <sup>a/</sup>	8.1	13.7 ('00)	24	28 ('00)	N/A	9	11	N/A	N/A
Philippines	18.1	42.7	38	57	12	13	15	33	24
Singapore <sup>b/</sup>	2.4	3.9	100	100	100	100	100	100	100
Thailand	7.9	12.8	17	21	10	11	15	59	55
Viet Nam	10.3	15	19	20	5	7	9	27	25

Sources: World Development Indicators (World Bank, 2000)

<sup>a/</sup> World Resources 1998 – 99 (WRI, 1998)

<sup>b/</sup> Yearbook of Statistics (Singapore, 2000)

Note: ('00) indicates data is for the year 2000



Ngoc Thai

*A better future*

– air pollution, poor water quality, inadequate sanitation, unsafe solid waste disposal, risk of disaster, risk of disease. These are problems faced disproportionately by the poor who impose a much lighter 'ecological footprint' than the affluent.

### Growth Dispersal and the Environment

The economic and environmental implications of excessive urbanisation are recognised by ASEAN Member Countries. Large AMCs like Indonesia, Thailand, the Philippines and Viet Nam have specific policies and programmes to disperse economic activities and encourage people to move away from large

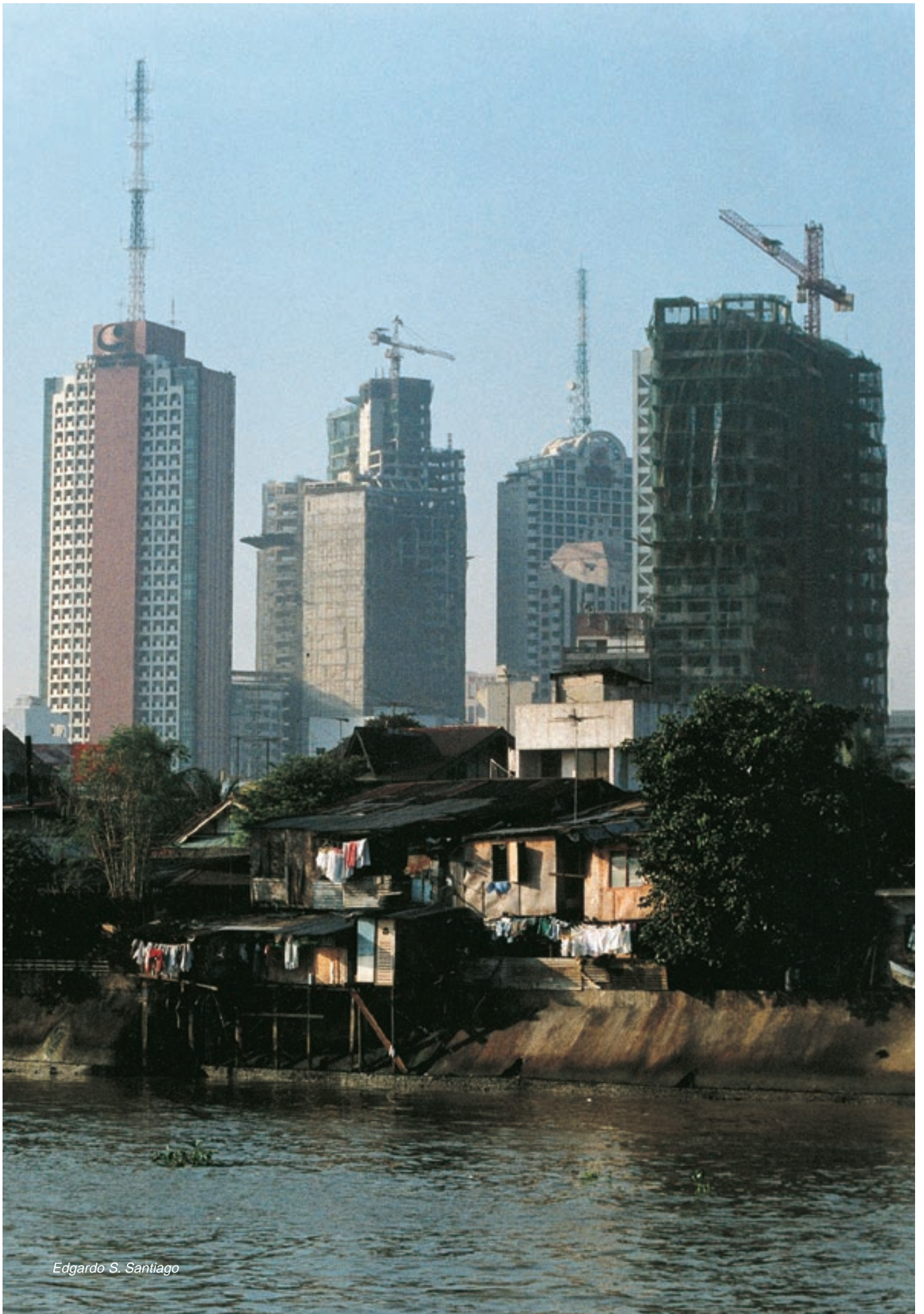
cities. Rural-based measures include integrated rural development in various forms and agrarian land reform. Urban-based measures include development of satellite towns and new growth poles with incentives for industries to shift from large cities to special industrial zones. Dispersal policies have had varying degrees of success. Even if they were effective and implemented equitably, it would require decades to complete while major cities would continue to grow.

By 2010, the populations of Jakarta, Metro Manila and Greater Bangkok are expected to reach 13.7, 11.8 and 10.3 million respectively. They will be among the largest cities in the world.

Whether or not future population growth is effectively dispersed among more urban centres, ASEAN's urban population growth is expected to accelerate. Social and environmental problems associated with urban growth – sanitation, air quality, waste disposal, crowding, and noise – will require increased attention. Otherwise, air and water pollution may become extremely serious and environmental quality will continue to decline in most large cities.

<sup>1</sup> **Total Fertility Rate** is defined in the Human Development Report 1998 as the average number of children that would be born alive to a woman during her lifetime, if she were to bear children at each age in accord with prevailing age specific fertility rates.





*Edgardo S. Santiago*

# Chapter 4 Economic Development



**T**he majority of ASEAN Member Countries rank in the middle-to-high levels in terms of per capita national income although four (40%) still remain in the low income category. AMCs are recovering from the economic crisis of the late 1990s but environmental spending in many countries has yet to reach pre-crisis levels, probably reducing the effectiveness of environmental management efforts. Most AMC economies, although developing rapidly, continue to depend heavily on agriculture and other food-based industries, which are relatively high polluters. Fisheries and forest products are important regional exports and continued growth in both could be jeopardised by unsustainable management practices. Despite considerable improvement since 1980, ASEAN economies are relatively inefficient in the use of energy. Recent projections also suggest that growth in AMCs' energy use from 2000–2010 will primarily be from sources that are heavy greenhouse gas emitters, namely oil and coal. This chapter provides information on the economies of the ASEAN member countries – summarising structures, similarities and differences – and discusses the economic crisis that began in 1997, particularly in terms of its effects on the environment.

## ASEAN FACTS AND FIGURES

Combined GDP (1998)	US\$ 464 billion
ASEAN Economic growth	
2000	5.3%
2001 (estimated)	3 – 5%
ASEAN GNP/capita (1998)	US\$ 1,150 (nominal)
range (nominal)	US\$ 260 – 30,200
range (purchasing power adjusted)	US\$ 1,250 – 25,300
National Income Levels *	
Low	Cambodia, Lao PDR, Myanmar & Viet Nam
Lower middle	Indonesia, Philippines & Thailand
Upper middle	Malaysia
High	Brunei Darussalam & Singapore

\* Per capita national income in 1998 as ranked by the World Bank



## ASEAN Economies and the Economic Crisis

Table 4.1 presents AMCs economic data for 1990, 1997 and 1998. In 1998, the Thai economy, despite substantial recession since the previous year, remained the largest (GDP of US\$ 111 billion in nominal terms), followed by Indonesia (\$94 b), and Singapore (US\$84 b). The combined 1998 AMCs' GDP was US\$464 billion with 92% accounted for by the five largest economies: Thailand, Indonesia, Singapore, Malaysia, and the Philippines. In 1998 per capita GNP in nominal terms ranged from \$260

(Cambodia) to \$30,200 (Singapore) with an average of \$1,150. Adjusted for purchasing power, the range was considerably less, from about \$1,250 to \$25,300. Table 4.1 also compares ASEAN to key trading partners. In 1997, the total GDP of ASEAN member countries was approximately 14% of the size of the Japanese economy and less than 9% that of the United States' economy.<sup>1</sup>

Table 4.2 shows the region-wide impact of the 1997–98 crisis on per capita GNPs and the recovery which began a year later. The devastating effect of the crisis is illustrated

**Table 4.1 – Trends in ASEAN GDP and GNP/capita: 1990–1998**

Country	1998		1990		1997		1998	
	GNP/capita (Nominal) (US\$)	GNP/capita (PPP) (US\$)	GDP (US\$ m)	Growth (%/year)	GDP (US\$ m)	Growth (%/year)	GDP (US\$ m)	Growth (%/year)
Brunei Darussalam <sup>a/</sup>	N/A	N/A	3,631	2.9	4,782	4.0	4,857	1.0
Cambodia	260	1,246	1,115	1.2	3,089	1.0	2,871	1.0
Indonesia	640	2,407	114,426	9.0	215,747	4.7	94,156	-13.2
Lao PDR	320	1,683	865	6.7	1,725	7.0	1,261	4.0
Malaysia	3,670	7,699	42,775	9.6	100,198	7.5	72,489	-7.5
Myanmar <sup>a/</sup>	44,577 <sup>(kyats)</sup>	N/A	N/A	2.8	N/A	5.7	N/A	5.8
Philippines	1,050	3,725	44,331	3.0	82,159	5.2	65,107	-0.5
Singapore	30,200	25,295	36,638	9.0	95,139	8.0	84,379	1.5
Thailand	2,160	5,524	85,345	11.2	149,071	-1.3	111,327	-9.4
Viet Nam	350	1,689	6,472	5.1	26,355	8.1	27,184	5.8
<b>ASEAN</b>	<b>1,150 <sup>b/</sup></b>		<b>335,558</b>		<b>678,905</b>		<b>463,631</b>	
Japan <sup>c/</sup>					4,812,100			
USA <sup>c/</sup>					7,783,100			

**Source:** World Development Indicators (WDI, World Bank, 2000)

**Note:** GDP in nominal terms, US\$ millions; <sup>a/</sup> Data from respective governments

<sup>b/</sup> Data from ASEAN Secretariat

<sup>c/</sup> Data from *The Economist, Pocket World in Figures, 2000 Edition* (1999)

PPP is Purchasing Power Parity, sometimes referred to as 'international dollars'.



**Table 4.2** – The Impact of the Economic Crisis in Selected AMCs

Country	GNP per capita (Atlas method)			Exports of Goods and Services US\$m; 1998	External Debt (total) US\$m; 1998	Net aid flows (per capita) US\$; 1998
	\$	Average real growth (%)				
	1999	1997–98	1998–99			
Cambodia	260	-2.3	-2.2	815	2,210	29
Indonesia	580	-18.0	0.3	54,850	150,875	6
Lao PDR	280	1.4	1.5	48	2,437	57
Malaysia	3,400	-7.6	1.9	71,900	44,773	9
Myanmar <sup>a/</sup>	N/A	-	-	1,634	5,680	1
Philippines	1,020	-2.1	1.4	36,973	47,817	8
Thailand	1,960	-11.6	4.1	65,903	86,172	11
Viet Nam	370	4.3	2.9	11,974	22,359	15

**Source:** *World Development Indicators*, World Bank (database updated 2 August 2000)

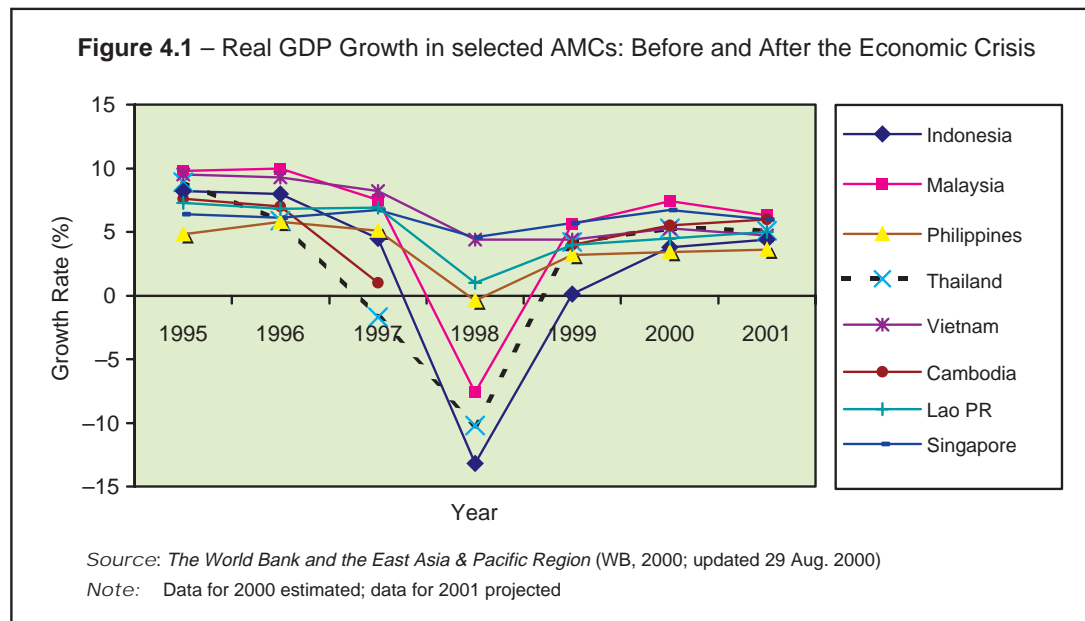
**Note:** <sup>a/</sup> Data from Myanmar

graphically, based on GDP growth rates in Figure 4.1 which also suggests a slow down of economic growth during 2001.<sup>2</sup>

### Economic Structure

As shown in Table 4.3, agriculture was the dominant sector for the economies of Cambodia,

the Lao PDR and Myanmar, contributing over 50% of GDP in 1997. For other AMCs, agriculture was a much lower percentage of GDP than industry or services. It was less than 20% each of GDP for Indonesia, Malaysia, the Philippines and Thailand. Nonetheless, the rural proportion of population in these countries (particularly in Indonesia, Thailand and the





Philippines) was high. In Thailand, for example, 70% of the population was rural. With agriculture's share of GDP only 10%, the income disparity between rural and urban Thais is therefore significant.

### Environmental Considerations

Most ASEAN economies are market-orientated as they are increasingly integrated with the global economy. Imports and exports form high percentages of GDP. Excluding Brunei Darussalam and Singapore, agricultural exports predominate. Among the AMCs, Thailand has the most diversified export profile. Although it is the world's biggest rice exporter, rice accounted for under 19% of Thai exports in 1998 (ADB, *Key Indicators*, 2000). Forestry products are significant export items for Cambodia, the Lao PDR, Indonesia, Malaysia, and Myanmar while Indonesia and Malaysia are major exporters of wood products. The growth and type of exports from ASEAN have important and increasing environmental implications, including trade policies and changing consumer preferences of importing countries, as will be discussed in Chapter 10.

The World Bank (*Environmental Implications of the Economic Crisis and Adjustment in East Asia*, 1999; *East Asia Update*, 2001) argues that the immediate environmental impacts of the economic crisis were relatively modest, but revealed longer-term shortcomings in regulatory and policy frameworks. According to the World Bank, national emphases during the 1990s were primarily on economic growth with insufficient consideration to environmental protection, sustainable management of important resources (e.g. forestry, fisheries, biodiversity), institutional weaknesses and failures, and lack of transparency in government-business relations. The relative levels of environmental spending, which were limited to begin with, declined in all

**Table 4.3 – Structure of ASEAN Economies (1997, Percentage of total GDP)**

Country	Agriculture	Industry	Services
Brunei Darussalam	2.7	46.0	51.3
Cambodia	50.7	14.8	34.5
Indonesia	16.1	44.3	39.6
Lao PDR	53.3	21.2	25.5
Malaysia	11.2	44.6	44.2
Myanmar <sup>a/</sup>	58.9	10.2	30.9
Philippines	18.7	32.2	49.1
Singapore	0.2	34.5	65.3
Thailand	9.7	41.3	49.0
Viet Nam	25.8	32.1	42.2

Source: *World Development Indicators* (World Bank, 2000)

Note: <sup>a/</sup> Data from Myanmar, current producers' prices

ASEAN economies except Malaysia. In addition, there were deep expenditure cuts at the provincial/district level, with a higher percentage of total government funds being allocated to the centre. The World Bank concludes, however, that there is no evidence that budgets for national environmental regulatory agencies were subject to disproportionate cuts. Nevertheless, the effectiveness of enforcement was probably compromised by the poor financial state of enterprises.

### Agriculture

#### Contribution to Employment

Agriculture absorbs over half of ASEAN's employment as shown in Table 4.4. In Malaysia, Thailand, Viet Nam and the Philippines, the agricultural share of GDP is significantly lower than the percentage of total employment in agriculture, indicating considerable economic disparity between agricultural and other households.

**Table 4.4** – Share of Agriculture in GDP & Employment, 1996

Country	Agriculture GDP (%)	Rural Population (%)	Agricultural Employment (%)
Brunei Darussalam	–	–	–
Cambodia	51	79	74
Indonesia	16	72	55
Lao PDR	52	79	78
Malaysia	12	46	27
Myanmar <sup>a/</sup>	60	74	67
Philippines	17	45	46
Thailand	11	80	64
Singapore	0	0	0
Viet Nam	26	81	71

Source: FAO website (www.fao.org)

Note: <sup>a/</sup> Data from Myanmar, rural population from 1983 Census

AMCs in 1980 and 1997. Excluding Brunei Darussalam and Singapore, there were increases in arable land, cropland and irrigated land during the period. Overall, arable land in AMCs in 1997 was approximately 617 thousand square kilometres or 14.2 % of total land area. The Philippines, Thailand, and Indonesia accounted for most of the expansion.

For most AMCs, arable land per capita declined between 1979–81 and 1995–97 as populations increased more rapidly than expansion of arable land. This suggests increasing environmental pressure on arable lands as new entrants are absorbed into the agricultural workforce through more intensive use of resources. (A notable exception is Cambodia

#### Agricultural Land Use

Agricultural production in most ASEAN member countries has increased through expanding arable land and increasing farm productivity. Table 4.5 summarises land use in

**Table 4.5** – Land Use in ASEAN Member Countries, 1980–1997

Country	Land Area '000 sq km	Arable Land				Permanent Crop Land		Other Land Uses	
		% of land area		Hectares per capita		% of land area		% of land area	
		1980	1997	1979–81	1995–97	1980	1997	1980	1997
Brunei Darussalam	5.76	N/A	1.0	N/A	0.009 <sup>a/</sup>	N/A	N/A	N/A	N/A
Cambodia	185	11.3	21.0	0.29	0.34	0.4	0.6	88.3	78.4
Indonesia	1,812	9.9	9.9	0.12	0.09	4.4	7.2	85.6	82.9
Lao PDR	237	2.9	3.5	0.21	0.17	0.1	0.2	97.0	96.3
Malaysia	333	3	5.5	0.07	0.09	11.6	17.6	85.4	76.9
Myanmar <sup>a/</sup>	677	27.4	26.6	0.55	0.40	12.4	13.4	25.1	25.4
Philippines	299	14.5	17.2	0.09	0.07	14.8	14.8	70.8	68.1
Singapore <sup>a/</sup>	0.68	3.3	1.6	0	0	9.8	0	86.9	0
Thailand	513	32.3	33.4	0.35	0.28	3.5	6.6	64.2	60
Viet Nam	331	18.2	17.4	0.11	0.08	1.9	4.7	79.8	77.9
ASEAN	<b>4,392</b>	–	<b>14.2</b>	–	–	–	–	–	–

Source: World Development Indicators (World Bank, 2000)

Note: <sup>a/</sup> Data from respective governments



where there was increased access to land due to de-mining after the Khmer Rouge years).

### Agricultural Production

**Production Trends.** Agricultural production in most AMCs, excluding Singapore, increased considerably from the 1979–81 period to the 1996–98 period as indicated in Table 4.6. Value added per worker in Malaysia and Viet Nam was high compared to other AMCs except Singapore.



WWW/Lee Kup Jip

Market Scene

**Major Crops.** The ASEAN region is among the world's major producers of rice, natural rubber, palm oil, sugar cane, coconut oil, cocoa, and prawns. In 1998, 40.9 million hectares of land were used for rice cultivation with total paddy production of 135 million tons as shown in Figure 4.2. Indonesia was the largest producer followed by Viet Nam and Thailand. About 90

million tons of milled rice was produced in the ASEAN region of which nearly 11 million tons were exported. Thailand was the largest exporter (6.6 million tons) followed by Viet Nam (3.8 million tons). The two countries accounted for 63% of rice exports from the region.

Malaysia and Indonesia are the major producers and exporters of palm oil in ASEAN. In

**Table 4.6 – ASEAN Agricultural Output and Productivity**

Country	Crop Production Index 1989-91 = 100		Food Production Index 1989-91 = 100		Livestock Production Index 1989-91 = 100		Cereal Yield (kg/ha)		Agriculture Value Added per worker (1995 \$)	
	1979-81	1996-98	1979-81	1996-98	1979-81	1996-98	1979-81	1996-98	1979-81	1996-98
Cambodia	55.2	128.9	48.9	130.6	27.3	136.7	1,025	1,784	177	141
Indonesia	66.2	116.8	62.8	120.4	47.2	139.0	2,837	3,915	610	749
Lao PDR	73.7	113.7	70.8	126.7	58.0	164.1	1,402	2,643	3,745	546
Malaysia	74.7	108.9	55.4	125.2	41.4	146.2	2,828	3,065	3,275	6,061
Myanmar	89.0	140.3	87.7	138.1	86.1	129.6	2,521	2,944	1,146	1,270
Philippines	87.7	113.8	86.0	125.8	73.3	160.4	1,611	2,437	1,348	1,352
Singapore	595.0	50.6	154.3	31.8	173.7	34.1	1,249	1,223	13,937	42,851
Thailand	79.0	111.8	80.4	112.6	65.4	130.1	1,911	2,466	630	924
Viet Nam	66.7	143.7	63.8	140.5	52.9	145.8	2,049	3,754	4,041	5,036

**Source:** World Development Indicators (World Bank, 2000)

**Note:** Indices are not available for Brunei Darussalam but crop production grew 108% from 1990 to 1998 (data from Brunei Darussalam)



Nguyen Dan

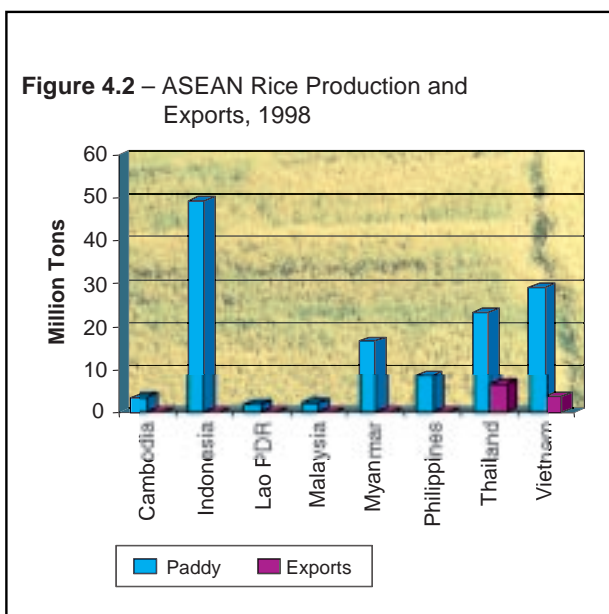
Bountiful Harvest

1998, oil palm plantations covered 4.5 million ha, of which about 40% were in Indonesia and 56% in Malaysia (FAO website). Total output in 1998 was 14.75 million tons of palm oil produced mainly by Malaysia (56%) and Indonesia (40%). Palm oil output in the two countries, particularly Indonesia, has been expanding rapidly, with growth of 16% in 1996–1997. Indonesia, Malaysia and Thailand are the major producers of rubber in ASEAN and also in the world. In 1997, the three produced 4.5 million tons of

rubber. Thailand and the Philippines are the major sugar cane and sugar producers in ASEAN. In 1998, about 2.1 million hectares were planted with sugar cane, of which Thailand alone accounted for 0.93 million ha. ASEAN member countries had about 6.4 million hectares of coconut plantation, of which 3.1 million hectares were in the Philippines. Indonesia and Thailand were the major producers of cassava. Of 2.75 million hectares planted with cassava, Indonesia accounted for 1.2 million hectares and Thailand 1.04 million hectares (all data from FAO

website).

**Fisheries.** 74 % of the 14 million tons of fish produced in 1997 in the ASEAN region was from marine fisheries, the rest from aquaculture and inland fisheries (see Table 4.7). Prawn farming is an important industry with Thailand being the top producer: 239,499 tons in 1998 from 11,264 hectares of farms, mostly located along the coast. A decade earlier, Thailand produced only 55,632 tons of prawns, about 1/5 as much, from 8,765 ha. This rapidly-growing and intensive prawn farming has caused serious environmental problems in several areas in Thailand, particularly with brackish sea prawns being raised in inland freshwater areas (*Annual Environmental Report, Thailand 1999*). Throughout the world, marine fisheries are being exploited beyond their sustainable yield. As will be discussed in Chapter 6, there may be modest growth in the ASEAN region but output is rapidly approaching unsustainable yields. Rapid growth in marine fishing may jeopardise an important regional industry.



**Forestry Products.** Forestry products are major exports of





**Table 4.7 – Fisheries Production in ASEAN (1997)**

Country	Total	Marine Fishery	Inland Fishery	Aquaculture
<b>In quantity (million tons)</b>				
<b>ASEAN</b>	<b>13,988,645</b>	<b>10,349,194</b>	<b>1,094,569</b>	<b>2,544,882</b>
Brunei Darussalam	6,214	6,108	106	–
Cambodia	112,510	31,231	81,279	–
Indonesia	4,263,587	3,292,930	329,710	640,947
Malaysia	1,245,117	1,108,436	3,939	132,742
Myanmar <sup>a/</sup>	1,171,000	880,000	291,000	–
Philippines	2,784,314	1,678,601	186,674	919,039
Singapore <sup>a/</sup>	13,529	9,250	–	4,279
Thailand	3,572,705	2,827,447	191,650	553,608
Viet Nam	1,200,000	900,000	300,000	–
<b>In value (US\$ 1,000)</b>				
<b>ASEAN</b>	<b>9,547,857</b>	<b>5,797,103</b>	<b>268,262</b>	<b>4,685,372</b>
Brunei Darussalam	11,533	10,754	779	–
Cambodia	–	–	–	–
Indonesia	–	–	–	–
Malaysia	1,242,039	1,084,362	–	157,677
Myanmar	–	–	–	–
Philippines	3,229,965	1,843,378	82,750	1,303,837
Singapore <sup>a/</sup>	31,741	23,013	2,150	8,728
Thailand	3,813,956	1,792,984	182,583	1,336,538
Viet Nam	–	–	–	1,838,389

Source: SEAFDEC, 1997

Note: <sup>a/</sup> Data from respective governments

**Table 4.8 – Trade in Forest Products in ASEAN (1998), US\$ millions**

Country	Exports	Imports	Balance
Brunei Darussalam	0.11	8.82	–8.71
Cambodia	123.26	1.96	121.29
Indonesia	5,142.29	975.95	4,166.34
Lao PDR	41.51	2.02	39.49
Malaysia	3,951.83	930.72	3,021.12
Myanmar <sup>a/</sup>	172.09	–	172.09
Philippines	63.48	690.65	–627.16
Singapore	635.09	1,094.38	–459.29
Thailand	574.64	1,528.18	–953.54
Viet Nam	44.37	87.44	–43.07
<b>ASEAN</b>	<b>10,748.67</b>	<b>5,320.12</b>	<b>5,428.56</b>

Source: FAO website

Note: <sup>a/</sup> Data obtained from Myanmar



Cambodia, Indonesia, the Lao PDR, and Malaysia. Indonesia and Malaysia are major producers and exporters of plywood. Timber, sawn logs and wood products are also major exports of Cambodia, Lao PDR, Malaysia and Myanmar. In 1998, ASEAN member countries exported over US\$10.7 billion of forestry and wood products, as shown in Table 4.8, Indonesia and Malaysia accounting for nearly 85% of the total. Imports in 1998 totalled US\$5.3 billion. As discussed in Chapter 7, the long-term sustainability of forest product output in ASEAN member countries is a serious environmental and economic issue.

#### Inputs of Fertilisers and Pesticides

Increased agricultural yields in AMCs has necessitated expanded use of fertilisers and pesticides. In 1998 (Table 4.9), the region consumed 6.6 million tons of fertilisers. Except in Cambodia, Lao PDR and Myanmar, the use of fertiliser per hectare of arable land has significantly increased in recent years. For example, consumption in Viet Nam grew from 30 kg per ha in 1979–81 to 249 kg per ha in 1994–96. In 1998, ASEAN imports of pesticides cost US\$ 309 million and exports were valued at US\$ 206 million.

#### Environmental Implications of Agricultural Development

Agriculture is still a major economic sector for most AMCs with an orientation towards exports, based on monoculture crops. This type of production requires good environmental management to ensure sustainable production without significant environmental consequences. Intensive prawn farming often destroys mangrove forests (which are essential fisheries nurseries) and causes serious water pollution and other problems. Sustainable forestry is becoming a major

environmental issue for Indonesia, Cambodia, Lao PDR and Malaysia.

### Industry

Export orientated industrial development has been an engine of rapid economic growth for most AMCs. In 1997, industry accounted for 16.7% (Myanmar) to 49.8% (Malaysia) of national GDP in ASEAN member countries (*Key Indicators*, ADB, 2000). Industry contributed about 20% of GDP for Cambodia and Lao PDR and over 30% for the remaining AMCs. Within the industrial sector, the manufacturing subsector is the largest contributor to GDP. In Indonesia, for example, manufacturing accounted for 25.5% of 1997 GDP compared to 8.7% for mining, 7.4% for construction and 1.3% for utilities. For the period 1990–1998, industry absorbed 30–36% of the labour force in Malaysia, 25–34% in Singapore, 17–22% in Thailand, 16–21% in Indonesia and considerably less in other AMCs. However, the Manufacturing Value Added (MVA) of AMCs (excluding Singapore) is relatively low compared to those of developed countries as shown in Figure 4.3. MVA for Singapore in 1997

Table 4.9 – Agriculture Inputs in 1998

Country	Pesticide Trade (US\$ '000)		Fertiliser Consumption (MT)
	Imports	Exports	
Brunei			
Darussalam	2,900	25	–
Cambodia	760	–	12,716
Indonesia	18,589	41,822	2,772,900
Lao PDR	120	–	10,166
Malaysia	51,865	60,713	1,406,111
Myanmar <sup>a/</sup>	N/A	N/A	121,000
Philippines	50,140	5,575	627,930
Singapore	50,468	81,479	2,350
Thailand	115,000	17,000	1,660,863
Viet Nam	20,000	–	1,947,400
ASEAN	309,840	206,614	6,614,036

Source: FAO website Note: <sup>a/</sup> Data obtained from Myanmar



Phan Thiet

Industrial Light

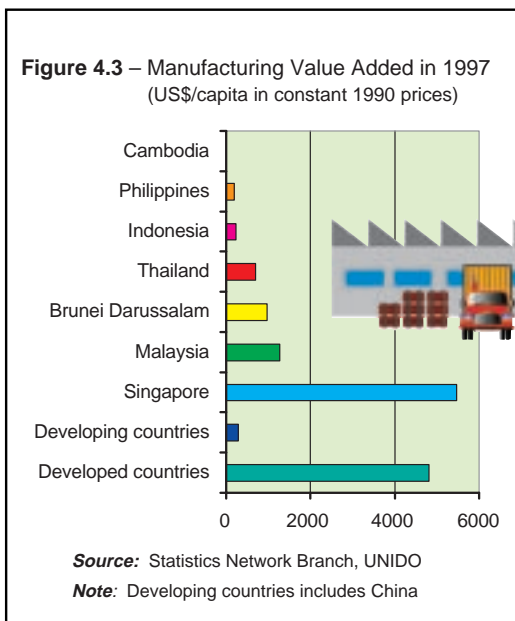
Rising wages have been eroding the industrial competitiveness of some ASEAN industries, particularly textiles and garments industries. Competition from lower-cost countries has increased pressure on ASEAN member countries to move up the technological ladder to produce higher value-added products. As Table 4.10 shows, economies such as those of AMCs which depend heavily on food-based industries (Table 6.5 of chapter 6), also tend to pose a greater threat of organic water pollution than those based on metals and non-metallic minerals. Industrial restructuring must emphasize improved environmental management to improve competitiveness, particularly for export industries. This will be further discussed in Chapter 10.

## Energy

### Energy Resources

ASEAN countries, particularly Indonesia, is endowed with abundant petroleum, natural gas, coal, hydropower, geothermal energy and biomass energy. As shown in Table 4.11,

was US\$ 5,461 compared to an average of US\$ 4,817 for developed countries. For the rest of ASEAN, the MVA ranged from \$12 (Cambodia) to \$1,273 (Malaysia).



**Table 4.10 – Sectoral Indices of Organic Water Pollution Intensity**

Sector	Index
Food	100
Pulp & Paper	87
Chemicals	29
Textiles	26
Wood Products	13
Metal Products	8
Metals	3
Non-metallic Minerals	2

**Source:** Greening Industry (World Bank, 2000)  
**Note:** Index ranges from 0 (least polluting) to 100 (most polluting).



Yeh Tang Hock

Energy fuels economic growth

Indonesia and Brunei Darussalam have large oil reserves, with considerable potential in Viet Nam, Malaysia and Myanmar. Indonesia, and to a lesser extent Malaysia, have sizeable gas and coal reserves. Myanmar and Indonesia have significant hydropower potential and most ASEAN member countries are well endowed with fuelwood, a common energy source for cooking and heating. Energy is discussed in

some detail as energy production and use can have profound environmental implications.

### Energy Production, Consumption and Efficiency

Table 4.12 provides data on commercial energy production and consumption for selected years. In 1997, Brunei Darussalam, Indonesia, Malaysia and Viet Nam were net energy exporters overall as well as net oil exporters.<sup>3</sup> Indonesia was ASEAN's largest producer and consumer of energy. Per capita commercial energy use varied from about 86 to 8,700 kg of oil equivalent (KGOE), reflecting the wide difference in the energy intensity of economic activities and the differing economic structures. In 1997 AMCs produced about US\$ 2.90–7.20 of GDP (purchasing power equivalent) per KGOE, generally lower than energy efficiencies in Europe (\$6–12) and Japan (\$10.5) in 1996 (Key

**Table 4.11 – ASEAN Energy Resources / Reserves**

Country	Oil Reserve (Billion Barrels)	Natural Gas Reserve (TCF)	Coal Reserve (Million MT)	Hydro Power Resource (MW)	Wood Fuels (KT)
Brunei Darussalam	6	34.8	–	–	–
Cambodia	–	9.89	–	10,000	81,565
Indonesia	10	169.5	38,000	75,625	439,049
Lao PDR	–	3.60	600	26,500	46,006
Malaysia	3.4	84.4	1,024.5	25,000	137,301
Myanmar	3.1	12.1	–	108,000	129,935
Philippines	0.26 <sup>a/</sup>	4.6	346	9,150	89,267
Singapore	0	0	0	0	–
Thailand	0.16	12.2	1,240	N/A	67,130
Viet Nam <sup>b/</sup>	3.21	21.78	3,520	17,566	17,000
ASEAN (rounded off)	26.0	353.0	45,000	27,000 <sup>c/</sup>	1,007,000

**Source:** ASEAN Centre for Energy website (ACE; data updated January 2001) except as noted below.

**Note:** <sup>a/</sup> Philippines based on midpoint of the ACE data; <sup>b/</sup> Data from Viet Nam, updated January 2001

<sup>c/</sup> Excludes Thailand which has a significant hydropower resource.

TCF = trillion cubic feet MT = million tons MW = megawatts KT = kilotons (thousand tons)



**Table 4.12 – Energy Production, Use and Efficiency**

Country	Commercial Energy Production		Commercial Energy Use			Commercial Energy Use per capita			Net Energy Imports*		GDP per Unit of Energy Use	
	Thousand MTOE		Thousand MTOE		Average annual growth (%)	kg of oil equivalent		Average annual growth (%)	% of commercial energy use		PPP \$ per kg oil equivalent	
	1980	1997	1980	1997	1980-97	1980	1997	1980-97	1980	1997	1980	1997
Brunei <sup>a/</sup> Darussalam		18,014										
Cambodia	–	–	–	–	–	–	–	–	–	–	–	–
Indonesia	128,403	221,549	59,561	138,779	5.4	402	693	3.5	-116	-60	2.0	4.5
Lao PDR	–	–	–	–	–	–	–	–	–	–	–	–
Malaysia	16,644	73,979	11,128	48,473	9.1	809	2,237	6.2	-50	-53	3.2	4.0
Myanmar <sup>a/</sup>	2,246	2,637	1,796	4,009	4.8	53	86	2.9	1.2	37	–	–
Philippines	10,670	16,616	21,212	38,251	3.7	439	520	1.1	50	57	5.1	7.2
Singapore	–	61	6,062	26,878	10.1	2,656	8,661	8.1	–	100	2.1	7.8 <sup>a/</sup>
Thailand	11,182	46,166	22,740	79,963	8.8	487	1,319	7.1	51	42	2.9	4.7
Viet Nam	18,052	43,525	19,347	39,306	3.5	360	521	1.4	7	-11	–	3.2

Source: World Development Indicators (World Bank 2000)

Note: \* negative value indicates that the country is a net exporter; <sup>a/</sup> Data from respective governments  
MTOE = megatons (million tons) of oil equivalent; KGOE = kg of oil equivalent

Indicators, ADB, 2000) but considerably improved from the earlier ASEAN levels of 1980.

primary energy demand in AMC's to increase by 59% from 2000 to 2010, an average annual growth rate of nearly 5% but with wide variation by country and energy form (Table 4.13).

The ASEAN Energy Centre (ACE) expects

**Table 4.13 – Primary Energy Supply-Demand**

Country	2000	2005	2010	% Increase 2000–2010
Brunei Darussalam	11.12	12.22	13.33	19.87
Indonesia	90.43	123.48	180.07	99.13
Malaysia	59.03	72.78	86.52	46.57
Myanmar	4.16	13.47	21.41	414.66
Philippines	26.60	36.15	48.30	81.58
Singapore	69.17	81.54	94.22	36.22
Thailand	88.60	82.47	100.55	13.49
Viet Nam <sup>a/</sup>	16.97	24.27	36.97	117.86
<b>Total</b>	<b>366.09</b>	<b>446.38</b>	<b>581.37</b>	<b>58.81</b>
<b>Fuel Type:</b>				
Oil	205.61	259.65	334.02	62.45
Gas	101.34	122.12	131.48	29.47
Coal	40.41	39.82	79.53	96.81
Renewable	18.49	24.55	34.83	88.37
Electricity imports	0.24	0.24	1.51	529.17
<b>Total</b>	<b>366.09</b>	<b>446.38</b>	<b>581.37</b>	<b>58.81</b>

Source : ASEAN Energy Centre website; data updated (7 March 2001).

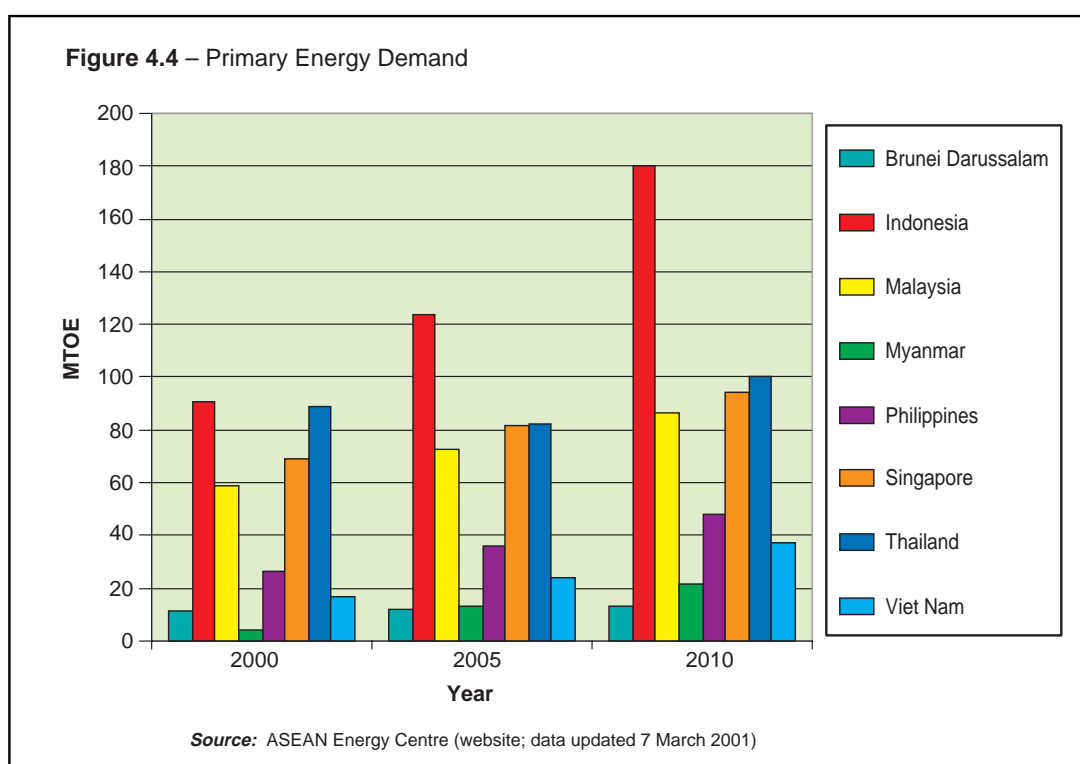
Note : <sup>a/</sup> Data from Viet Nam MTOE = million tons of oil equivalent; excludes Cambodia and Lao PDR as data was not available.



Indonesia, the largest energy producer and consumer, expects energy to double in the coming decade (7.1% per year) with even faster growth in Myanmar and Viet Nam. Oil and coal use which produce considerably more greenhouse gas (GHG) emissions per MTOE than natural gas will grow at faster rates than energy use overall.

energy consumption are expected to be high from 2000–2005, accelerating more rapidly from 2006–2010. This rapid and increasing growth rate, with a larger percentage of oil and coal use in 2010 than today, could have various environmental implications. Among other issues, it suggests significant per capita increases in GHG emissions<sup>4</sup> for ASEAN member countries from energy production, refining, transportation, and consumption.

As illustrated in Figure 4.4, growth rates in



<sup>1</sup> The comparisons of GDP are only approximate as different data sources were used for ASEAN and the other economies.

<sup>2</sup> This projection was strengthened when ASEAN Finance Ministers anticipated overall regional economic growth of 3–5% for 2001, reduced from 5% for 2000 (ASEAN Communiqué, April 2001).

<sup>3</sup> Energy exports and oils exports can differ as some AMCs (e.g. the Lao PDR) export electricity to neighbouring countries.

<sup>4</sup> As discussed in Chapter 9, GHGs from the energy sector are mainly in the form of carbon dioxide (CO<sub>2</sub>). Although ASEAN emissions are expected to grow fairly rapidly, this growth is from a relatively low current baseline.







**S**ustainable development aims not only at generating wealth but also at ensuring its equitable distribution. ASEAN Member Countries recognise that a decent quality of life for its people require a high quality natural environment. Contrary to popular belief, the activities of the poor are not the main source of environmental degradation. But they are the most affected by it in terms of quality of life and health. National surveys show that a relatively high percentage of people in AMCs remain poor. However, various indices of development – such as UNDP's Human Development Index, the percentage of people living in poverty, and adult literacy rates – all showed encouraging trends of improvement over the past decade. This chapter presents recent information on social development trends in ASEAN member countries, and examines, among others, the interrelationship between poverty and environment, as well as the impact of poverty on environmental health.

## ASEAN FACTS AND FIGURES

Average HDI* Ranking of AMCs (Of 174 countries; lower is better)	1993 96	1997 92	1999 87
Trends in Poverty in AMCs	1987	1993	1998
Income under US\$1 per day	24%	16%	11%
Income under US\$2 per day	63%	52%	45%
Income distribution in AMCs	Poorest 10%		Richest 10%
Approximate share of household income, mid-late 1990s	2.2%		26%
Illiteracy in AMCs	1990		1998
men (range among all countries)	5 – 49%		3 – 43%
women (range among all countries)	10 – 86%		6 – 80%

\* HDI is UNDP's Human Development Index.



## The Human Development Index: Trends in ASEAN Member Countries

Each year the United Nations Development Programme (UNDP) publishes its 'Human Development Index' (HDI), a composite of longevity (measured by life expectancy), knowledge (based on adult literacy and mean years of schooling) and living standards (calculated as real GDP per capita adjusted for purchasing power). Social development trends in a country can be roughly estimated by changes over time in the HDI. Table 5.1 presents HDI values for AMCs for 1995 and 1998 (listed in decreasing order based on 1998 data). In 1995 four AMCs were classified by UNDP as 'high human development' (Brunei Darussalam, Malaysia, Singapore, Thailand), three as 'medium' (Indonesia, Philippines, Viet Nam) and three as 'low' (Cambodia, Myanmar and Lao PDR). However, by 1998, all but one ASEAN member country was ranked as 'medium' or 'high'.

UNDP also calculates HDI rankings for all countries for which data are available, the highest ranking country being ranked 1 and the lowest currently 174. Most AMCs have steadily improved their HDI rankings from 1993 to 2000 as shown in Figure 5.1 and Table 5.2. The 'average' AMC ranking improving from 96 (in 1993) to 87 (1999) followed by a slight decline to 89 in 2000<sup>1</sup>. On average, ASEAN member countries are in the middle of the range with Singapore and Brunei Darussalam well within the 'high human development' category as classified by UNDP.

## Poverty

Poverty and environment are closely interrelated. Although people living in poverty are seldom the main source of environmental damage, they often suffer the worst impacts of environmental damage and are often caught in a downward spiral: the poor are forced to deplete resources to survive, and this degradation of the

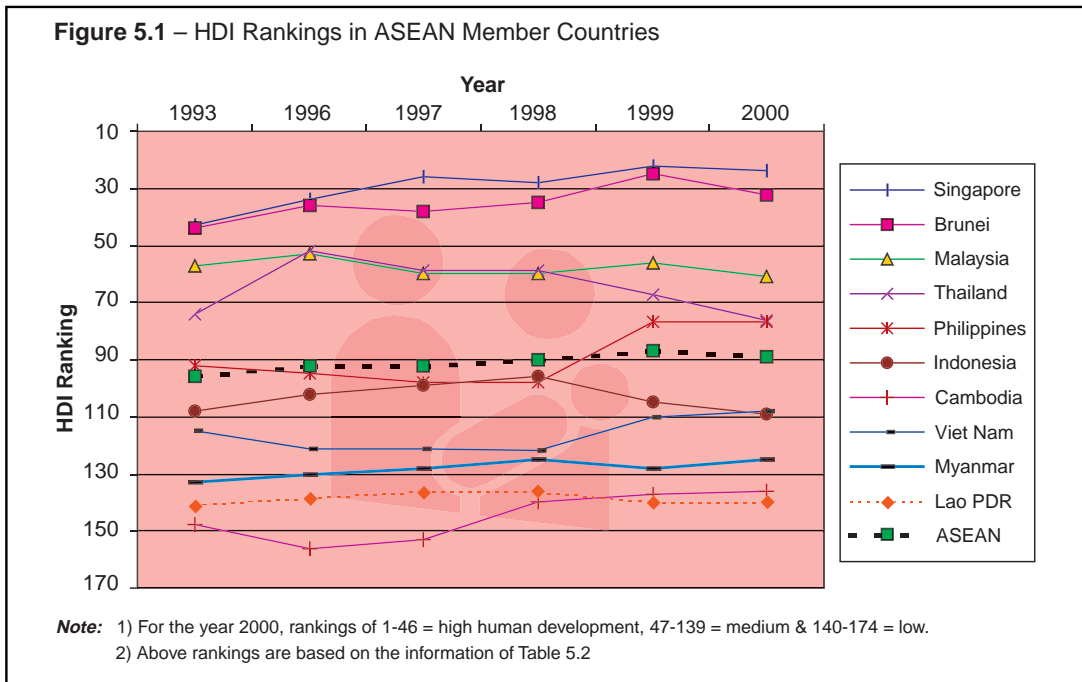
**Table 5.1** – Human Development Index values in ASEAN Member Countries: 1995 & 1998 (ranked in terms of 1998 HDI value)

Country	Life Expectancy (years) <sup>1/</sup>		Adult Literacy <sup>2/</sup> (%)		Educational Enrolment <sup>3/</sup> (gross ratio)		Real GDP (PPP) (thousand \$/capita)		HDI Value <sup>4/</sup>		HDI Category in 1998
	1995	1998	1995	1998	1995	1998	1995	1998	1995	1998	
Singapore <sup>a/</sup>	76.3	77.3	90.8	91.9	85	87	22.6	24.2	0.90	0.88	high
Brunei Darussalam	75.1	75.7	88.2	90.7	74	72	31.2	16.8	0.89	0.85	
Malaysia	71.4	72.2	83.5	86.4	61	65	9.6	8.1	0.83	0.77	medium
Thailand	69.5	68.9	93.8	95.0	55	61	7.7	5.5	0.84	0.75	
Philippines	67.4	68.6	94.6	94.8	80	83	2.8	3.6	0.68	0.74	
Indonesia	64.0	65.6	83.8	85.7	62	65	4.0	2.7	0.68	0.67	
Viet Nam	66.4	67.8	93.7	92.9	55	63	1.2	1.7	0.56	0.67	
Myanmar	58.9	60.6	83.1	84.1	48	56	1.1	1.2	0.48	0.59	
Cambodia	52.9	53.5	65.0	65.0	62	61	1.1	1.4	0.42	0.51	low
Lao PDR	52.2	53.7	56.6	46.1	50	57	2.6	1.7	0.46	0.48	

**Source:** UNDP website (*Human Development Reports* with 1995 data from HDR 1999 & 1998 data from HDR 2000) except <sup>a/</sup> where columns 2–7 were provided by Singapore.

**Note:** <sup>1/</sup> Life Expectancy at birth <sup>2/</sup> Age 15 and above <sup>3/</sup> Combined primary, secondary & tertiary levels <sup>4/</sup> Possible range 0 to 1





environment further impoverishes them. If this self-reinforcing downward spiral becomes extreme, people can be forced to move in increasing numbers to marginal and ecologically fragile lands or to cities. In urban areas, poor environmental health conditions can compound poverty as poor health affects productivity and increases family medical expenses. Consequently, poverty reduction and environmental improvement are intricately linked and need to be addressed simultaneously. Table 5.3 summarises trends in urban and rural poverty in AMCs based on national poverty lines (which are defined differently in each country).

Until the 'crisis' of the late 1990s, national surveys displayed a trend of decreasing poverty over time, although with a higher percentage of rural

people usually living in poverty. Despite the positive trend, a relatively high percentage of people in some AMCs are still poor, particularly in Cambodia, the Lao PDR, the Philippines and Viet Nam where over 30% of the population remain in poverty. Countries significantly affected by the economic recession were Indonesia, Thailand, Malaysia, and the Philippines. For Indonesia, poverty grew from 9.4% in February 1997 to around 15% a year later and may have increased by another 4-7 percentage points by the end of 1999 (ADB, 2000). For Thailand, poverty increased from 11.4% in 1996 to 12.9% in 1998 and for Malaysia, from 6.5% in 1997 to 7.6% in 1998. In the Philippines, national surveys (ADB, January 1999) indicate that self-rated poverty grew from



Sisey Vilaysack

Caring for the young



**Table 5.2 – HDI Rankings of ASEAN Member Countries : 1993–2000**

Country	1993	1996	1997	1998	1999	2000
Singapore	43	34	26	28	22	24
Brunei Darussalam	44	36	38	35	25	32
Malaysia	57	53	60	60	56	61
Thailand	74	52	59	59	67	76
Philippines	92	95	98	98	77	77
Indonesia	108	102	99	96	105	109
Cambodia	148	156	153	140	137	136
Viet Nam	115	121	121	122	110	108
Myanmar <sup>a/</sup>	133	130	128	125	128	125
Lao PDR	141	138	136	136	140	140
ASEAN average	96	92	92	90	87	89

**Table 5.3 – Poverty in selected ASEAN Member Countries**

Country	Survey Years	% of people in poverty		
		Rural	Urban	National
Cambodia	1993-94	43.1	24.8	39
	1997 <sup>a/</sup>	40.1	21.1	36.1
Indonesia	1987	16.4	21.1	17.4
	1994 <sup>a/</sup>	14.3	16.8	15.1
	1996 <sup>a/</sup>	19.8	13.6	17.6
	1997 <sup>a/</sup>	16.3	12.1	14.7
	1998 <sup>a/</sup>	22.0	16.2	19.9
	1999 <sup>a/</sup>	26.1	19.4	23.5
Lao PDR	1993	53	24.1	46.1
Malaysia	1989	–	–	15.5
	1997 <sup>a/</sup>	16.1	4.1	16.1
Myanmar	1997	22.4	23.9	22.9
Philippines	1994	53.1	28	40.6
	1997	51.2	22.5	37.5
Thailand	1990	–	–	18.0
	1992	15.5	10.2	13.1
	1994 <sup>a/</sup>	13.1	10.2	13.1
	1997 <sup>a/</sup>	17.2	1.5	12.9
Viet Nam	1993	57.2	25.9	50.9

**Table 5.4 – Poverty in East Asia and the Pacific <sup>a/</sup> 1987-1998**

Population below:	1987	1993	1998
US\$ 1 / day	24 %	16 %	11 %
US\$ 2 / day	63 %	52 %	45 %

40% in 1997 to 43% in 1998. The economic downturn adversely affected the urban population more immediately than rural people.

A common international measure of poverty is the percentage of the population subsisting on an income below US\$1 per day. As Table 5.4 shows, for East Asia and the Pacific, excluding China (i.e. mainly AMCs), poverty by this measure had dropped from 24% in 1987 to 11% in 1998. However, about 45% of the population still have incomes of US\$2 per day or less.

Box 5.1 summarises some links between poverty and the environment. Further reducing rural poverty is a key strategic element for addressing rural environmental problems for ASEAN Member Countries. For example, integrated farming and the creation of employment in rural areas through cottage industries are being pursued in Thailand as reported in Box 5.2.

Table 5.5 shows the distribution of income in ASEAN member countries as measured by the Gini Index.<sup>2</sup> There is a relatively high degree of inequality in the countries surveyed, the top 20% of households accruing almost half of national GDP. This indicates a skewed distribution of formal sector jobs and limited access by the poor to secondary and vocational education.

**Table 5.2:** Source: Human Development Reports (UNDP, 1993 through 2000) Notes: <sup>a/</sup>Data obtained from Myanmar for 1993–1998; HDI methodology has changed since 1993; some rankings may not be fully comparable for all years.

**Table 5.3:** Source: World Development Indicators (World Bank, 2000) except <sup>a/</sup> Official Poverty Line & Poverty Incidence, ARIC/ADB website, updated 16 October 2000. Note: Data not strictly comparable as national poverty lines differ from country to country.

**Table 5.4:** Source: Sustainable Development in Asia (ADB, 2000) Note: <sup>a/</sup> Excludes China



### Box 5.1 – Poverty Associated with Land Use and Environment

Poverty is often concentrated in environmentally fragile ecological zones, where communities face and/or contribute to different kinds of environmental degradation. ESCAP and ADB have identified four forms of poverty based on land use and environment in the region:

- the first occurs in areas of active and productive agricultural land which is not used efficiently and equitably by the poor due to poor access to the land, its resources or jobs;
- a second takes place in marginal lands (uplands, and already degraded lowlands) with few opportunities for increasing agricultural productivity or economic diversification, the problems often compounded by unsustainable agricultural practices;
- a third group of impoverished people inhabit coastal areas with inadequate or depleted marine resources where economic development often destroys or depletes the

resources that are fuelling economic growth; and

- the final form of poverty is experienced by the poor inhabitants of urban slums and squatter settlements, with constant exposure to poor sanitary and environmental conditions.

The variables most strongly correlated with rural poverty are unemployment and limited or no access to land. Geographical concentration of the worst poverty causes serious localised degradation. High population density and growth against a background of an inequitable distribution of productive assets make sustainable development more difficult to achieve. Impoverished communities also tend to rely disproportionately on common property resources such as forest and pasture, which are vulnerable to degradation when exploited by growing numbers of people.

*Source: State of the Environment in Asia and the Pacific (ADB & ESCAP, 2000)*

## Labour Force and Employment

The labour force of AMCs, excluding Brunei Darussalam, was about 246 million in 1998 (Table 5.6), growing slightly faster than population, and projected to reach 279 million in 2010. To create work for 33 million additional job

seekers, the agriculture and industrial sectors will have to expand considerably, potentially exerting considerable additional pressure on the environment.

Unemployment in AMCs, as shown in Table 5.7, generally decreased in recent years as

**Table 5.5 – Income Distribution in selected ASEAN Member Countries**

Country	Survey Year	Gini Index	Percentage Share of Income or Consumption						
			Lowest 10%	Lowest 20%	Second 20%	Third 20%	Fourth 20%	Highest 20%	Highest 10%
Cambodia	1997 <sup>a/, b/</sup>	40.4	2.9	6.9	10.7	14.7	20.1	47.6	33.8
Indonesia	1996 <sup>a/, b/</sup>	36.5	3.6	8	11.3	15.1	20.8	44.9	30.3
Lao PDR	1992 <sup>a/, b/</sup>	30.4	4.2	9.6	12.9	16.3	21.0	40.2	26.4
Malaysia	1995 <sup>c/, d/</sup>	48.5	1.8	4.5	8.3	13.0	20.4	53.8	37.9
Philippines	1997 <sup>a/, b/</sup>	46.2	2.3	5.4	8.8	13.2	20.3	52.3	36.6
Singapore <sup>e/</sup>	1999 <sup>e/, f/</sup>	46.7	0.3	2.8	9.3	15	23.1	49.8	32.9
Thailand	1998 <sup>a/, b/</sup>	41.1	2.8	6.4	9.8	14.2	21.2	48.4	32.4
Viet Nam	1998 <sup>a/, b/</sup>	36.1	3.6	8	11.4	15.4	20.9	44.5	29.9

*Source: World Development Indicators (World Bank, 1998 and 2000) except <sup>e/</sup> / from Singapore.*

**Note:** Survey year is the year in which the underlying data were collected.

<sup>a/</sup> Refers to expenditure shares by percentiles of population;

<sup>c/</sup> Refers to income shares by percentiles of population.

<sup>e/</sup> Refers to household income shares by percentiles of households.

<sup>f/</sup> Households ranked by total household income from work.

<sup>b/</sup> Ranked by per capita expenditure.

<sup>d/</sup> Ranked by per capita income.





**Box 5.2 - Thailand: Sustainable Rural Land Use and Management**

Under His Majesty the King's guidance, a more rational use of resources and enhanced self-reliance is being implemented leading to sustainable agriculture in order to set the rural areas on a rational path to food security. This is necessary not only to satisfy material needs and create wealth and jobs, but also to sustain the people, and to restore to health the foundation of their quality of life, land, soil, water and the ecosystem.

Producing enough to eat, earning sufficient income, and avoiding damage to the environment is the traditional Thai approach to agriculture. In the past, farm families lived in a respectful relationship with their environment. Although life involved subsistence farming, it was a sufficient subsistence.

With many mouths to feed and little money in hand, Phan Thamkindee, an aging farmer in Tha Kruad village, Tha Luang district of Saraburi province has set self-sufficiency and food security as his goals. He practices integrated agriculture on his farm, applying what he learnt in agricultural

extension courses and through the mass media. In addition to rice, Phan's 16-rai (about 2.6 hectare) farm combines an orchard, a fishpond and a kitchen garden. His entire family works the land, growing rice, vegetables, fruit and herbs. Behind their home is sugar cane and maize, beans, pumpkins, morning glory, pineapples, limes and sweet potatoes. Near the pond is a small kitchen garden with basil, sweet basil, chilli peppers, peppermint and vegetables. The orchard has papayas, rose apples, guavas and custard apples.

Fish farming is a central feature of integrated farming, helping to generate higher, more consistent incomes and better nutrition. In Thamkindee's irrigation ditches and pond, he raises Nile tilapia, Barb, carp, catfish, soft-shell turtles and bullfrogs. Nearby a coop contains dozens of native chickens. Poultry farmers such as Phan have discovered catfish farming can generate income while recycling chicken waste.

*Source: Building a Self-sufficient Future, Retaining a Heritage, FAO, RID*

countries recovered from the economic crisis of the late 1990s, but there has been some worrying upturns again in 2000. Where data exist, the table shows that unemployment rates for women have generally been worse than for men, although this seems to be changing in

recent years. Box 5.1 shows that unemployment, unsurprisingly, is closely correlated with poverty and poverty in turn with poor environmental surroundings. Unemployment indirectly exerts pressure on environmental resources, induces increased rural-urban migration, and

**Table 5.6 – Labour Force Structure in selected ASEAN Member Countries**

Country	Population Aged 15–64 (millions)		Labour Force								
			Total (millions)			Average Annual Growth Rate (%)		Female % of Labour Force		Children 10-14 (% of age group)	
	1980	1998	1980	1998	2010	1980–98	1998–2010	1980	1998	1980	1998
Cambodia	4	6	4	6	8	2.7	2.2	55.4	51.9	27	24
Indonesia	83	130	58	98	124	2.9	2	35.2	40.4	13	9
Lao PDR	2	3	–	–	–	–	–	–	–	31	26
Malaysia	8	14	5	9	13	3.1	2.7	33.7	37.5	8	3
Myanmar <sup>a/</sup>	19	29	*17	23	N/A	**2.6	N/A	*39.7	38.2	N/A	***8
Philippines	27	44	19	32	42	2.9	2.4	35	37.6	14	6
Singapore	2	2	1	2	2	2.3	0.7	34.6	41.8 <sup>a/</sup>	2	0
Thailand	26	42	24	37	42	2.3	1.2	47.4	46.3	25	14
Viet Nam	28	46	26	39	48	2.3	1.7	48.1	49.1	22	7
ASEAN	199	316	154	246	279	2.05	1.43				

**Sources:** World Development Indicators (WB, 1998 & 2000) except <sup>a/</sup>from respective governments.

**Note:** \* = 1990; \*\* = 1990-1998 \*\*\* = 1990 with unpaid family workers considered employed



**Table 5.7 – Unemployment as Percentage of Labour Force in Selected ASEAN Member Countries**

Country		1994	1995	1996	1997	1998	1999	2000 <sup>a/</sup>
Indonesia	Total	–	–	4.0	4.7	5.5	6.4 <sup>a/</sup>	6.1
	Men	–	–	3.3	–	–	–	–
	Women	–	–	5.1	–	–	–	–
Malaysia	Total	–	2.8	2.5	2.5	3.2	3.4	3.1
Philippines	Total	8.4	8.4	7.4	7.9	9.6	9.4	10.1
	Men	7.9	7.7	7.0	7.5	9.5	9.5	–
	Women	9.4	9.4	8.2	8.5	9.8	9.2	–
Singapore	Total	2.6	2.7	3.0	2.4	3.2	4.6	4.4 <sup>b/</sup>
	Men	2.5	2.7	2.9	2.4	3.2	4.5	4.0 <sup>b/</sup>
	Women	2.8	2.8	3.1	2.4	3.3	4.6	5.1 <sup>b/</sup>
Thailand	Total	1.3	1.1	1.1	0.9	3.4	3.0	3.6
	Men	1.1	0.9	1.0	0.8	3.4	3.0	–
	Women	1.5	1.4	1.1	0.9	3.4	3.0	–

**Source:** *Yearbook of Labour Statistics* (ILO, 2000) except where noted; – = Not Available  
<sup>a/</sup> 2000 data from ARIC/ADB website (updated 27 Mar. 2001) except <sup>b/</sup> from Singapore

exacerbates the poor conditions of low-income squatters in urban areas. Consequently, unemployment has far reaching environmental implications.

### Literacy

For most AMCs, the illiteracy rate for women has been significantly higher than for men. Children of illiterate women are likely to suffer disproportionately from environmental health hazards. Myanmar, the Philippines, Thailand, and Viet Nam had all achieved about 90% or higher female literacy by 1998 (Table 5.8).



Phan Thiet

*Better facilities are needed to combat illiteracy*

### Environmental Health

Table 5.9 summarises trends in AMCs Health Services (health care, safe water, sanitation, and child immunisation). Access to safe water and sanitation has been relatively low for Cambodia, the Lao PDR, Indonesia, and the Philippines. In recent decades, most AMCs have made remarkable progress in improving the health of their rural populace through better preventive and curative health services, improved health and hygiene education, and access to clean water and basic sanitation. Nonetheless, the costs of poor health due to environmental degradation can be extremely high as shown in Table 5.10.

Life expectancy in AMCs has increased significantly between 1980 and 1998 as shown in Table 5.11: Cambodia, for example, improving from 39 to 54 years. These improvements were due to reductions in mortality rates. As Table 5.12 indicates, however, tuberculosis (TB) has re-emerged as a health concern in the region. Cambodia and the Philippines experienced high incidences of TB in 1997: 539 and 310 persons per 100,000



population respectively. In Malaysia, Myanmar, Singapore, and Viet Nam, TB which is normally associated with poverty was in the order of 100 cases per 100,000 persons or less. Table 5.12 also indicates the high extent of anaemia among women in some AMCs, the prevalence of child malnutrition, and the high percentage of men who smoke cigarettes, all of which are of concern for future health in the region.

**Table 5.8 – ASEAN Illiteracy, % Aged 15 and Above**

Country	1990		1997		1998	
	Male	Female	Male	Female	Male	Female
Brunei Darussalam	9	21	6	14	6	13
Cambodia	49	86	44	81	43	80
Indonesia	13	27	9	20	9	20
Lao PDR	47	80	39	71	38	70
Malaysia	13	10	10	19	9	18
Myanmar <sup>a/</sup>	15	16	10	11	9	10
Philippines	7	8	5	6	5	5
Singapore <sup>a/</sup>	5	17	4	13	4	13
Thailand	5	11	3	7	3	7
Viet Nam	6	13	5	10	5	9

Source: World Development Indicators (WB, 1998 & 2000)  
except <sup>a/</sup>obtained from respective governments

**Table 5.9 – Access to Health Services**

Country	% of population with access to:									Child Immunisation (% of children aged under 12 months)					
	Health care			Safe water			Sanitation			Measles			DPT		
	1980	1995	2000	1980	1995	2000	1980	1995	2000	1980	1995	2000	1980	1995	2000
Cambodia					13						75			79	
Indonesia		43			62			51	73 <sup>b/</sup>	0	89		0	92	
Lao PDR					39			19	70 <sup>b/</sup>		65			54	
Malaysia		88			88		75	91	100 <sup>b/</sup>	11	81		58	90	
Myanmar <sup>a/</sup>	30		75	20	60	67	20	43	61	–	82	86	4	84	75
Philippines									88 <sup>b/</sup>	9	86		47	86	
Singapore		100		100	100			97	100 <sup>b/</sup>	47	88		84	95	
Thailand	30	59			81			70	98 <sup>b/</sup>		86		49	94	
Viet Nam	75				36			21	43 <sup>b/</sup>	1	95		4	94	

Source: World Development Indicators (World Bank, 1998 and 2000)

Note: <sup>a/</sup> Data obtained from Myanmar <sup>b/</sup> for urban areas only

**Table 5.10 – Health Effects of Environmental Degradation**

Country	Period	Environmental Health Effects	Annual Cost	
			US\$ billions	% of GDP
Indonesia	1989	Health effects of particulate and lead levels above WHO standards in Jakarta	2.2	2.0
Philippines	Early 1990s	Health and productivity losses from air and water pollution in the vicinity of Manila	0.3–0.4	0.8–1.0
Thailand	1989	Health effects of particulate and lead levels above WHO standards	1.6	2.0

Source: Excerpted from Table 9.5 of ESCAP & ADB, 2000

<sup>1</sup> The year in parentheses refers to the date of the UNDP's *Human Development Report*. However, data are typically 2-3 years earlier so declines in 2000 reflect the economic crisis which began in 1997.

<sup>2</sup> A Gini index measures to the extent to which the distribution of income (or, in some cases, consumption expenditures) among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of zero represents *perfect equality* while an index of 100 implies *perfect inequality*.



Table 5.11 – Life Expectancy and Mortality Rates.

Country	Life Expectancy at Birth		Infant Mortality (per 1000 live births)		Under-five Mortality (per 1000)		Child Mortality (per 1000)		Adult Mortality (per 1000)		Survival to Age 65 (% of cohort*)	
	1980	1998	1980	1998	1980	1998	Male	Female	Male	Female	Male	Female
							1988-98 <sup>a/</sup>	1988-98 <sup>a/</sup>	1998	1997	1997	1997
Brunei Darussalam	–	–	–	–	–	–	–	–	–	–	–	–
Cambodia	39	54	201	102	330	143	–	–	357	309	45	51
Indonesia	55	65	90	43	125	52	19	20	237	186	62	70
Lao PDR	45	54	127	96	200	–	–	–	376	320	43	50
Malaysia	67	72	30	8	42	12	4	4	186	113	71	82
Myanmar <sup>b/</sup>	52	61	N/A	47	–	72	–	–	–	–	–	–
Philippines	61	69	52	32	81	40	21	19	197	149	68	75
Singapore <sup>b/</sup>	72	77	8	4	10	5	–	–	131	75	80	88
Thailand	64	72	49	29	58	33	11	11	206	116	67	79
Viet Nam	63	68	57	34	105	42	–	–	225	153	65	75

Sources: World Development Indicators (World Bank, 1998 and 2000)

Note: <sup>a/</sup> Data for most recent year available; <sup>b/</sup> Data from respective governments

\* A cohort is a generational group as defined in demographics, statistics, or market research.

Table 5.12 – Risk Factors and Potential Future Challenges for Health Services.

Country	Prevalence of anaemia (% of pregnant women)	Low-birth weight babies (% of births)	Prevalence of child malnutrition (% of children under 5)		Consumption of iodised salt (% of households)	Smoking prevalence		Cigarette consumption (per smoker per year)	Tuberculosis		Prevalence of HIV	
			Age	Height for Age		Male (% of adults)	Female (% of adults)		Incidence (per 100,000)	Prevalence (thousands of cases)	Adults infected (%)	People infected (number; all ages)
Cambodia	–	18	–	–	7	70	10	912	539	101	2.4	130,000
Indonesia	64	11	34	42	62	–	–	–	285	1,606	0.05	52,000
Lao PDR	62	18	40	47	93	62	8	949	167	17	0.04	1,100
Malaysia	56	8	20	–	–	–	–	–	112	30	0.62	68,000
Myanmar <sup>b/</sup>	58	16	36	37	80	N/A	N/A	N/A	83	20	0.11	29,636
Philippines	48	11	30	33	15	–	–	–	310	481	0.06	24,000
Singapore	–	–	–	–	–	32	3	5,110	55 (1997) 48 (1999)	2	0.15 <sup>b/</sup>	1,325 <sup>b/</sup>
Thailand	57	7	–	–	50	49	4	2,140	142	180	2.23	780,000
Viet Nam	52	17	40	36	65	73	4	730	89.7 <sup>b/</sup>	124 <sup>b/</sup>	–	8,302 <sup>b/</sup>

Source: World Development Indicators (World Bank, 1998 and 2000) except <sup>b/</sup> provided by respective governments

Note: <sup>a/</sup> Data are for the most recent year available.

Prevalence of anaemia, or iron deficiency, is defined as haemoglobin levels less than 11 grams per decilitre among pregnant women. Low-birth weight babies are newborns weighing less than 2,500 grams, with the measurement taken within the first hours of life, before significant postnatal weight loss has occurred. Prevalence of child malnutrition is the percentage of children under 5 whose weight for age is less than minus two standard deviations from the median of the reference population. Smoking prevalence is the percentage of men and women over 15 who smoke tobacco products. Incidence of tuberculosis is the estimated number of new tuberculosis cases (all forms). Adult HIV-1 seroprevalence is the estimated percentage of people over 15 who are HIV 1 position.









**W**ater is a very important environmental resource; it sustains life and economic activities and is used extensively as a waste sink. Population and economic growth in the ASEAN region have exerted pressure on water resources both in terms of quantity used and quality, with adverse impacts on aquatic ecosystems. The rational management of water resources and aquatic ecosystems is a crucial element of environmental management for sustainable development. Problems related to water resources and aquatic ecosystems vary in extent and severity among ASEAN Member Countries depending on socio-economic conditions, the effectiveness of environmental management practices, and the natural capacity of the aquatic ecosystems to absorb external pressures. Compared to most regions of the world, ASEAN has adequate renewable water resources but seasonal and some local pressures on clean water availability are increasing. The ASEAN region is a major producer and exporter of fish products but the resources on which they depend - clean waters, mangroves and coral reefs - are deteriorating. ASEAN has established over 90 marine and coastal Protected Areas covering nearly 100,000 sq km to better protect these resources.

## ASEAN FACTS AND FIGURES

ASEAN Coastline	173,000 km
ASEAN Renewable Water Resource	15% of world total (2000)
ASEAN Marine Fish Production	14% of world total (1998)
ASEAN Overall Fish Exports	15% of world total (1998)
ASEAN Mangrove Forests	35% of world total (1998)
ASEAN Coral Reefs (the most species-diverse in the world)	25–30% of world total (1998)
Global coral reefs at risk	58% (27% at high / very high risk)
ASEAN coral reefs at risk	80% (55% at high / very high risk)
ASEAN Wetlands	19 sites of global significance covering over 620,000 hectares

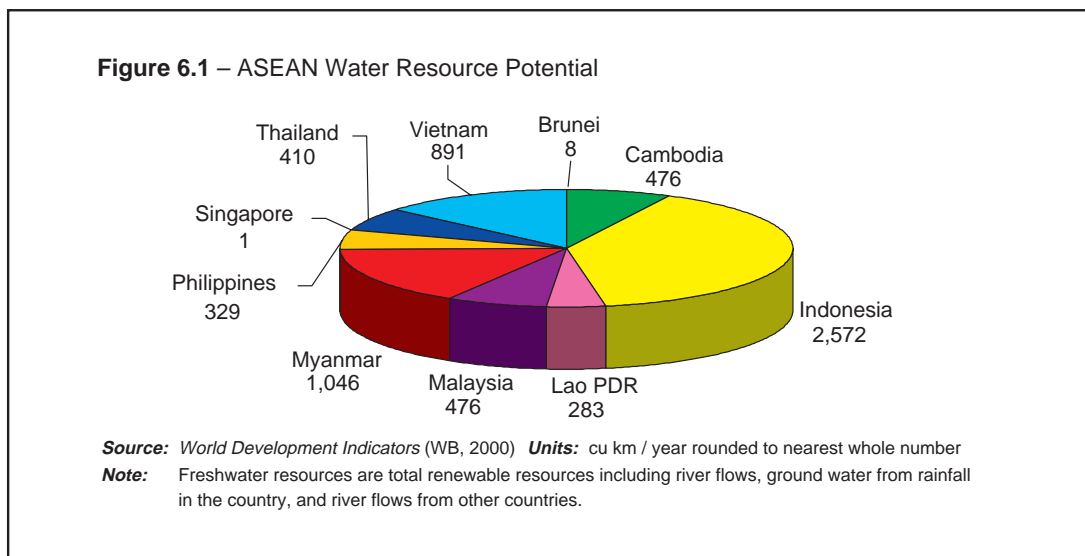




## Fresh Water Resources

**Overview.** Fresh water endowment in ASEAN varies widely by country as shown in Figure 6.1. Overall the region has an average annual resource of about 6,476 cu km (1.45 cu m/sq m of land area), about 15% of the world total, with Indonesia having by far the biggest amount.

In 2000, the annual internal<sup>1</sup> water resource per person in the ASEAN region was about 12,900 cu m ranging from 155 cu m for Singapore to 35,000 cu m for the Lao PDR as shown in Table 6.1. Roughly 90% of water use is for agriculture, withdrawals ranging from 66 to 814 cu m/capita. In 1990, the ASEAN region consumed about 200 cu km of water, about 5% of world withdrawal, growing at an average rate

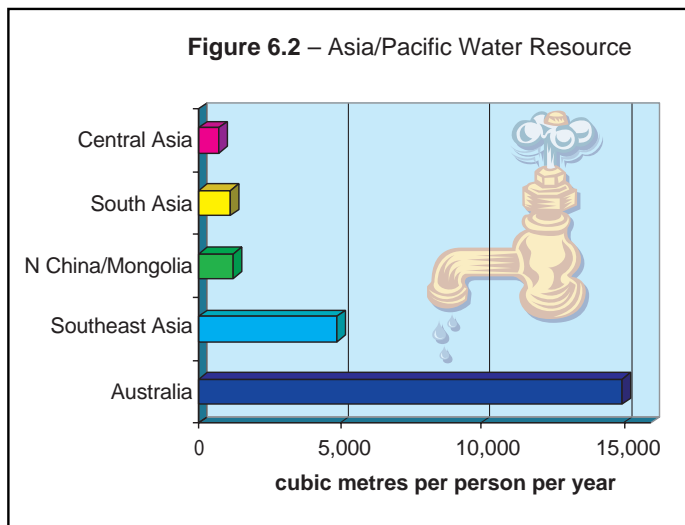


**Table 6.1 – Fresh Water Resources and Withdrawals in ASEAN**

Country	Annual Internal Renewable Resources		Annual Freshwater Withdrawals		Sectoral Withdrawal (% of total)		
	Total (cu km)	cu m/capita (2000)	% of total internal resources	Per capita (cu m)	domestic	industry	agriculture
Brunei Darussalam <sup>al</sup>	8.0	N/A	N/A	N/A	50	N/A	N/A
Cambodia	120.6	10,795	0	66	5	1	94
Indonesia	2,838.0	13,380	3	407	6	1	93
Lao PDR	190.4	35,049	1	260	8	10	82
Malaysia	580.0	26,074	2	633	11	13	76
Myanmar	880.6	19,306	N/A	102	7	3	90
Philippines	479.0	6,305	12	811	8	4	88
Singapore <sup>al</sup>	0.6	155 *	56 *	109 *	55	45	0
Thailand	210.0	3,420	16	596	5	4	91
Viet Nam	366.5	4,591	15	814	4	10	86

**Sources:** World Resources 2000 – 2001 (WRI, 1999) except <sup>al</sup> from respective governments

**Notes:** \* average from 1987 – 1994; N/A – Not Available



conditions and locations govern the characteristics of rivers in ASEAN. Table 6.2 lists the major rivers of each ASEAN member country with data on drainage areas, river lengths and average discharge. In general, the continental countries – such as Myanmar, Lao PDR, and Thailand – have fewer rivers compared to archipelagic countries such as Indonesia and the Philippines. The continental rivers are also longer, with larger drainage areas and lower runoff yields. Islands and the southern

parts of Thailand and Peninsular Malaysia have more numerous rivers of shorter length, smaller drainage areas and higher runoff yields.

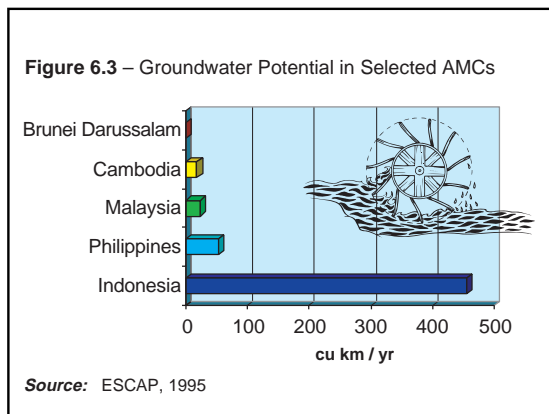
Indonesia has more than 700 rivers, about 40 times more than Myanmar. The largest and most important river in the ASEAN region is the Mekong which supports the livelihood of about 50 million people living in the riparian countries. It is densely populated in the lower parts of Cambodia and in southern Viet Nam, the latter one of the world's major rice growing regions.

of 3.4% annually to 279 cu km in 2000. Regional withdrawal is only about 2% of the potential.

The volume of water actually available per person for use in 2000 was 4,900 cu m (considerably lower than the potential resource of 12,900 cu m). This is considerably higher than most of the Asia / Pacific region as shown in Figure 6.2. AMCs may well experience future water shortages but these are likely to be seasonal, location specific and less severe than in much of Asia.

**Surface Waters.** Rivers, lakes and natural or man-made reservoirs are major surface water resources in the ASEAN region. Topographic

Major fresh water lakes in the ASEAN region include the Tonle Sap in Cambodia, Lake Toba in Indonesia, Laguna de Bay in the Philippines and Songkhla Lake in Thailand. Table 6.3 lists these



Water Use – A Floating Market

Indonesia tourism website: www.emp.pdx.edu/ititiano/travel.html



**Table 6.2 – Rivers and Waterways in ASEAN**

Country	No of major rivers	Major Rivers				Total inland navigable waterway (km)
		Name	Drainage area (sq km)	Length (km)	Average discharge (cum/sec)	
Brunei Darussalam	3	Sungai Belait Sungai Tutong Sungai Temburong	1,837 740 430			
Cambodia						3,700
Indonesia <sup>a/</sup>	744	Citarum Cimanuk Karangkates Kampar Indragiri Batanghari Bengawan Solo Barito Kapuas Mahakam Memberamo	6,080 1,460 2,050 35,287 30,291 52,999 19,958 79,459 94,480 93,423 137,656			4,579
Lao PDR	14	Mekong, Luang Prabang Mekong, Pakse Xe ang Hieng (Mek. Tributary Suwavannakhet) Nam Nguam (Mekong Tri. Vientiane Pr.)	268,000 545,000 19,400 16,500		3,973 9,805 499 696	7,484
Malaysia	150	Pahang (Peninsular) Rajang (Sarawak) Kinabatangan (Sabah)	29,000 51,000			7,296
Myanmar <sup>a/</sup>	4	Ayeyarwady Chindwin Sittaung Thanlwin	404,000 124,320 35,000 285,900	2,170 1,100 420 1,040	12,742 4,700 1,332 3,880	2,617
Philippines	18	Cagayan Mindanao Agusan	25,649 23,169 10,921			N/A
Singapore	5	Jurong Kranji	N/A N/A			N/A
Thailand	17	Chao Phraya Mun Chi	177,500 69,700 49,476		1,305 669 335	4,000
Viet Nam <sup>a/</sup>	2,360	Mekong Red Dong Nai Ma Thu Bon	795,000 168,700 42,655 28,990 10,496	1,200	9,500	N/A

Source: ESCAP, 1995 except <sup>a/</sup> from respective governments



Nguyen Dan

*Groundwater for domestic use.*

and other lakes of the ASEAN region. The Tonle Sap is the largest, with a surface area varying from approximately 2,500 sq km in the dry season to well over 16,000 sq km late in the wet season. It is an important wetland ecosystem and a major fishery resource for Cambodia. AMCs have built about 1,000 reservoirs formed by storage dams with heights over 15 m, of which 650 are in Viet Nam and about 110 in Thailand.

**Groundwater Resources.** Because of favourable conditions and rainfall, a substantial volume of groundwater exists in the ASEAN region at various depths with yields ranging from small volumes at shallow weathered and jointed layers of ancient crystalline basement rock to enormous volumes at several hundred-meter depths in alluvial plain sediment. Indonesia (Figure 6.3) has by far the largest groundwater potential in ASEAN, about 456 cu km/year, nearly 18% of its renewable fresh water resources. The Philippines has the second largest potential,

about 52 cu km/year. Groundwater is used mainly for domestic and industrial consumption; in Thailand, it is the dominant source of industrial water<sup>2</sup>. Excessive withdrawal of groundwater in the Bangkok Metropolitan area has caused land subsidence; excessive groundwater pumping in Samut Sakorn and Samut Prakan, (outlying provinces of Bangkok) has caused subsidence of 3–5 cm per year over the past decade.

#### **Water Resources Management.**

Water, as a critical natural resource, is intrinsically linked to economic development and environmental protection. Although water resources are broadly adequate in most AMCs, management could generally be improved with better legal, regulatory and organisational arrangements. Usually no single agency or overseeing body is entrusted with the overall responsibility of integrated water planning and management at national, state, or basin levels.

The enormous variability of conditions in AMCs affects how water resource issues and their management might best be addressed. A high priority in one country may have much less urgency in another and national or local solutions to similar problems will differ. Nonetheless, many common or generic issues can be identified. These include:

- capacity building;
- development of national water policy, legal tools and institutional frameworks for water sector management;
- better knowledge of the economic value of water in rice cultivation;
- identification and study of key transboundary issues both within and across borders;



**Table 6.3** – Major Lakes of ASEAN Member Countries

Country	Name	Area (sq km)	Depth (metres)	Volume (cu km)	Remarks
Brunei Darussalam <sup>a/</sup>	Tasek Merimbun	N/A	N/A	N/A	
Cambodia	Tonle Sap	2,500-16,000	shallow	10	
Indonesia <sup>a/</sup>	Sentaram	1,250	N/A	1258	volcanic
	Toba	1,130	"		
	Mainjau	221	"		
	Limboto	45	"		
	Tondano	43	"		
Malaysia	Tasek Bera	61.5		0.15	tidal
Myanmar	Inle	155 max	5.4 max	361 max	
		103 min	2.7 min	158 max	
Philippines	Laguna de Bay	900	2.5 mean	22	tidal
	Lanao	347	60 mean 112 max	N/A	
	Taal	234	60 mean 200 max	N/A	
Thailand	Songkla	1,082	2 mean 5.8 max	1.6	tidal
	Bung Boraphet	106		276	
Viet Nam	Ba Be	4.5	18 mean 29 max	90	
	Ho-Tay	4.1	1.7 mean 3.5 max	8	

Source: ESCAP, 1995 except <sup>a/</sup> from respective governments

- identification and study of resource management issues in a basin wide context;
- catchment management and flood control;
- improved water quality and environmental protection;
- clear policies on private sector participation;
- autonomous and accountable water service providers in urban and rural areas;
- information for better resource planning and management of shared water resources;
- more, and effective, stakeholder consultation and participation; and
- addressing water sector financing, water pricing, cost recovery and incentive issues.

Capacity building in water resources planning and management is a key issue in most AMCs as institutions can lack appropriate management tools. Information systems for water management

of most AMCs also need to be strengthened as reliable and up-to-date information is critical for effective decisions. Sharing of water between lower and upper riparian areas can also sometimes be contentious.

### Water Quality

**Quality of Freshwater Bodies.** Although siltation of rivers and lakes can have adverse impacts on water resources, this problem is relatively minor at both regional and national levels; it is not considered a serious threat to the sustainability of water resources in AMCs. A more pressing problem is the degradation of water quality (i.e. from water pollution) which has been a ubiquitous environmental problem in the ASEAN region for some decades, especially in urban areas. Water pollution is caused mainly by





the discharge of untreated or inadequately treated wastewater from domestic, industrial and agricultural point sources of pollutants, as well as surface runoff from non-point sources. The extent and severity of water pollution problems in AMCs vary widely depending on the pollution loads and waste assimilative capacities of the waters. In general, rivers and coastal waters near large cities (such as Metro Manila, Bangkok, and

Jakarta) are severely polluted by domestic and industrial wastewater. In rural areas, water pollution is normally caused by agricultural and localised industrial waste discharges. The quality of freshwater bodies in selected AMCs, based on detailed monitoring information provided by governments, is summarised in Box 6.1<sup>3</sup>. Box 6.2 summarises recent AMCs approaches to reduce the contamination of groundwater supplies.

### Box 6.1 – Trends in Quality of Fresh Water in selected ASEAN Rivers

**Cambodia.** The Mekong River in Cambodia is still relatively clean as indicated by high levels of

DO (dissolved oxygen) in all sections, all year round.

**Indonesia.** The main concern regarding water quality in Indonesia is pollution of rivers that provide raw water to water treatment plants of major cities to produce potable (drinking) water. Major rivers of concern are the Ciliwung supplying Jakarta, the Surabaya supplying Surabaya, the Siak supplying Riau and the Citarum supplying Bandung. Monitoring carried out by local

governments under the Clean River Program indicates that water quality of priority rivers remained relatively unchanged during the last decade. However, for several rivers with significant industrial pollution sources, water quality has apparently deteriorated. The Ciliwung River in Jakarta is a source of potable water but the monitoring standard used is that for raw water.

**Malaysia.** Of the 120 river basins in Malaysia, 33 were considered clean in 1998 (up from 24 in 1997), 71 slightly polluted, and 16 polluted (down from 25 in 1997) according to the *Malaysian Environmental Quality Report, 1998*. The polluted rivers were the Miri/Lutong, Balok, Merbok, Air Baloi, Buloh, Danga, landas, Jimah, Jejawi, Kelang, Juru, Segget, Tukang Batu, Sepang, Kempas and Pinang. In 1998, 43% of the 120 river basins were polluted by ammonia-nitrogen from

livestock wastes and domestic sewage, 34% by SS (suspended solids) due to earthworks and land-clearing activities, and 21% by BOD (biochemical oxygen demand) due to discharges from agro-based and manufacturing industries. In 1997, the corresponding figures were 80% ammonia-nitrogen, 31% SS and 69% BOD. The improvements in ammonia-nitrogen and BOD pollution from 1997 to 1998 resulted in the decline in numbers of polluted rivers from 25 in to 16.

**Singapore.** Singapore has small and short rivers and streams, classified into those in water catchment areas and those in non-water catchment areas. For the former, water quality improved from 1998 to 1999, meeting the national

BOD standards 86% of the time. For rivers and streams in non catchment areas, water quality also improved from 1998 to 1999, meeting BOD standards 78% of the time.

**Thailand.** In 1998, the Pollution Control Department monitored coastal water quality at 218 station scattered through 23 coastal provinces of Thailand in the dry and wet seasons. Such parameters as temperature, pH, salinity, dissolved oxygen, coliform bacteria, nutrient, pesticide and some heavy metals were analysed. The results indicated that coliform bacteria contamination is the main problem in some areas of Gulf of

Thailand and Andaman Sea especially in the areas of major river mouths. The river mouth areas have been receiving accumulated wastewater from human activities from main cities. Evidently, if wastewater is not adequately managed, coastal water quality is continuously deteriorated in the future considering the expected increasing number of population, tourism, coastal aquaculture and industries.

(continued next page)



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**Viet Nam.** Untreated industrial discharge and municipal sewage from urban centres have caused serious local contamination of surface water bodies in major industrial cities such as Ha Noi, Ho Chi Minh City, Hai Phong, Viet Tri and Bien Hoa. Available monitoring data for 1995 indicate that the quality of the northern rivers did not meet the national Category A standards for domestic water supply but met the lower Category B Standards for other uses. For the central and southern rivers, the water quality in the upstream reaches was still good, meeting Category A Standards. However, in downstream reaches, water quality met only Category B standards due

to industrial pollution. High levels of organic contamination were identified in the Sai Gon, Vam Co Dong and Thi Vai Rivers, and moderate pollution levels were determined in Dong Nai River. Most of the rivers in the northern, central and southern regions were polluted by nutrients (nitrogen and phosphorus). In other rivers, heavy metal, phenol and pesticide residues were found at lower levels than those of the environmental quality standards. Bottom deposits of the Sai Gon and Thi Vai rivers were found to have heavy metals according to Viet Nam's *State of the Environment Report*, 1999.

*Source: Reports provided by respective governments*

### Box 6.2 – Approaches to Reduce Contamination of Freshwater Bodies

**Thailand.** Shrimp farming. Market forces led some areas of Thailand to the brink of dangerous environmental contamination in 1998. A strong market for panaeid saltwater shrimp raised in freshwater areas led to a rapid expansion of fresh water agricultural lands used for this form of aquaculture, resulting in the introduction of significant amounts of brine into fresh water ecosystems. The government reacted to protect deteriorating water quality; water supplies were being contaminated by brine intrusion, negatively affecting other uses. In 1998 the National Environmental Board advised provincial governors to halt shrimp farming in inland freshwater areas, a move that was supported by all agricultural sectors – except shrimp farmers. During the 120 day period given to comply, the shrimp farmers lobbied to delay enforcement, protesting the government decision, asking for more time to comply, and requesting extension of operations

at farms which had not experienced negative environmental impacts.

Salt water shrimp farming in fresh water areas affects basic land and water resources central to Thailand's core agricultural life. The government decision to halt the activity was necessary and appropriate, in conformance with national economic and social development policy regarding land and water resources and their use. Measures must be taken to alleviate effects that have already occurred so that natural resources may be used collectively by all groups in society rather than appropriated by special interests. The State must set clear and lawful procedures to reduce inappropriate land use and the concomitant risk of destroying natural resources, as land and water resources are a fundamental to national development.

*Source: Report from Thailand*

**Indonesia.** Groundwater has been the primary source of water for varied sectors and for the general population, supplying 70% of Indonesia's total demand for clean water and nearly 100% of water supplied for its industrial uses. Increased exploitation of this critical resource and consequent environmental changes due to development have resulted in both reduced quality and quantity of

groundwater. Contamination is primarily caused by saltwater intrusion and by domestic, industrial and agricultural waste. Unacceptable levels of nitrogen, major organic constituents and contaminants, trace metals, boron and pesticides mark contamination in several major cities and many rural areas.

Countermeasures have been designed to conserve groundwater resources, including legal

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and technical measures to reduce water abstraction and extraction, artificial water recharge, adjustment of the strata of extraction, work plans and regulations to guide deep groundwater extraction and setting up other

groundwater protection. The sustainability of groundwater resources is not possible without an increased level of such countermeasures.

**Source:** Soetrisno, S. and Hehanusa, P. (1991)

Despite a range of water pollution problems, a forthcoming ASEAN report<sup>4</sup> concludes that “in general, since the rise of environmental awareness in the 70’s, all member countries have succeeded in improving the water quality of their various water resources through legislation and institutional set-ups on the one hand, and

planning and implementation of various rehabilitation programs on the other.”

#### Quality of Coastal and Marine Waters.

Some coastal and marine waters in the ASEAN region tend to be heavily polluted as summarised from selected AMCs reports in Box 6.3.

#### Box 6.3 - Coastal and Marine Water Pollution in selected ASEAN Member Countries

**Indonesia.** Domestic, industrial and agricultural wastes are mostly concentrated along the coastal areas of Java, Sumatra and Kalimantan as growing urban settlements dump solid and liquid wastes into the coastal and marine waters. The sea water of Jakarta Bay and the Malaccan Strait and the coastal waters of Semarang, Surabaya, Lhokseumawe and Balikpapan are all grossly polluted. Mercury levels in Jakarta Bay were already excessively

high in 1982 ranging from 0.005 to 0.029 ppm (parts per million) compared to the national standard of 0.003 ppm or less. The concentration of PCB<sup>5</sup> in clams and mussel in Jakarta Bay were found to be 279 ppb and 264 ppb, respectively. E.coli and streptococcus bacteria reached high levels of 122,000 and 15,000 per ml, respectively, compared to the normal standard of 10,000 per ml for E.coli and 100 per 100 ml for streptococcus.

**Malaysia.** In 1998, 836 marine water samples were collected from 231 stations for analysis of oil and grease, total suspended solids, and E.coli. The major pollutants were oil and grease, total suspended solids, and E.coli. Copper exceeded the interim standard of 0.1 mg/l in water samples collected from Sarawak,

Pulau Langkawi, Terengganu, Kedah/Perlis and Pinang. Mercury and lead levels exceeding the interim standards of 0.001 mg/l and 0.1 mg/l, respectively were observed in the coastal waters off Melaka and Sarawak. The levels of cadmium, chromium and arsenic were all within the interim national standards.

**Singapore.** Physical, chemical and bacteriological quality parameters of coastal waters in the Straits of Johor and the Straits of Singapore are routinely monitored at 9 locations in each water body. The Straits of Singapore is

relatively clean compared to the Straits of Johor. In 1999, faecal coliform counts in the Straits of Singapore were within the required standard 98% of the time, compared to 85% for the Straits of Johor East and 68% for Johor West.

**Thailand.** In 1998, the Pollution Control Department monitored coastal and marine water quality in the dry and wet seasons at 436 stations scattered throughout 23 coastal provinces of Thailand. Such parameters as temperature, pH (acidity), salinity, turbidity,

dissolved oxygen, faecal coliform and some heavy metals were analysed. The results indicated deterioration of water quality in the Gulf of Thailand and the Andaman Sea. Key quality parameters were worse than prescribed standards in several areas along the coasts of

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both sea bodies: coliform bacteria exceeded the permissible maximum level by 4-5 times in the wet season. The polluted areas are the upper part of the Gulf of Thailand (Chonburi Bay, Bang Saen Beach, Pattaya), Ban Don Bay in Surat Thani Province and Patong Beach in Phuket

Province. If wastewater is not adequately managed, coastal water quality will continue to deteriorate in the future considering the expected increases in population, tourism, coastal aquaculture, and industries.

**Viet Nam.** Since 1995, the National Environmental Monitoring Network has been monitoring coastal water quality at about 19 stations. The major findings are: i) coastal water was contaminated at between slight to moderate levels; ii) four major pollutants identified in coastal water included ammonium, oil, zinc and faecal coliform, with concentrations exceeding permissible levels, and iii) among the 19 sampling sites, higher concentrations of suspended solids were found in Do Son, Dinh

An and Sam Son. High oil concentrations were found in Ba Lat, Nha Trang, Cua Luc, Cua Lo, and in areas adjacent to Vietopetro oil and gas production sites. The highest copper contents were detected in Phu Qui, Cua Lo and Sam Son. The highest zinc contents were found in Cua Luc, Sam Son, Do Son, Rach Gia and Ba Lat. The highest concentrations of coliform were detected in Nha Trang, Vung Tau and Dinh An.

*Source: Information provided by respective governments*

### Wastewater Management and Discharges into Water Sources

Wastewater management is an integral element of water quality management, the objective being to minimise pollutants returned to the water to maintain high water quality. AMCs are pursuing various mechanisms for waste

water management. Figure 6.4 shows the dramatic reductions after Indonesian authorities threatened public disclosure of a factory which was emitting organic pollutants far above legal limits.

Sewage collection and treatment facilities are

important infrastructure for water pollution control but they require a large capital investment and a significant budget for effective operation and maintenance. AMCs that have made substantial investments in domestic wastewater treatment include Brunei Darussalam, Malaysia, Singapore, and Thailand. Major polluting industries in the ASEAN region include palm oil, tapioca, pulp and paper, sugar, and other food processing industries. The share of emissions of organic pollutants of important

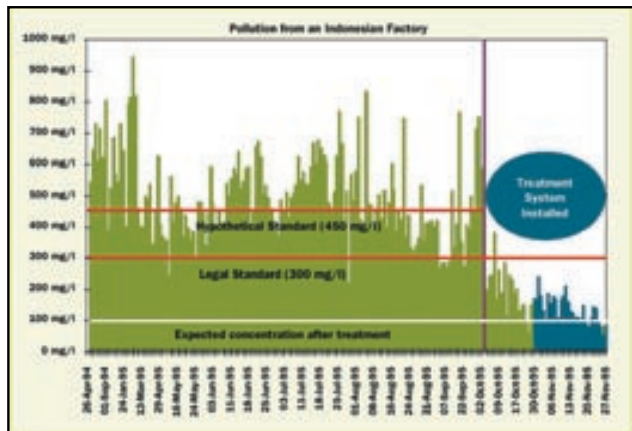
**Table 6.4 – Water Quality of Rivers in Thailand in 1997–1998**

River	DO (mg/l)		BOD (mg/l)		Faecal Coliform (MNP/100 ml)	
	1997	1998	1997	1998	1997	1998
Upper Chao Phraya	6.4	5.7	1.2	0.9	20,000	1,300
Middle Chao Phraya	4.1	4.5	1.5	0.8	2,000	2,700
Lower Chao Phraya	0.5	1.0	3.1	2.8	46,000	14,500
Upper Tachin	5.1	4.8	1.0	1.1	7,000	1,450
Middle Tachin	2.1	1.5	2.0	1.6	43,000	10,000
Lower Tachin	1.0	1.3	2.1	2.0	24,000	2,400
Mae Klong	6.0	6.0	1.3	1.0	3,200	790
Pasak	6.2	6.0	1.6	1.4	5,500	1,100
Phetch Buri	6.0	6.4	1.4	1.6	4,700	485
Ping	6.2	6.6	1.2	1.1	7,000	800
Wang	6.1	6.7	1.8	1.5	2,800	850
Yom	5.8	5.9	1.5	1.5	1,300	270
Nan	6.1	6.7	1.0	1.5	1,300	215
Bang Pakong	4.3	4.7	0.9	0.9	500	195
Prachin Buri	6.4	5.5	1.3	1.2	1,900	340
Nakhon Nayok	3.8	4.4	1.3	0.8	2,000	330
Rayong	6.8	5.2	1.1	1.5	11,000	2,000
Chantaburi	5.7	5.8	1.1	1.2	4,100	500

*Source:* Pollution Control Department, Thailand



**Figure 6.4** Reducing Water Pollution from Indonesian Factory



Greening Industry (World Bank, 2000) based on BAPEDAL data

As expected from the results of the previous table, the food and beverage industry is a moderate to major source in much of ASEAN with high levels fairly common from both animal farming and textiles. Pesticides and fertilisers are relatively moderate contributors to water pollution in the region.

Industrial wastewater treatment is now legally required in all AMCs but monitoring

ASEAN industries are estimated in Table 6.5; food processing is the main source of organic pollutants in most AMCs. Of particular concern are 'persistent organic pollutants' (POPs), which is a class of chemicals that persist in the environment. POPs, are capable of long-range transport by air and water, and they bioaccumulate in human and animal tissue. They can have significant impacts on human health and the environment, even at low concentrations. POPs include dioxin, PCBs and DDT.

requires considerable resources and actual compliance varies. Singapore, for example, had 2,329 industrial wastewater treatment facilities in 1999. Of 1901 collected effluent samples, 11.5% failed to comply with the standards. In Malaysia, 3,889 manufacturing industries were inspected in 1998, of which 14% were found non-compliant with environment quality regulations. Industrial permits for textile, metal finishing and electroplating, paper, and food and beverages achieved 60, 65, 71, and 72% compliance respectively.

Table 6.6 summarises the main sources of wastewater in AMCs and the relative levels of contribution from each source for each country.

Agricultural activities that are major sources of pollutants include pig farming, fish and prawn

**Table 6.5** – Industry Share in Emissions of Organic Water Pollutants in selected ASEAN Member Countries, 1997

Country	Industrial Organic Water Pollutants (%)							
	Primary Metals	Paper & Pulp	Chemical Industry	Food & Beverages	Stone Ceramic & Glass	Textiles	Wood	Other
Cambodia	0.0	3.4	3.3	59.2	0.6	24.7	5.8	3.1
Malaysia	7.3	13.1	15.2	32.0	0.3	8.5	8.5	14.9
Myanmar	11.4	6.8	29.6	18.5	1.5	3.9	27.1	1.2
Philippines	5.2	9.8	7.3	54.5	0.2	16.4	2.0	4.6
Singapore	2.4	27.9	14.2	18.7	0.1	6.2	1.5	29.0
Thailand	6.1	5.3	5.3	42.2	0.2	35.4	1.5	3.9

**Source:** World Development Indicators (World Bank, 2000);

**Note:** (i) Data refer to most recent year between 1993–1997 (ii) Industry share may not add up since they relate to different years.





**Table 6.6 – Main Sources of Wastewater in selected ASEAN Member Countries, 2000**

Sources	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Philippines	Singapore <sup>a/</sup>	Thailand	Viet Nam
Domestic Waste	*	***	***	***	***	***	***	***	***
Industrial Waste:									
Food & beverage	*	**	**	*	***	***	*	**	**
Pulp & paper	*	*	***	*	**	**	**	**	**
Chemical	*	*	**	*	**	**	*	*	**
Sugar mills			**	*	**	**		*	
Mining	*	**	**	*	*	**		*	**
Oil based	*		**		**	**	*		
Textiles	*	**	***	*	**	**		**	**
Distillation		*	**	*	**	**		*	
Palm oil mills		*	**		**	**		**	
Electroplating	*		***		**	**	*	**	**
Metal finishing	*	**	**		*	**	*	**	*
Agriculture waste:									
Animal farming	*	*			**	**		***	
Fertilisers	*	**	**			**		**	*
Pesticides	*	**	**			**		**	*
Oil spills	*	*	**		*	*	*	*	*

**Source:** adapted from *ASEAN Achievements and Future Directions in Pollution Control* (forthcoming, 2001)

**Note:** Levels of Contribution: \* = minor    \*\* = moderate    \*\*\* = major

<sup>a/</sup>In Singapore, all wastewater is discharged into sewerage system for treatment and disposal

farming. In addition to organic pollutants, their agricultural wastewater contains high concentrations of nitrogen and phosphates. Pig farming, when concentrated in a limited area, can cause serious water pollution as experienced by Indonesia, Malaysia and Thailand. Effluents from prawn farms and fish ponds carry high BOD loads and could seriously pollute receiving waters. The pollution control laws of most AMC do not require treatment of agricultural wastes.

**Water Quality Management in ASEAN.**

Most AMCs have national environmental framework laws that establish basic legal frameworks for water quality management with specific laws controlling industrial, domestic and agricultural wastewater. These are listed in Box 6.4. AMCs have also agreed on river water-quality standards to be achieved by 2010 as in Table 6.7 with the highest priority accorded to urban and industrial pollutants.

**National Standards and institutions.** Most AMCs (except Cambodia, the Lao PDR, and Myanmar) have promulgated national water quality standards and these are broadly comparable to each other and to the ASEAN regional standards, differing only in terms of intended uses for the water. Brunei Darussalam adopted WHO Water Quality Standard. Most countries (except Cambodia, and the Lao PDR) have also established effluent standards for controlling the discharge of industrial wastewater.

Water quality management in most AMCs involves several (sometimes competing) agencies in different ministries. For example, in Thailand the Pollution Control Department under the Ministry of Science, Technology and Environment, issues national water quality and effluent standards, conducts water quality monitoring, and prepares water quality management plans. The Department of



### Box 6.4 – Laws Related to Water Pollution in selected ASEAN Member Countries

#### Brunei Darussalam

- Petroleum Mining Act Chap 44
- Mining Act Chap 42
- Merchants Shipping Act
- Ports Act
- Fisheries Act Chap 61
- Land Code Chap 40
- Penal Code Chap 22
- Municipal Board Act Chap 57
- Forestry Act Chap 46

#### Indonesia

- Act No. 4 of 1960 on Indonesian Waters
- Act No.11 of 1974 on Water Resource Management
- Act No.5 of 1983 on the Indonesian Exclusive Economic Zone (EEZ)
- Act No. 9 of 1985 on Fisheries
- Act No. 15 of 1985 on Ratification on United Nations Convention on the Law of the Sea
- Government Regulation (GR) No. 22 of 1982 on Water Drainage
- GR No. 23 of 1982 on Irrigation
- Government Regulation No. 20 of 1990 on Water Pollution Control
- GR No. 27 of 1991 on Swamps
- GR No. 35 of 1991 on Rivers
- Act No. 23 of 1997 on Environmental Management
- GR No. 19 of 1999 on Marine Pollution and Degradation Control

#### Malaysia

- Environmental Quality Act (EQA) 1974;
- Environmental Quality (Licensing) Regulations 1974 ;
- Environmental Quality (Prescribed Premises)(Crude Palm Oil) Regulations 1977 ;
- Environmental Quality (Prescribed Premises)(Raw Natural Rubber) Regulations 1978;
- Environmental Quality (Sewage and Industrial Effluents) Regulations 1979;
- Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987;
- Environmental Quality (Scheduled Wastes )(Regulations) 1989;
- Environmental Quality (Delegation of Powers on Marine Pollution Control) Order 1993;
- Environmental Quality (Delegation of Powers on Marine Pollution Control) Order 1994;
- Environmental Quality (Prohibition on the Use of Controlled Substance in Soap, Synthetic Detergent and Other Cleaning Agents) Order 1995
- Merchant Shipping (Oil Pollution) Act 1994

#### The Philippines

- Pollution Control Law (P.D. 984)
- Water Quality Management Act of 1977 (P.D.1152)
- Department Administrative Order (DAO) 34 of 1990 on Water Usage and Classification and Water Quality Criteria
- DAO No. 35 of 1990 on Effluent Quality Standards
- The Water Code on Appropriation of Water Permits (P.D. 1067)
- Marine Pollution Law of 1976 (P.D. 600 as Revised by P.D. 979)

#### Singapore

- The Environmental Pollution Control Act
- Environmental Pollution Control (Trade Effluent) Regulations
- Prevention of Pollution of the Sea Act and Regulations Made Thereunder
- The Merchant Shipping (Civil Liability and Compensation for Oil Pollution) Act 1998
- Environmental Public Health Act
- Sewerage and Drainage Act
- Sewerage and Drainage (Trade Effluent) Regulations

#### Thailand

- The Navigation of Thai Waters Act of 1913
- People Irrigation Act of 1939
- State Irrigation Act of 1942
- Field Dykes and Ditches Act 1962
- The Enhancement and Conservation of the National Environmental Quality Act of 1992
- The Factory Act of 1992
- The Public Health Act of 1992
- The Fisheries Act of 1947
- Industrial Estate Authority of Thailand Act of 1979

#### Viet Nam

- Decree 175/CP of 1994
- Gas and Oil Law and Mining Code
- The Law on Mineral Resource Exploitation of 1989
- National Law on Protection of Environment (NLEP) of 1993
- Directive Guiding the Implementation of the Law on Water Resources
- Directive No 199/TTg on Urgent Measures for Management of Solid Waste in Town and Industrial Areas of 1997
- Provincial Regulations
- Law on Water Resources 1999

*Source: First SoER, updated with information from respective governments*



**Table 6.7 – ASEAN River Classification and Long Term Water Quality Goals**

Pollutants or Parameter	Class I: potable water	Class II: recreation	Class III: commercial fisheries	Class IV: irrigation
pH	6-9	6-9	5-9	5-9
BOD (mg/l)	5	5	10	10
COD (mg/l)	30	30	100	100
Amm-N (mg/l)	0.3	0.3	1	3
TSS (mg/l)	50	50	150	300
DO (mg/l)	5	5	3-5	3
Faecal Coliform (counts per 100 ml)	–	1,000	–	–

**Note:** Class I (drinking water) requires conventional water treatment; TSS = total suspended solids

Industrial Works (Ministry of Industry) is responsible for controlling industrial wastes while the Department of Livestock Development (Ministry of Agriculture and Cooperatives) is involved in livestock wastes. Municipalities are responsible for initiating sewage treatment projects with technical support from the Pollution Control Department. The Department of Public Works under the Ministry of Interior conducts training for personnel of local governments in wastewater treatment.

In Malaysia, the Department of Environment under the Ministry of Science, Technology and Environment is the principal agency responsible for monitoring raw water quality of terrestrial and marine water. A nation-wide network of monitoring stations have been established since 1975 involving in-situ measurements and laboratory analysis and data interpretation in terms of physico-chemicals and biological characteristics. Water quality appraisal is based on water Quality Index (WQI) computed from parameters such as Dissolved Oxygen Demand, Biochemical Oxygen Demand, Chemical Oxygen Demands, Ammonical Nitrogen, Suspended Solids and pH. The WQI serves as a basis for categorisation of pollution and classification of beneficial uses in accordance

with the Interim National Water Quality standards for Malaysia. Currently, a total of 902 stations have been established within 120 river basins. DOE also conducts enforcement activities to monitor compliance with EQA and the various environmental quality regulations promulgated. These pertain to agro-based wastes, and industrial effluent discharges, and disposal of scheduled wastes from specific sources. Discharge standards are specified in these regulations and licensing are required for occupying and operating prescribed activities.

Responsibilities are similarly divided in other AMCs, Singapore being an exception with most tasks centralised within the Ministry of Environment.

### Freshwater Wetlands

Wetlands (essentially areas between terrestrial and aquatic ecosystems) are broadly defined and classified under the *Ramsar Convention on Wetlands of International Importance* to cover:

- lacustrine (wetlands associated with lakes);
- riverine (wetlands along rivers and streams);
- marine (coastal wetlands, including rocky



- shores & near-shore coral reefs and sea grass within a 6-meter depth zone);
- palustrine (marshes, swamps and bogs);
  - estuarine (including deltas, tidal marshes and mangroves); and
  - artificial water bodies (fish ponds, reservoirs and artificial lakes).

Wetlands are complex ecosystems, the boundaries of which are often in a state of flux, and therefore easily affected by external events. Coastal wetlands are vital spawning and nursery areas for numerous fish species. Inland wetlands are the natural storehouses of considerable levels of biological diversity (biodiversity) and provide the life support systems for much of humanity. They play a vital role in sediment and erosion control, flood control, maintenance of water quality and abatement of pollution, maintenance of water supplies (including groundwater) and support for fisheries. Box 6.5 describes a recent innovative approach to wetlands rehabilitation in Malaysia.

In the ASEAN region, freshwater wetlands consist mainly of swamp forests and peat swamp forests. Freshwater swamp forests occur in permanently or seasonally flooded areas, particularly along rivers and as inland extensions of mangrove areas. In these wetland forests, trees are buttressed with aerial roots that enable them to survive in flooded conditions. Freshwater swamps are very rich in biodiversity with much greater number of species than mangrove forests. Peat swamps are evolutionary successors to freshwater swamps. The ASEAN region has the largest global extent of peat swamp forests, found mainly in Indonesia and Malaysia. Although peat soils are acidic, they support a rich variety of plants, other organisms, and large animals such as reptiles and birds. Both freshwater and peat swamps prevent or reduce flooding by detaining runoff and regulating its release.

Wetlands of all types cover nearly 120 million ha in the Asia-Pacific region. However, the distribution is highly skewed with seven countries (one of which is Indonesia) accounting for over 80% of the total area. Table 6.8 provides data on the number of wetlands of all types in the ASEAN region. The ASEAN region has at least 334 wetland sites of which Indonesia has the greatest number, 129 scattered throughout the country. Of these wetland sites in ASEAN, 19 are registered as internationally important as RAMSAR sites.

Table 6.8 summarises the degree of threat to wetlands in AMCs and the level of protection as reported by the countries. The causes of wetland loss or degradation in the ASEAN region generally include excessive exploitation of wood products, disturbances from human settlements, reclamation of land for agriculture, conversion to fish ponds, and pollution of various kinds. Other specific threats include mining, oil exploration, conversion to aquaculture ponds, commercial logging and woodcutting, use of poisons and explosives for hunting and fishing, and harvesting of eggs and hatchlings of reptiles and water birds. Logging and woodcutting affects about 30% of all sites in the region.

The management of wetlands is complex and typically involves several sectoral agencies as well as local communities. While wetland conservation policies are normally formulated by national environmental agencies, implementing and monitoring conservation measures usually fall under the responsibility of forestry agencies under broad forestry laws or specific laws for wetlands. An increasingly common approach for managing wetlands is to actively involve local communities in conservation efforts. One example is the Lao Community Fisheries and Dolphin Protection Project in the Khong District of Champasak Province. Wetland conservation



### Box 6.5 - The Paya Indah Wetlands, Malaysia: Return to Grandeur

It began with a vision to conserve and rehabilitate an important wildlife habitat, the wetlands of Malaysia. "Among some of the natural features of Malaysia are the wetlands, which are fast disappearing. We must make a special effort to protect the environment and the wetlands or we may not have them anymore", said Dato' Seri Dr Mahathir Mohamed, the Prime Minister of Malaysia and patron of Paya Indah Wetlands.

Paya Indah Wetlands, Selangor, is close to the new federal administrative capital, Putrajaya, and the Kuala Lumpur International Airport (KLIA), one of the main gateways to the country. Covering 3,100 ha, the wetlands encompasses a myriad of ecosystems, including abandoned mining land, logged peat swamp forests, large open lakes, and the northern part of Kuala Langat Permanent Peat Swamp Forest. In early 1997, a master plan for the wetlands was approved by the Government and implemented by the Malaysian Wetlands Foundation, a non-profit organisation established to rehabilitate, develop and manage Paya Indah Wetlands with the assistance of the Malaysian Government.

The Federal Government's commitment to and support for Paya Indah Wetlands remained steadfast even during the Asian financial turmoil. The Selangor State Government demonstrated strong support, putting a stop to illegal sand and clay mining, both rampant during the early stages of rehabilitation. Once possession of the area was complete, earthworks began along with the rehabilitation of ponds and lakes. Peat swamp forest makes up two-thirds the total area. Logging, fire and poor drainage have all contributed to damage inflicted by the forest. Plans included greening the denuded area and water management measures to restore the hydrological regime. Fire threats were combated by building water control structures along the canals to restore the appropriate water balance.

Most of Paya Indah Wetlands was covered by mounds of sand and clay. Today, over 5,000 trees have been planted to establish the much-needed green lung in the rapidly developing growth triangle of Kuala Lumpur, Putrajaya and KLIA. The trees were selected based on several factors; shade, diversity and hardiness. They include *Samanea samans*, *Melaleuca cajaputi*, and *Eugenia sp.* Fruit trees were also planted to encourage more bird migration. The lakes had their origins as mining



Degraded land in early 1998

pools and as a result remained as pockets of water without vegetation. About 300 aquatic plants have been introduced, including *Phragmites karka*, a favourite for nesting or roosting birds. The notorious *Salvinia*, a pretty but deadly weed (which chokes a pool by blocking oxygen from reaching the organisms below the surface) was successfully removed. Lotus and lilies in lovely shades of cream and pink now flourish, adding to the beauty of the wetlands.

Due to its strategic location, Paya Indah Wetlands is envisaged to be a unique eco-tourism destination and an invaluable source of educational experience. School children find an array of exciting interactive exhibits which answer their questions about wetlands. Visitors will eventually get to see the various species of fish that can be found in Paya Indah as well as hippopotami, crocodiles, and swamp deer. A decommissioned tin



A lush and green promenade in 1999

dredge will be converted into a tin museum to showcase the history of tin mining and demonstrate its environmental consequences. Paya Indah Wetlands also aims to be an exciting destination for bird watching enthusiasts. Since its inception, the number of bird species has increased to 210 with more expected to make a comeback.

Source: Malaysian Wetlands Foundation  
([www.payaindah.org.my](http://www.payaindah.org.my))



**Table 6.8** – Wetlands in ASEAN Member Countries

Country	Number of Sites	Degree of Threat				Protection Level (% of PAs)		Wetlands of International Importance	
		None	Low	Moderate	High	Some	Full	Number	Area (ha)
Brunei Darussalam	3	0	2	1	0	10	10	3	54,600
Cambodia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	242,700
Indonesia	129	1	54	66	8	35	33	2	191,931,700
Lao PDR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	–	–
Malaysia	37	0	5	22	10	35	55	1	38,446
Myanmar	46	0	11	26	9	–	–	4	15,257
Philippines	49	2	13	24	10	8	6	4	68,404
Singapore	0	N/A	N/A	N/A	N/A	–	–	1	–
Thailand	47	1	18	14	3	9	4	–	494
Viet Nam	23	3	14	4	2	–	–	1	12,000
<b>ASEAN</b>	<b>334</b>	<b>7</b>	<b>108</b>	<b>134</b>	<b>34</b>	<b>–</b>	<b>–</b>	<b>19</b>	<b>192,363,601</b>

**Source:** SoER1, AMCs & RAMSAR website; **Note:** ASEAN total rounded off

efforts in the ASEAN region have also received external assistance. A number of initiatives have been undertaken to coordinate and integrate approaches to the management of the Tonle Sap in Cambodia. A Living Aquatic Resources Research Centre was established in Vientiane with support from the Danish Government to further basic research initiated by the Mekong River Commission on fish resources of the Lao PDR. Cambodia, Indonesia, Malaysia and Thailand have all received support from Wetlands International for restoring and protecting wetlands. Malaysia (with technical assistance from Wetlands International) has begun integrated management of Tasek Bera, Malaysia's first RAMSAR site and the largest natural freshwater lake in Peninsular Malaysia. Like many wetlands, it plays an important role in flood control, water flow regulation and purification, and provides natural resources for the local community.

### Coastal and Marine Resources

Coastal and marine resources play essential ecological, economic and social roles in the

ASEAN region (except land-locked Lao PDR). Coastal and marine waters invariably serve as sinks for wastes from land-based sources. They also provide livelihood directly and indirectly to millions of people in AMCs, provide food, maintain the water cycle, regulate climatic conditions, and maintain the complex balance of the coastal and marine ecosystems. Consequently, maintaining high-quality coastal and marine resources and ecosystems is a crucial element of effective environmental management for sustainable development.

**Overview.** A coastal zone is conventionally defined as land within 60 km inland of the sea. The marine environment consists of coastal waters – and coastal ecosystems including estuaries, mangroves, coral reefs and sea grasses – and high seas. The coastal zone and the marine environment are closely linked, both ecologically and economically. Of the ten AMCs, nine have coastlines, the total length estimated as 173,000 km. Table 6.9 summarises information on coastlines, coastal populations, and the territorial sea areas of AMCs.



Coastal and marine ecosystems are very fragile but are being subjected to serious threats from human activities including wastes discharged from coastal populations, industries, and agriculture; shipping and accidental oil spills; and siltation due to soil erosion in the hinterlands. Coastal resources in the ASEAN region are declining rapidly due to over-fishing, destructive fishing methods such as fishing with dynamite and the use of cyanide, and the destruction of mangrove forests for aquaculture.

Coastal erosion is a major concern in some AMCs, affecting, for example, at least 20% of Viet Nam's coastline. Some coastal areas of Viet Nam have experienced erosion of about 50 m per year leading to the loss of agricultural lands and even entire villages. Integrated coastal management plans have been developed under an ASEAN/AusAID Coastal Zone Environmental and Resource Management Project for key areas such as Lingayen Gulf in the Philippines, Segara Anakan in Indonesia, Ban Don Bay and Phangnga Bay in Thailand, South Johor in Malaysia, and coastal areas of Singapore and Brunei Darussalam. An ASEAN Working Group on Coastal and Marine Environment has also been established to improve cooperation among AMCs in addressing coastal and marine environment issues through: i) formulating detailed regional action plans for sustainable development and management of coastal and marine resources; ii) developing a framework for cooperation and exchange of information; and iii) creating public awareness on the need for rational management of coastal and marine resources. An example of a Singapore national awareness effort for school children is presented in Box 6.6.

**Mangroves.** Mangroves include trees, shrubs, palms, or ground ferns growing in inter-tidal zones. There are approximately 70 species of mangroves of which some 65 contribute significantly to the structure of mangrove forest. At least 45 of these species occur in Indonesia, and twenty or more in six other AMCs: Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam (WRI, 1999).

Mangroves play an important role in coastal



Shrimp farms

Ministry of Environment, Cambodia

**Table 6.9 – Coastlines and Territorial Seas of ASEAN Member Countries**

Country	Coastline (km)	Population within 100 km of coast (%)	Territorial Sea to 12 nm ('000 km <sup>2</sup> )
Brunei Darussalam <sup>a/</sup>	130	N/A	N/A
Cambodia	1,127	24	20
Indonesia	95,181	96	3,206
Lao PDR	0	6	x
Malaysia	9,323	98	152
Myanmar	14,708	49	155
Philippines	33,900	100	680
Singapore	268	100	0.7
Thailand	7,066	39	76
Viet Nam	11,409	83	159
<b>ASEAN</b>	<b>173,112</b>	<b>–</b>	<b>4,449</b>

*Source:* World Resources 2000–01 (WRI, 1999); <sup>a/</sup> from Brunei Darussalam  
*Note:* nm = nautical mile = 1.852 km



*Seas support livelihood*

Nilio A. Pelayo



*Mangroves support marine species.*

WWF/M. Azwad MN

zone ecology by supporting marine species that utilise the mangrove environment during part or all of their life cycles. Despite the socio-economic and ecological importance of mangroves, it was only about thirty years ago that concern about their degradation began to emerge and their sustainability widely discussed. Vast areas of mangrove forest have been degraded by conversion to human settlements, fish and shrimp farms, rice fields and industrial sites.

Mangroves are usually restricted to tropical coastlines where seawater temperature drop below 20°C only occasionally in winter. The forests best develop on tropical shorelines where

large areas emerge between high and low tides. Large mangrove formations are typically found in sheltered muddy shorelines that are often associated with the formation of deltas at the mouth of a river system. Mangroves exist in all AMCs except the Lao PDR. In 1997, their global extent was approximately 18 million hectares, of which about 35% were in Southeast Asia. Table 6.10 summarises data on mangrove areas and their rate of decrease in some AMCs. Additional information on mangrove forests in selected AMCs is provided in Box 6.7.

The use of mangroves for recreation and ecotourism is potentially non-destructive. Unfortunately, excessive numbers of visitors result in substantial physical disturbance. In Malaysia, ecotourism within mangrove forests has been successfully promoted at Kampong Kuantan Fireflies Park where visitors travel by boat at night to watch thousands of fireflies. In addition to generating local income, the park creates environmental

awareness among local people who now realise that the fireflies cannot exist without the mangroves. As noted earlier, mangrove forests fulfil important ecological functions, preventing coastal erosion and saltwater intrusion and supporting economically important fisheries by providing habitats and food for various plants and animals. They also have an important regulatory role in improving water quality by attenuating peaks in nutrient discharge and sediments, neutralisation of sulphuric acids by frequent flooding, and maintenance of groundwater level. Mangrove sediments can incorporate, trap or immobilise various inorganic nutrients, heavy metals or pesticides that would



otherwise flow towards the sea, degrading the quality of coastal waters. Mangroves also play an important role in protecting the coastal communities from cyclones and storms. Waves and currents are weakened by mangrove roots and the trees break up wave energy. If the forest is sufficiently large, soil is not easily washed away or eroded. However, if mangroves are removed, the shoreline can be scoured by waves and erode, placing large amounts of sediments in suspension and increasing water turbidity. Because of the range of essential services provided by mangroves, AMCs are pursuing various strategies for their sustainable utilisation as summarised in Box 6.8. These strategies include legal tools which are separately presented in Box 6.9.



WWF/Azward MN

*Sustainable eco-tourism.*

**Coral Reefs.** Coral reefs – the marine

equivalent of tropical forests – are among the most productive and diverse of natural ecosystems providing a wide variety of habitats for a huge number of species. Their abundant biological diversity<sup>6</sup> includes not only coral and commercially important species associated with the reef but also tens of thousands of other plant and animal species. They are among the most important, diverse, and complex ecosystems on

### Box 6.6 – Singapore’s Seashore Life Programme

The *Seashore Life Programme*, jointly developed by the Ministry of the Environment and the Hongkong and Shanghai Banking Corporation, is designed to help students gain a better appreciation of the marine environment and their responsibility in protecting it. The programme exposes students to basic education on the seashore ecosystem and highlights the adverse impact pollution has on marine life. It also includes a beach clean-up which gives students an opportunity to contribute to the well being of the environment. The program for primary schools was launched in 1997 as part of the annual Clean and Green Week campaign. Based on feedback, it was clear that the Seashore Life Programme was well received by students and teachers, as it deepened their awareness of the importance of the marine environment and motivated them to play their part on caring for a fragile and vital part of our ecosystem. The two sponsors launched an advanced version of the programme for secondary school students in 1999.

Seashore Life Programme materials include a colourful activity sheet for primary school students and an activity book for secondary school students. These provide information on the types of local seashore life and harmful impacts on the seashore ecosystem. They also contain interesting questions and puzzles to help reinforce the knowledge gained. To make the program more challenging, secondary school students were encouraged to undertake a project – Protecting Our Marine Environment – which requires them to identify seashore life, the types of litter found on the beach, and the effects of litter on marine life and people, and then recommend ways of protecting the marine environment and influencing their peers to do the same. There are teachers’ guides providing instructions, background and additional information to help teachers conduct the program more effectively.

*Source: Information obtained from Singapore*





earth. WRI (1998) estimates that 58 per cent of the world's reefs are at risk from human activities, and about 27% are at high or very high risk.

Of the approximate 600,000 sq km of coral reefs worldwide, about 10% have already been degraded beyond recovery and another 30% are

likely to decline significantly within the next 20 years. Coral reef ecosystems in more remote areas are probably in better condition. If this trend is not reversed, it is estimated that most reefs will be severely depleted within the next 40 years. The reefs of Southeast Asia, 25–30% of the global total, are the most species-diverse in

**Table 6.10** – Mangrove Areas and their Rate of Decrease in ASEAN Member Countries

Country	Land Area (ha)	Year	Mangrove Area		Average Annual Decrease (ha/year)
			(ha)	(%) *	
Brunei Darussalam	576,000	1995	18,400	3.19	–
Cambodia	18,480,000	1973	94,600	0.51	3,164
		1993	85,100	0.46	
		1995	25,000	0.14	
Indonesia	181,200,000	1984	4,251,011	2.34	–
Lao PDR	23,100,000	–	–	–	–
Malaysia	33,266,500	1980	505,300	1.51	23,630
		1990	269,000	0.81	
Myanmar <sup>a/</sup>	67,655,300	2000	382,030	0.56	–
Philippines	29,817,000	1920	450,000	1.51	4,453
		1967	418,900	1.40	
		1976	249,138	0.84	
		1978	246,699	0.83	
		1994	120,500	0.40	
Singapore	64,600	1978	7,300	11.30	917
		1984	1,800	2.79	
Thailand	51,400,000	1961	367,900	0.72	3,943
		1975	312,700	0.61	
		1979	287,308	0.56	
		1986	196,435	0.38	
		1989	180,559	0.35	
		1991	173,821	0.34	
		1993	168,683	0.33	
1996	167,582	0.33			
Viet Nam <sup>b/</sup>	33,104,200	1965	252,500	0.76	6,494
		1975	378,000	1.14	
		1985	151,200	0.46	
		1993	252,500	0.76	
		1999	31,700	0.10	

**Source:** Forest Inventory and Planning Institute (FIPI), Viet Nam

**Note:** <sup>a/</sup> Data from Myanmar; <sup>b/</sup> Viet Nam excludes swamp forests (i.e. Malaleuca dominant species on inundated acid sulfate land)

\* Calculated from previous columns \*\* Average of all years for country, except Thailand.





### Box 6.7 – Status of Mangrove Forests in Selected ASEAN Member Countries

**Cambodia.** The main threats to Cambodia's mangrove forests are intensive shrimp farming and charcoal production in Koh Kong province fuelwood extraction and conversion to salt farming in Kampot province. The conversion of mangrove shrimp farms is fairly recent but adversely affects coastal people and coastal biodiversity. Approximately 840 ha of 16,000 ha of Koh Kong's mangrove forest was used for intensive shrimp farming in early 1994, with 105

entrepreneurs taking part. By the end of the year, 1,240 ha had been converted. There is large scale cutting of mangrove trees for charcoal. During the 1980s, this was limited to local use and was sustainable. By 1992, 300 kilns were producing 24,000 tonnes of charcoal, mostly for illegal export. The number of charcoal kilns may have increased by a factor of five during 1993–1994.

**Indonesia.** In terms of total coverage, Indonesia's mangrove forest is believed to be the largest in the world. Mangroves are found in almost all islands although tree size and extent vary. However, growing populations demand land to produce food, build settlements, and create employment, stimulating the conversion of

mangrove to coastal aquaculture, rice paddy fields and settlements. Cutting of mangrove for firewood is common in many coastal areas. There is a general lack of awareness of the important functions of the mangrove ecosystem, and a widespread perception of the mangrove belt as exploitable public property.

**Malaysia.** In Malaysia, mangrove forests are mainly found along sheltered coastlines protected from strong waves, mainly in the states of Kedah, Perak, Selangor and Johor in Peninsular Malaysia and Sabah and Sarawak in East Malaysia. As

elsewhere, mangrove is being converted to other land uses such as agriculture and shrimp; the forests decreased 47% in area from approximately 505,300 ha in 1980 to 269,000 ha in 1990.

**Philippines.** Mangrove loss in the Philippines has been high, declining from 450,000 ha in 1920 to 120,500 ha. in 1994, due to overexploitation by coastal dwellers and conversion to settlements, agriculture, salt beds and industry. However, aquaculture remains the major cause: around half of the 279,000 ha. lost from 1951 to 1998 were developed into culture ponds. 95% of the Philippines

brackish water ponds in 1952–1987 were derived from mangroves. The shoreline at the mouth of Naisud River, has reportedly eroded some 300 m in the past decade because the loss of mangrove and beach vegetation has exposed the area to strong wave action especially during typhoons (which average 20 per year) and the northeast monsoon winds.

**Thailand.** As a result of changes in land use accompanying rapid economic development, Thailand lost 54% of its original mangrove cover from 1961 to 1996. Major causes have been conversion to aquaculture ponds, clear felling for timber, charcoal and wood chip production,

conversion for agriculture and conversion for industrial and urban development. Much of the loss of mangroves was for short-term economic gain involving unregulated and illegal activities that are destroying endangered species.

**Viet Nam.** During the last war, a large area of mangroves – 104,123 ha – was destroyed by herbicides. After reunification in 1975, many localities replanted forests. However, most mangroves, both natural and the replanted forests, have been destroyed for extensive shrimp farming. During 1991–1994, areas south west of Ca Mau Cape were invaded by illegal migrants who built thousands of shrimp ponds, resulting in the death of mangrove forests. In 1995, the government banned

the shrimp ponds in the area with reported full recovery of more than 30,000 ha of denuded mangroves within four years after the ban (Hong, 1999). In Viet Nam, mangrove trees have recently been planted to protect sea dykes from erosion. An action plan for mangrove forestation is also being developed to achieve rapid rehabilitation of ecosystems in some coastal zones, with the help of local communities.

*Source: Information provided by respective governments*



### Box 6.8 – Sustainable Mangrove Utilisation in ASEAN

**Silviculture.** Malaysia's Matang mangroves are among the best-managed in the world, the main objective being to maximise sustained yield for charcoal production. An earlier variable 25–40-year rotation has been replaced with 30 years. The Matang mangrove forest produces about 43,000 tons of charcoal annually, about one ton of charcoal from five tons of green wood. Poles are generally a product of forest thinning, about 2,000 ha thinned annually yielding three to four million poles.

**Aquaculture.** Further conversion of mangroves to pond aquaculture can and should be minimised by more intensive aquaculture on existing sites, promotion of aquaculture systems which can be developed with minimum impact on the mangrove ecosystem, better pond siting within mangroves, integrated management of sustainable uses of the mangrove ecosystem, a shift of pond development outside the mangrove forest, and non-land based culture systems such as mariculture. AMCs are trying these methods.

**Silvofisheries.** Silvofishery is a form of integrated mangrove tree culture with brackish water aquaculture which allows a relatively high level of integrity of mangrove. There are mangroves within or outside the aquaculture pond with a typical ratio of 60–80% mangroves and 40–20% pond canal culture water area. A range of designs attempt to balance conservation and utilisation. The system is in principle non-destructive but is very labour-intensive, appropriate for individual or family operations. Thailand, Viet Nam and the Philippines are pursuing silvofisheries, some based on traditional long-term practices and others on new approaches.

**Restoration.** Mangrove cultivation has been practiced for years in Malaysia, Thailand and Myanmar. Silviculture techniques in both natural forests and plantations usually results in vulnerable single-species stands (i.e. monocultures) of the

most commercially valuable trees. Recently, there have been efforts to restore natural mangrove systems to recover their natural productivity or to shelter communities and their lands against tropical storms. Between 1964 and 1992, some 39,000 ha of mangroves were replanted in Indonesia, mainly on degraded or logged land including abandoned fishponds. The main reason for mangrove replanting in Indonesia have been restoration of the natural forest and commercial production of mangrove timber.

In some mud flats, degraded forest, and shrimp culture areas of Thailand, mangrove replanting has also begun. Rehabilitation involves not only government agencies but also the private sector and local communities, including shrimp farmers. In Viet Nam, restoration aims to repair the damaged environment and ensure protection of exposed coastal areas from tropical storms. Approximately 82,000 ha of mangroves have been planted for restoration purposes. Problems reported included slow growth (possibly because of residual herbicides) and illegal conversion of planted mangrove areas into shrimp ponds. In some remote coastal regions of Viet Nam, the local government has allocated land to individual households for protection and care of the forest. The government has also provided limited sums of money for re-forestation, resulting in more reforestation and less forest destruction.

**Community-based Resource Management.** A recent trend in resource management in Southeast Asia is towards community-based resource management. In Thailand, for example, the Eighth National Economic and Social Development Plan focuses on community participation in environmental management through sustainable management of mangrove forest.

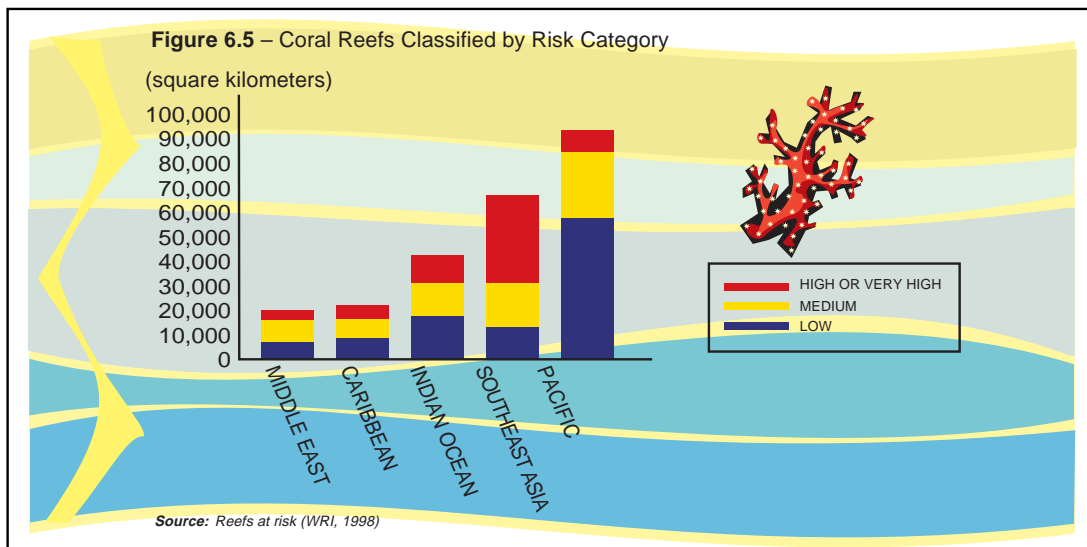
*Source: Information provided by respective governments*



**Box 6.9 – Institutions and Legislation Concerning Mangrove Forests in ASEAN Member Countries**

Country	National Institutions	Legislation
<b>Brunei Darussalam</b>	<ul style="list-style-type: none"> <li>• Ministry of Industries and Primary Resources               <ul style="list-style-type: none"> <li>– Forestry Department</li> <li>– Fisheries Department</li> </ul> </li> <li>• Ministry of Development, Environment Unit</li> <li>• Ministry of Culture, Youth and Sports               <ul style="list-style-type: none"> <li>– Museums Department</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Forest Act, 1934 (Amended 1984)</li> <li>– Wildlife Protection Act</li> <li>– Fisheries Act</li> <li>– Fisheries Regulation</li> </ul>
<b>Cambodia</b>	<ul style="list-style-type: none"> <li>• Ministry of Environment</li> <li>• Ministry of Agriculture, Forestry and Fisheries               <ul style="list-style-type: none"> <li>– Department of Forestry and Wildlife</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Law on Environmental Protection and Natural Resource Management</li> <li>– Law Decree on Forestry Administration</li> <li>– Law Decree on Fishery Management and Administration</li> </ul>
<b>Indonesia</b>	<ul style="list-style-type: none"> <li>• Ministry of Forestry</li> <li>• Ministry of Home Affairs</li> <li>• Ministry of State of Environment</li> <li>• Environmental Impact Management Agency</li> </ul>	<ul style="list-style-type: none"> <li>– Conservative Act 1990</li> <li>– Environmental Management Act, 1997</li> <li>– Forestry Act, 1999</li> <li>– Ratification of Ramsar Convention 1991</li> <li>– Ratification of Biological Diversity 1994</li> </ul>
<b>Malaysia</b>	<ul style="list-style-type: none"> <li>• Ministry of Primary Industries               <ul style="list-style-type: none"> <li>– Forestry Department Peninsular Malaysia</li> <li>– Forest Research Institute of Malaysia (FRIM)</li> <li>– Malaysian Timber Industry Board (MTIB)</li> <li>– Malaysian Timber Council (MTC)</li> </ul> </li> <li>• Ministry of Science, Technology and the Environment               <ul style="list-style-type: none"> <li>– Department of Environment</li> <li>– Department of Wildlife and National Parks</li> </ul> </li> <li>• Ministry of Agriculture               <ul style="list-style-type: none"> <li>– Department of Agriculture</li> <li>– Department of Fisheries</li> </ul> </li> <li>• National Resources Environmental Board, Sarawak</li> <li>• Department of Conservation Sabah</li> </ul>	<ul style="list-style-type: none"> <li>– National Forestry Act 1984</li> <li>– Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987</li> <li>– National Parks Act, 1980</li> <li>– Protection of Wildlife Act, 1972</li> <li>– Fisheries Act 1985</li> <li>– National Resources Environmental Ordinance, Sarawak, 1995</li> <li>– Environmental Conservation Enactment Sabah, 1996</li> </ul>
<b>Myanmar</b>	<ul style="list-style-type: none"> <li>• Ministry of Forestry               <ul style="list-style-type: none"> <li>– Forestry Department</li> </ul> </li> <li>• Forest Research Institute (FRI)</li> <li>• National Commission for Environmental Affairs (NCEA)</li> </ul>	<ul style="list-style-type: none"> <li>– Forest Law, 1992</li> <li>– Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law</li> <li>– The National Forestry Action Plan (NFAP)</li> <li>– National Environmental Policy</li> </ul>
<b>Philippines</b>	<ul style="list-style-type: none"> <li>• Ministry of Natural Resources               <ul style="list-style-type: none"> <li>– Department of Environment and Natural Resources</li> <li>– Bureau of Forest Development</li> <li>– Bureau of Fisheries and Aquatic Resources</li> <li>– Bureau of Lands</li> </ul> </li> <li>• Forest Research Institute</li> <li>• Natural Resources Management Center</li> <li>• Forest Management Board (FMB)</li> <li>• National Mangrove Committee</li> </ul>	<ul style="list-style-type: none"> <li>– Revised Forestry Code of the Philippines, 1975</li> <li>– National Integrated Protected Areas System Act, 1992</li> </ul>
<b>Singapore</b>	<ul style="list-style-type: none"> <li>• Ministry of National Development               <ul style="list-style-type: none"> <li>– Agri-food and Veterinary Authority</li> <li>– National Parks Board</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Fisheries Act</li> <li>– Parks and Trees Act</li> </ul>
<b>Thailand</b>	<ul style="list-style-type: none"> <li>• Ministry of Agriculture and Cooperatives               <ul style="list-style-type: none"> <li>– Royal Forest Department</li> <li>– Department of Fisheries</li> </ul> </li> <li>• National Research Council of Thailand (NRCT)               <ul style="list-style-type: none"> <li>– National Mangrove Committee</li> </ul> </li> <li>• Ministry of Science, Technology and Environment               <ul style="list-style-type: none"> <li>– Office of Env. Policy &amp; Planning (OEPP)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Forestry Act, 1947 (amended in 1989)</li> <li>– Forest Reserve Act, 1964</li> <li>– Fisheries Act, 1945 (amended in 1985)</li> <li>– Enhancement and Conservation of National Environmental Quality Act, 1992</li> <li>– Environmental Quality Act, 1992</li> </ul>
<b>Viet Nam</b>	<ul style="list-style-type: none"> <li>• Ministry of Agriculture</li> <li>• Ministry of Fisheries</li> <li>• Ministry of Science, Technology and Environment</li> </ul>	<ul style="list-style-type: none"> <li>– Law on Forest Protection and Development</li> <li>– Law on Fisheries</li> <li>– Law on Environmental Protection, 1993</li> </ul>

*Source: Information provided by respective governments*



the world, and also the most threatened (Figure 6.5), with more than 80% at risk, including 55% at high or very high risk. Overexploitation (overfishing and destructive fishing practices) and coastal development appear to pose the greatest potential threats. Most coral reefs in the ASEAN region are in Indonesia with a total area between 60,000 and 75,000 sq km. Peninsular Malaysia has coral reefs, mostly fringing, on both the eastern and western coasts as well as off the coasts of Sabah and Sarawak. In Thailand, reefs are scattered along coastal waters of numerous islands in the Gulf of Thailand and the Andaman Sea.

Few reefs exist off the coasts of Brunei Darussalam, Cambodia, and Viet Nam because of high coastal turbidity. Nonetheless, Brunei Darussalam's reefs are rich in coral and fish species as fishing pressure is low. The best coral reefs in Myanmar occur near the Thailand border where river effects are low. Reefs of the Mergui Archipelago are in good shape although many of the larger reef animals (turtles) are exploited. Box 6.10 summarises the poor and declining condition of coral

reefs, and the threats to their survival, in selected AMCs. Figure 6.6 illustrates numerous sites of coral bleaching in Southeast Asia, where high surface temperatures of the sea water can badly damage or kill coral.

The very high degree of biological diversity among coral reefs in AMCs is shown in Figure 6.7.

**Coral reef and marine management.** The management of coral reefs in AMCs typically involves three key agencies: the national environmental agency, the fisheries agency and

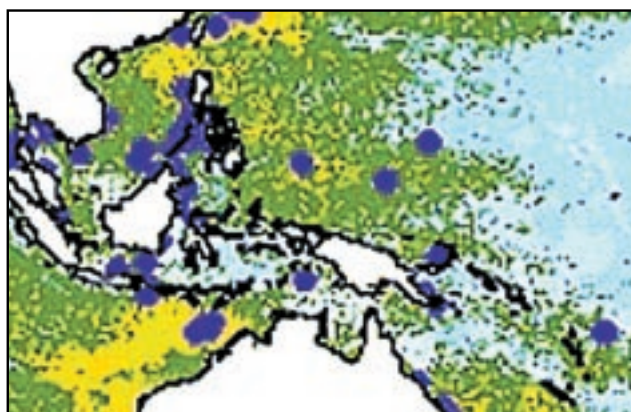


Figure 6.6 – Coral bleaching in Southeast Asia

WRI, 2001



### Box 6.10 – Conditions of Coral Reefs in Selected ASEAN Member Countries

**Indonesia.** Reef conditions in Indonesia vary from place to place. Off the Java and Sumatra coasts, reefs are damaged from overexploitation, sedimentation, and organic pollution. To the far east and northeast, reef ecosystems tend to be in excellent shape – particularly those which are relatively inaccessible to coastal dwellers. In central Indonesia, reefs are degraded from blast fishing, cyanide fishing and over fishing / collecting. Population pressures are lower on eastern Indonesian reefs and if destructive fishing is controlled, many damaged reefs in this area may recover. Human population growth and associated forest clearing and sedimentation are expected to severely affect reef health in western Indonesia.

Coral reef ecosystems of Palau Seribu, which provide both fishery resources for Jakarta and tourist opportunities, are being severely impacted by mainland pollution and over fishing.

In 1993, the Ministry of Environment reported that 14% of the coral reef ecosystems in the country were in alarming condition, 46% damaged, 33% in good condition, and 7% in excellent condition. The situation has worsened (*Indonesia State of the Environment Report*, 2000). At 24 coral reef locations, it has been observed that 39.5% are in bad condition, 33.5% in moderate condition, 22.5% in good condition and 7% in excellent condition.

**Malaysia.** Coral reefs of Malaysia suffer from organic and sediment pollution and overexploitation, but not to the extent of some other AMCs. Construction related sedimentation has badly affected reefs in the Palau Redang marine

reserve. All reefs in Peninsular Malaysia are expected to decline significantly over the next 20 years as a result of sedimentation and water pollution. Reefs off Sabah are also experiencing overexploitation.

**Philippines.** Coral reefs are in decline throughout the Philippines Archipelago due to blast and cyanide fishing, muro-ami fishing (involving the use of weights on ropes to smash corals and drive fish into nets), sedimentation, port construction and eutrophication. Coral cover is rapidly declining and fish populations are low from over fishing. The loss of 80% of the mangrove area and over half of the total forest area since 1920 has stressed reefs with

sedimentation and also caused fish populations to decline. Large areas of Scarborough reef off Luzon and other large, offshore reefs have been denuded of fish and coral from blast- and muro ami fishing within the last two years. Between 1966 and 1986 the productivity of coral reefs in the Philippines dropped by one third as the national population doubled.

**Singapore.** The coral reefs of Singapore are valuable ecotourism destinations. However, they are being severely degraded by the construction of port and oil processing facilities and other coastal development. Coral cover is high on the outer reefs

and reduced (less than 50%) on near-shore reefs. Heavy sediment loads limit coral distribution to depths of less than 10 m. Fish and coral collecting for the aquarium trade are also threats.

**Thailand.** Thailand's near shore reefs are suffering from coastal development while offshore reefs have relatively high coral cover. Domestic and industrial pollution from Bangkok and Pattaya have almost totally destroyed the reefs in the northern Gulf of Thailand. Reefs off the western coast of the Gulf are in better shape with coral cover often exceeding 50%. However, recent reports show that coral cover is declining by 20% annually due to

tourist related coastal clearing and sewage pollution. Healthy reefs with over 75% coral cover can be found in the Andaman Sea off Similan and Surin Islands. Off Phuket, reefs are being stressed by over fishing, tourist activities and the release of sewage and sediment into shallow Phangnga Bay. The Gulf of Thailand fishery is close to collapse.

**Source:** Information provided by respective governments

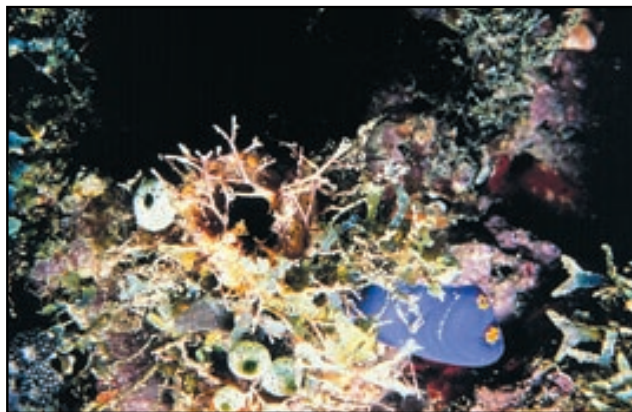




the forestry agency. Laws relevant to nature conservation generally cover the management of coral reefs. In the case of Thailand, the Office of Environmental Policy and Planning formulated a master plan in 1992 for coral reef management. The master plan delineates three types of coral reef zones based on their uses and functions: i) local use zone; ii) tourism and recreational zone; and iii) conservation zone for ecological balance and research. Surveys of coral reefs have been carried out to establish basic data and maps.

Research projects are to be carried out to establish methods for rehabilitating degraded coral reefs appropriate to each area. In addition, there has been efforts to disseminate information on coral reef management and to train various organisations concerned. The Department of Fisheries is responsible for coral reef management, in collaboration with the Royal Forest Department which conducts surveillance of coral reefs in national marine parks.

The precise number of threatened marine species in the ASEAN region is not known but there are a number of well-known examples. For instance, the single remaining species of the dugong (*Dugong dugon*) is now found only in

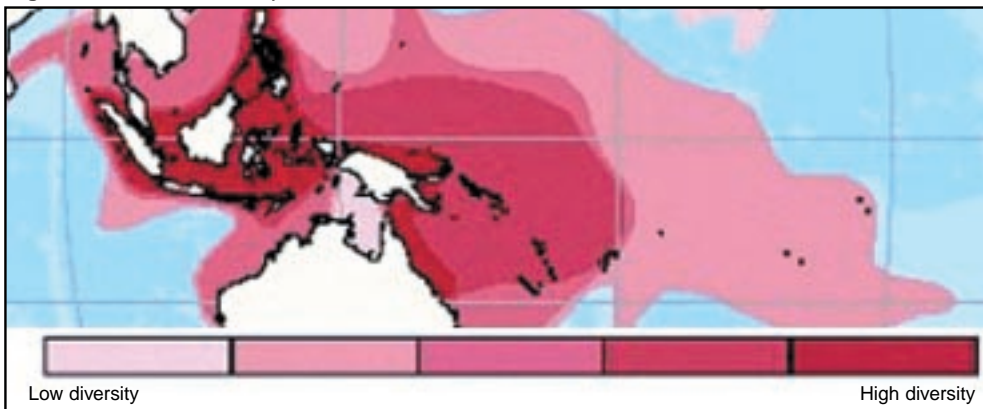


Coral reefs at risk

Thai tourism website: www.tat.or.th

scattered populations in the waters of the Indo-Pacific area. Sea turtles are threatened by hunting, collection of their eggs, and accidental capture in fishing nets. National marine parks have been established to protect coral reefs and threatened marine species. Indonesia has 30 marine parks, Malaysia 21, Myanmar 4, the Philippines 19, Thailand 18, Brunei Darussalam 4, and Viet Nam 2, totalling 98 parks (WRI/UN Earthwatch Website, 1999, and data provided by AMCs). In Thailand, the marine protected areas cover 60% of the country's coral reef areas and other important marine habitats such as seagrass beds, marine turtle nesting sites, and mangrove forests (*Thailand State of the Environment Report, 2000*).

Figure 6.7 – Coral Diversity in Southeast Asia



(adapted from WRI, 2000)



**Seagrass.** Seagrasses are seed bearing marine plants (halophytes) that occur in shallow near-shore waters of sheltered coves, and in estuaries and lagoons. The world has about 58 species of seagrass. The most diverse seagrass flora in the world – about 20 species – is found in the ASEAN region (Table 6.11). Like coral reef ecosystems, seagrass beds are an important ecological system related to mangrove and coral reef ecosystems. They have high rates of biological production and play an important role in maintaining coastal marine ecosystems. Seagrasses are often found intermingled with mangroves and, in the deeper waters, with coral reef systems. Together, these systems provide a highly productive habitat that supports a large quantity of marine life including commercial fish. Seagrass functions as regulators of the flow of organic nutrients washed down from the land. They provide important feeding and breeding areas for fish. For instance, the endangered green turtle and Dugong from the Philippines feed on seagrass.

In Thailand, seagrass are found along the coastal waters of the Gulf of Thailand and the Andaman Sea. The largest bed is in Trang waters with an area of 6.36 sq km. Fourteen species of seagrass are found in Thailand. In Indonesia at least a dozen species of seagrass are known and their distribution includes the water areas of Java, Sumatra, Bali, Kalimantan, Sulawesi, Maluku, Nusa Tenggara, and Irian Jaya. At a Seagrass Workshop held in Bangkok in late 1993, seagrass scientists involved in the ASEAN-Australia Living Coastal Resources Project indicated that seagrass habitats in East Asia were rapidly being destroyed. In Indonesia about 30–40% of seagrass beds had been lost in the previous 50 years, with as much as 60% destroyed around Java. In Singapore, land reclamation had covered the patchy seagrass habitats near the coastal areas. In Thailand, about 20–30% of seagrass beds had already been lost. In the Philippines, seagrass loss

**Table 6.11 – Seagrass Diversity in ASEAN Member Countries**

Country	No of species
Cambodia	1
Indonesia	12
Malaysia	9
Myanmar	3
Philippines	19
Singapore	11
Thailand	14
Viet Nam	9

Source: World Resources 2000–2001 (WRI, 1999)

amounts to about 30–50%. Little information on seagrass loss is available for Malaysia. Seagrass requires protection, along with coral reefs, as an integral part of the coastal ecosystem.

### Fishery Resources

Under FAO's marine statistical areas system, ASEAN falls within the 'Western Central Pacific' region which extends from the seas of AMCs south to north and east Australia and eastwards to the island countries of the Pacific. The area is dominated by a large continental shelf area, which is bordered in the north by Southeast Asian countries and in the southeast by Indonesia and Australia. The majority of this shelf lies within the Exclusive Economic Zone (EEZ) of AMCs, reflected in the major contribution these countries make to the total fish production of this area. The shelf areas are rich in demersal<sup>7</sup> resources, including panaeid shrimps, and small pelagic resources, while the oceanic waters of the Pacific have rich tuna resources. ASEAN seas are very rich in marine life, with an estimated 2,500 species of fish, as well as many kinds of invertebrates (cephalopods and crustaceans). As Table 6.12 shows, AMCs are significant producers of captured and cultivated fish, accounting in 1998 for over 7% of the

**Table 6.12** – Fisheries and Aquaculture Production, Food Balance and Trade in ASEAN

	1986	1990	1994	1998
<b>Aquaculture production</b>				
Inland production ('000 tonnes)	755	940	1,187	1,545
% of world total	13.0	11.5	9.8	8.2
Marine production ('000 tonnes)	212	469	736	802
% of world total	6.2	9.5	8.5	6.6
<b>Fisheries production</b>				
Inland production ('000 tonnes)	1,003	999	1,045	984
% of world total	16.8	15.5	15.6	12.3
Marine production ('000 tonnes)	7,403	8,451	10,040	10,748
% of world total	9.4	10.7	11.8	13.7
<b>Fisheries and aquaculture production</b>				
Combined total ('000 tonnes)	9,372	10,859	13,008	14,079
% of world total	10.0	11.0	11.6	12.0
<b>Food balance</b>				
Total food supply ('000 tonnes)	7,640	8,597	10,334	N/A
Per capita supply (kg)	18.7	19.5	21.9	N/A
Fish as share of animal protein (%)	47.7	45.7	43.7	N/A
<b>Trade in fishery commodities</b>				
Total imports (US\$ millions)	720	1,437	1,996	1,626
Percentage of world total	3.0	3.6	3.9	3.0
Total exports (US\$ millions)	1,996	4,484	7,758	7,600
% of world total	8.7	12.6	16.4	14.8

Source: State of the World's Fisheries & Aquaculture 2000 (FAO, 2000)

world's inland aquaculture production, nearly 7% of marine aquaculture production (both declining percentages), nearly 14% of fisheries production, 12% of combined fisheries/aquaculture production and 15% of global fisheries trade. People in ASEAN consume about 20 kg of fish per capita per year, providing nearly half of their animal protein.

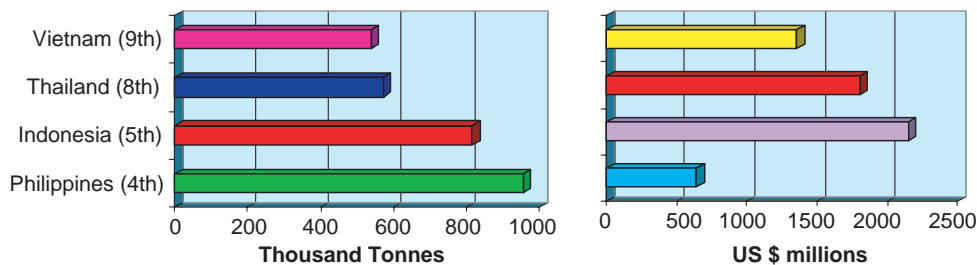
Asia dominates global aquaculture output, particularly China which produced 27,072 thousand tonnes in 1998 with a value of US\$25.5 billion. Four AMCs were among the top nine producers in the world as shown in Figure 6.9, together producing 2.88 million tonnes valued at nearly US\$ 6 billion.<sup>8</sup> Similarly, three AMCs were

in the top dozen in world marine and inland fish capture in 1998, together accounting for 8.4 million tonnes of fish, 14% of the global total.

The FAO (2000) notes that reports of fisheries catches and sustainable levels of production are subject to various errors. However, globally, marine fisheries face increased pressure with only about 25% of major marine fish stocks under-exploited or moderately exploited, about 50% fully exploited (therefore at or near maximum sustainable limits), perhaps 15% over exploited and 10% depleted or recovering from depletion. The only areas where total catches are still tending to grow, and where in principle there is potential for production



Figure 6.8 – Overall Aquaculture Production and Value in 1998



Source: FAO, 2000

increases, are the Eastern and Western Indian Ocean and the Western Central Pacific (i.e. the ASEAN region). These areas have a lower incidence of fully exploited, overexploited, depleted or recovering fish stocks than elsewhere, and a prevalence of under-exploited or moderately exploited stocks (although they also have the highest incidence of stocks whose state of exploitation is unknown or uncertain and for which overall production estimates are less reliable). Nonetheless, the Eastern Indian Ocean and the Western Central Pacific are the only areas showing little sign of stress, and hence the potential for continued development of resources. However, even the Western Central Pacific is expected to be fully fished by 2003 (*World Resources 2000–2001*; WRI, 1999).

With a sea area of 5.8 million sq km, Indonesia has a large and diverse fishery resource potential. According to the State of the Environment Report (Indonesia, 2000), the fishery resource potential of Indonesia is estimated as 5.65–6.12 million tonnes per year with a large proportion of small pelagics (3.2–4.0 mt), followed by demersals (1.0–1.8 mt) and skipjack tuna (0.3 to 0.37 mt). Although the contribution of the fishery sub-sector to national GDPs is relatively small in AMCs, it is a major source of employment in coastal areas. In Malaysia, there were about 79,000 fishermen in 1997, but this is declining (*Environmental Quality*

*Report*; Malaysia, 1998). In Indonesia, the number of fishermen was estimated at about 2.09 million in 1997, increasing from 1.42 million in 1988. Thailand in 1995 had about 161,700 fishermen. There are strong indications of over-fishing for some species in coastal waters. For instance, the abundance of demersal fish stock in the Gulf of Thailand in the early 1990s was only one tenth of the 1960s level when trawling started.

**Environmental concerns.** Pressure on marine fishery resources in AMCs has continued, rising in line with high domestic and export demand. The main concern is over-fishing which has resulted in a decline in productivity of a large number of species. A number of local stocks of small coastal pelagic fish are nearing full exploitation. These include mackerel and round scad in the Straits of Malacca and the Gulf of Thailand, round scad in the Philippines, and sardines in the Straits of Bali. Larger coastal pelagic fish have probably been slightly to moderately exploited in recent years. Cephalopods (e.g. squids and cuttlefish) are probably the only major marine resource in some Indonesian waters and in a limited part of Viet Nam waters, with potential for further development. The catch of cephalopods increased from 165,000 tons in 1984 to 270,000 tons in 1994 of which Thailand contributed about 43%.



Other environmental problems affecting fishery resources are deteriorating marine water quality and degradation of coastal areas caused by inadequate waste management and ineffective management of coastal zones. In addition, some AMCs have substantial difficulties with illegal and damaging fishing methods such as cyanide or explosives to catch fish from coral reefs.

Rehabilitation of degraded fishery resources could be achieved by increasing significantly the age at first capture, prohibiting the exploitation of juveniles, increasing net mesh sizes, and closing temporarily or permanently areas of concentrations of young fish. The Philippines have shown that, with careful management, increases of 100% in sustainable production can be obtained within 18 months. The Gulf of Thailand is closed annually to prevent fishing of juvenile mackerels. The potential for increased sustainable marine fisheries production in ASEAN, noted by FAO,

would benefit from the following:

- rehabilitation of degraded resources;
- further exploitation of under-utilised resources, avoiding overfishing;
- reduced exploitation of overexploited resources; and
- reduction in the very high levels of discard and wastage.<sup>9</sup>

All AMCs have adopted an integrated approach to managing coastal and marine resources. Indonesia, for example, is implementing two large-scale projects whose objectives are to facilitate management of the marine and coastal environments. These are the Marine Resources Evaluation and Planning Project and the Coral Reefs Rehabilitation and Management Project. In addition, a number of smaller-scale projects have been undertaken to improve the management of coastal and marine environments.

- <sup>1</sup> The 'internal' water resources are those located within national boundaries, i.e. excluding any water imports.
- <sup>2</sup> In 1995, the total volume of groundwater consumed by industries in Thailand was estimated at 1,716 million cu m, an order of magnitude larger than surface water consumption of 153 cu m.
- <sup>3</sup> Box 6.1 includes information on BOD or 'biological oxygen demand', the amount of dissolved oxygen consumed by micro-organisms in effluent in a given time period as they decompose organic material in polluted water. 'Pure' water has a BOD of about 1 g/m<sup>3</sup>.
- <sup>4</sup> *ASEAN Achievements and Future Directions in Pollution Control* (forthcoming; 2001).
- <sup>5</sup> PCBs are polychlorinated biphenyls - industrial chemicals which can accumulate in human tissues and cause diseases. They can also cause malformations in embryos and fetuses.
- <sup>6</sup> Biological diversity in ASEAN is discussed primarily in Chapter 7. Box 7.4, *Biodiversity Hotspot: The Philippines*, briefly describes the biodiversity of the coral reefs of the Philippines.
- <sup>7</sup> A demersal species lives at or near the sea bottom.
- <sup>8</sup> Note that this is more than the entire ASEAN aquaculture output shown in Table 6.11.
- <sup>9</sup> The Western Central Pacific averaged 33% discards as percentage of the total fish catch, the highest in the world in 1988-92, the latest available figures. The global average was considerably lower, but still high, at 25% (World Resources 2000-2001; WRI, 1999).







# Terrestrial Ecosystems



**I**n many ASEAN Member Countries, land resources and terrestrial ecosystems are under increasing stress due to growing populations and increased agricultural production through the extension of agricultural land into forest and other ecologically sensitive areas. Consequences include the loss of natural terrestrial ecosystems – such as primary forests, wetlands, and grasslands – upon which long term economic development and sustainability largely depend. Uncontrolled logging and deforestation have led to soil erosion; and improper agricultural practices, including overgrazing by livestock, have degraded soils. The costs of this degradation include rural poverty and the loss of economically valuable and ecologically important biological diversity. However, deforestation in ASEAN should be viewed in its proper perspective. ASEAN remains one of the most heavily forested regions of the world; over 48% of land area is forest-covered compared to only 18% for Asia overall and less than 30% globally. This chapter also reviews the disposal and management of municipal solid and hazardous wastes as these are usually returned to the land.

## ASEAN FACTS AND FIGURES

Megadiversity Countries (80% of global biological diversity)	Indonesia, Malaysia, Philippines (of 17 countries globally)	
Protected Areas		
Land	1,014 sites protecting 418,000 sq km	
Coastal & marine	94 sites protecting 97,000 sq km	
Forest Cover (2000)	Percent of land area	
World	under 30%	
ASEAN	over 48%	
Forest Loss in ASEAN (average annual decrease, sq km/year)	1970–1990 15,720	1990–2000 23,260
Deforestation rate, 1990–2000		
World	0.23% per year	
ASEAN	1.04% per year	
Asia overall	< 0.1% per year	
Hazardous Waste Production	ranges from 1 – 19 kg/person/year	



## Land Resource

### Land Use

The ASEAN region has a total land area of 4.4 million square kilometres (nearly 439 million hectares) of which over 68% is concentrated in the three largest countries: Indonesia (41.2%), Myanmar (15.4%) and Thailand (11.7%). Most of Southeast Asia was once covered with forest. As shown in Table 7.1, much of this has been

converted to crop lands and pasture. The data suggests a trend of arable land and pasture decreasing slightly since 1988, permanent crop lands increasing, and land under forest and woodlands relatively unchanged<sup>1</sup> (the latter for 1988–1994). The following regional picture emerges: about 53% of land area in the mid 1990s was covered with forests and woodland, 21% was available for agriculture (arable land plus permanent crop land), 4% for pasture, and 22% for other uses including urban areas.

**Table 7.1** – Land Use in the ASEAN Region, 1988-1998 (thousand hectares)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Arable Land	65,099	64,945	64,339	62,310	62,237	62,241	60,997	60,842	61,662	61,789	61,813
% of Total	14.98	14.95	14.81	14.34	14.32	14.32	14.04	14.00	14.19	14.22	14.22
Forest & Woodland	229,375	228,344	229,656	229,080	229,018	229,683	229,375	N/A	N/A	N/A	N/A
% of Total	52.79	52.55	52.85	52.72	52.70	52.86	52.79	N/A	N/A	N/A	N/A
Permanent Crops	23,807	24,280	26,123	25,584	26,582	27,447	28,635	28,784	29,013	29,098	29,214
% of Total	5.48	5.59	6.01	5.89	6.12	6.32	6.59	6.62	6.68	6.70	6.72
Pasture	17,871	18,579	18,487	17,056	17,153	17,154	17,140	17,135	16,892	16,881	16,878
% of Total	4.11	4.28	4.25	3.93	3.95	3.95	3.94	3.94	3.89	3.88	3.88
Other Uses	98,390	98,394	95,937	100,512	99,552	98,017	98,395	327,781	326,975	326,774	326,637
% of Total	22.64	22.64	22.08	23.13	22.91	22.56	22.64	75.43	75.25	75.20	75.17

**Source:** FAO website, undated **Note:** for 1995 - 1998, forest data are included in 'other uses'

**Table 7.2** – Forests and Woodlands in ASEAN Member Countries ('000 ha), 1970 – 1994

Country	Land Area	1970	1975	1980	1985	1988	1989	1990	1991	1992	1994	Loss <sup>a/</sup> 1970-90
Brunei Darussalam	576	440	450	450	450	450	450	458	450	450	450	-18
Cambodia	18,480	13,210	13,190	13,160	13,000	12,400	12,143	12,170	12,200	12,200	12,200	1,040
Indonesia	181,200	122,800	122,220	117,600	112,800	111,000	110,400	110,775	111,775	111,000	111,774	11,025
Lao PDR	23,680	14,700	14,200	13,735	12,930	12,690	12,612	12,600	12,600	12,580	12,550	2,100
Malaysia	33,266	21,149	21,149	21,149	22,248	22,248	22,248	22,248	22,248	22,248	22,248	-1,099
Myanmar	67,655	38,831	38,831	38,831	38,831	38,794	38,793	34,422	34,422	34,419	34,375	4,409
Philippines	29,940	15,899	13,476	12,457	13,600	13,600	13,600	13,640	13,600	13,600	13,600	2,259
Singapore	68	3	3	3	3	3	3	3	3	3	3	0
Thailand	51,311	22,280	18,500	16,547	15,087	15,000	14,970	14,968	14,965	14,900	14,500	7,312
Viet Nam	33,104	13,800	13,550	11,950	9,642	9,600	9,500	9,395	9,617	9,650	9,650	4,405
ASEAN	439,283	263,112	255,569	245,882	238,591	235,785	234,719	231,679	231,105	231,050	231,350	31,433

**Source:** FAO website, undated, except 'Land Area' from AMCS **Note:** <sup>a/</sup> negative figure indicates an increase



WWF/M. John Payne

*Species rich tropical forest*

Forest cover and deforestation vary widely among AMCs as shown in Table 7.2 for 1970 through 1994. From 1970 to 1990, ASEAN lost 31.4 million hectares of forest, a rate of about 15,700 sq km per year. During this twenty year period, Indonesia, Thailand, Myanmar and Viet Nam accounted for 86% of the total decrease while Brunei Darussalam and Malaysia increased their net forest cover.

From 1990 to 2000 there has been an increase in deforestation within AMCs, the average annual loss growing<sup>2</sup> by 48% to 23,260 sq km (Table 7.3). Indonesia, Myanmar, Malaysia and Thailand accounted for well over 90% of the total while Viet Nam was the sole country with a net gain in forested area. During the past decade, the annual rate of deforestation within ASEAN exceeded 1% (Figure 7.1), which is considerably higher than other regions of the world. Despite this increase in deforestation rates, ASEAN remains among the most heavily forested regions of the world, coming a close second to South America, as shown in Figure 7.2.

The map in Figure 7.3 illustrates forest cover for Asia and much of the Middle East. ASEAN's forest cover (over 48%) is far higher than Asia overall (under 18%). Box 7.1 summarises other pertinent information on the forest resources of the AMCs.

### Forest Products Trade

In 1998, the ASEAN region exported forest products valued at US\$10.75 billion and imported US\$5.32 billion of forest products, i.e. net exports of US\$5.43 billion (see Chapter 4, Table 4.8). Indonesia and Malaysia had the largest trade surplus of forestry products, while Thailand had the largest deficit. Although the total amount of official exports is relatively small for Cambodia, Lao PDR and Myanmar,

the forestry sector plays a significant role in the economies of these three countries.

### Sustainable Forest Management

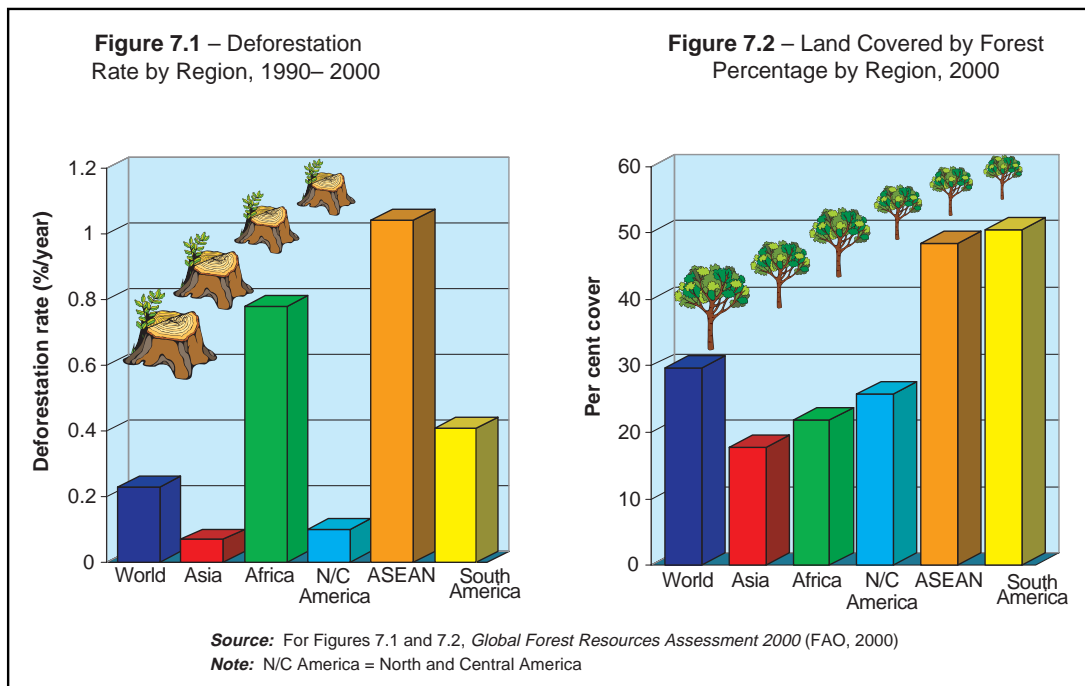
Sustainable management of forestry resources primarily falls under the responsibility of the forestry agencies and is carried out under various legal and administrative frameworks. The management strategies adopted in the ASEAN

**Table 7.3** – Change in Forest Cover in ASEAN Member Countries, 1990 - 2000

Country	Total Forest Area		Forest Cover Change 1990 – 2000	
	'000 ha (1990)	'000 ha (2000)	Annual change ('000 ha)	Annual change (%)
Brunei Darussalam	452	442	- 1	- 0.2
Cambodia	9,896	9,335	- 56	- 0.6
Indonesia	118,110	104,986	- 1,312	- 1.2
Lao PDR	13,088	12,561	- 53	- 0.4
Malaysia	21,661	19,292	- 237	- 1.2
Myanmar	39,588	34,419	- 517	- 1.4
Philippines	6,676	5,798	- 89	- 1.4
Singapore	2	2	0	0.0
Thailand	15,886	14,762	- 112	- 0.7
Viet Nam	9,303	9,819	52	0.5
<b>ASEAN</b>	<b>234,662</b>	<b>211,407</b>	<b>- 2326</b>	<b>- 1.04</b>

*Source:* Global Forest Resources Assessment 2000 (FAO, 2000; data tables updated 1 March 2001)

*Note:* Changes include any additional new plantation areas.



**Figure 7.3 – Forest Cover in Asia and the Middle East**



Global Forest Assessment 2000 (FAO 2000) (from FAO website, information updated 1 March 2001)





### Box 7.1 – Forest Resources in ASEAN Member Countries

**Brunei Darussalam.** The natural vegetation throughout Brunei Darussalam is tropical evergreen rain forest. In the mid 1990s, forest covered 4,690 sq km (81% of land area), of which 22% was secondary forest and plantations and 59% primary forest. FAO data indicate 77% forest cover in 2000. Just over half of primary forest is mixed dipterocarp, one quarter is peat swamp forest and the remainder either swamp forest, heath or montane forest. Mangroves on the coast probably represent the largest remaining intact mangrove forests in northern Borneo. Together with those in neighbouring countries in Brunei Bay, they comprise one of the largest tracts of relatively undisturbed mangroves in eastern Asia. The main

areas of peat swamp forest are along the basin of the Belait River in western Brunei Darussalam. Substantial areas of seasonally flooded peat swamp forest occur in the middle reaches of the Tutong River. All of these swamp forests are in almost pristine condition. The dipterocarp forest, which covers most of the country, gives way to montane forest from about 700 m upwards. In the upper Temburong area, where the land rises above 1,500 m, this in turn gives way to montane vegetation with stunted, gnarled trees covered with mosses. These forests have not been widely exploited because most people live along the coast and most of the country's development has been centred around hydrocarbon fuels.

**Cambodia.** Cambodia reportedly had 69% forest cover in 1994 although recent FAO data suggest only 51% in 2000. Three main types of forest are found in Cambodia: relatively open deciduous forest; generally closed semi-deciduous forest; and evergreen closed forest. The first covers a larger area than the others, the second is the richest in timber, while the third represents an eco-floristic type, unique in Southeast Asia. Forest areas in Cambodia are almost evenly split between broadleaved evergreen forests and deciduous forests, with smaller areas of flooded forest around

the Tonle Sap Lake, and small areas of coastal mangroves. Forests in the west are mainly evergreen and the Northeast is largely covered by deciduous forests. The southern and central parts of the country have less forest cover and face a shortage of wood, in particular fuelwood. It is likely that logging has had its major impacts along the international borders of Cambodia and in the coastal province of the Koh Kong. Illegal logging and cross-border log smuggling are significant problems for Cambodia. Over 20% of land area is under some form of legal conservation protection.

**Indonesia.** Indonesia is heavily forested with about 58% forest cover (FAO, 2000). The forests are diverse and represent about 10% of all tropical forests of the world. Indonesia's closed broadleaved forests can be divided into two broad classes: *wetland forests*; comprising mangroves, swamp, peat and heath forests; and *dryland forests*; comprising tropical, montane and sub-alpine rainforests, and monsoon forests. Indonesia has small areas of naturally occurring coniferous forests, mainly *Pinus merkusii* and *Agathis spp.*, and open savannah forests, particularly east of the Wallace Line. With the exception of the Lesser Sunda Islands, the natural vegetation of the 'outer' islands of Sumatra, Kalimantan, Sulawesi, Moluccas and Irian Jaya consists primarily of tropical moist forest. Deciduous monsoon forest occurs in seasonally dry areas, particularly in

southern and eastern islands such as the Lesser Sundas and southern Irian Jaya. Vegetation types to the east and west of the Wallace-line are divided by a biogeographic boundary that extends north to south along the Sunda Shelf. Forests on the islands of the shelf itself are principally Malesian and dominated by the commercially important Dipterocarpaceae, while those found to the east have greater affinities with the Australo-Pacific realm and are dominated by mixed tropical hardwood species. Extensive natural wetlands, including many of international importance, are found in the low-lying alluvial plains and basins, flat-bottomed valleys and mangrove estuaries of Sumatra, Kalimantan and Irian Jaya. In addition, Indonesia contains some of the largest artificial wetlands in the world, including millions of hectares of rice paddies and 200,000 ha of fish ponds.

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**Lao PDR.** The original forest cover consisted largely of evergreen and semi-evergreen forests. These comprised dry evergreen forests, which covered much of the mountainous northern part of the country; tropical montane evergreen forests, primarily along the Annamite Mountains and on the Bolovens Plateau; and lowland semi-evergreen forests over the Mekong Plain. Other original vegetation types were tropical montane deciduous forests scattered throughout the north, dry dipterocarp and mixed deciduous forests in the south and on the Mekong Plain, forest on limestone and pine forests in the Annamites and parts of the north, and a small area of subtropical montane forest in the extreme north (along the Chinese border). Seasonally flooded wetlands previously covered large parts of the Mekong Plain, but have now largely been converted to rice cultivation. Ten year old data on forest cover (Lao Forest Inventory and Management Office, 1991), based on 1988-89 SPOT satellite imagery, indicated a forest cover of 111,816 sq km (47.2% of land area). An additional

88,051 sq km (37.2% of area) was classified as potential forest, including bamboo and secondary formations; 15,515 sq km (6.6%) as other wooded areas, primarily savannah and scrub forest; 10,083 sq km (4.3%) as permanent agricultural land; and 11,336 sq km (4.8%) as other non-forest land, including barren areas, grasslands, urban areas and wetlands. The best and most extensive forests are confined primarily to the southern and central parts of the country, deforestation having been most severe in the north and along the densely settled Mekong Plain. The 1991 current forest area is approximately 2% less than 1981/82 estimates. In 1993, a Protected Area System (PAS) was established and now comprises 20 National Biodiversity Conservation Areas (NBCAs), covering 3,012,900 ha, or about 14.0% of the total area of the country. Twelve additional areas are currently proposed for designation as NBCAs. Management plans for the protected areas. Besides this there are a number of Provincial Protected Areas. In 2000, the FAO estimated total forest cover at 54%.

**Malaysia.** Malaysia has a substantial land mass on both its mainland and archipelagic areas. Lowland evergreen tropical rain forest is the principal original formation in Peninsular Malaysia on dry land at low altitudes. In the extreme northwest this is replaced by semi-evergreen formations. The rain forest is rich in Dipterocarpaceae and may be subdivided into lowland (below 300 m) and hill (300-1,300m) forest, on the basis of floristic composition. Along the east coast there remain a few patches of heath forest on recent unconsolidated sands, but most have been degraded to open grasslands or scrub. Widely scattered patches of forest on limestone occur north of Kuala Lumpur, peat swamp and freshwater swamp forests are extensive on both east and west coasts, although most of the latter have been cleared for agriculture, and extensive montane rain forests exist. A hundred years ago rain forests probably covered 90% of land area. In 1995, the forest cover was estimated at 15.5 million ha or

47% of the total land area. but recent FAO data (2000) suggest 58%. Both Sabah and Sarawak were originally clothed in forest, including lowland evergreen rain forests, peat swamps, heath forests, forests on limestone, a floristically distinct formation on the ultrabasic rock which forms a mountainous arc extending from Mount Kinabalu to the east coast and lower and upper montane forests. According to FAO (1987), the forest estate in Sarawak stood at 84,000 sq km of broad-leaved forest in 1980 (67.5% of land area). In Sabah in 1953 natural forest covered 63,725 sq km, 86% of land area. Thirty years later this had diminished to 46,646 sq km (63%).

**Myanmar.** Myanmar is a heavily forested country with the forest cover estimated at 27.2 million ha in 1995, about 41.3% of total land area (although FAO, 2000 suggest 51%). The most extensive forest types are mixed deciduous forests, and hill and temperate evergreen forests, with

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smaller areas classified as tropical evergreen forests; dry forests; deciduous dipterocarp forests; and swamp, beach and tidal forests. The mixed deciduous forests are economically the most important in Myanmar, as they produce teak (*Tectona grandis*) and other hardwoods. Teak plantations have been planted in Myanmar since

1856, though a large-scale planting programme was not implemented until 1980. Myanmar has more than a half-million hectares of plantations, of which more than 40% are teak. Myanmar has a relatively small proportion of forests in formal protected areas but hopes to protect 5% of forest area in the short term and 10% in the longer term.

**The Philippines.** The archipelago was originally primarily forest. There are some 8,000 estimated species of flowering plants, of which over 3,000 are tree species that can attain a diameter at breast height of 30 cm or more. Five very broad forest types are recognised: mixed dipterocarp, molave, mangrove, mossy and pine forests. The Philippines is modestly forested with cover in 1995 estimated at 6.8 million ha, about 22.7% of total land area. The country has slightly less than 4 million hectares of dipterocarp rainforest, with slightly less than 1 million hectares of "old growth"

dipterocarp forest. There are small areas of highland pine forests and coastal mangroves, and extensive areas of brushland. The Philippines has moderate plantation forest. Forests were logged extensively through the 1960s - 1980s, followed by clearing for agriculture, resulting in major deforestation and degradation. Ownership of Philippine forests is largely vested in the State. There is a network of about 70 parks, reserves and protected areas. In 2000, the FAO estimate of forest cover is about 19%.

**Singapore.** More than half the island of Singapore is built-up area, and the dipterocarp rainforests that once covered the island now occupy only about 2,000 ha, about 3% of total land area. The major forest reserves are the Nature

Reserves, which retain the only substantial area of primary rainforest left, and the Pulau Ubin and Sungei Buloh nature parks, which contain areas of remnant secondary rainforests, mangroves, and beach vegetation.

**Thailand.** Thailand is moderately forested, although forest cover has roughly halved since 1960. Forest cover in 1995 was estimated at 13.12 million ha, about 25.62% of total land area (FAO, 2000 suggest 22.8%). Most of the remaining forests are restricted to relatively inaccessible mountainous areas. The main forest types are evergreen montane rain forest; mixed deciduous monsoon forest; and open dry dipterocarp and savannah forests. *Dipterocarpus spp.*, *Shorea spp.*, and *Hopea spp.* are among the most prevalent species. Teak (*Tectona grandis*) has generally been

the most important timber species. Since 1989, Thailand has had a ban on all logging in natural forests, and has implemented a series of supporting measures to protect the remaining forests and to promote private sector involvement in forest management and plantations. Thailand presently has more than a half-million hectares of plantation forests. A network of parks and reserves encompasses more than 10% of the total land area. About 29% of Thailand is currently under forest (FAO, 2000).

**Viet Nam.** Viet Nam is moderately forested with forest cover estimated at 9.1 million ha in 1995, about 28% of land area. Viet Nam has almost 20 million ha classified as forest land, slightly less than half of which is forested, the remainder being denuded hillsides and barren lands. Viet Nam's

forests comprise temperate and sub-tropical pine dominant forests (*Pinus merkusii*, *P. kesiya*); mixed conifer-broadleaved forests (*Podocarpus spp.*); dry dipterocarp types (*Lagerstroemia spp.*, *Pterocarpus spp.*) in upland zones; moist lowland dipterocarp forests (*Dipterocarpus spp.*, *Anisoptera*

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spp.); and mangroves. The most densely forested areas are the Western High Plateau, the north central region, and the coastal south central region. Viet Nam has more than a million ha of mainly immature plantations. Viet Nam has more than

10,000 sq km in 50 protected areas. Forest cover has grown in recent years to nearly 30% of land (FAO, 2000).

Source: Information provided by governments, FAO website and FAO, 2000

region include classification of forests into various types depending on the level and extent of protection, reforestation and afforestation, community participation, and agroforestry. Some management issues include:

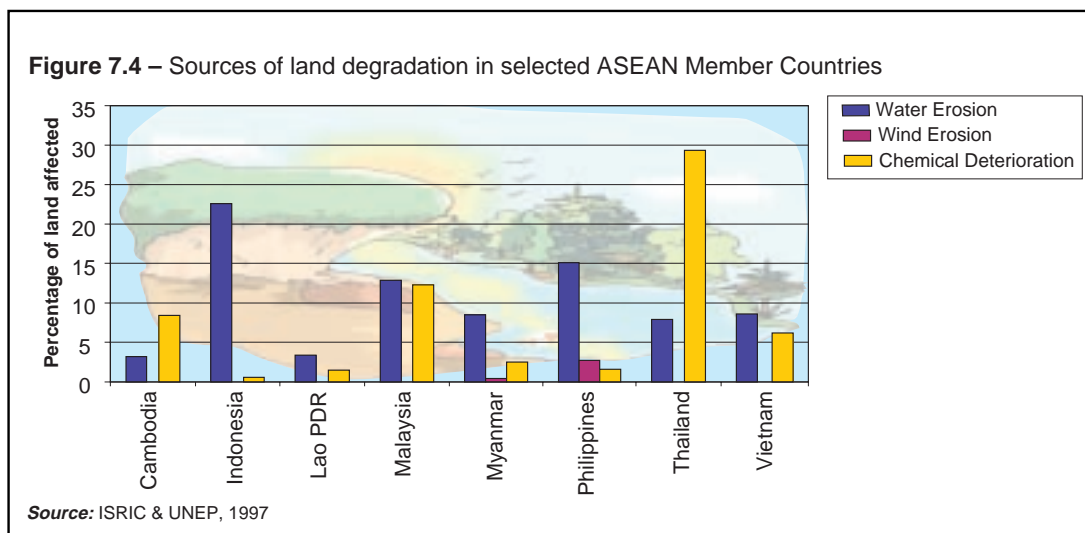
- inadequate resources for carrying out activities effectively, particularly reforestation programmes and monitoring and control of illegal logging;
- socio-economic pressure on forest resources leading to conflict between local communities near the forest, loggers and forestry agencies;
- outmoded legal frameworks; and
- ineffective law enforcement.

### Land Degradation

Land degradation is a significant environmental problem, occurring in almost all AMCs. It occurs in various ways including nutrient

depletion, structural decline and compaction, biological decline, chemical deterioration (through increased levels of alkalinity and salinity, for example), and soil erosion. Land degradation is caused by several factors including deforestation, excessive application of farm chemicals, inadequate management of soil quality, and improper irrigation. The problems are closely linked to forest management and agricultural development. Land and soil management is thus a key element of sustainable agriculture development.

In 1997, the International Soil Reference and Information Centre (ISRIC) with financial support from the United Nations Environment Program (UNEP) assessed the status of human-induced soil degradation in eight AMCs, (all except Brunei Darussalam and Singapore). The study covered erosion by water, erosion by wind and





deterioration by chemicals. Results are summarised in Figure 7.4.

Soil erosion by water<sup>3</sup> is the most pervasive form of land degradation found in ASEAN affecting nearly 14% of all land. This varied widely among the countries from 3.1% (Myanmar) to 39% (the Philippines). About 75% of the erosion was through loss of topsoil, 21% through terrain deformation, and 4% caused by off-site effects. Sizable areas in Malaysia (12.9 million ha), Indonesia (12.1 million ha), and the Philippines (11.4 million ha) were affected by topsoil loss. In Malaysia and the Philippines the loss of topsoil affected as much as 39% of total land area. The percentage was also significant in Viet Nam (22%) and Thailand (15%). However, the impact on soil productivity was only moderate or better for AMC's except the Philippines where about 5.6 million hectares suffered strong to extreme land productivity impacts. Terrain deformation by water erosion affected only Indonesia (10.5 million ha) and Myanmar (6 million ha). Off-site effects were notable only for the Philippines (2.7 million ha).

Wind erosion (wind action causing loss of topsoil, terrain deformation, or off site effects) is not a major problem in AMC's. Only the Philippines and Myanmar suffer from light to moderate problems covering only 0.4 million ha of Myanmar and 2.7 million ha in the Philippines.

Decline in soil fertility was the major chemical deterioration<sup>4</sup> in ASEAN, affecting 56 million ha. Only 0.4 million ha of land in Viet Nam were strongly affected. Nearly 26 million ha in Thailand (about 50% of land area), experienced this problem with a moderate impact on productivity. Fertility decline was insignificant in Indonesia and the Philippines.

About 2 million ha of land in Thailand suffered from increased soil salinity which is a growing problem in the northeast and southern regions along the coast. In Thailand's arid northeast, the cause is irrigation using high-salinity water. In the south, salinisation has been caused by expansion of brackish aquaculture. This problem is increasingly common in agricultural areas in the coastal zones of most AMC's. Soil acidification has moderately affected 0.9 million ha of land in Viet Nam and lightly affected about 1.6 million ha in Thailand.

A more general illustration of the severity of soil degradation in AMC's appears as Figure 7.5 with the black areas experiencing 'very high' degradation.

### Soil Contamination

Excessive use of agricultural chemicals can contaminate soil and agricultural produce by chemical residues, uptake of chemicals by agricultural produce, soil salinisation, and soil acidification. Pollutants in contaminated soil can find their way into groundwater aquifers and surface waters, and into the ecosystems through food chains. Chemical residues on agricultural produce can be harmful to human health. These problems are becoming more common in ASEAN. Pesticides used in Viet Nam, Cambodia,

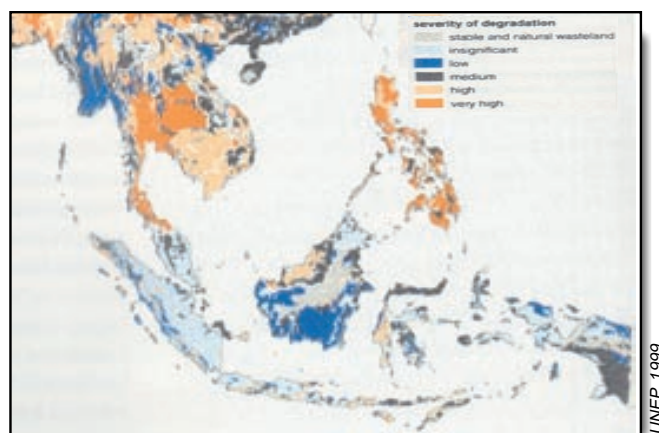


Figure 7.5 – Soil Degradation in Southeast Asia





and Lao PDR are reported to exceed the safety levels recommended by the Food and Agriculture Organisation (FAO). Table 7.4 shows pesticide imports of US\$321 million and fertiliser imports of nearly US\$7 billion in AMCs in 1998. Net consumption within AMCs is not known.

In 1999, the Pollution Control Department of Thailand collected random samples of soil, surface water and groundwater from various areas, and analysed them for pesticides (organochlorines, organophosphates and carbamates). Of 107 soil and 97 water samples collected, organochlorines were found in 38 samples (18% of the total). Endosulfan residue was found most in water ranging from 0.02–86.5 micrograms per litre (mg/l), and in soil from 0.09–0.28 mg/l. Organophosphate (methyl parathion) was found in one water sample (6.7 mg/l) and in one soil sample (0.46 mg/l). The carbamate group was found in one water sample (0.907 mg/l).

#### Land Management

Management of land resources cuts across

various subsectors, including forestry and agriculture. Responsible agencies in ASEAN Member Countries are usually the forestry and land development departments. Control of disposal on land of solid and hazardous wastes is the responsibility of national pollution control agencies. A weakness in land resource management in some AMCs is the lack of comprehensive land use planning at national and regional levels and effective measures to implement those plans which exist, particularly in controlling deforestation. Conflicting land use is becoming more evident in some AMCs.

### Biological diversity

#### Status

Biological diversity (biodiversity) covers the variety, variability and uniqueness of genes, species and ecosystems. The UN Convention on Biological Diversity defines biodiversity as “*the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, this includes*

**Table 7.4** – Value of Pesticide and Fertiliser Trade in ASEAN Member Countries, 1998

Country	Pesticide Trade (US\$ '000)		Fertiliser Trade (US\$ '000)	
	Imports	Exports	Imports	Exports
Brunei Darussalam	2,900	25	N/A	N/A
Cambodia	260	N/A	12,716	N/A
Indonesia	18,589	41,822	317,600	725,800
Lao PDR	120	N/A	11,135	N/A
Malaysia	51,865	60,713	1,376,061	196,000
Myanmar	11,500	N/A	53,805	17,000
Philippines	50,140	5,575	339,070	183,684
Singapore	50,468	81,479	2,350	N/A
Thailand	115,000	17,000	1,497,423	371,200
Viet Nam	20,000	N/A	3,354,213	5,000
ASEAN	320,842	–	6,964,373	–

Source: FAO Website (undated)



*diversity within species, between species and between ecosystems*". Just seventeen nations (the 'megadiversity' countries) collectively contain over two-thirds of the Earth's biological resources. In terms of plant and animal species at risk, these countries may account for fully 80% of the planet's most endangered biodiversity (the biodiversity 'hotspots'). Of the seventeen, three are in ASEAN: Indonesia, Malaysia, and the Philippines.



WWF/M.Azward FM

*Gapis flower*

As Box 7.2 shows, biodiversity is of enormous value to ASEAN and the world economically, socially and in terms of a range of essential ecosystem services. Biodiversity is under tremendous threat in the region with a variety of inevitable underlying causes. Economic losses can usually be reversed or reduced with appropriate policies and actions; loss of biological diversity, however, is essentially irreversible.

Table 7.5 shows the rankings of the ASEAN megadiversity countries globally in terms of overall biodiversity and endemism (i.e. species which are native to a particular place and found nowhere else). Indonesia (illustrated in Box 7.3) probably has the greatest marine diversity in the world, rivalling Brazil as the single richest country on Earth in terms of biological diversity. The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) recently completed a

distributional analysis of the bird species in the ASEAN Region. Out of a total of 2,371 birds recorded within AMCs, about 71% are resident species of which 1,067 (63%) are endemic to the ASEAN region. As shown in Table 7.6, of these 798 are 'national endemics' (confined to only one country) and 269 are shared between two or more AMCs.

Seven of the world's 25 recognised biodiversity hotspots (biologically rich areas under greatest threat of destruction) lie in Asia covering the entire ASEAN region; (Figure 7.6). Table 7.7 summarises those bird and mammal species under most threat in the region. The rain forest of the Philippines have the highest levels of endemism in Indo-Malaya. Box 7.4 illustrates the case of the Philippines as a hotspot.

As Table 7.8 indicates, the megadiversity countries in ASEAN also rank high globally in terms of plant diversity.

It is not known how many species of plants have already become extinct in the ASEAN region. Table 7.9 lists plant species considered by IUCN to be at risk of extinction, about 1,917 species or 2.2% of the ASEAN total. According to these estimates, the percentage of threatened plant species is highest in the Philippines, about 4%.

**Table 7.5** – World Rank of ASEAN Member Countries in Total Diversity & Endemism

Country	Rank (Biodiversity)	Rank (Endemism)
Indonesia	3	2
Malaysia	14	8
Philippines	17	15

*Source: Megadiversity Country Data Tables (CI, 2001)*

**Note:** A ranking of 1 indicates the country with the most biological diversity in the world



**Box 7.2 - Summary of Benefits of, and Major Threats to, Biodiversity within ASEAN**

The value of biodiversity products and services is enormous. It has been estimated that more than 40% of the world's economy and 80% of the needs of the world's poor are derived from biodiversity. There are four kinds of benefits which can be derived from biodiversity:

- \* Direct harvesting of plants or animals for food, fodder, medicine, fibre, dyes, fuel, construction materials and other uses.
- \* Social, including aesthetic, cultural, recreational, educational and research values.
- \* Indirect ecosystem services such as climate regulation, flood and drought, good water supply, nutrient recycling, natural pest control, pollution cleansing and soil generation.
- \* Benefits can be developed through domestication, development and improvement of genetic resources and by biotechnology. Huge numbers of micro organisms have their own antibiotics; the tip of iceberg has barely been explored in terms of identifying potential uses. Bio-technicians can now isolate useful genes and transfer them to different species to create new varieties with new properties.

There are numerous threats to biodiversity in the region listed under six broad threat categories below:

<i>Threat</i>	<i>Sub-category</i>	<i>Affected regions</i>	<i>Comments</i>
<i>Habitat Loss</i>	Forest logging	All forested regions	Most forests are logged not only for their timber resources but also for agricultural expansion. AMCs have begun to practise sustainable forest management to reduce impacts on loss of biodiversity
	Agricultural clearing	Forests, grasslands, marshes	Countries with fast population growth & lack of employment
	Forest fires	All forested regions	Intensified by El Nino cycles and the need to convert non-commercial forests into plantations
	Drainage of wetlands	Land hungry regions.	Impounding of lakes, creation of fish ponds, extension of paddy.
	Flooding by reservoirs behind giant dams	Most regions	Some critical areas threatened. Added importance of watershed protection can be positive.
<i>Over-harvesting</i>	Coral blasting and mining	Most coral reefs, especially South China Sea.	Mostly due to illegal activities.
	Fisheries	Lakes and inland seas	Most fish stocks are approaching unsustainable levels.
	Hunting/poaching	Most regions	Increased pressure as human consumption grows and wild stocks crash.
	Firewood collection	Poor rural areas	Prevents natural regrowth of forests.
	Wildlife trade	Most countries	Wildlife, corals mostly endangered due to illegal practices
<i>Pollution</i>	Destructive methods	Some regions	Dynamiting, use of poison, fine nets etc.
	"Biopiracy" – unfair access to valuable genetic resources	Biorich native regions	By removing valuable genetic resources, 'biopirates' rob local communities of potential earnings.
	Rivers and lakes	All countries	Increasing with human and industrial growth
<i>Alien Invasives</i>	Marine	Most countries	Silt pollution as well as toxic metals
	Oil spills	Major shipping routes	Increasing frequency
	Accidentals	All countries	Weed seed in grain ships
<i>Desertification</i>	Deliberate Introductions	Use of exotics in forestry and fisheries.	Lack of development of local species. Risk increasing with raised levels of reforestation. Introduced fish are destroying local endemics in many areas.
	Genetically modified organisms	Many countries are undertaking release trials	Increasing scale of threat as new forms developed.
	Lowered water tables	Most arid regions	Changes in river flow related to deforestation. Overuse of wells.
<i>Climate Change</i>	Spreading salt	Saline and estuarine areas	Reduced winter river flows (estuaries) or increased evaporation.
	Spreading sand	coastal Viet Nam	Inadequate ground cover to bind wind-blown dunes.
	Rising sea levels	All coasts	Threat to mangroves, reefs and coastal communities.
	Warmer climate	Most regions	Shifting of vegetation zones prohibited by fragmentation of vegetation. Coral bleaching.
	Phenological changes	Forests	Failure to flower at correct times can lead to species failures
	Local changes	Increased seasonality related to deforestation	Conversion from evergreen to monsoon systems.

**Underlying Causes of the Threats.** The above threats are often created by underlying causes related to population growth, demographics, trade pressures, political instability, perverse incentives, economic performance, poverty, inadequate law enforcement, poor protection standards, or lack of awareness.

*Source:* Adapted with substantial modification from John MacKinnon, ASEAN Regional Centre for Biodiversity Conservation (ARCBC), 2001





### Biodiversity Conservation

Biodiversity and wildlife conservation require protection of individual species, their populations and their habitats. This in turn requires the enforcement of legislation, developing conservation plans targeted at protection, and/or preservation in zoos or botanical gardens. An important approach is the creation of 'Protected Areas' (PAs)<sup>5</sup>, i.e. setting aside predominantly natural areas for the purposes of conservation. AMCs have used both approaches.

Within ASEAN, PA systems have been strengthened over the past decade but still vary greatly in extent and effectiveness. By the 1980s, there were significant PA systems in Brunei Darussalam, Indonesia, and Malaysia. During the 1990s, there were notable advances in establishing PAs in Cambodia, the Lao PDR, Thailand, and Viet Nam. Myanmar is also beginning to set up reserves. According to the ASEAN Regional Centre for Biodiversity Conservation (ARCBC), standards of managing PAs are often deficient. PAs tend to have inadequate budgets plus insufficiently trained and equipped staff. Most PAs in ASEAN (as elsewhere) are already significantly damaged and contain human settlements within their boundaries, often communities whose presence predates the establishment of the area's protected status. Efforts to solve the problems have ranged from ejecting local settlements, to

**Table 7.6** – Endemism in Bird Species in ASEAN Member Countries

Country	Total Species	National Endemics	Shared ASEAN endemics
Brunei Darussalam	471	0	170
Cambodia	456	0	37
Indonesia	1518	591	234
Lao PDR	623	0	40
Malaysia	659	12	200
Myanmar	994	3	122
Philippines	668	183	72
Singapore	385	0	87
Thailand	904	2	183
Viet Nam	783	8	44
<b>ASEAN</b>	<b>2371</b>	<b>798</b>	<b>269</b>

Source: Communication from ARCBC, 15 April 2001



WWF/M.Yusuf Ghani

*Panthera Tigris*

**Table 7.7** – ASEAN Member Countries With the Most Species of Threatened Birds and Mammals

Country	Threatened Bird Species		Threatened Mammal Species	
	Number	World Rank	Number	World Rank
Indonesia	104	1	128	1
Philippines	86	4	49	8
Viet Nam **	47	10	38	14
Thailand **	>45	12	34	18
Myanmar **	44	13	–	–
Malaysia	34	18	42	12

Source: Megadiversity Country Data Tables (CI, 2001)

Note: \*\* These three are not among the world's 17 Megadiversity Countries





### Box 7.3 – Megadiversity Country Profile: Indonesia

Indonesia, the fifth most populous country in the world, vies for top position on the list of megadiversity countries. It likely has the greatest amount of marine diversity in the world and rivals Brazil for the single richest country on Earth in terms of biological diversity.

**Rankings.** Indonesia ranks second in the world in mammal diversity (515 species) and similarly in mammal endemism (185 species). The orang-utan, one of Indonesia's most prominent and well-known species, has been subject to pressures that have decreased its population to such low levels (2,000–4,000) that they were listed on Appendix I of the Convention on International Trade of Endangered Species (CITES) in 1977. Most recently, the forest fires in Indonesia have threatened the orang-utan. Indonesia's other vertebrates and plants also rank high. First in the world in palm diversity with 477 species, (225 endemic), Indonesia is in the top five countries in plant diversity with an estimated 38,000 species. Indonesia is home to 1,519 species (381 endemic) of birds and 411 (150 endemic) reptiles, placing it fourth in the world in these categories.

**Indigenous Cultural Diversity.** With more than 336 recognized cultures and at least 250 languages spoken, Indonesia is as rich in culture as it is in biodiversity. While the majority of all Indonesians reside on the island of Java, tribal communities thrive throughout the 17,000 islands which make up the archipelago.

**Threats.** Indonesia's forests are under considerable threat from logging and the clearing of land for agriculture. Over the last 15 years, forest loss has increased exponentially due to fires which have burned even in the normally wet rain forests. Compounding this is an explosive growth in population which has resulted in increased pollution, destruction of coastal reefs and mangroves, and depleted fisheries.

**Source:** Conservation International web page; (megadiversity profiles updated 23 February 2001)

**Ecosystems:** Forty-seven distinct ecosystems have been identified in Indonesia, more than in any other megadiversity country

Lowland evergreen rain forest are dominant, covering 27 percent of the total area of the archipelago. Swamps, savannah grasslands, and unique alpine and marine ecosystems are also found in Indonesia

**Conservation:** 356 established conservation areas including 26 terrestrial national parks equal to 10 percent of the land area. Only 1.5 percent of Indonesia's total marine resources are protected.

**Coral Reefs:** Indonesia has some of the world's richest marine ecosystems and the greatest diversity of corals in the world. Coral reefs are under great threat from the use of explosives, poisons, and drift nets used to harvest fish and other marine animals

**Java:** Java is extremely fertile and productive due to rich volcanic soils. With only 10 percent of its natural forest left due to agricultural and human pressures, Java has lost species and genetic diversity.

establishing integrated development projects or buffer zones, to accepting local people inside the reserves and zoning a few core areas in a mosaic of land-use with varying degrees of conservation as the management objective. The ARCBC argues that none has yet been very successful. Finding solutions to the conflict of interests between local people and biodiversity conservation will be a great challenge for the next decade.

Table 7.10 summarises information on Protected Areas within AMCs. Indonesia has both the highest number of PAs and the largest area under legal protection, followed by Thailand and the Philippines. Overall, ASEAN has over 1,000 PAs covering nearly 41.8 million ha (418,000 sq km)<sup>6</sup>, or 9.5% of the total land area of AMCs. Six AMCs each have over 10% of land set aside as PAs: Brunei Darussalam and Cambodia (about 16% each), the Philippines,



Lao PDR and Thailand (14%), and Indonesia (10%).

In addition to the existing national protection systems, AMCs have been active participants as signatories or contracting parties in various international conventions and programmes aimed at conserving natural areas of worldwide significance.

- The 1972 World Cultural and Natural Heritage Convention, which established a system of collective protection of natural and cultural heritage sites;
- The 1973 Convention on International Trade in Endangered Species, which controls



*Rafflesia*

**Table 7.8** – Plant Diversity and Endemism in the Megadiversity Countries of ASEAN

Country	World Ranking	Plant Diversity (Number)	Endemic Species (Number)	Endemics as% of Global Diversity of Higher Plants
Indonesia	2	37,000	14,800 – 18,500	5.9 – 7.4
Philippines	8	8,000 – 12,000	3,800 – 6,000	1.5 – 2.4
Malaysia	15	15,000	6,500 – 8,000	2.6 – 3.2

**Source:** Megadiversity Country Data Tasks (CI, 2001) **Note:** Total world plant diversity estimated at 250,000

**Table 7.9** – IUCN Red List of Threatened Plants for ASEAN, 1997

Country	Ex	Ex/E	E	V	R	I	Total no. threatened	No. of species	% threatened
Cambodia			1	4			5		
Indonesia	1	4	24	73	102	61	264	29,375	0.9
Lao PDR					2		2		
Malaysia	3	3	84	146	14	113	490	15,500	3.2
Myanmar			3	7	14	8	32	7,000	0.5
Philippines		4	5	60	47	244	360	8,931	4.0
Singapore	1		4	7	8	10	29	2,168	1.3
Thailand			27	21	33	304	385	11,625	3.3
Viet Nam		2	6	25	301	7	341	10,500	3.2

**Source:** WCMC website

**Note:** Total number threatened includes **Ex** (Presumed Extinct), **Ex/E** (Critically Endangered), **E** (Endangered), **V** (Vulnerable), **R** (Lower Risk) and **I** (Invalid Taxon), but excludes extinct



**Box 7.4 – Biodiversity Hotspot: The Philippines**

The Philippines has been identified as one of the 17 megadiversity countries and one of the 25 biodiversity hotspots in the world. The government through the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) convened a National Biodiversity Conservation Priority Setting Workshop (NBCPSW) which called on the participation of experts from multisectoral, multidisciplinary institutions/agencies both local and foreign NGOs, academe and government, among others. The overall objective was to develop consensus on areas of high importance and priority actions needed for the conservation of biodiversity, through the NBCPSW as an urgent strategy to pool together scientific expertise and provide site-specific priority bases to ensure effective and strategic action to slow down/ stop environmental degradation, particularly biodiversity loss in the country. This 11 month activity was co-convened by the Conservation International (CI-Philippines) and the University of the Philippines, Quezon City, as the Scientific Adviser. One of the many supporting organizations was the ASEAN Regional Center for Biodiversity Conservation (ARCBC), Los Banos, Laguna.

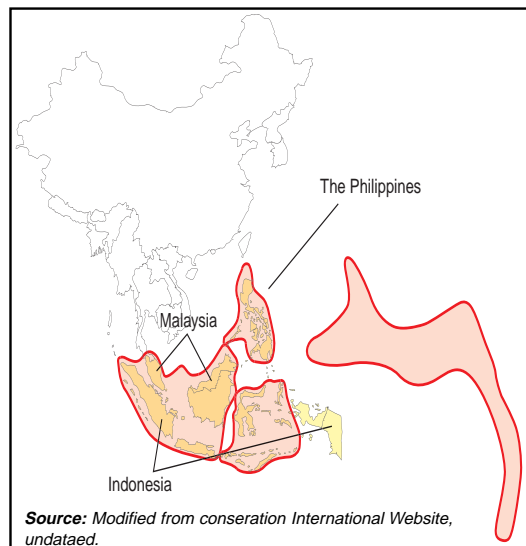
In terms of monitoring biodiversity, the Philippines is in the process of testing a Biodiversity Monitoring System (BMS) in 17 protected areas in the country. The System aims to improve the information available for decision-makers in protected areas through the following methods: (a) Field Diary – standardized recording of routine observations on resource use, habitat and wildlife in a simple pocketbook or data sheet during patrolling; (b) Photo Documentation – repeated taking of pictures over a certain period in a designated area; (c) Transect Walk – somewhat similar to routine patrolling using Field Diary. However, transects are permanent, demarcated routes where there are precise recommendations as to where to walk, when to walk and what to note, etc.; (d) Transect Swim – adaptation of Transect Walk method to marine areas; (f) Focus Group Discussion – constructive dialogue between protected area staff and local communities on the status and management of the protected area. The BMS was formulated as an output of the NORDECO-Technical Assistance for Improving Biodiversity Conservation in Protected Areas.

*Source: Protected Areas and Wildlife Bureau, DENR, Philippines*

**Table 7.10 – Protected Areas in ASEAN**

Country	Number of PAs	Land Area Protected	
		('000 ha)	(% of total)
Brunei Darussalam <sup>a/</sup>	13	930	16.4
Cambodia	20	2,863	15.8
Indonesia	331	19,253	10.1
Lao PDR <sup>b/</sup>	20	3,012	14.0
Malaysia	143	1,507	4.6
Myanmar <sup>b/</sup>	31	1,849	2.7
Philippines <sup>b/</sup>	243	4,268	14.0
Singapore <sup>b/</sup>	1	3	4.5
Thailand	158	7,077	13.8
Viet Nam	54	995	3.0
<b>ASEAN</b>	<b>1,014</b>	<b>41,757</b>	<b>9.5</b>

*Sources: World Resources 2000–2001 (WRI, 1999) except, <sup>a/</sup>Global Protected Areas Summary Statistics (WCMC, 1996), <sup>b/</sup>from respective countries; Data for Myanmar is provisional 1999 data.*



*Source: Modified from conservation International Website, undated.*

**Figure 7.6 - Biodiversity Hotspots in ASEAN**



trade in wild fauna and flora through a system of permits; and

- The 1992 Convention on Biological Diversity aims to achieve three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

Although not legally binding compared to conventions, the UNESCO Man and Biosphere Programme has also promoted the protection of representative natural ecosystems in ASEAN, including restoring degraded areas to more natural conditions. Seven such biosphere reserves have been established in the AMCs. These are discussed further in Chapter 11.

AMCs have developed a number of national strategies and action plans for biodiversity conservation. Among the activities being undertaken are research on conservation and



*Snow-capped mountain – ecosystem diversity of ASEAN*

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sustainable use, survey and monitoring, establishment of database and information exchange, human resource development, public education and awareness, and regulation of access to genetic resources. Boxes 7.5 and 7.6 describe some national approaches to improve fragile ecosystems in Indonesia and Viet Nam.

## Solid Waste Management

### Volume and Composition of Wastes

In the cities of ASEAN, solid waste generation is substantial. Poorly controlled disposal can lead to public health hazards, soil pollution and water pollution. This section deals with “Municipal Solid Waste” (MSW) – heterogeneous unwanted materials produced through daily activities of households, industry, offices and others. It consists mostly of decomposable organic materials, inert matter and sometimes smaller amounts of hazardous materials from hospitals and elsewhere. Proper management of MSWs renders them harmless to humankind by removal and transportation to a location where treatment and/or final disposal can eliminate potential hazards. Methods of disposal vary, dictated by land availability, environmental performance required at the disposal site, and affordability.



*Orang Utan*





**Box 7.5 – Karst Area Exploitation: Mining vs. Preservation in Indonesia**

Large-scale exploitation of Indonesia’s extensive karst (areas of irregular limestone in which erosion has produced fissures, sinkholes, underground streams, and caverns) is being carried out in a manner consistent with improved preservation of endangered areas. Through the consistent activity of the Indonesian Federation of Speological Activities since 1983, Indonesia’s Minister of Forestry, the Minister of Mining and Energy; the Minister of Tourism and Culture; the Minister of Home Affairs; and the Indonesian Science Institute have recognised the multifaceted value of Indonesia’s karst formations and caves.

Earlier recognition of karst formations as valuable and easily accessible sources of minerals (calcium carbonate and dolomite) led to their exploitation and caused irreparable damage. Karst formations are important as aquifers, habitats for animals such as bats and swiftlets, cultural heritage (archaeological burial sites, cave paintings and artefacts, and meditation and worship), for scientific research (biospeleology, speleogenesis and paleontology) and cave tourism. Indonesia has now taken steps toward preservation of this important ecosystem.

Supported by three successive Ministers of Mining and Energy, a ministerial decree regarding

national karst classification has been issued together with an implementation plan. Protection is to be achieved by a ‘Class 1’ classification: mining is prohibited due to scientific, ecological, cultural or aesthetic value, caves and/or aquifers at the site. (A Class 2 classification allows limited, strictly delineated, mining and the site may be preserved in part for non-mining values. A third category, Class 3, for sites with no significant non-mining values, may be mined for carbonic minerals.)

The ministerial decree will be followed by a presidential decree which is considered necessary to educate stakeholders and investors regarding the classification procedure. Some large mining activities have been hatted, awaiting interdisciplinary teams to evaluate and classify karst formations. It is not known what degree of compliance will be achieved. However, it is important to support the 1993 appeal of the International Union of Speleology announcing World Heritage status for the world famous classical tropical karst of Gunung Sewu, Maros and Irian Jaya, already partially exploited for cement, marble and chalk. A multidisciplinary intergovernmental team, backed up by scientists in karst studies, NGOs and scientific centres is to classify many karst areas during 2001.

*Source: Dr. R. K. T. Ko, Indonesia*

Some limited information on MSW generation and collection for major cities in the ASEAN region is summarised in Table 7.11. MSW

production tends to increase with income levels. For ASEAN cities, generation ranges from about 0.5–1.5 kg per capita per day. In high income countries, the range is from 1–2 kg per capita.



*Indiscriminate dumping of solid waste*

WWF/Dionysius Sharma

The amount of MSW collected for disposal varies among cities in ASEAN. Bangkok Metropolis has the highest amount – 8,952 tons per day in 1998 – projected to reach 15,700 tons by 2019 and requiring an estimated 3,200 ha (32 sq km) of land for sanitary landfill. This requirement has significant implications for land use planning and MSW management planning.



### Box 7.6 – Viet Nam: Building Eco-villages within Fragile Ecosystems

Viet Nam has over one million ha of coastal sandy and marshy land, about 150,000 ha of submerged land in the delta and two million ha of barren hills and mountains. There is considerable potential for increasing food production, achieving ecological balance, reducing the threat of serious flooding, and the loss of life and damage to property. From 1993 to 2000, the Institute of Ecological Economy under the Viet Nam Association for Nature and Environment Protection built six 'eco-villages' in three different ecosystems: hilly and mountainous areas, sandy coastlands and coastal marshes and submerged lands.

*Ethnic Dao eco-village on barren hills, Ba Vi district, Ha Tay province.* Local villagers using shifting cultivation in the buffer zone of Ba Vi National Park previously encroached into forest areas and expanded depleted zones. Intervening to halt and reverse environmental degradation, the project applied traditional rice terracing with labour-saving innovations to increase production and economic returns. Earth banks were planted as hedgerows to control erosion, reduce runoff, store rainfall, and improve fertility. Resultant higher yields meant more food for family use and for sale at market. Trees for fruit, firewood and timber were planted on hilltops and as canopies in conjunction with selected food crops. A kindergarten and village clinic for mothers and children were also begun. Within 5 years since inception, it has become a model for other villagers to replicate.

*Ba Trai ethnic Muong eco-village, Ba Vi district, Ha Tay province.* Tea mono-cropping provided limited income for the ethnic Muong villagers. Monoculture also meant that the village environs were artificially fragile: shallow root systems, fed by light application of chemical fertilisers, resulted in an inappropriate physical structure of the soil. Introduction of fruit trees and microbiological gardens for a multi-level cropping system improved economic performance and ecological viability.

*Trieu Van eco-village, Trieu Phong district, Quang Tri province.* This coastal area characterised by migrating sand hills and low-grade agricultural fields provided poor quality living for inhabitants.

The project helped local villagers to plan and dig drainage ditches and build raised beds for casuarina and acacia trees. After a year of growth, the trees provided shade for sweet potatoes. Three years later, when the environmental conditions have significantly improved, maize, beans, tomato, millet, groundnut and sesame were grown. Accessible ground water allowed digging of wells and fishponds, with a resultant village change from subsistence to relative abundance. What was formerly a white sand wasteland has changed into a model village.

*Hai Thuy eco-village, Le Thuy district, Quang Binh province.* Built on inherently unstable moving sand hills, the village was forced to move inland by wind and water, challenging the existence of homes and farmsteads. An investigation of the natural transfer of water within the sand dunes was carried out. It was decided to use the hill-contained water both for crops and to generate electricity. Local fishermen dug 40 fish culture ponds and reclaimed hills for a similar number of vegetable gardens and for other food crops. Now almost all homes have electricity from generators operated by wind and the water flow.

*Phu Dien eco-village, Nam Sach district, Hai Duong province.* Difficult natural conditions – submerged fields during the wet season, limited rice planting to one crop per season – meant that the land did not achieve full productive value. The project helped farmers turn one fourth of the area into fishponds, while another fourth was reclaimed for fruit trees. The remainder was dedicated to rice production. After two years, the fruit orchards provided cover for vegetable production plus fish, fruit and vegetable production. These changes plus a tree canopy make Phu Dien village a wealthier, healthier and happier place to live. Local women were formerly unemployed during the off-season, but now their farms operate year round and they have more fish and vegetables. Their success has been a model for other villages.

*Xuan Lam eco-village, Tinh Gia district, Thanh Hoa province.* In the past, coastal mangrove forests were developed as forest reserve or redeveloped

(continued next page)



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into shrimp farms. Under a new approach, coastal marshes in Xuan Lam were planted to restore marshy flora and ecological balance for aquatic tidal fauna. The project aimed to restore mangroves, which it did successfully; trees developed well, growing to 1.5 m height in two years. In the third year, one tenth of the mangroves were excavated to make way for shrimp rearing

ponds, while the overall mangrove habitat was maintained. A unique mangrove ecosystem is being developed and modified to include gardens and ponds. The next step is planned in 2002: to extend diversification allowing rice production as well.

**Source:** Information provided by Viet Nam

Information on the extent of collection of MSW among ASEAN cities is limited. Table 7.11 suggests a range of 32%–100% whereas 85%–95% is a reasonable goal for well managed systems. As summarised in Table 7.12, MSW (at the time of collection) in ASEAN cities is characterised by high moisture content, high proportion of organic matter and market wastes, and low heating value.

### Waste Recycling

The terms 'recovery', 'reuse', and 'reclamation' tend to be used synonymously with 'waste recycling'. Informal recycling by households for cash is common in ASEAN's cities and reduces the amount of MSW treated as wastes. Saleable materials are scavenged from household or communal containers, during transporting to dump sites, and at dump sites.

Studies of informal MSW recovery were conducted in Thailand in 1999 and Singapore in 1998. Findings are summarised in Tables 7.13 and 7.14. In Thailand the recycling rate was high for paper (78%) followed by glass (70%) and ferrous material (37%). In Singapore, the recycling rate for glass (10%) and paper (40%) was much lower compared to Thailand, while recycling rates for metals were significantly higher (85%–92%) perhaps as the availability of metallic wastes in MSW would be higher in cities with large per capita incomes.

City governments in several AMCs have taken steps to establish mechanisms to convert informal waste recycling activities into more formal businesses. The experiences of three attempts, described in Box 7.7, suggest that a better approach might be to help strengthen existing informal waste recycling systems rather than create new ones.



WWWFM/S.Sreedharan

Landfill

### MSW Disposal

Land disposal is the most commonly used method for most cities in ASEAN except Singapore (Table 7.15) where 85% of MSW is incinerated. Singapore has one off-shore landfill site and four incineration plants. Land disposal is used in most countries because land is available cheaply, requires



**Table 7.11** – MSW Generation & Collection in ASEAN Member Countries and Elsewhere

Country	City	Waste Generation (kg / capita / day)	Waste Collection: (tons / day)	(%)
<i>ASEAN Member Countries</i>				
Brunei Darussalam	Bandar Seri Begawan	1.0	333	N/A
Cambodia	Phnom Penh	0.756 (1998)	838 (1998)	80
Indonesia	Jakarta	0.82 (1990)	6,560 (1990)	
Malaysia <sup>al</sup>	Kuala Lumpur	1.5 (1997)	–	
Myanmar	Yangon	0.45 (1993)	1,510 (1993)	32
Philippines	Metro Manila	0.4 – 0.5 (1989)	4,000 (1989)	
Singapore <sup>al</sup>	–	1.1 (1998)	7780 (1999)	100
Thailand	Bangkok	1.51 (1997)	8,592 (1998)	90
Viet Nam	Ha Noi	1.14 (1998)	1,370 (1998)	65 – 80
<i>High-income Economies</i>				
Japan	Tokyo	1.5 (1993)	–	
Hong Kong	–	1.34 (1997)	–	
Switzerland	–	1.1 (1992)	–	
Australia	–	1.89 (1992)	–	
USA	–	2.0 (1994)	–	

**Source:** Bangkok Metropolitan Administration, 1999 except <sup>al</sup> from respective governments.

a much smaller capital outlay, and has low operating expenses compared to alternatives. Composting is done but not widely practised because of poor quality compost (when feedstock is not sorted before composting), limited market demand, low market value, and small radius of supply. In Bangkok, a composting plant closed down despite estimated market for good quality compost of 3,000 tons per day.

Except for Singapore, incineration of MSW remains uncommon. In Thailand, the City of Phuket built a modern incineration plant with 250 tons per day (t/d) capacity. The

**Table 7.12** – Solid Waste Composition in ASEAN Cities (%)

Composition	Bangkok	Bandar Seri Begawan <sup>al</sup>	Central Jakarta	North Jakarta	Phnom Penh
Organic waste	44.28	37	57.05	74	87.00
Plastic bottle	17.43		11.5	8	0.60
Mixed plastic	17.43	13	11.5	8	1.70
Polystyrene	–		–	–	0.10
Paper	11.39	26	13.51	9.5	2.90
Metal	2.30	11	1.94	2	2.30
Can alum.	–		–	–	0.10
Can iron	–		–	–	1.70
Iron	–		–	–	0.50
Glass	4.47	6	2.1	1.75	0.70
Wood	5.77	2	–	–	1.30
Textiles	6.17	2	3.08	1.5	0.80
Scrap rubber	–	1	1.41	0.5	0.60
THW	–		–	–	0.10
Residual waste	–		–	–	2.00
Others	3.16	2	9.41	2.75	–
Density (kg/cu m)			–	–	590

**Source:** Work group report "Recycling in Phnom Penh" (22 April 1997)  
Solid waste Master Plan of Bangkok (BMA 2000);  
<sup>al</sup> from Brunei Darussalam





### Box 7.7 - Converting Informal Waste Recycling Activities Into Formal Systems

**Manila's Eco-Centre.** In the late 1970s, the Department of Human Settlements of the Philippines initiated a pilot project in Manila on waste recycling and trading. It established 30 eco-centres intended to promote waste collection at source and improve the earnings of collectors by bypassing their middlemen. The eco-centres sold recovered wastes to a single recycling corporation. The scheme soon ran into numerous difficulties regarding financing,

management, and marketing of reclaimed wastes, and was eventually abolished. Reasons for the failure included competition with the existing informal system of waste recovery and resistance of the middlemen whose profits declined. Although not successful, the Manila experiment attracted interest because it was a well-documented example of an attempt by a government department to improve waste recovery by formalising it.

**Bandung's Ecovilles.** In Indonesia, the Centre for Environmental Studies of the Bandung Institute of Technology proposed waste-recycling 'ecovilles' whereby communities of former waste pickers and scavengers would be established in residential urban neighbourhoods. Primary collection of refuse would be by ecovilles members, through cooperatives. They would sort out recyclables and compost the organic materials in their settlements, leaving only useless residues to be

collected by municipal staff and transported to the dumps. Ecoville members would be assisted in designing and building basic housing with sanitary facilities, and in acquiring the necessary skills. However, the municipality did not accept the practicality of the proposal. The city of Surabaya was willing to cooperate and funding was allocated from the Ford Foundation. Nonetheless, no ecoville were established in Surabaya either due to land scarcity or opposition of residents.

**Jakarta's Waste Processing Zones.** The Centre for Environmental Studies proposed another version of the concept. Waste processing was to be developed throughout Jakarta, beginning with about five initial sites. Under this revised scheme, waste pickers were to rent space in the zone, to which they would

bring gathered refuse items for sorting, processing (e.g., compost making) and trading. The zones were to be work places, not residential communities of the earlier 'ecoville' concept. The pilot projects received only partial support for three months and has since been abandoned.

*Source: Information for respective governments.*

Bangkok Metropolitan Administration (BMA) has plans for a 2,000 t/d integrated MSW processing complex at which MSW will be sorted into streams for composting, land filling, recycling, and incineration. The plant will include electricity generation capacity of about 25 megawatts (MW). However, NGOs have expressed strong concern about incineration due to emissions, especially of dioxin. The Philippines 1999 Clean Air Act explicitly bans incineration.

### MSW Management

Management of MSW in most ASEAN cities faces common issues and problems. Collection and disposal have long been treated as social services rather than public utilities with charges kept low relative to true cost. For example, households in Bangkok are charged 40 Baht (about US\$0.95) or less per month for MSW service. Therefore MSW operations must be subsidised from other sources of revenue. The

**Table 7.13** – Waste Recycling in Thailand, 1999

Waste Type	National Consumption ('000 tons)	Quantity Recycled ('000 tons)	Recycling Rate (%)
Paper	1,908	1,500	78
Glass	1,170	820	70
Glass	150	39	26
Ferrous Material	5,619	2,088	37
Aluminium	448	144	32
Plastic	2,350	580	25

Source: Pollution Control Department, Thailand 2000

capacities of most local governments in MSW management require strengthening. In Bangkok, collection efficiency is only 1.3 tons/day/worker compared to 3.2 tons/day/worker in Kuala

Lumpur and 8.5 tons/day/worker in Singapore. Low productivity of collection in Bangkok is due mainly to traffic congestion and the time spent by workers in sorting out saleable materials from collected wastes (BMA, 2000).

It is difficult for many ASEAN cities to find new MSW disposal sites as local people are increasingly aware of the environmental impacts of inadequately managed sites. The NIMBY attitude – Not In My Backyard – is particularly strong when MSW is transported from

other cities, a growing problem in Thailand. As the volume of MSW increases, so does the need for improving performance of disposal sites: landfill sites require adequate lining to protect

**Table 7.14** – Waste Recycling in Singapore, 1999

Waste Type	Estimated Quantity in Tonnes			Recycling Rate (%)
	Total Waste Output	Total Waste Disposed	Total Waste Recycled	
Food Waste	1,108,500	1,083,500	25,000	2.3
Paper/Cardboard	964,100	575,300	388,800	40.3
Plastics	191,900	162,000	29,900	15.6
Construction debris	414,200	125,700	288,500	69.7
Wood/Timber	281,600	248,500	33,100	11.8
Horticultural waste	120,400	75,400	45,000	37.4
Earth spoils	75,400	75,400	–	–
Ferrous metals	886,400	75,400	811,000	91.5
Non-ferrous metals	90,200	14,000	76,200	84.5
Used slag	297,100	120,100	177,000	59.6
Sludge (Industry/PUB)	50,300	50,300	–	–
Glass	34,100	30,700	3,400	10.0
Textile/Leather	25,100	25,100	–	–
Scrap tyres	7,900	5,600	2,300	29.1
Others	126,900	125,600	1,300	1.0
<i>Total</i>	<i>4,674,100</i>	<i>2,792,600</i>	<i>1,881,500</i>	<i>40.3</i>

Source: Annual Report (Ministry of the Environment, Singapore 1999) Note: PUB - Public Utilities Board



groundwater, leachate needs adequate treatment and landfill gas requires better control. Increasingly, hazardous materials (which should be separated at source) appear in MSW: expired medicines, dry batteries, spray cans, infectious materials, and even radioactive substances.

Institutional arrangements for MSW management are generally simpler than those for water and air quality management: fewer government agencies are involved. Typically, national environmental agencies provide broad national policies and plans. Local governments are responsible for routine MSW operations and new investment. Table 7.16 summarises institutional arrangements for MSW management in AMCs.

### Hazardous Wastes

Management of toxic and hazardous<sup>7</sup> wastes (THW) has generally been regarded as a

significant problem primarily in those AMCs with a large and relatively broad-based industrial sector: Indonesia, Malaysia, the Philippines, Singapore and Thailand. In the remaining five countries (Brunei Darussalam, Cambodia, the Lao PDR, Myanmar, and Viet Nam), THW has been regarded as less serious, the main concern being to prevent illegal exports of THW from other countries into AMCs.<sup>8</sup>

Globally, between 300 and 500 million tons of hazardous waste are generated annually, with over 90% originating in industrialised nations. (*Hazardous Waste Trade*, IISD website, undated). A 1988 ASEAN study on THW estimated that 3,000-6,000 tons of THW were generated for every US\$1 billion worth of output in OECD countries. About 5%–6% of THW generated within the OECD was shipped across frontiers of which about 15% was exported to non-OECD countries. 50%–60% of this went to AMCs. It is estimated that AMCs also account for

**Table 7.15** – Solid Waste Disposal Methods in some ASEAN Member Countries

Country	Open Dumping	Controlled tipping	Sanitary landfill	Disposal in water*	Marine disposal	Open burning	Incineration	Compost	Anaerobic Digestion	Other	Recycle & Recover
Brunei <sup>a/</sup> Darussalam	no	90% MSW	practised	–	–	–	–			10% MSW	
Cambodia	80% MSW			practiced		practiced					informal
Indonesia	no control	80% MSW		drains		in pits	5% MSW	10% MSW		5% MSW	
Lao PDR	practiced		practiced	swamps rivers		practiced					
Malaysia	practiced	70% MSW		rivers	practiced	practiced	5% MSW	10% MSW		15% MSW	
Myanmar	practiced	partly in Yangon	practiced								informal
Philippines	85% MSW		Metro Manila	drains rivers		practiced		10% MSW	practiced	5% MSW	informal govt.
Singapore			15% MSW				85% MSW	some			formally organised
Thailand	70% MSW		20% MSW	canals rivers			1% MSW	10% MSW			practiced
Viet Nam	practiced							practiced			

**Source:** ADB, 1995 except <sup>a/</sup> from Brunei Darussalam **Note:** \* = disposal in canals, rivers or lakes



about 40% of all THW traded among developing countries, a significant volume.

Some data on quantities of THW generated and collected in several AMCs is given in Table 7.17 based on information from government reports. In 1999, industries in Singapore reportedly generated about 118,000 tons of toxic industrial wastes. Of this, 70% was recovered or reclaimed for reuse and the remaining 30% was treated for disposal by landfill (*Annual Report 1999*, Singapore Ministry of Environment). In addition, about 9,000 tons of infectious wastes from hospitals and clinics was collected and treated. In Malaysia, nearly 399,000 tons of THW were collected in 1998. Of this, over half went to

recovery facilities, centrally treated (14%), treated on-site (6%), and exported for special treatment (2%). The remaining 25% was uncollected, probably stored on-site. In 1998, two central THW treatment facilities received 191,000 tons of THW. The data for Indonesia covers only some regions, for various years from 1987 to 1995. The total of 274,000 tons is not for one specific year but reflects the annual magnitude of THW produced. In 1999 the centralised processing plant received nearly 19,000 tons, compared to a peak of 29,000 tons in 1995. The amount of hazardous waste in Thailand has increased continually and reached 1.65 million tons in 2000. As a principal source of hazardous waste, the industrial sector produced

**Table 7.16** – Institutional Arrangements for MSW Management in ASEAN

Country	National Policy and Planning	MSW Management and Operations	Private Sector Participation
Brunei Darussalam	Public Works Department Ministry of Development	Public Works Dept. Ministry of Development	Yes, all districts
Cambodia	Dept of Public Works and Transportation Ministry of Environment		Phnom Penh
Indonesia	Dept. of Public Works	Local governments	Jakarta, Bandung, and others
Lao PDR	Dept. of Housing and Urban Planning Min. of Public Health; and Science and Technology Organization	Local governments	
Malaysia	Ministry of Housing and Local Government	Local Authorities	4 consortia have been established to manage solid waste collection and disposal all over Peninsular Malaysia
Myanmar	State Peace and Development Council under the direction of the Cabinet	City Development Committees	Yangon
Philippines	Environmental Management Bureau; Dept. of Environment & Natural Resources		
Singapore	Environmental Services Department, Ministry of the Environment		All MSW collection has been privatised
Thailand	Office of Environmental Policy and Planning, Pollution Control Department	Local governments, such as municipalities	Bangkok, Phuket
Viet Nam	Min. of Science, Technology and Environment, and Ministry of Construction	City governments	

**Sources:** ASEAN Secretariat and AMCs





up to 1.29 million tons or 78% of the total amount. However, only 0.22 million tons or 17% of these industrial wastes were treated at central facilities and a small amount (164 tons) exported together with the municipal waste or illegally dumped. Community generated THW (0.36 million tons or 22% of the total) are not properly disposed of and treated.



WWF/Azward MN

*Indiscriminate dumping of toxic wastes*

Another THW issue is proper containment or destruction of large volumes of toxic chemicals used during wars of the 1960s–70s in the region and/or stored for long periods since then. From 1961–71, for example, the a foreign military sprayed 72 million litres of herbicides (61% of which was Agent Orange including about 170 kg of dioxins) over large parts of Viet Nam, the Lao PDR and Cambodia; 9,000 tonnes of tear gas; and 100,000 tonnes of napalm and other substances. Dioxin residues and buried toxic chemicals have been recently identified in many provinces in Viet Nam (*State of the Environment Report*, Viet Nam, 1999). Of the fifty Persistent Organic Pollutant (POPs) ‘toxic hotspots’ recently

identified globally (Greenpeace, 1999), three are in AMCs: i) the Philippines (stockpiles of PCBs, dieldrin, aldrin, chlordane, lindane, hexachlorobenzene, possibly dioxins, other pesticides, and heavy metals, all at former foreign military bases); ii) Thailand (Agent Orange dioxin apparently stockpiled by foreign military in the 1970s); and iii) Viet Nam (dioxins and other toxics as described above). It is important to pay careful attention to dioxins.<sup>9</sup>

THW management in AMCs is at a relatively early stage. Indonesia, Malaysia, the Philippines, Singapore, and Thailand have established legal and institutional frameworks. Indonesia, Malaysia, Singapore, and Thailand have granted concessions to the private sector to construct central THW processing facilities. A review of THW management in eight countries (Canada, Denmark, Germany, Hong Kong and the United States plus the AMCs: Indonesia, Malaysia, and Thailand) concludes that it takes a long time – 10 to 15 years – to develop an effective THW management programme. Programmes evolve through a complex process subject to the economic, political, legal, and cultural context of individual countries.

**Table 7.17** – Industrial Toxic and Hazardous Waste Generated in some ASEAN Member Countries

Country	Industrial THW			Data Year
	Generated (tons)	Recovered (%)	Treated (%)	
Singapore	118,000	70	30	1999
Malaysia <sup>a/</sup>	398,518	52.60	13.9 <sup>b/</sup>	1998
			6 <sup>c/</sup>	1998
			2.2 <sup>d/</sup>	1998
Thailand	1,290,000		17 <sup>b/ d/</sup>	1998
Indonesia	273,842			various: 1987-95

**Source:** from AMC government reports

**Note :** <sup>a/</sup> estimated <sup>b/</sup> treated and disposed at central facility

<sup>c/</sup> treated in site

<sup>d/</sup> exported for treatment in other countries



As programmes improve, they typically pass through five stages: i) identifying the problem and enacting legislation; ii) designing and designating a lead agency with clear lines of authority; iii) promulgating rules and regulations; iv) developing treatment and disposal capacity; and v) developing a mature compliance and

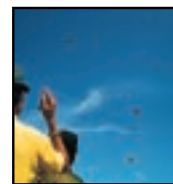
enforcement programme. AMCs are at various stages of this evolution. Indonesia, Malaysia, the Philippines, Thailand and Singapore are within stages iii) and iv). These countries, except the Philippines, have developed treatment and disposal capacity with the participation of the private sector.

- <sup>1</sup> However, the forest cover data of Table 7.1 are for 1988-1994. As shown in the most recent information of Table 7.3, deforestation in ASEAN has been considerable for the decade 1990 - 2000.
- <sup>2</sup> The older FAO data shown in Tables 7.1 and 7.2 are apparently not completely consistent with the new data of Table 7.3 as the earlier years have been reassessed by FAO. For example, the older series showed ASEAN as 53.1% forested in 1990 whereas the revised data indicate 53.5%. Indonesia forest cover is shown as 62% and 65%, for the old and new data respectively in 1990. Other national data also differ slightly.
- <sup>3</sup> Three types of water erosion are defined by ISRIC: loss of topsoil by sheet erosion/surface wash; terrain deformation by gully and/or hill erosion or mass movements; and off-site effects of water erosion in up-stream areas.
- <sup>4</sup> ISRIC defines three types of chemical deterioration: fertility decline and reduced organic matter content (through a net decrease of available nutrients and organic matter); salinisation/alkalinisation (net increase of the salt content of topsoil leading to a productivity decline); and dystriification or lowering of soil pH (increased soil acidity).
- <sup>5</sup> The IUCN definition of a Protected Area is: "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means."
- <sup>6</sup> The protected areas total excludes 94 marine areas. There are 9.7 million ha of protected coastal and marine areas in five AMCs. Indonesia accounts for 92% of total area and Thailand 6.5%. The remaining 0.5% is shared by Malaysia, the Philippines and Viet Nam (ASEAN Achievements and Future Directions in Pollution Control 2001, forth coming).
- <sup>7</sup> Hazardous and toxic wastes are not the same although hazardous wastes are often toxic. A *toxic waste* is any discarded material capable of causing harm or death to living organisms, especially by chemical means. Examples are lead, mercury, and dioxins. 'Supertoxics' can include carcinogens (cancer causing) or teratogenic (causing malformations in a foetus) or mutagenic (causing mutations) materials. A *hazardous waste* is a substance, such as nuclear waste or an industrial byproduct, that is potentially damaging to the environment and harmful to the health and well-being of human beings and other living organisms. They are often solid, liquid or gaseous materials which are: i) ignitable, ii) corrosive, iii) highly reactive, and/or iv) toxic.
- <sup>8</sup> A successful recent case in which Cambodia was able to force a foreign company to take back THWs illegally shipped to the port of Kompong Som (Sihanoukville) is well documented in the Basel Action Network (BAN) website.
- <sup>9</sup> Exposure to dioxins can produce an increase in all cancers and non-cancerous tumors; diminished levels of the male hormone, testosterone; increased incidence of diabetes; developmental effects; chloracne; and altered immune and endocrine function. Dioxins in the body of a pregnant woman can cause irreversible changes in the development of the central nervous system, immune system, reproductive system and endocrine system of her fetus. The dioxins in a woman's body are also passed to her nursing infant in breast milk.



## Chapter 8

# Atmosphere



**W**ith increasing industrialization and urbanization in ASEAN member countries, air pollution has become a more serious problem. A major source of air pollution in AMCs is the combustion of fossil fuels, especially from motor vehicles and thermal electric power stations. In some AMCs, substantial indoor pollution results from inefficient burning of charcoal or wood for cooking. However, the most serious problem in the region in recent years has been transboundary haze pollution from land and forest fires. ASEAN's response to the transboundary haze problem has been swift and substantial. AMCs have addressed air pollution through a variety of measures, including legal, enforcement and specific programs and activities. While lead, sulphur dioxide and nitrogen dioxide pollutants are well below WHO guidelines in many ASEAN countries, other pollutants such as total suspended particulates are of particular concern. This Chapter highlights the problems caused by air pollution, and the measures taken by AMCs collectively and individually to address them.

### ASEAN FACTS AND FIGURES

Urban Air Quality	WHO Guideline	ASEAN Range
<b>total suspended particulates</b>	100 µg/cu m	95–270
<b>sulphur dioxide</b>	50 µg/cu m	< 50
<b>nitrogen dioxide</b>	50 µg/cu m	< 50
Leaded Gasoline	Phased out in much of ASEAN; planned for the rest by 2001–2005	
Lead in Ambient Air	Before change to unleaded gas:	After change to unleaded gas:
<b>Malaysia and Thailand</b>	1.4 – 1.5 µg/cu m	about 0.1 µg/cu m
<b>Singapore</b>	0.5 – 0.6 µg/cu m	about 0.1 µg/cu m
Cost of the 1997–1998 Haze	US\$ 9 billion	
<b>Land Damaged in Indonesia</b>	9 million hectares	
<b>People Adversely Affected</b>	70 million	



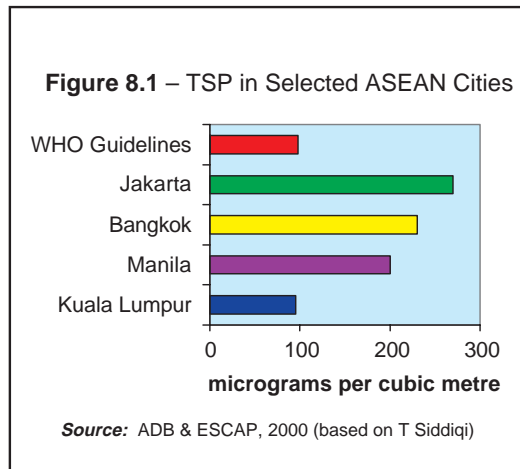


## Urban Air Quality

The combustion of fossil fuels and biomass in transport, industries, agriculture and households releases huge volumes of pollutants. For most ASEAN cities, the rapid growth in transportation has caused the release of various gases and particulate matter into the atmosphere, impacting on the health of the people. The common air pollutants and their effects on health are summarised in Table 8.1.

Figure 8.1 shows the annual average level of 'total suspended particulates' (TSP) in the air of several ASEAN cities in the late 1990s. Except for Kuala Lumpur, these were more than double the World Health Organisation (WHO) guidelines. However, Manila and Bangkok were well within the WHO annual mean limit of 50 micrograms per cu m for sulphur dioxide (SO<sub>2</sub>). The amount of nitrogen dioxide (NO<sub>2</sub>) released in Bangkok is only about half of the WHO guideline of 50 µg/cu m.

Air quality in most urban centres in ASEAN is improving but remains unsatisfactory (Box 8.1). Urban air pollution is significant in major cities such as Bangkok, Jakarta, Manila, Ha Noi, Ho Chi Minh City, and Kuala Lumpur; as well as some secondary cities such as Surabaya and Bandung in Indonesia; Cebu and Davao in the Philippines; and Chiang Mai and Hatyai in Thailand.<sup>1</sup> Urban areas with high usage of three-



**Table 8.1 – Health Effects Associated with Common Air Pollutants**

Pollutant	Population at risk	Health Impact	Exacerbating Factors
Particulate emissions	Entire population, especially motorists and pedestrians	Increase in illness, cancer and death from respiratory illness and decrease in lung function	Especially PM <sub>10</sub> or if there are high concentrations of diesel emissions
Lead (Pb)	Children, motorists, and pedestrians	Acts as an acute toxin, damaging the kidneys, nervous system, and brain	Chronic exposure to lead also increases death rates from stroke and heart disease
Carbon monoxide (CO)	Pedestrians, roadside vendors, and vehicle drivers	Shortness of breath, increased blood pressure, headaches, and difficulty in concentration	Most significant in pregnant women, young children, and those suffering from heart and respiratory diseases
Nitrogen dioxide (NO <sub>2</sub> )	Urban commuters and dwellers	Respiratory infection, increased airway resistance, and decreased lung function	Most significant effects in children and asthmatics
Ozone (O <sub>3</sub> )	Urban commuters and dwellers	Irritation of the eyes and respiratory tract and reduced lung function	Long-term exposure may cause irreversible deterioration of lung.
High BOD	Users of untreated public water supplies	Gastro-intestinal illnesses	Greatest impact through dehydration and diarrhoea in young children
Heavy metals	Ingested through water supply or from exposed foods	Poisoning, increased child morbidity, and mortality	Populations on watercourses close to gold mining at risk of mercury poisoning

**Source:** ADB & ESCAP, 2000; **Note:** PM<sub>10</sub> = particulate matter of 10 microns or less; BOD = Biological Oxygen Demand



wheeled vehicles and motorcycles tend to have relatively high air pollution as the vehicles generally use inefficient two-stroke engines which can release ten times the emissions of automobile engines.

### Rural Air Quality

Data on air quality in AMCs are mainly available for *outdoor urban* levels of various pollutants. Although data for the region were not

#### Box 8.1 - Air Quality in Some ASEAN Cities

**Brunei Darussalam.** The PSI readings in Brunei Darussalam during the period January to September 1998 as detected by the Post Office Air Quality Monitoring Station were good, as levels of

PM<sub>10</sub>, nitrogen dioxide, ozone, carbon monoxide and sulphur dioxide shown below fell within the "healthy" standard.

PSI at the Post Office Air Quality Monitoring Station, Brunei Darussalam, January to September 1998

	Jan 1998	Feb 1998	Mar 1998	Apr 1998	May 1998	June 1998	July 1998	Aug 1998	Sep 1998
PSI PM <sub>10</sub>	18	12	12	—	23	12	13	12	24
PSI NO <sub>2</sub>	9	12	12	—	23	21	20	18	19
PSI O <sub>3</sub>	32	35	39		37	29	25	23	27
PSI CO	19	34	65	6	36	37	43	46	47
PSI SO <sub>2</sub>	3	2	6	0	3	3	4	5	2

**Indonesia.** Urban air quality in major cities in Indonesia is often unsatisfactory. Unleaded gasoline remains widely used and only 33% cars met mandated emission standards in 1999. Dust is the main problem in Jakarta, and forest fires in Pontianak in Kalimantan. Jakarta's air quality for 1999, with moderate levels of pollution most of the time, is shown at the right. In 1999, no days were considered 'very unhealthy' or 'dangerous'.

Month	Days with Air Quality Indicated		
	Good	Moderate	Unhealthy
Jan.	23	8	0
Feb.	12	16	0
Mar.	16	15	0
April	16	14	0
May	3	27	1
June	1	28	1
July	1	26	4
Aug.	1	28	2
Sept.	0	30	0
Oct.	3	28	0
Nov.	17	11	0
Dec.	13	17	1
%	29.2	68.3	2.5

**Malaysia.** On average, the air quality in Malaysia in 1998 – measured as Air Pollution Index (API) – was good throughout the year except in Miri in Sarawak where air quality reached the 'hazardous level', mainly due to high concentrations of PM<sub>10</sub> emitted from forest and peat fires nearby. The API in Kota Kinabalu reached

unhealthy levels during the same period as a result of the same cause. Levels of carbon monoxide, ozone, sulphur dioxide, nitrogen dioxide and lead were all well below the permissible maximum levels prescribed in Malaysia's recommended air quality guidelines.

(continued next page)



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**Singapore.** In 1999, the annual average concentration of sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, and PM<sub>10</sub> were all within the US Environmental Protection Agency (USEPA) standards which have been adopted by Singapore. Overall average concentrations are shown on the right. The Pollution Standard Index (PSI) was “good” for 65% of days measured during 1999 and “moderate” for 35%.

Pollutant	Concentration
Sulphur Dioxide	22 µg/cu m
Nitrogen Dioxide	36 µg/cu m
PM	34 µg/cu m
Low-level Ozone	< 235 µg/cu m limit
Carbon Monoxide	0.9 mg/cu m

**Viet Nam.** The 1996 data on air quality for Viet Nam shows that levels of TSP exceeded the permissible level of 0.1 µg/cu m in Ha Noi, Hai Phong, Can Tho, and Ho Chi Minh. Sulphur dioxide concentrations were below the permissible level of 0.5 mg/cu m in residential areas but exceeded the

permissible level in industrial areas. Nitrogen dioxide was lower than the permissible level of 0.1 mg/cu m. In only one industrial zone did the nitrogen dioxide level of 0.177 mg/cu m exceed the permissible limit.

**Thailand.** The Bangkok Metropolitan Area (BMA) has had serious air pollution problems. However, overall air quality in BMA in 1998 (shown below) improved compared to previous years. Levels of sulphur dioxide, nitrogen dioxide, carbon monoxide, TSP and lead were all within the national

standards while ozone slightly exceeded the limit. The main concern was PM<sub>10</sub> which exceeded the limit 12% of the time. Air quality in other urban centres, although slightly better, exhibited a picture similar to that of Bangkok.

Pollutant	Standard	Ambient Air Quality					Roadside Air Quality				
		Max	P 95	Ave	Min	% measured exceeding limit	Max	P 95	Ave	Min	% measured exceeding limit
<b>SO<sub>2</sub></b> 1 hr (ppb)	300	177	19	6.2	0	0 ( 0 / 65,307 )	140	27	9.8	0	0 ( 0 / 21,246 )
<b>NO<sub>2</sub></b> 1 hr (ppb)	170	142	49	21	0	0 ( 0 / 55,660 )	183	71	32.9	0	0.005 ( 1 / 18,272 )
<b>CO</b> 1 hr (ppb) 8 hr (ppm)	30 9	13 6.04	2.6 2.23	0.93 0.94	0 0	0 ( 0 / 64,174 ) 0 ( 0 / 62,295 )	33.7 18.04	6 5.6	2.2 2.28	0 0	0.01 ( 3 / 45,022 ) 0.71 ( 298 / 44,692 )
<b>O<sub>3</sub></b> 1 hr (ppb)	100	191	47	14	0	0.26 ( 120 / 45,714 )	112	29	8	0	0.01 ( 3 / 21,907 )
<b>PM<sub>10</sub></b> 24 hr (µg/cu m)	120	225	126	66.4	23	6.38 ( 108 / 1,692 )	251	150	81.6	9	12 ( 156 / 1,304 )
<b>Dust</b> 24 hr (mg/cu m)	0.33	0.33	0.19	0.1	0.02	0 ( 0 / 760 )	2.71	0.64	0.29	0.06	28 ( 211 / 751 )
<b>Lead</b> 1 m (µg/cu m)	1.5	0.49	0.2	0.08	0.02	0 ( 0 / 97 )	0.25	0.16	0.08	0.02	0 ( 0 / 83 )

**Note:** P95 = Percentile 95 For lead, 1 m = 1 month

**Source:** Information from respective governments



available for this report, it should be noted that indoor air pollution in some rural (and urban) areas of ASEAN may be a worse health hazard than outdoor pollution for those who depend on wood, charcoal and other biomass fuels. When burned using inefficient stoves with poor ventilation, concentrations of particulates may exceed WHO guidelines by ten times or more (ADB & ESCAP, 2000). Over time, there is a high risk of emphysema, other lung problems and serious eye irritations, mainly affecting women. This is compounded by numerous factories in the region with poorly controlled emissions.

### Improving Air Quality in ASEAN Member Countries

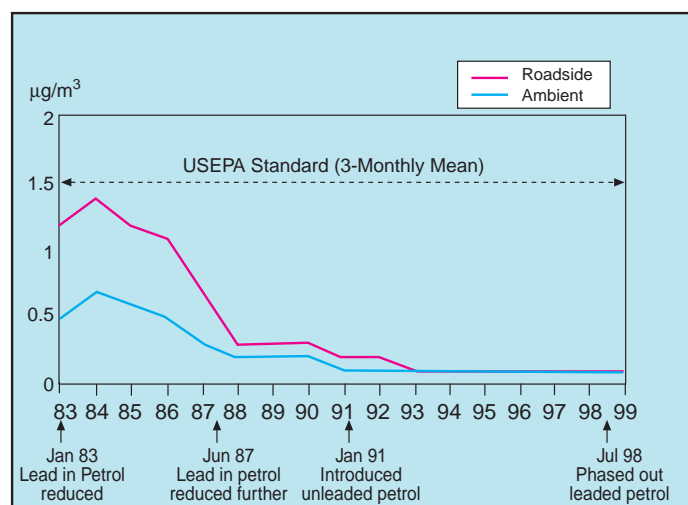
A Pollutant Standards Index (PSI) was developed by the United States Environmental Protection Agency (USEPA) to provide a simple, uniform way to report air pollution concentrations. A PSI level of 50 and below is good and 51–100 is moderate, neither causing health problems. Readings of 101–200 are considered unhealthy, 201–300 very unhealthy and above 300 hazardous. AMCs have agreed to a long-term goal of ambient air quality based on a PSI below 100 “adjusted wherever appropriate, by the year 2010 with priority on urban and industrialised areas.” Currently, national standards for ambient air in most AMCs are based on guidelines issued by WHO or the USEPA. Table 8.2 compiles the available ambient air quality standards established by AMCs.

Lead compounds, such as tetra-ethyl lead and tetra-methyl lead, were for many years added to gasoline in

AMCs (as in many other countries worldwide) as anti-knock agents. Exhaust fumes from automobiles contained high levels of lead which (as indicated in Table 8.1) is a health hazard. Low-lead or unleaded gasoline is the most effective way to quickly reduce lead concentrations in ambient air. ASEAN has been very effective in doing this. As Table 8.3 shows, leaded gasoline is being progressively phased out in most AMCs. The impressive results in Singapore and Thailand are quite evident in Figure 8.2; results in Malaysia are similar. Thailand’s ambitious programme to eliminate lead was completed a year early in 1995 as a result of which airborne lead dramatically declined from 1.55 micrograms per cu m in 1991 to only 0.1 in 1996 (*State of the Environment Report, Thailand 2000*). Singapore, as a major petroleum refining centre, has been in the forefront of ASEAN efforts to reduce lead in ambient air. Box 8.2 describes Singapore’s unleaded fuel programme and cooperation among Thai community, government and industrial leaders to reduce factory emissions.

Other efforts to reduce air pollution in the

**Figure 8.2 (Chart A) - Effect of Unleaded Gasoline on Ambient Air Lead Levels**



Source: Government of Singapore





**Table 8.2 – Ambient Air Quality Standards in Selected ASEAN Member Countries**

Pollutant	Average Period	Country					
		Brunei Darussalam (µg/cu m)	Indonesia (µg/cu m)	Malaysia (µg/cu m)	Philippines (µg/cu m)	Singapore (µg/cu m)	Thailand (µg/cu m)
TSP	1 hour		90		150		
	24 hour		230				330
	Annual						100
PM <sub>10</sub>	24 hour	100	150	150		150	120
	1 month					50	
	Annual	60					50
Lead (Pb)	1 hour		1				
	24 hour		2				0.0 (mg/cu m)
	1 month						1.5
	3 month Annual	1		1.5		1.5	
SO <sub>2</sub>	1 hour	350	900				780
	24 hour	125	365		0.07 ppm	365 (0.14 ppm)	300
	1 month			40 ppb		80 (0.03 ppm)	
	Annual	50	60				40
NO <sub>2</sub>	30 min						
	1 hour	300	400		190		320
	24 hour	100	150				
	1 month Annual		100	40 ppb		100 (0.053 ppm)	
CO	1 hour	30	30,000			40,000 (35 ppm)	34,200
	8 hour	10	22.6 (mg/cu m)	9 ppm		10,000 (9 ppm)	10,260
	24 hour Annual		10,000				
O <sub>3</sub>	30 min						
	1 hour	120	235			235 (0.12 ppm)	200
	8 hour	60		0.10 ppm		160 (0.08 ppm)	
SPM	24 hour						
	Annual	150					
H <sub>2</sub> S	30 min						
	1 hour						
NH <sub>3</sub>	24 hour		160				
HC	3 hour						
	24 hour						

**Sources:** Environment Quality Reports:  
 Brunei Darussalam Country Report, 2000      Indonesia Country Report, 2000  
 Malaysia Country Report, 1998      The Philippines Country Report, 1998  
 Singapore Country Report, 1999      Thailand Country Report, 1998

**Note:** TSP = total suspended particulates; SPM = suspended particulate matter



Greening Industry, World Bank, 2000

Uncontrolled emissions from factories

Table 8.3 – Unleaded Gasoline in ASEAN

Country	Unleaded Introduced	Completely unleaded
Brunei Darussalam	Jan. '93	Mar. '00
Cambodia	N/A	N/A
Indonesia	'97/'98	'99/'00
Lao PDR	N/A	N/A
Malaysia	1991	N/A
Myanmar	N/A	N/A
Philippines	1993	2001
Singapore	Jan. '91	July '98
Thailand	May '91	Jan. '96
Viet Nam	May '00	'05

Source: from AMCs

### Box 8.2 – Improving Air Quality in Singapore and Thailand

**Phasing out Leaded Petrol in Singapore.** The sale of leaded petrol (gasoline) at all stations in Singapore was phased out effective 1 July 1998 to eliminate lead emissions in ambient air. This decision was in line with worldwide trends to stop the use of leaded petrol because of serious concerns regarding the effects of lead on human health. Lead is harmful and can cause irreversible damage to the nervous system and other organs if absorbed in excessive amounts. To reduce the public's exposure to lead, Singapore regulated and progressively reduced the lead content in petrol as long ago as 1980. In 1991, unleaded petrol was introduced. To promote its use, a differential tax system was adopted to make unleaded fuel cheaper for the consumer than leaded. The phase out of leaded petrol adversely affected some 30,000 older vehicles mostly registered prior to 1986. To help motorists adjust to the switch to unleaded petrol, the oil companies published brochures with information on using unleaded petrol in vehicles with unhardened valve seats.

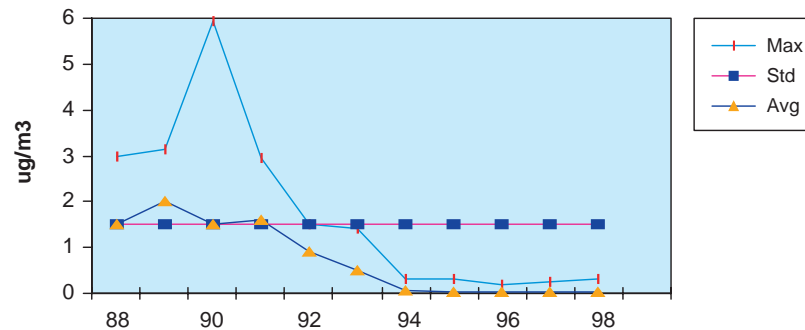
**Reducing SO<sub>2</sub> Factory Emissions Affecting Community Health in Thailand.** In June 1997, authorities investigated the Maptaphut Industrial

Estate following complaints from teachers and students at Pitaya School and the neighbouring community of Tambon Mabtaphut in Rayong province. Complainants claimed that air pollution from refineries and factories in the estate was causing headaches, queasiness, vomiting, chest pains, sore throats and eye irritation. A committee was formed (comprising representatives from the Department of Industrial Works, the Industrial Estate Authority of Thailand, the Pollution Control Department, the Office of Environmental Policy and Planning and the Mabtaphut community) to investigate means of reducing pollution. The committee supervised the factories as they corrected various production procedures to reduce both short and long term pollution problem. The companies complied with the necessary mitigation strategies and air pollution levels were gradually reduced. This case illustrates the need for good environmental management mechanisms to govern the siting of factories and buffer zones and to monitor factory procedures to ensure compliance with regulations. It also shows the impact a determined community can have.

Source: Information from respective governments



**Figure 8.2 (Chart B): Lead Levels in Bangkok (Roadside Area) from 1988 –1998**



Source: Pollution Control Department, Thailand 1999

transport sector include low-sulphur diesel fuel and catalytic converters. Diesel fuel, used mainly by trucks and other heavy vehicles, is a major source of sulphur dioxide (SO<sub>2</sub>) and particulate emissions. These can be effectively lowered through low sulphur diesel oils. Sulphur levels in diesel fuel have been reduced to 0.05% or lower in Thailand and Singapore, and about 0.06% in Brunei Darussalam. The Philippines will reduce SO<sub>2</sub> from 0.5% to 0.2% by September 2001 and ultimately to 0.05% by January 2005. Carbon monoxide (CO) can be reduced through the use of catalytic converters, which also require unleaded gasoline. These are now mandatory for cars in Malaysia, Singapore and Thailand.

### Legal and Institutional Arrangements

A list of laws in AMCs which are relevant to air quality management is shown in Box 8.3. Emission standards for stationary and mobile sources have also been promulgated by AMCs and are provided in Box 8.4. Improving air quality involves a range of national environmental and sectoral agencies. The institutional arrangements in two AMCs, typical of others, are shown in Table 8.4

### Transboundary Haze Pollution and the ASEAN Response

Recurrent episodes of transboundary haze pollution arising from land and forest fires have

been, and still are, the most prominent and pressing environmental problems facing ASEAN today. Over the past two decades, the recurring climatological disturbance known as the El Niño Southern Oscillation (ENSO) has repeatedly set the stage for large-scale wildfires and its associated transboundary smoke haze in the region. There have been several large-scale fire-and-haze episodes since the early 1980s, in particular, during the dry seasons of 1982-83, 1987, 1991, 1994, and 1997-1998. These episodes have inflicted massive damage not only destroying forestland and its ecology, but also endangering human health and economic well being in the most affected AMCs, particularly in Brunei Darussalam, Indonesia, Malaysia, and Singapore. The land and forest fires in 1997-1998 were particularly severe, with the United Nations Environment Programme (UNEP) labelling the blaze among the most damaging in recorded history. The environmental, economic and social dimensions and impacts of these catastrophic fires, and the associated transboundary atmospheric haze pollution, were profound. The total economic losses in terms of agriculture production, destruction of forest lands, health, transportation, tourism, and other economic endeavours have been estimated at \$9.3 billion<sup>2</sup> (ASEAN & ADB, 2001). Box 8.5 and Table 8.5 indicate the far-reaching and devastating effects on health in the region. Figure 8.3 shows how the



### Box 8.3: Air Quality Laws in Selected ASEAN Member Countries

#### Brunei Darussalam

- Petroleum (Pipelines) Act of 1920
- Municipal Boards Act 1920 (Revised 1984)
- Penal Code 1951
- Atmosphere (Sec.278)
- Petroleum Mining Act 1963

#### Indonesia <sup>a/</sup>

- Act No. 23 of 1997 on Environmental Management
- Government Regulation (GR) No. 41 of 1999 on Air Pollution Control
- Minister of Environment Decree No. 35 of 1993 on Emission Standards on Motor Vehicles
- Minister of Environment Decree No. 13 of 1995 on Emission Standards on Stationery Sources
- Minister of Environment Decree No. 45 of 1997 on Air Pollutants Index

#### Malaysia

- Environmental Quality Act (EQA) 1974;
- Environmental Quality (Licensing) Regulations 1974 ;
- Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 ;
- Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978;
- Environmental Quality (Sewage and Industrial Effluents) Regulations 1979;
- Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987;
- Environmental Quality (Scheduled Wastes) (Regulations) 1989;
- Environmental Quality (Delegation of Powers on Marine Pollution Control) Order 1993;
- Environmental Quality (Delegation of Powers on Marine Pollution Control) Order 1994;
- Environmental Quality (Prohibition on the Use of Controlled Substance in Soap, Synthetic Detergent and Other Cleaning Agents) Order 1995
- Merchant Shipping (Oil Pollution) Act 1994
- Environmental Quality (Sewage and Industrial Effluents) (Amendments) Regulations 2000;

#### The Philippines

- P.D. 984-Pollution Control Law
- Air Quality Management (P.D. 1152) Establishing Air Quality to Protect Public Health and Damage to Living Things and Property
- Air Pollution from Motor Vehicles (P.D. 1181) Prescribing for Allowable Emission Levels for Motor Vehicles
- P.D. 1152 Establishing Standards on Noise Producing Equipment
- Memorandum Circular No. 29 Prescribing Applicable Air Quality Standards for Thermal Power Plants
- DAO 14 and 14-A of 1993 on Air Quality Standards that Prescribes Allowable Emissions from Different Sources

#### Singapore <sup>a/</sup>

- Environmental Pollution Control Act
- Environmental Pollution Control (Air Impurities) Regulations
- Environmental Pollution Control (Prohibition on the Use of Open Fires) Order
- The Environmental Public Health Act
- Environmental Pollution Control (Vehicular Emissions) Regulations

#### Thailand <sup>a/</sup>

- Factory Act of 1992
- Public Health Act of 1992
- The Enhancement and Conservation of the National Environmental Quality Act of 1992
- Industrial Estate Authority of Thailand Act of 1979
- Land Transportation Act of 1979
- Industrial Products Standards of 1968
- The Petrol Act of 1978
- Land Traffic Act of 1992
- Highway Act of 1992

#### Viet Nam <sup>a/</sup>

- National Law on Environmental Protection (NLEP) of 1993
- Decree 175/CP of 1994
- Provincial Regulations
- Directive No 199/TTg of 1997
- Law on People's Health Protection of 1989
- Ordinance on Radiation Safety and Control of 1996
- Directive No – TT406 on Prohibition on Production, Trading and Using of Firecrackers of 1994

Source: First SoER, updated with <sup>a/</sup> information from respective governments

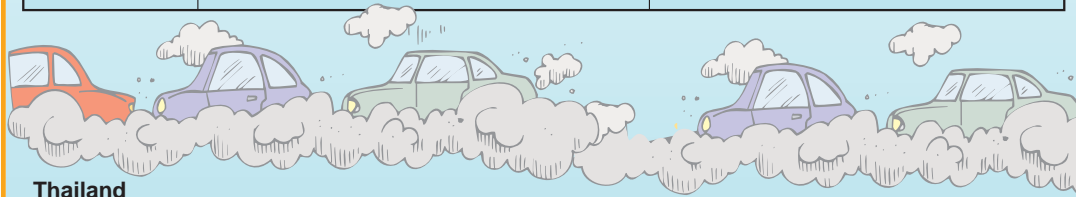




**Box 8.4: National Emission Standards of Selected ASEAN Member Countries**

**Brunei Darussalam**

Pollutant	Standard Applicable to	Standard Adopted
Smoke	All stationary fuel-burning sources	Ringelmann No. 2 or equivalent (not to exceed more than 5 minutes in any period of 1 hour)
Solid particles	Any trade, industry, process, industrial plant or fuel-burning equipment	0.20 gm/Nm <sup>3</sup> (corrected to 12% CO <sub>2</sub> )
Sulphuric acid mist or sulphur trioxide	Any trade, industry or process (other than combustion processes and plants for the manufacture of sulphuric acid)	0.1 gm/Nm <sup>3</sup> as sulphur trioxide
Acid gases	Any trade, industry, or process in which sulphuric acid is manufactured	3.0 gm/Nm <sup>3</sup> as sulphur trioxide
Fluorine compounds	Any trade, industry, process in the operation of which fluorine, hydrofluoric acid or any inorganic fluorine compounds are emitted	0.10 gm/Nm <sup>3</sup> as hydrofluoric acid
Hydrogen chloride	Any trade, industry or process	0.20 gm/Nm <sup>3</sup> as hydrogen chloride
Chlorine	Any trade, industry or process	0.10 gm/Nm <sup>3</sup> as chlorine
Hydrogen sulphide	Any trade, industry or process	5 ppm as hydrogen sulphide gas
Nitric acid or oxides of nitrogen	Any trade, industry, process in which the manufacture of nitric acid is carried out	2.0 gm/Nm <sup>3</sup> as nitrogen dioxide
	Any trade, industry or process other than nitric acid plants	1.0 gm/Nm <sup>3</sup> as nitrogen dioxide



**Thailand**

Vehicles	Measurement	CO (% Volume)	HC (ppm)	Black (%)	White (%)	Enforcement Date
Gasoline cars licensed before 1 Nov. 93	Idle Engine	4.5	600	–	–	23 Sept. 1997
Gasoline cars licensed after 1 Nov. 93		1.5	200	–	–	
Motorcycles	Idle Engine	4.5	– 10,000	– –	– –	7 Oct. 1994 1 Jan. 1996
	Accelerated to 3/4 of maximum rpm				30	In the process of legal declaration
Diesel cars	1. No load snap acceleration					20 Sept. 1997
	Filter	–	–	50	–	
	Transparency	–	–	45	–	
	2. Load snap acceleration					
	Filter	–	–	40	–	
	Transparency	–	–	35	–	

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**Singapore**

Substance	Trade, industry, process, fuel burning equipment or industrial plant	Emission limits
(a) Ammonia and ammonium compounds	Any trade, industry or process	76 mg/Nm <sup>3</sup> expressed as ammonia
(b) Antimony and its compounds	Any trade, industry or process	5 mg/Nm <sup>3</sup> expressed as antimony
(c) Arsenic and its compounds	Any trade, industry or process	1 mg/Nm <sup>3</sup> expressed as arsenic
(d) Benzene	Any trade, industry or process	5 mg/Nm <sup>3</sup>
(e) Cadmium and its compounds	Any trade, industry or process	3 mg/Nm <sup>3</sup> expressed as cadmium
(f) Carbon monoxide	Any trade, industry, process or fuel burning process	625 mg/Nm <sup>3</sup>
(g) Chlorine	Any trade, industry or process	32 mg/Nm <sup>3</sup>
(h) Copper and its compounds	Any trade, industry or process	5 mg/Nm <sup>3</sup> expressed as copper
(i) Dioxins and furans	Any waste incinerator	i 1.0 ng TEQ/Nm <sup>3</sup> for waste incinerators commissioned before 1 <sup>st</sup> Jan 2001 ii 0.1 ng TEQ/Nm <sup>3</sup> for waste incinerators commissioned on or after 1 <sup>st</sup> Jan 2001
(j) Ethylene oxide	Any trade, industry or process	5 mg/Nm <sup>3</sup>
(k) Fluorine, hydrofluoric acid or inorganic fluorine compounds	Any trade, industry or process	50 mg/Nm <sup>3</sup> expressed as hydrofluoric acid
(l) Formaldehyde	Any trade, industry or process	20 mg/Nm <sup>3</sup>
(m) Hydrogen chloride	Any trade, industry or process	200 mg/Nm <sup>3</sup>
(n) Hydrogen sulphide	Any trade, industry or process	7.6 mg/Nm <sup>3</sup>
(o) Lead and its compounds	Any trade, industry or process	5 mg/Nm <sup>3</sup> expressed as lead
(p) Mercury and its compounds	Any trade, industry or process	3 mg/Nm <sup>3</sup> expressed as mercury
(q) Oxides of nitrogen	Any trade, industry, process or fuel burning equipment	700 mg/Nm <sup>3</sup> expressed as nitrogen dioxide
(r) Particulate substances including smoke, soot, dust, ash, fly ash, cinders, cement, lime, alumina, grit and other solid particles of any kind	Any trade, industry, process, fuel burning equipment or industrial plant (except for any cold blast foundry cupolas)	i 100 mg/Nm <sup>3</sup> ; or ii where there is more than one flue, duct or chimney in any schedules premises, the total mass of the particulate emissions from all of such flue, duct or chimney divided by the total volume of such emissions shall not exceed 100 mg/Nm <sup>3</sup> and the particulate emissions from each of such flue, duct or chimney shall not exceed 200 mg/Nm <sup>3</sup> at any point in time.
(s) Smoke	All stationary fuel-burning sources	Ringelmann No.1 or equivalent opacity (Not to exceed more than 5 minutes in any period of one hour)
(t) Styrene monomer	Any trade, industry or process	100 mg/Nm <sup>3</sup>
(u) Sulphur dioxide (non-combustion sources)	Any trade, industry or process	500 mg/Nm <sup>3</sup>
(v) Sulphur trioxide and other acid gases	The manufacture of sulphuric acid	500 mg/Nm <sup>3</sup> expressed as sulphur trioxide Effluent gases shall be free from persistent mist.
(w) Sulphur trioxide or Sulphuric acid mist	Any trade, industry or process, other than any combustion process and any trioxide plant involving the manufacture of sulphuric acid	100 mg/Nm <sup>3</sup> expressed as sulphur
(x) Vinyl chloride monomer	Any trade, industry or process	20 mg/Nm <sup>3</sup>

**Source:** Information from respective governments.



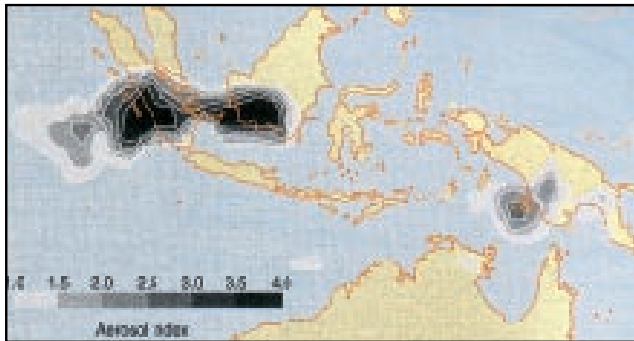
thick smoke emitted from forest fires was spread widely within the region in October 1997.

About 20 million people in Indonesia (see geographical spread of haze, Fig. 8.3) suffered from respiratory problems during the worst episodes. Table 8.5 summarises the health impact in the eight most-affected provinces of Indonesia (Riau, West Sumatra, Jambi, South Sumatra, Central Kalimantan, West Kalimantan, South Kalimantan, and East Kalimantan). The haze incidents seriously affected tourism and impeded other economic activities in the affected regions. Airports in the eight affected provinces closed on 313 occasions, seriously disrupting air traffic.



WWF/M/Lena Chan

Open burning



NASA image from Global Environmental Outlook 2000 (UNEP, 1999)

Figure 8.3 – Smoke Haze Over Indonesia 19 October 1997

Figures 8.4 and 8.5 show the

Table 8.4 – Institutional Arrangements for Air Quality Control

Function	Singapore	Thailand
<b>1. Emission Source</b> <b>Mobile Sources</b> Annual vehicle inspection; Periodic checking of emission quality  <b>Stationary Industrial Sources</b> Registration and licensing Monitoring of emission sources	Pollution Control Department (PCD)	Department of Land Transport Department of Land Transport Traffic Police Division Pollution Control Department Bangkok Metropolitan Administration
<b>2. Ambient Air Quality</b> Monitoring	Strategic Planning and Research Department (SPRD)	Pollution Control Department Department of Health Bangkok Metropolitan Administration
<b>3. Policy and Legislation</b> Overall Policy  Promulgation of standards	PCD / SPRD  PCD / SPRD	Office of Environmental Policy and Planning  Pollution Control Department

Source: Information obtained from respective governments



**Table 8.5** – Health Effects of Haze in Indonesia: Sept. – Nov. 1997

Effect	No. of Cases	Cost (million Rupiah)
Death	527	252,960
Asthma	298,125	4,770
Bronchitis	58,095	2,092
Respiratory	1,446,120	43,384
Limited activities	4,758,600	12,373
Medical care	36,462	3,734
Hospitalised	15,822	26,329
Workdays lost	2,446,352	48,438
<i>Total</i>		<i>394,080</i>

**Source:** State of Environment Report, Indonesia 1999

areas of AMCs (and beyond) most affected. During July–August 1997, air quality deteriorated to unhealthy levels in many parts of the region causing poor visibility. In September 1997, Singapore's PSI reached an unhealthy record and the Air Pollution Index in Sarawak reached hazardous levels. Smoke haze also reached as far as southern Thailand and the Philippines (MSS, 2000).

As smoke from the fires remained stagnant over Southeast Asia, smog (tropospheric, low-level ozone) spread more rapidly across the Indian Ocean toward India. This was the first time satellite images had shown smoke move slowly and in different directions from smog. In Figure 8.5, white represents aerosols (i.e. smoke) that remained in

### Box 8.5 - The Health Impacts of the 1997 Fires in Southeast Asia

During the peak period of the haze in September 1997, air pollution levels considerably exceeded the WHO recommended levels. An estimated 20 million people in Indonesia suffered from respiratory problems, with levels of total suspended particulates exceeding the national standard by 3-15 times. Visits to the Kuala Lumpur General Hospital due to respiratory problems increased from 250 to 800 persons a day. The economic costs associated with the haze have been estimated at US\$6 billion for all the countries affected. These include direct costs, such as losses to agriculture, as well as indirect costs such as medical expenses and a decline in tourism.

Information on the extent and the impacts of the haze were presented at a Workshop organised by WHO. In Brunei Darussalam, measurements taken during the dry weather period February - April 1998

showed that the Pollution Standard Index (PSI) readings exceeded 100, and were sometimes as high as 250 causing disruption of daily activities, closure of schools, and changes in government working hours. The PSI in Singapore exceeded 100 for 12 days, reaching a maximum of 138. About 94% of the haze particles were found to be PM10 with a diameter less than 2.5 microns. Hospital visits for all haze-related illnesses increased by about 30%. In Southern Thailand, PM10 concentrations in Hat Yai also increased significantly. In Papua New Guinea, about 50% of commercial flights were cancelled due to poor visibility. In the capital Port Moresby, visibility during the peak haze period was limited to about one km, and in the southern islands of the Philippines, 4-5 km.

**Source:** Edited from pp 117-118, ADB & ESCAP, 2000

The forest fires that occurred in September 1997 in Kalimantan and Sumatra greatly increased pollution levels in Southeast Asia, releasing an estimated 180 million tonnes of CO<sub>2</sub> during that month<sup>3</sup>. The area affected by CO<sub>2</sub> and other pollutants spread east-west for more than 3,200 km covering 6 Southeast Asian states and affecting 70 million people. Peak levels of particulates in Kuala Lumpur, Singapore and many Indonesian cities

exceeded 6,000 µg/cu m. The API reached a critical level of 288 in southern Thailand and 839 in Sarawak. 100-200 is considered unhealthy; over 300 is equivalent to smoking 80 cigarettes a day and is 'hazardous.'

**Source:** Modified from page 90 of *Global Environment Outlook 2000 (UNEP, 1999)*





the vicinity of the fires. Green, yellow, and red show increasing amounts of ozone (i.e. smog) being carried west by high-altitude winds

ASEAN's response to the problem has been swift and substantial. Resolutions, declarations, communiqués, and memoranda of understanding signed during the period 1985 to 1995 showed ASEAN's increasingly focused strategy towards the transboundary haze pollution issue. The ASEAN Ministerial Meeting on Haze was convened, and a Haze Technical Task Force (HTTF) was established in September 1995 (Fig. 8.6). Following the 1997 fire-and-haze disaster, ASEAN adopted a *Regional Haze Action Plan* (RHAP) described in Box 8.6. The RHAP has an operational focus, in that it seeks to identify concrete measures to be taken by specific parties at the regional, subregional, and national levels for preventing and mitigating transboundary haze pollution.

The adoption of the RHAP was a turning point in the region's approach to mitigating damage from recurrent transboundary haze episodes. The RHAP outlines an overall framework for guiding the process of strengthening the region's capacity to address transboundary haze pollution problem. It contains three major components: prevention, mitigation, and monitoring. Different countries have been designated to spearhead the activities that fall under each of the three components. Malaysia coordinates activities on prevention, Indonesia on mitigation, and Singapore on monitoring of fires and haze. All AMCs also undertake national-level activities related to the RHAP components.

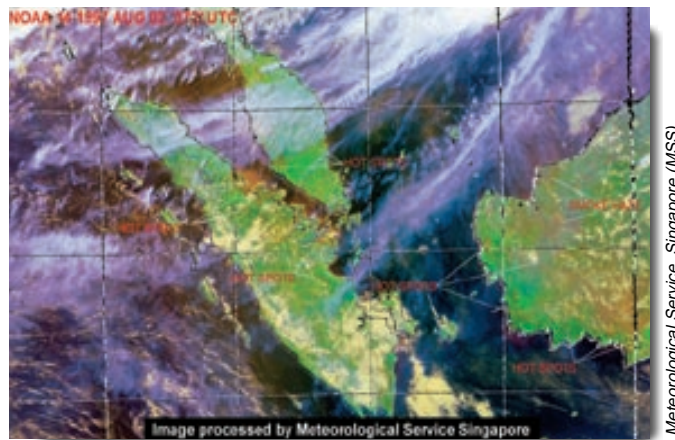


Figure 8.4 – Smoke Haze and Hot Spots: 2 August 1997

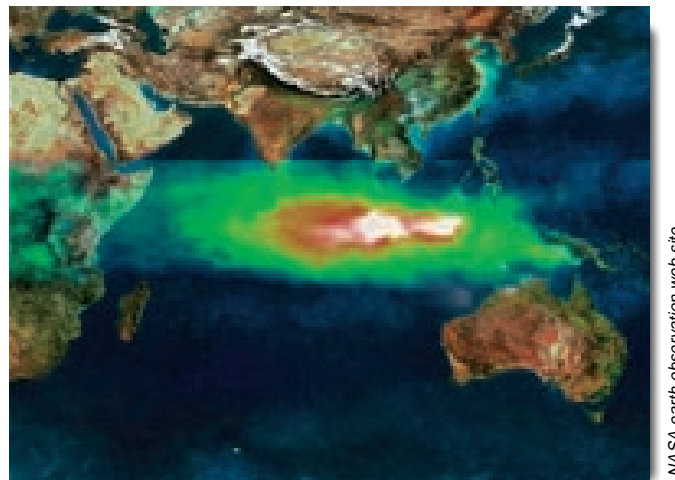


Figure 8.5 – Smoke & Haze Over Southeast Asia: 22 Oct. 1997

Since the adoption of the RHAP, the HTTF under the guidance of ASEAN Environment Ministers has undertaken several initiatives, which are highlighted in Box 8.7. Major ongoing activities include development of Fire Suppression Mobilisation Plans (FSMPs) for all fire-prone areas in the region, promotion of 'zero-burning' policy adopted by ASEAN through dialogue sessions and corporate awareness campaigns among plantation companies, strengthening of monitoring networks including the ASEAN Specialised Meteorological Centre based in Singapore, training programmes to strengthen law enforcement capability of AMCs,



### Box 8.6 – The ASEAN Regional Haze Action Plan - In Summary

Objectives	Measures
To prevent land and forest fires through better management policies and their enforcement	<ul style="list-style-type: none"> <li>Strengthen national policies and strategies to prevent and reduce land and forest fires.</li> <li>Develop National Plans to encapsulate their policies and strategies to prevent and mitigate land and forest fires.</li> </ul>
To establish operational mechanisms to monitor land and forest fires	<ul style="list-style-type: none"> <li>Strengthen the region's early warning and monitoring system.</li> <li>The ASEAN Specialised Meteorological Centre (ASMC) will be further streamlined and strengthened. ASMC will serve as a regional information centre for compiling, analysing and disseminating information derived from satellite imagery and meteorological data necessary to detect and monitor land and forest fires and the occurrence of smoke haze.</li> </ul>
To strengthen regional land and forest fire-fighting capability and other mitigating measures.	<ul style="list-style-type: none"> <li>Strengthen national and regional land and forest fire-fighting capability through the following measures:</li> <li>Complete the on-going preparation of the inventory of land and forest fire-fighting capability of each country (agencies, manpower, equipment, available land and forest fire hazard maps and other resources) and identify resources that can be made available for regional fire-fighting efforts;</li> </ul>
To strengthen regional land and forest fire fighting capability and other mitigating measures.	<ul style="list-style-type: none"> <li>Formulate a program to strengthen the fire-fighting capability of individual countries and the region and compile a list of equipment and technical expertise that is needed at the regional level to tackle land and forest fires;</li> <li>Identify sources of technical assistance within and outside ASEAN</li> <li>Establish an operating procedure to activate the deployment of the fire-fighting resources in each country for regional fire-fighting operations;</li> <li>Establish a mechanism in each country to provide, in the event of an outbreak of land and forest fires, regular updates to the Haze Technical Task Force on progress made in efforts to fight the fires.</li> </ul>

Source: ASEAN Secretariat

### Box 8.7 – Highlights of ASEAN's Initiatives and Achievements on Transboundary Haze Pollution

- Establishment of two Sub-Regional Fire-fighting Arrangements (SRFAs) for Borneo and Sumatra (April 1998);
- Implementation of ASEAN-ADB project – Strengthening the Capacity of ASEAN to Prevent and Mitigate Transboundary Atmospheric Pollution (1998–1999);
- Adoption of zero burning policy and strict enforcement of the policy (April 1999);
- Launching of ASEAN Haze Action Online ([www.haze-online.or.id](http://www.haze-online.or.id)), which includes public-access website on fire and transboundary haze and restricted intranet-based system for monitoring RHAP implementation (April 1999);
- Establishment of RHAP Co-ordination and Support Unit within the ASEAN Secretariat to provide coordination and support to the implementation of RHAP (April 1999);

(continued next page)



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- Implementation of Immediate Action Plans (IAPs)<sup>4</sup> in Riau and West Kalimantan Provinces for addressing fires and haze problems in fire-prone areas, and development of an operating procedure for activating forest fire-fighting resources in the ASEAN region (Fire Suppression Mobilisation Plans<sup>5</sup>) (1999 – ongoing);
- Convening of dialogue sessions with plantation companies as part of the effort to promote the zero burning policy and raise awareness on zero burning techniques among plantation companies (Jan 2000 - ongoing);
- Establishment of the Subregional Climate Review Group to closely monitor the weather condition especially during the dry seasons (April 2000);
- Establishment of the SRFA Legal Group on Law and Enforcement to discuss legal and law enforcement matters and the implementation of zero burning policy among all relevant parties (June 2000);
- A pilot activity in West Kalimantan Province to explore traditional values of Dayak and Melayu tribes in managing fires and haze in/or surrounding their areas (March 2001);
- Development of an ASEAN Agreement on Transboundary Haze Pollution (2001 – ongoing);
- Development of an ASEAN Fire Danger Rating System as part of the effort to strengthen regional wildfire prevention, management and mitigation (ongoing);
- Development of a GIS Database for Sumatra, Borneo and Peninsula Malaysia to strengthen the capacity of the AMCs to use spatial data layers for forest fire prevention, monitoring and suppression planning in the ASEAN region (ongoing);
- Video-conferencing (VC) for the ASEAN Secretariat and SRFA Member Countries to provide facilities for discussions and meetings particularly during emergency situations and dry periods (ongoing);
- Capacity development programmes for the RHAP-CSU in the forms of training programmes on VC, website development/ information management, on-the-job training, etc. (ongoing);
- Strengthening of the RHAP's monitoring network of national- and regional-level institutions, which include the ASEAN Specialised Meteorological Centre (ASMC), national meteorological agencies, and other related agencies in the region (ongoing);
- Development of a prototype FSMPs in South Sumatra, South Kalimantan and East Kalimantan Provinces (2000 – June 2001);
- A pilot Land and Forest Fire National Disaster Simulation Exercise to create a practice field for learning and strengthening existing institutional structures responsible for coordination and response aspects of national land and forest fire disaster (June 2001);
- Launching of a joint ASEAN-ADB publication entitled Fire, Smoke and Haze – the ASEAN Response Strategy, which provides reviews on fire and haze episodes worldwide, its causes and impacts, the social and economic impacts of the 1997-98 haze episode in ASEAN and the ASEAN Response Strategy, particularly with regard to the short, medium and long term strategy of the RHAP (Jakarta, mid 2001);
- A joint training programme for prosecutors, investigators, judges, law enforcement officers as part of the effort to strengthen law enforcement capacity of the AMCs (2001/ 2002);
- Development and conduct of a feasibility study for the establishment of a centre to manage environmental disasters with particular emphasis on land and forest fires and haze (2001/2002);
- Convening of a World Conference and Exhibition on Land and Forest Fire Hazards to bring international fire experts, senior government officials, researchers, plantation companies, community to deliberate issues and discuss strategies with regard to land and forest fire issues (Kuala Lumpur, 2002).

Source: ASEAN Secretariat



community-based fire management activities, and public and community awareness campaigns. A website – ASEAN Haze Action Online ([www.haze-online.or.id](http://www.haze-online.or.id)) – provides a variety of regularly updated information on the haze situation and ASEAN's response in dealing with the issue (Box 8.8).

Realising the need to focus on fire management efforts in specific areas, the HTTF established two working groups for the sub-regions of Sumatra and Borneo, namely the Working Group on Subregional Firefighting Arrangement for Sumatra (SRFA-Sumatra) and the Working Group on Subregional Firefighting

### Box 8.8 – ASEAN Haze Action Online Homepage

Implementing the RHAP ultimately depends on an efficient flow of information among the various partners, agencies, and countries implementing the RHAP at the national, subregional, and the regional levels. **ASEAN Haze Action Online** website ([www.haze-online.or.id](http://www.haze-online.or.id)) allows sharing of knowledge and experience, and coordination and monitoring of national, regional, and international initiatives among institutions in the region. The website provides a public information service, as well as an intranet information system to facilitate monitoring of RHAP and provide up-to-date information to help in decision making. The website serves the following clients: ASEAN Environment Ministers, ASEAN environment senior officials and the HTTF, SRFAs committees, relevant government agencies, collaborative partners, the general public, as well as researchers and scientists working on fire and haze issues.

ASEAN Secretariat





*Fire Suppression Simulation Exercise*

ASEAN Secretariat

problem too large for any one country to manage alone. It requires concrete actions by ASEAN collectively, national governments, international donor agencies, non-governmental organisations (NGOs) as well as local communities. It also requires a considerable amount of resources, in terms of financial and technical inputs. In this respect, while ASEAN has taken the lead in addressing this problem by undertaking various core measures at the regional level and national level, support from all relevant stakeholders will help to speedily alleviate this problem.

This Agreement is expected to elaborate policy and technical issues with regard to monitoring, assessment and prevention, mechanisms for coordination, lines of communication, simplified customs and immigration procedures for immediate deployment of people and goods across borders in case of an environmental disaster. The Agreement is expected to be signed by the end of 2001.

ASEAN's Regional Haze Action Plan has been helpful in generating various measures and actions to address the transboundary haze pollution issue. Transboundary haze pollution, however, is a



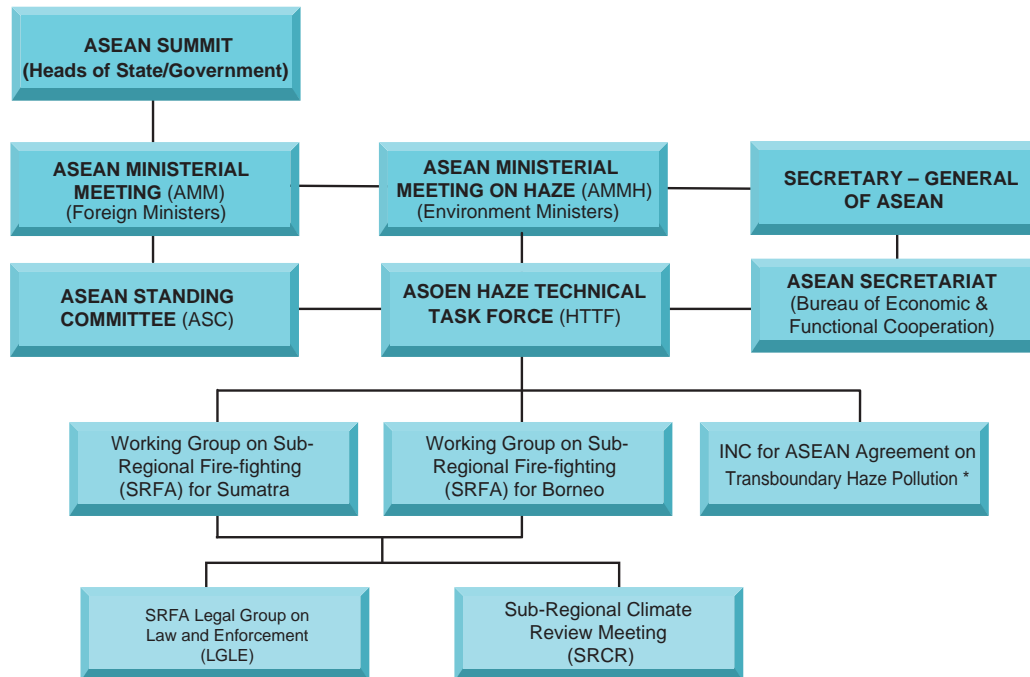
*A dialogue session with plantation companies*

ASEAN Secretariat





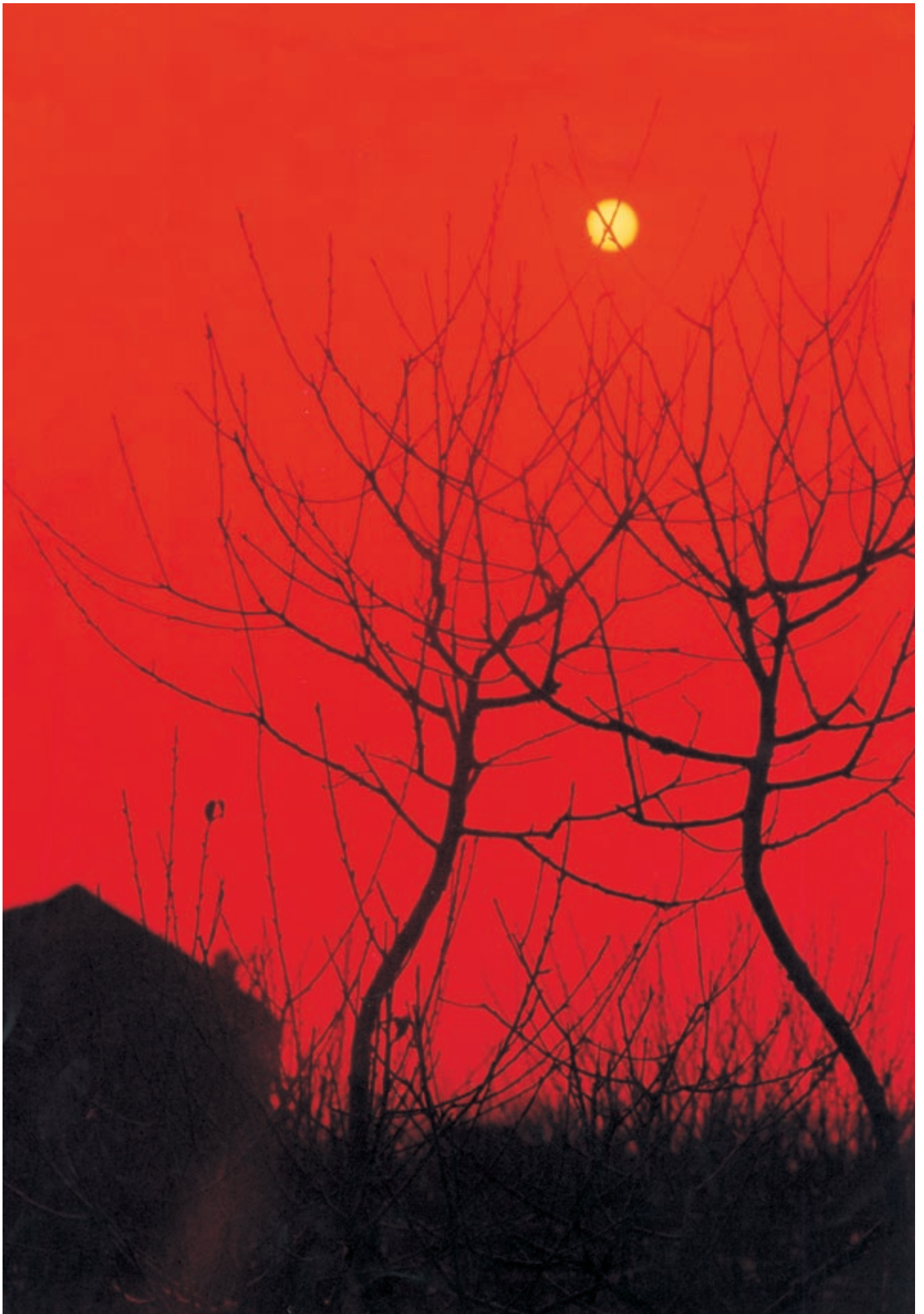
**Figure 8.6 – Institutional Arrangement for ASEAN Cooperation on Transboundary Haze Pollution**



**Source:** ASEAN Secretariat

**Note:** \* The Intergovernmental Negotiating Committee (INC) for the ASEAN Agreement on Transboundary Haze Pollution is an ad-hoc body established to negotiate, and draft the Agreement

- 1 Government reports indicate that air quality monitoring has been established in at least the following: Brunei Darussalam (1 station), Indonesia (data not available), Malaysia (38 stations), the Philippines (11 stations), Singapore (19 stations), Thailand (54 stations), and Viet Nam (19 stations).
- 2 This was for agriculture (farm and plantation crops); forestry (timber, lost growth, non wood forest products; flood protection; erosion and siltation; carbon sink); health; transmigration, buildings and property; transportation, tourism and fire fighting.
- 3 The ADB (ASEAN & ADB, 2001) later estimated that a total of nearly 760 million tonnes of CO<sub>2</sub> costing some \$1.5 billion were produced as a result of the 1997 and 1998 fires, 85% from combustion of peat. Some other estimates are nearly five times higher.
- 4 Activities of the Immediate Action Plans Field Training Exercise for Prevention and Control of Land and Forest Fires (IAPs) include the three components of RHAP, namely prevention, monitoring and mitigation (fire suppression). The centrepiece of IAP activities is development of Fire Suppression Mobilisation Plans (FSMPs). Prevention and monitoring components under the IAP are conducted to support the development of these FSMPs. IAP in West Kalimantan (2000) also included community-based fire management component (a workshop to explore traditional values in fire management). IAP in Riau (Second Phase) focused on strengthening the fire management capacity of the Province. The outputs included a ten-year plan for the fire management structure (named PUSDALKARHUTLA), a Standard Operating Procedure (SOP) for land and fire management, glossary of terminology, socialisation of the new decree on PUSDALKARHUTLA, and an integrated FSMP for the Province.
- 5 Development of FSMPs for all fire-prone areas of the region is one of the key activities of RHAP. A well formulated FSMP lays out the exact procedures to be followed in carrying out fire suppression. FSMPs will ensure that all suppression resources available can be used as efficient as possible, and will avoid spur-of-the-moment crisis management-oriented decision making. Development of FSMPs includes establishing inventory and tracking system though provision of computerised database and manual lists, dry exercise (tactical exercise without troops) and wet exercise (full scale drill) in the selected areas, and interagency agreement on the draft FSMP document by the relevant agencies. Full and integrated FSMPs have been developed in two fire-prone areas, namely Riau and West Kalimantan. Some other fire-prone areas, namely South Sumatra, East Kalimantan, South Kalimantan have also developed pilot FSMPs. However, these pilot FSMPs need to be followed with the development of full FSMPs.



## Chapter 9

# Global Environmental Issues



**A**SEAN member countries are actively engaged in addressing global environmental issues in accordance with the principle of sustainable development, and based on common but differentiated responsibilities. These include protecting the ozone layer, mitigating climate change, sustaining biological diversity and protecting endangered species, controlling transboundary movements and disposal of hazardous wastes, making wise use of wetlands, and practicing sustainable management of forests. While AMC's are not the major source of global environmental problems such as climate change, ozone layer depletion, and hazardous wastes disposal, they are most vulnerable to their adverse effects. The majority of AMC's are still grappling with domestic environmental problems such as water and air pollution, degradation of land and loss of biodiversity, in addition to providing basic human needs and addressing poverty. Nevertheless, AMC's have contributed substantially to addressing these global issues despite their scarce resources and other pressing national priorities. This chapter highlights ASEAN's proactive involvement in global environmental issues and measures to implement them at the national and regional levels.

## ASEAN FACTS AND FIGURES

### Participation in Multilateral Environment Agreements (*r* – ratified; *s* – signed)

	ASEAN:	Asia / Pacific:
Vienna Convention (ozone) (r)	90%	82%
Montreal Protocol (ozone) (r)	90%	–
UNFCCC (climate change) (r)	90%	90+%
Kyoto Protocol (climate change) (s)	50%	–
Basel Convention (hazardous waste) (r)	70%	53%
Stockholm Convention (POPs) (s)	50%	–
Rotterdam Convention (PIC)(s)	20%	–
Convention on Biological diversity (r)	80%	90%
Cartagena Protocol on Biosafety (s)	40%	–
CITES (flora & fauna trade) (r)	90%	62%
RAMSAR (wetlands) (r)	60%	45%

Greenhouse Gas (CO <sub>2</sub> ) Emissions:	ASEAN	Developing countries	OECD
(tonnes per capita per year; 1996)	1.5	2.1	10.9

### Cost of Doubling Atmospheric CO<sub>2</sub>:

ASEAN	2.1 – 8.6% of GDP
World	1.4 – 1.9% of GDP

Projected Temperature Rise in ASEAN	By 2010:	By 2070:
Coastal and island areas	0.1–0.5 °C	0.4–3.0 °C
Inland or mainland SE Asia	0.3–0.7 °C	1.1–4.5 °C



## Ozone Layer Protection

The formation of the 'ozone hole' over the Arctic has been a major international concern for the last two decades. Depletion of stratospheric ozone increases the amount of ultraviolet rays from the sun reaching the earth's surface. This has adverse effects on human health, (particularly increased eye problems, skin cancers and depressed immune systems), and ecosystems. Consequently, the global community agreed to phase out ozone depleting substances (ODS)<sup>1</sup> in 1985. Despite remarkable achievements in reducing ODS production<sup>2</sup> and consumption, the ozone hole is still expanding due to the long life (75-110 years) of ODS in the atmosphere. In late 2000, satellite images confirmed that the ozone hole reached a record 28.3 million sq km, over one million sq km larger than the previous record. The two major Multilateral Environmental Agreements (MEAs)<sup>3</sup> for protecting the ozone layer are the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). The Vienna Convention outlines States' responsibilities for protecting human health and the environment against the adverse effects of ozone depletion. The Montreal Protocol is a landmark international agreement designed to protect the stratospheric ozone layer with ODS time-bound reduction targets for specific states and the means to achieve them. It has since been substantially amended in London (1990), Copenhagen (1992), Montreal (1997) and Beijing (1999). 'Developing country' parties to the Montreal Protocol must phase out the use of ODS by their industries by 2010.

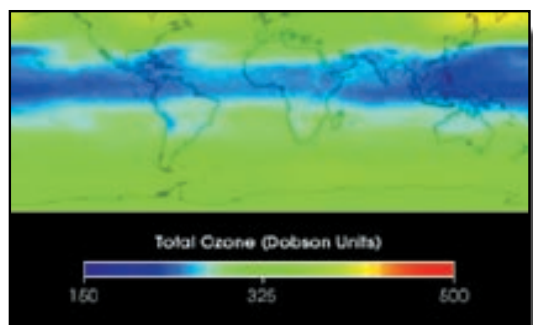
While ozone depletion is not a relatively serious concern for AMCs compared to other regions, ASEAN has, in line with global responsibility, actively participated in implementing the related MEAs. As shown in Table 9.1, all AMCs, except Cambodia, ratified

the 1987 Montreal Protocol between 1989 and 1998. Brunei Darussalam, the Lao PDR and Myanmar have not yet ratified the 1990 London Amendment. Five AMCs Indonesia, Malaysia, Singapore, Thailand and Viet Nam have ratified the 1992 Copenhagen Amendment.

The nine AMCs participating in the Montreal Protocol have adopted market-based instruments, legal measures, and public awareness to effect a smooth transition from the main ODS (chlorofluorocarbons or CFCs) to non-CFC technologies, sometimes with financial assistance designed to enable compliance. Box 9.1 summarises the ODS reduction activities of selected AMCs. Indonesia, the Philippines, Singapore and Thailand have enacted legislation banning the imports of ODS while Malaysia implements a permit system to control import of ODS in accordance with the national phase-out programme. Brunei Darussalam, Myanmar, the Lao PDR and Viet Nam are in the process of developing appropriate legislation.

## Climate Change

The 1990s was the hottest decade on record since 1861. Since the *First ASEAN State of the Environment Report* was published in 1997, the Intergovernmental Panel on Climate Change (IPCC), the scientific advisers to the Climate Change Convention, have become highly confident that most of the earth's recent warming is due to human activities. They expect global



Global Ozone Levels: December 2000

NASA earth observation web page



**Table 9.1** – Status of Ratification of ozone related MEAs by ASEAN Member Countries

Country	Vienna Convention	Montreal Protocol	London Amendment	Copenhagen Amendment	Montreal Amendment
Brunei Darussalam	26 July 1990 (Ac)	27 May 1993 (Ac)			
Indonesia	26 June 1992 (Ac)	26 June 1992 (R)	26 June 1992 (Ac)	10 Dec 1998 (Ac)	
Lao PDR	21 Aug 1998 (Ac)	21 Aug 1998 (Ac)			
Malaysia	29 Aug 1989 (Ac)	29 Aug 1989 (Ac)	16 June 1993 (Ac)	5 Aug 1993 (Ac)	
Myanmar	24 Nov 1993 (Ac)	24 Nov 1993 (Ac)	24 Nov 1993 (Ac)		
Philippines	17 Jul 1991 (Ac)	17 Jul 1991 (R)	9 Aug 1993 (R)		
Singapore	5 Jan 1989 (Ac)	5 Jan 1989 (Ac)	2 Mar 1993 (Ac)	22 Sept 2000 (Ac)	22 Sept 2000 (Ac)
Thailand	7 July 1989 (Ac)	7 July 1989 (R)	25 June 1992 (R)	1 Dec 1995 (R)	
Viet Nam	26 Jan 1994 (Ac)	26 Jan 1994 (R)	26 Jan 1994 (Ac)	26 Jan 1994 (Ac)	

**Sources:** ASEAN Secretariat

**Note:** R = Ratification Ac = Accession A = Acceptance Ap = Approval Sc = Succession  
AMCs have yet to ratify the 1999 Beijing Amendment.

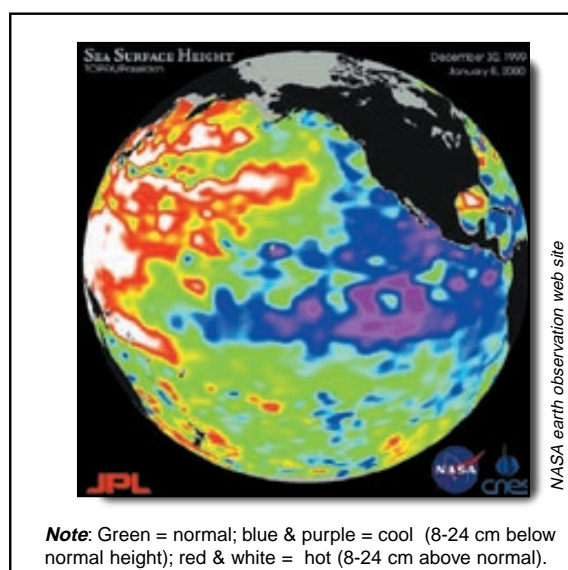
average temperature and sea levels to rise throughout the 21<sup>st</sup> Century under all of their scenarios. In 2001, the IPCC for the first time formally warned that global climate warming could unleash catastrophic and irreversible changes to key planetary processes that make the world habitable including: <sup>4</sup>

- A slowdown in ocean circulation which will accelerate warming in much of the globe;
- Runaway global warming as carbon dioxide and methane escape from melting permafrost and sediments on continental shelves; and
- The disintegration of the Greenland and West Antarctic ice sheets.

These fundamental shifts in planetary processes, or 'climate surprises', are additional to many high-probability changes which are already under way. The IPCC warns that the coming century will see extensive melting of glaciers, spreading mosquito-borne diseases, worsening droughts, declining crop yields, the collapse of many ecosystems and widespread coastal flooding. Even without sea-level rise, up to 200 million people could face flooding from coastal storms before 2080. There is a growing realisation

that the planet is likely to respond to global warming with a series of unpredictable shudders, rather than with smooth, predictable change.

As Table 9.2 summarises, the IPCC concludes that the adaptive capacity of human systems is low and vulnerability is high in the developing countries of Asia. Figure 9.1 highlights variations from normal sea-surface levels. Box 9.2, from an earlier IPCC report,

**Figure 9.1** – Higher than Normal Sea-Surface: Western Pacific/ Asia (January 2000)





provides more details on the anticipated effects of climate change on health, economies and the ecological systems of the ASEAN region.

Increased global temperature is being caused by the greenhouse effects of such gases as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrogen oxides (NO<sub>x</sub>) and CFCs emitted from various activities, particularly combustion of fossil fuels. Consequently, the global community has negotiated reductions



NST Malaysia

Energy-efficient transportation

### Box 9.1 – Phasing Out Ozone Depleting Substances in selected ASEAN Member Countries.

**Brunei Darussalam.** Brunei Darussalam became a Party to the Montreal Protocol in August 1993 and proposes to maintain consumption of CFCs at the average of 1995–1997 levels.

Consumption is to be completely phased out by 2006, four years earlier than required under the Protocol.

**Indonesia.** Indonesia does not produce or export any Ozone Depleting Substances (ODS). All local demand is met by imports. Consumption in 1992 was 6,567 tons of 'Ozone Depleting Potential' (ODP), about 0.03 kg./capita, less than 1% of world consumption. However, estimates of cumulative consumption, based on unconstrained demand from 1992 to 2010, are almost 500,000 tons of ODP equivalent. ODS consumption is mostly CFC-12 (53.3%), followed by CFC-11 (11.9%), Halons (2.6%), and smaller amounts of CFC-113, CFC-115, 1,1,1 trichloroethane (TCA) and carbon tetrachloride (CTC). For the industrial sector in

1992, refrigeration and air conditioning accounted for 27% of ODP, aerosols (25.6%), foams (13.1%), fire extinguishers (2.6%), and solvents (3.6%). Before ratification of the Vienna Convention and the Montreal Protocol in May 1992, the Ministry of Health in 1990 issued Ministerial Decree No.376/MenkeKs/ PER/VIII/1990 which prohibited CFCs in aerosols and cosmetics. Indonesia's Pesticide Commission banned the use of CFCs in pesticide products in 1991 and the use of methyl bromide from 1997. Indonesia plans to phase-out all ODS well ahead of the Montreal Protocol date of 2010 for Article 5 countries.

**Malaysia.** A National Steering Committee on the Protection of the Ozone Layer was established to oversee the implementation of a national plan and country programme on CFC and Halon. Policies and strategies include monitoring imports and consumption of controlled substances and encouraging the use of alternatives. The cost to Malaysia of phasing out chlorofluorocarbons and Halons and switching to alternatives is estimated at US\$270 million. Of the 70 countries which have

received support from the Multilateral Fund for planning and implementing CFC phase-out, Malaysia has led in terms of both projects completed and actual phase-out. By end of December 1999, 100 ODS projects and activities were completed amounting to US\$32 million disbursed from the Multilateral Fund. In 1997 Malaysia was awarded the UNEP Ozone Awards and USEPA's Best-of-the Best Stratospheric Protection Award.

(continued next page)



Date	Measure
5 Oct 1989	Quota Allocation System implemented for Chlorofluorocarbons (CFCs)
5 Feb 1991	Prohibit import & manufacture of nonpharmaceutical aerosol products & polystyrene sheets/products containing controlled CFCs.
1 Jan 1992	Prohibit the use of Halon 1301 for new fire-protection systems. Prohibit the import of Halon 2402.
1 Jan 1993	Prohibit the import of new air-conditioning and refrigeration equipment using CFC 11 and 12.
1 Jan 1994	Prohibit the import of Halon 1211 and Halon 1301.
15 Apr 1994	Prohibit the import of fire-extinguishers filled with Halon 1211.
1 Jan 1995	All new cars must be equipped with non-CFC air-conditioning systems.
1 Apr 1995	Prohibit the import of HBFCs
1 Jan 1996	Prohibit the import of CFCs, carbon tetrachloride and 1,1,1-trichloroethane (methyl chloroform)

**Singapore.** Singapore acceded to both the Vienna Convention and the 1987 Montreal Protocol on 5 January 1989 and acceded to the 1992 Copenhagen and Montreal Amendments to the Protocol. Singapore has adopted a comprehensive and multi-pronged approach to reduce, and eventually phase out, the consumption of ozone-depleting substances (box above).

**Thailand.** Thailand has been a party to the Montreal Protocol since 1989 and has ratified two subsequent Amendments to the Protocol. Thailand as an Article 5 country, is eligible for assistance from the Multilateral Fund. Altogether, a total of 101 projects (comprising grant estimated at US\$ 35 million and concessional loan estimated at US\$ 5 million) have been approved for the following sectors: refrigeration, foam, halon, aerosol and solvent. By the end of 2000, Thailand completed 73 projects which decreased about 3500 ODP (Ozone Depletion Potential) MT. The Department of Industrial Works (DIW) has promoted the phaseout of ODS on a regular basis for many years. In 1999, activities included public hearing for National CFCs Phaseout Programme and signing MOUs on Codes of Good Practices for chillers between DIW and seven chiller suppliers.

*Source: Information from respective governments*

**Table 9.2** – Adaptive Capacity, Vulnerability and Key Concerns for Climate Change in Asia

Adaptive Capacity, Vulnerability and Key Concerns	Confidence
Extreme events have increased in temperate and tropical Asia, including floods, droughts, forest fires, and tropical cyclones	high
Decreases in agricultural productivity and aquaculture due to thermal and water stress, sea-level rise, floods and droughts, and tropical cyclones would diminish food security in many countries of arid, tropical, and temperate Asia; agriculture would expand and increase in productivity in northern areas	medium
Runoff and water availability may decrease in arid and semi-arid Asia but increase in northern Asia	medium
Human health would be threatened by possible increased exposure to vector-borne infectious diseases and heat stress in parts of Asia	medium
Sea-level rise and an increase in the intensity of tropical cyclones would displace tens of millions of people in low-lying coastal areas of temperate mid tropical Asia; increased intensity of rainfall would increase flood risks in temperate and tropical Asia	high
Climate change would increase energy demand, decrease tourism attraction, and influence transportation in some regions of Asia	medium
Climate change would exacerbate threats to biodiversity due to land-use and land-cover change and population pressure	medium
Sea-level rise would put ecological security at risk. including mangroves and coral reefs	high
Poleward movement of the southern boundary of the permafrost zones of Asia would result in a change of thermokarst and thermal erosion with negative impacts on social infrastructure and industries	medium

**Source:** *Climate Change 2001: Impacts, Adaptation and Vulnerability* (IPCC, 2001)

**Note:** 'Confidence' is confidence in the predictions

**Box 9.2 – Possible Impacts of Climate Change in ASEAN Member Countries**

Exploitation of natural resources associated with rapid urbanisation, industrialisation, and economic development has led to increasing pollution, land degradation, and other environmental problems in Southeast Asia. Climate change adds a further stress. Over the long period of human occupation in the region, human use systems have developed some resilience to a range of environmental stresses. However, it is uncertain whether such resilience can continue in the face of projected rapid changes in climate.

**Global Warming.** The IPCC reports that global warming during the 20th Century was less in Southeast Asia in summer than the global mean change. Future warming is projected to be least in the islands and coastal areas throughout Indonesia, the Philippines, and coastal south Asia and greatest in inland continental areas of the Mekong region. Projections of regionally averaged temperature changes for 2010 and 2070 are shown at the right.

**Rainfall.** In terms of rainfall, IPCC models suggest an April-to-September maximum over the Mekong peninsula and a minimum over Indonesia and areas near Australia. Projections of regionally averaged rainfall changes for 2010 and 2070 are shown at the right.

**Economic Impact.** Best estimates for the annual impact resulting from a doubling of atmospheric concentrations of CO<sub>2</sub> are about 2.1–8.6% of GDP for Southeast Asia, compared with 1.4–1.9% of GDP globally. Many assumptions underlie these estimates; large uncertainties remain.

**Climate Characteristics and Trends.** Over the past 100 years, mean surface temperatures across the region have increased by 0.3–0.8°C. No long-term trend in mean rainfall is discernible over the period, although there has been a decreasing trend in many in the past 30 years. Similarly, no identifiable change in the number, frequency, or

**Expected Temperature Change: 2010 & 2070 (°C)**

Region	2010	2070
Indonesia, Philippines & coastal Southeast Asia	0.1 – 0.5	0.4 – 3.0
Inland Southeast Asia	0.3 – 0.7	1.1 – 4.5

**Rainfall Scenarios for 2010 & 2070 (% change)**

Year	2010		2070	
	Wet	Dry	Wet	Dry
<i>Southwest Monsoon Region: Philippines (western), and Viet Nam (except east coast)</i>	0	0	0 to 10	-10 to +10
<i>Northeast Monsoon Region: Indonesia, Philippines (eastern), Viet Nam (east coast), and Malaysia</i>	0 to -5	0	-5 to +15	0 to +10

intensity of tropical cyclones has been observed in the region over the past 100 years; however, substantial decade-scale variations have occurred.

**Ecological Systems.** Substantial elevational shifts of ecosystems in the mountains and uplands are projected. At high elevations, weedy species are expected to displace tree species. Changes in the distribution and health of rainforest and drier monsoon forest will be complex. In Thailand, the tropical forest could increase from 45% to 80% of total forest cover. Projected increases in evapotranspiration and rainfall variability are likely to have a negative impact on freshwater wetlands, resulting in shrinkage and desiccation. Sea-level rise and sea-surface temperature rise are the most probable major climate change-related stresses on coastal ecosystems. Coral reefs may be able to keep up with sea-level rise but may suffer bleaching from high temperatures. Landward migration of mangroves and tidal wetlands is expected to be constrained by human infrastructure and human activities.

**Hydrology and Water Resources.** Runoff from rain-fed rivers may change in the future, although a reduction in snowmelt water would result in a decrease in dry-season flow of these rivers. Larger populations and increasing demands in the agricultural, industrial, and hydropower sectors will put additional stress on water resources. Pressure will be most acute on drier river basins and those

(continued next page)



subject to low seasonal flows. Hydrological changes in island and coastal drainage basins are expected to be small, apart from those associated with sea-level rise.

**Agriculture.** The sensitivity of major cereal and tree crops to changes in temperature, moisture, and carbon dioxide (CO<sub>2</sub>) concentration of the magnitudes projected for the region has been demonstrated in many studies. For instance, projected impacts on rice yields suggest that any increases in production associated with CO<sub>2</sub> fertilisation will be more than offset by reductions in yield resulting from temperature and/or moisture changes. Although climate change impacts could result in significant changes in crop yields, production, storage, and distribution, the net effect of the changes region wide is uncertain. Low-income rural populations that depend on traditional agricultural systems or on marginal lands are particularly vulnerable.

**Coastal Zones.** Sea-level rise is the most obvious climate-related impact in coastal areas. Densely settled and intensively used low-lying coastal plains, islands, and deltas are especially vulnerable to coastal erosion and land loss, inundation and sea flooding, upstream movement of the saline/freshwater front, and seawater intrusion into freshwater lenses. Especially at risk are the large deltaic regions of Myanmar, Viet Nam, and Thailand, and the low-lying areas of Indonesia, the Philippines, and Malaysia. Socio-economic impacts could be felt in major cities, ports, and tourist resorts; artisanal and commercial fisheries; coastal agriculture; and infrastructure development. International studies have projected the displacement of several million people from the region's coastal zone in the event of a 1 m rise in sea level. The costs of response measures to reduce the impact of sea-level rise in the region could be immense.

**Human Health.** The incidence and extent of some vector-borne diseases are expected to increase with global warming. Malaria, schistosomiasis, and dengue – which are significant causes of mortality and morbidity in Tropical Asia – are very sensitive to climate and are likely to spread into new regions on the margins of presently endemic areas as a consequence of climate change. Newly affected populations initially would experience higher fatality rates. In presently vulnerable regions, increases in epidemic potential of 12–27% for malaria and 31–47% for dengue fever are anticipated, along with an 11–17% decrease for schistosomiasis. Waterborne and water-related infectious diseases are expected to increase.

**Adaptation and Integration.** Strategies for adapting to different climatic conditions will be diverse. For example, responses to impacts on agriculture will vary depending on the local agro climatic setting as well as the magnitude of climate change. New temperature- and pest-resistant crop varieties may be introduced and new technologies may be developed to reduce crop yield losses. Countries could improve irrigation efficiency from current levels, to reduce total water requirements. Integrated approaches to river basin management, which already are used in a number of countries in the region, could be adapted region wide. Such approaches could increase the effectiveness of adapting to the often-complex potential impacts of climate change that generally transcend political boundaries and encompass upstream and downstream areas. Similarly integrated approaches to coastal zone management can include current and longer-term issues, including climate change and sea-level rise.

*Source: 'Tropical Asia', Special Report on Regional Impact of Climate Change: An Assessment of Vulnerability (IPCC, 1999)*

in emissions of these greenhouse gases (GHGs) into the atmosphere.

CO<sub>2</sub> is the main target due to its quantity and effect on global warming. The major international agreements for reducing GHGs are the United Nations Framework Convention on Climate

Change (UNFCCC) and the Kyoto Protocol. All ASEAN member countries, except Brunei Darussalam, have ratified the UNFCCC (Table 9.3) These related agreements oblige developed and other countries (referred to as Annex I Parties to the UNFCCC) to limit emissions of GHGs, particularly CO<sub>2</sub>. Although AMCs (as





non-Annex I Parties) are not obliged to reduce their GHG emissions, many have voluntarily developed plans and strategies for doing so.

The major source of GHGs in ASEAN member countries is the combustion of fossil fuels for energy and transport. CO<sub>2</sub> emissions for the ten current AMCs have grown by an average annual rate of 7.5% from 1980–1996. In 1996 (Table 9.4), AMCs emitted about 750 million tonnes of CO<sub>2</sub> or 3% of the global total. The ASEAN Energy Centre (Table 4.13) projects average growth in energy demand for AMCs of 7.1% per year over the next decade, with a fuel mix that suggests a slightly higher growth rate for CO<sub>2</sub> emissions unless the efficiency of energy production and use improve. In per capita terms, AMCs released about 30% less CO<sub>2</sub> than developing countries overall, and about 14% of the output from the Organisation for Economic Cooperation and Development (OECD) countries. The OECD countries alone accounted for about half of all CO<sub>2</sub> emissions globally.

Detailed calculations of GHG emissions have been made by ASEAN member countries using an agreed standard IPCC methodology (i.e. revised 1996 guidelines) for the base year 1994, the only year for which comparable data are available for most countries internationally. Emissions for the energy and industry sectors tend to be accurate whereas those for land use and agriculture have higher levels of uncertainty due to less precise methodologies and emission factors. This also applies to the forestry sector which functions both as a CO<sub>2</sub> source and sink. Table 9.5 summarises available data for AMCs, all of which show, due to their large forest and tree cover, considerable levels of CO<sub>2</sub> removals (sinks) from land use and the forestry sector.

Although not obliged to reduce GHGs under the Kyoto Protocol, the AMCs have scope for doing so depending upon agriculture, forestry and energy policies. Numerous options for the

**Table 9.3** – Status of Ratification of Climate Change Agreements by ASEAN Members

Country	UNFCCC (Date Ratified)	Kyoto Protocol (Date Signed)
Brunei Darussalam	–	–
Cambodia	18 Dec 1995 (Ac)	–
Indonesia	23 Aug 1994	13 Jul 1998
Lao PDR	4 Jan 1995 (Ac)	–
Malaysia	13 Jul 1994	12 Mar 1999
Myanmar	25 Nov 1994	–
Philippines	2 Aug 1994	15 April 1998
Singapore	29 May 1997	–
Thailand	28 Dec 1994	2 Feb 1999
Viet Nam	16 Nov 1994	3 Dec 1998

Source: ASEAN Secretariat Note: Ac – Acceded

**Table 9.4** – CO<sub>2</sub> Emissions from ASEAN, Developing Countries and OECD, 1996

Region	1996 Emissions: million tonnes		Global Share
	Total	Per capita	(%; 1996)
ASEAN	752	1.5	3.1
All Developing Countries	8,716.5	2.1	36.4
OECD Countries	11,902.6	10.9	49.7

Source: Calculated from data in HDR 2000 (UNDP, 2000)

energy sector have been investigated under the GEF/UNDP/ADB 'Asia Least-Cost Greenhouse Gas Abatement Strategy' (ALGAS) between 1995 and 1998 in which five AMCs participated – Indonesia, Myanmar, the Philippines, Thailand, and Viet Nam. ALGAS identified four main technical options for reducing emissions: i) improving the energy efficiency of existing facilities, equipment and systems, ii) adapting more energy-efficient techniques in new capital stock, iii) using low or zero emissions energy sources, and iv) reducing methane emissions in energy production and transmission. Although beyond the scope of this report, it is noted that a

**Table 9.5** – Total and Net CO<sub>2</sub> Emissions from ASEAN Member Countries, 1994

Country	Gross Emissions in Million Tonnes of CO <sub>2</sub>					Removals	Net Emissions
	Energy	Industry	Land Use & forestry	Wastes	Total		
Cambodia <sup>a/</sup>	1.27	0.05	45.20	–	46.52	64.85	–18.3
Indonesia	170.0	19.1	559.5	–	748.6	403.8	344.8
Malaysia	84.4	5.0	7.6	0.3	97.3	68.7	28.6
Philippines	47.3	10.6	65.5	–	123.4	68.3	55.1
Singapore	26.6	0	0	0.2	26.8	0	26.8
Thailand	125.5	16.0	99.6	–	241.0	39.1	201.9

Sources: from national GHG inventory communications to UNFCCC, except <sup>a/</sup> from draft national communication

number of practical and cost-effective alternatives were identified which could reduce the growth of energy<sup>5</sup> and GHG emissions considerably.

Most AMCs have also introduced some energy conservation and 'demand side management' (DSM) measures in the power sector. In 1991, Thailand became the first country in Asia to formally adopt a nationwide DSM master plan. By April 1999, the DSM programme had saved 558 megawatts (MW) of power and 2,623 GWh (i.e. 2,623 million kWh) of energy, respectively. Assuming that the electricity saved would have come from heavy fuel oil, emissions of nearly two million tonnes of CO<sub>2</sub> were prevented (EGAT, 1999).

### Biological diversity

Biodiversity and related issues are covered by five key MEAs:

- (i) the 1971 Convention on Wetlands of International Importance especially as waterfowl habitats (RAMSAR Convention);
- (ii) the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage (Heritage);
- (iii) the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);



Hornbill

WWF/MM. Kavanagh

- (iv) the 1992 Convention on Biological Diversity (CBD); and
- (v) the 2000 Cartagena Protocol on Biosafety.

Table 9.6 provides information on the status of participation of AMCs in these MEAs. AMCs have complied with these MEAs through strengthening their legal framework and institutional capacity, developing various national plans and implementing appropriate management measures. The activities of some AMCs are summarised in Box 9.3.

### Biosafety

The conclusion of the Cartagena Protocol on Biosafety at Montreal on January 29, 2000 marks a cornerstone in the regulation of transboundary movement, handling and use of



### Box 9.3 – Activities of selected ASEAN Member Countries in Support of Biological Diversity

**Indonesia.** Indonesia has enacted several legislation in support of its commitment to conservation of biodiversity. In 1990, Indonesia promulgated Act No. 5 on the Conservation of Natural Resources and their Ecosystems which protected biological diversity in accordance with various treaties signed by Indonesia. Article 21 of the Act stipulates that 'any person found killing, injuring, transporting or trading in protected animals or destroying their eggs or nests is subjected to a maximum of one year's imprisonment and a fine of one hundred million rupiah'.

Indonesia ratified the CBD through an Act of Parliament in 1994. At the national level, the ratification of the Biodiversity Convention is

important from at least three perspectives:

- (i) provides a stronger legal basis for protection and sustainable use of biodiversity;
- (ii) accords protection against becoming a testing ground for release of genetically modified organisms that may harm biodiversity; and
- (iii) shows Indonesia's commitment to international cooperation on global conservation issues.

Indonesia is one of the few AMCs to have a strategy, a country study and an action plan on biodiversity. There are three approaches to the management of biodiversity: fulfilling basic needs, providing income and developing a healthy environment.

**Malaysia.** The National Policy on Biological Diversity adopted in 1997 envisions transforming Malaysia into a world centre of excellence in conservation, research and utilization of tropical biodiversity by the year 2020. Among its objectives are to optimise economic returns from the sustainable utilization of biological diversity, ensure long-term food security and preserve the unique biological heritage of Malaysia. Various areas are designated as national/state parks, wildlife reserves, sanctuaries and forest reserves. There

are plans to expand the network of conservation areas to ensure full representation of ecosystems and all ecological processes therein. The capacity and role of *ex-situ* facilities in conservation activities and research are being strengthened to complement *in-situ* conservation activities. Efforts are underway to expand *ex-situ* conservation sites, giving particular attention to threatened plant species for breeding and as a source of germplasm.

**Philippines.** The Philippines has been identified as one of the 17 megadiversity countries and one of the 25 biodiversity hotspots in the world. The government through the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR) convened a National Biodiversity Conservation Priority Setting Workshop with the participation of experts from multisectoral, multidisciplinary institutions and agencies, local and foreign NGOs, academe, government and others. The overall objective was to develop consensus on areas of high importance and priority actions needed for the conservation of biodiversity. This 11 month activity was co-convened by the Conservation International (CI-Philippines) and the University of the Philippines, Quezon City, as Scientific Advisers.

One of the many supporting organisations is the ARCBC based at Los Baños, Laguna.

The Philippines is testing a Biodiversity Monitoring System in 17 Protected Areas in the country. The system aims to improve information available for decision-makers in PAs through: a) Field Diaries – standardised recording of routine observations on resource use, habitat and wildlife in a simple pocketbook or data sheet during patrolling; b) Photo Documentation – repeatedly taking pictures over a certain period in a designated area; c) Transect Walk -similar to routine patrolling but transects are permanent, demarcated routes where there are precise recommendations as to where to walk, when to walk and what to note, etc.; d) Transect Swim – adaptation of Transect Walk method to marine

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areas; e) Transect Cruise – adaptation of Transect Walk method to wetland areas; and f) Focus Group Discussions – constructive dialogue between PA

staff and local communities on the status and management of the protected area.

**Thailand.** At national level, a committee on Convention on Biological Diversity has been established under the National Environment Board. Furthermore, four agencies under the Ministry of Agriculture and Cooperatives had established their

own departmental committees on biodiversity namely: the Royal Forest Department, Department of Fisheries, Department of Agriculture and Department of Livestock Development.

**Viet Nam.** The National Action Plan on Biodiversity Protection was promulgated by the

Prime Minister on 22 December 1995 and is progressively being implemented.

*Source: Information from respective governments*

**Table 9.6** – Status of participation of AMCs in MEAs related to Biological Diversity

Country	Ramsar Convention	World Heritage	CITES	CBD	Cartegena (signed)
Brunei Darussalam			4 May 1990*		
Cambodia	23 Oct 1999	28 Nov 1991*	4 July 1997	9 Feb 1995*	
Indonesia	8 Aug 1992	6 July 1989*	28 Dec 1978	23 Aug 1994	24 May 2000
Lao PDR		20 Mar 1987		20 Sept 1996*	
Malaysia	10 Mar 1995	7 Dec 1988	10 Oct 1977	24 June 1994	24 May 2000
Myanmar		29 April 1994*	13 June 1997	25 Nov 1994	
Philippines	8 Nov 1994	19 May 1985	18 Aug 1981	8 Oct 1993	24 May 2000
Singapore			30 Nov 1986	21 Dec 1995	
Thailand	13 Sept 1998	17 Sept 1987*	21 Jan 1983		
Viet Nam	20 Jan 1989	19 Oct 1987*	20 Jan 1944*	16 Nov 1994	

*Source:* ASEAN Secretariat

*Note:* \* = acceded or accepted

Genetically Modified Organisms (GMOs) (or Living Modified Organisms as referred to in the Cartegena Protocol). For the first time, the international community dealing with the development, handling, transport, use, transfer and release of any GMO has a set of obligations to comply with. Since all Parties to the Protocol (and even non-Parties in order to protect their trade interests) have to take necessary and appropriate legal, administrative and other measures to implement their obligations under

the Protocol when it eventually comes into force, it is essential that countries in the ASEAN region be prepared to meet these new challenges. Whilst the science of biotechnology are in various stages of development in these countries, expertise in risk assessment and risk management of GMOs however is lacking. Notwithstanding that trade in GMOs is expected to increase exponentially in the future, concern for safety of GMOs to human and animal health and the environment, including its impact on





ASEAN's rich biological diversity, cannot be ignored.

It is therefore imperative that ASEAN member countries prepare themselves to meet the legal, trade, environmental, human health, religious and ethical requirements pertaining to biosafety. Of immediate concern is the need to set in place or strengthen the legal and institutional framework to address biosafety concerns arising from the demands of consumers and the international community. Capacity building in terms of risk assessment and risk management, enhancing networking in biosafety, information sharing and increased public awareness of biotechnology and its products are measures that need to be commenced immediately and on a sustained basis in the long term.

ASEAN member countries are in various stages of development in terms of biosafety measures. While some countries have developed guidelines for R&D and field-testing of biotechnology products, none have a comprehensive legal framework to address the commercial and consumers' concerns as regards biosafety as mandated by the Cartagena Protocol. Many of these regulations are guidelines in nature and do not have legal compliance status. The efficacy of these guidelines is being challenged in the face of growing interest in biotechnology research and increasing availability of GMO products. In October 1999, the ASEAN Ministers for Agriculture and Forestry adopted the ASEAN Guidelines on Risk Assessment of Agriculture-Related GMOs. The Guidelines provide a common framework for ASEAN Member Countries to undertake risk assessment of agriculture-related GMOs and focuses on a science-based risk assessment. However, these are merely guidelines pertaining only to risk assessment of agriculture related products. Issues such as compensation, and liability,

labeling, socio-economic and religious factors were not covered under the Guidelines. National regulatory frameworks need to be set in place within the framework of these guidelines.

Box 9.4 describes the status of the legal and institutional biosafety framework in ASEAN member countries.

### Hazardous Wastes

The global concern regarding hazardous wastes is their transboundary movement from one country to another, especially from an industrialised to a developing country. Thailand experienced this problem in 1991 when a shipment of hazardous wastes arrived at Bangkok port with no importer identified. In late 1998, hazardous waste was imported into Cambodia and dumped on open ground near the port of Sihanoukville; its discovery sparked riots and several people died. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal regulates trade and encourages treatment and disposal of the wastes close to the source of generation in an environmentally sound manner. Six AMCs have ratified or acceded to the Basel Convention<sup>6</sup>: Indonesia, Malaysia, the Philippines, Viet Nam, Singapore, and Thailand. The AMC parties to the Basel Convention are meeting their obligations through strengthening legal frameworks and institutional capacities in hazardous waste management. Table 9.7 summarises actions taken by AMCs in compliance with the Basel Convention.

Chapter 7 noted the existence of several hazardous Persistent Organic Pollutants (POPs) hotspots in AMCs. POPs such as DDT, PCBs, toxaphene, dieldrin, and hexachlorobenzene are used as pesticides and in industrial processes, or are generated as by-products of combustion.



### Box 9.4 - Status of Biosafety in ASEAN Member Countries

#### BRUNEI DARUSSALAM

Brunei Darussalam does not have any biotechnology industry, as yet, and research in biotechnology has only been done on a small scale. However, in anticipation of the availability of GMOs, Brunei Darussalam, through the Agriculture Department of the Ministry of Industry and Primary Resources, has proposed the formation of a National Authority on Genetic Modification in 1999 to oversee, among others, the biosafety aspects of GMOs.

The foremost biosafety issue Brunei Darussalam will be facing is the import of GMOs

into the country. Appropriate labelling of genetically modified foods will be helpful to relevant authorities in deciding whether the foods are acceptable for human consumption or not. Questions on whether GMOs are *halal* or not for Muslims will be expected as well. In anticipating issues and challenges pertaining to GMOs, a core of experts in biotechnology, of which Brunei Darussalam is lacking, will be vital as policy and decision makers for the country. There is a need for biosafety procedures and guidelines for GMOs even though biotechnology activities in the country are only minimal in the country.

#### INDONESIA

The Ministry of Agriculture and the State Ministry of Research and Technology have produced guidelines for biosafety for their own purposes. The Ministry of Agriculture in 1995 drafted the regulation on Biosafety and became a Ministry of Agriculture Decree in 1997. Since the aspect of Food Safety was not covered in the Food Act, in September 1999, the decree has been revised and signed by four Ministries (Ministry of Agriculture, Ministry of Health, Ministry of Forestry and Estate Crops, and State Ministry of Food and Horticulture). The Ministry of Research and Technology also published the guideline manual for

working with LMOs/GMOs in laboratories.

Following the adoption of the Cartagena Protocol, the State Ministry of Environment is in the process of drafting a comprehensive regulation regarding biosafety. Indonesia is currently developing and field testing several transgenic crops. Among the major challenges faced by Indonesia is to promote a true picture with regard to GMOs among the people. Another challenge facing Indonesia is to develop effective and efficient regulations for ensuring environmental and biodiversity safety.

#### MALAYSIA

The National Policy on Biological Diversity aims to conserve Malaysia's biology diversity and to ensure that its components are utilised in a sustainable manner for the continued socio-economic development of the nation. Malaysia does not have a comprehensive set of laws pertaining to biosafety. In 1996, the Ministry of Science, Technology and the Environment established administratively the Genetic Modification Advisory Committee (GMAC) comprising relevant government agencies, experts and representatives from NGOs. GMAC does not have any legal authority to monitor and regulate GMOs, but acts as an advisory body to provide assessment based on science and other aspects

on any GMOs that is intended to be released to the environment. Currently, the Ministry of Agriculture (through its Plant Quarantine Act) has the authority to regulate agricultural products and the Ministry of Health (through its Food Regulations) to regulate GMOs which may have adverse impacts to health.

However, recognizing that these sector based regulatory frameworks may be insufficient to regulate in a comprehensive manner all biosafety concerns, the Malaysian Government, through the Ministry of Science, Technology and the Environment, is in the process of drafting a Biosafety Bill. The process which commenced in early 1999 is expected to be completed by 2001.

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On-going research on transgenic crops in Malaysia has been given emphasis on rice, papaya, orchid and chilli. Two most widely available transformation technologies are presently used to introduce any specific gene construct into a plant to develop transgenic crops, namely the

Agrobacterium-mediated transfer system and the biolistic transformation system. Of these three crops, only rice and papaya have reached a stage of transgenic development from which potential breakthroughs could be possible in the near future.

#### PHILIPPINES

The Philippines has adopted the R&D Guidelines administered by the National Committee on Biosafety of the Philippines (NCBP) on the following: (i) Biosafety Guidelines for Small-scale Laboratory Work, (ii) Biosafety Guidelines for Large-Scale Contained Work, and (iii) Biosafety Guidelines for Plant Release of Genetically Modified Organisms (GMOs) and Potentially

Harmful Exotic Species (PHES). In addition, commercialization guidelines are presently being prepared by the Department of Agriculture.

Coordinated by NCBP, the Philippines has embarked on R&D activities on plant genetic engineering in crops such as rice, papaya, mango, banana, coconut, sugarcane and mungbean.

#### SINGAPORE

Since Singapore's agricultural land only totals 1,500 hectare or about 2.5% of total land area, the productivity of the land is maximized by the application of agrotechnology and agri-biotechnology. Singapore has established agrotechnology and agri-bio parks to attract MNCs to invest and develop biotechnology products in various fields. Singapore has also established the Institute of Molecular Agrobiotechnology to conduct agricultural research at genetic and molecular levels through research collaboration among government institutions, local SMEs and international institutions. A Genetic Modification Advisory Committee has been established in 1999 to oversee and advise on the research and development, introduction, use, handling and release of GMOs in Singapore, ensuring that these are done in compliance with international standards. Four sub committees have been

established working on biosafety guidelines on agriculture-related GMOs; biosafety guidelines for research on GMOs; labeling of GMOs or GMO-related products; and public awareness on GMOs.

Up- and middle-stream R&D plant genetic engineering activities in Singapore are confined to the laboratory or containment greenhouse. Due to limitations in land resource, no field planting of transgenic crops has been carried out in Singapore. Field assessments of transformed plants are conducted with collaborating institutions in China and New Zealand. Basic research is focused on the development of transformation technology and isolation-cum-identification of novel promoters and regulatory sequences. Applied research is geared towards gene-mediated enhancement of agricultural traits of a broad range ornamental, vegetable and food crops.

#### THAILAND

Thailand has developed biosafety guidelines since 1992 with the establishment of the National Biosafety Committee a year later. The guidelines provide voluntary procedures for laboratory practices and field releases of genetically modified organisms. Introduction of transgenic plants into the country is regulated under the Plant Quarantine Act B.E. 2507. Introductions can only be made after approval from the Director General, Department of Agriculture.

Thailand has conducted R&D activities in

genetic engineering in the following plants: tomato, papaya, chili, pepper and cotton. However, deregulation of *Bt-cotton* was hampered by food safety issues. There were questions on the safe use of cotton shoots as food in some villages, cotton seed meal as animal feed and cotton oil. At present, no commercial production of any transgenic plant is allowed in Thailand.

Thailand is the world's leader in the export of rice, cassava products, canned pineapple, canned baby corn, and ornamental cut flowers such as



orchids. It also ranks among the top in the production of tropical fruits, rubber and palm oil. Since the EU, one of Thailand's biggest trade partners, recently adopted labelling regulations on GMO food products and raw materials, export industries have been greatly affected. For example, Thailand's canned tuna has been banned in Saudi Arabia and Kuwait in March 2000 on suspicion of using oil produced from GM soya beans.

The weakness of the current regulatory framework is that these Guidelines are not law, meaning that there are no provisions to impose penalties on any party not following the guidelines, though some relevant laws can be applied to these regulations such as the 1964 Plant Quarantine Act.

Although there has been no information on any violations of the guidelines, over time, however, the system will have to confront several problems. One is with the increasing number of applications for biosafety field trials, it is becoming clear that the country lacks standard infrastructures for most operational procedures such as standard steps and personnel for systematic biosafety field testing, monitoring, risk assessment research, management and training. Thailand, as with many other countries, has to confront the question of public acceptance of GMOs. The need for harmonization among government bodies and the private sector is also necessary to respond to the needs of all stakeholders.

#### **CAMBODIA, LAOS AND MYANMAR**

Research activities on GMO in these three countries have not started due to lack of R&D infrastructure and technical expertise. These constraints have also hampered the development of national biosafety guidelines. The three countries

have initiated limited R&D work in biotechnology using conventional biotechnology procedures, such as tissue culture for mass propagation of agro-forestry and plantation crops.

#### **VIETNAM**

The Viet Nam Government has established a working group to draw-up biosafety regulations for GMOs and their products. This working group includes experienced and qualified experts from various ministries. It is expected that the Biosafety Regulations for GMOs and their products will be issued by the end of 2000.

R&D activities on plant genetic engineering in Viet Nam are being undertaken through laboratory and contained field experiments focusing on crops such as rice, papaya, tobacco and cauliflower utilizing different types of genes developed by Viet Nam scientists or from other countries such as Belgium, Canada, England, Japan, Spain and USA.

*Source: AMC reports presented at the ASEAN Regional Workshop on Biosafety of GMOs in Kuala Lumpur, Malaysia, 24–26 April, 2000*

They persist for long periods in the environment as they resist photolytic, chemical and biological degradation and circulate far away from the original source. POPs concentrate in living organisms through bioaccumulation, being readily absorbed in fatty tissue, where concentrations can become magnified by up to 70,000 times greater than background levels. POPs are highly toxic, causing cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system.

In May 2001, the Stockholm Convention on Persistent Organic Pollutants was finalised, requiring parties to the Convention to minimise the use of POPs and eliminate some of them. The Convention controls the production, import, export, disposal, and use of POPs through promoting technologies and practices for replacing them, while preventing the development of new POPs. By May 2001, five ASEAN member countries – Cambodia, Indonesia, Philippines, Singapore and Viet Nam – had signed the POPs convention. Controls



**Table 9.7 – Implementation of the Basel Convention in selected ASEAN Member Countries**

Country	Activities
Indonesia	<ul style="list-style-type: none"> <li>• Government Regulation No.18 of 1999 on Management of Hazardous and Toxic Wastes (30 April 1994), as amended by Government Regulation No. 12 of 1995 (2 May 1995)</li> <li>• Decree of the Minister of Trade No.349/KP/XI/1992 on the Ban on Importation of B3 Waste and Plastics</li> <li>• National target for the reduction of hazardous waste by 50% by 2020 is proposed</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>• Environmental Quality Act of 1974</li> <li>• Environmental Quality (Scheduled Wastes) Regulations 1989</li> <li>• Environmental Quality (Prescribed Premises)(Scheduled Waste Treatment &amp; Disposal Facilities) Regulation 1989</li> <li>• Custom (Prohibition of Import/Export)(Amendment) Order 1993</li> <li>• Established a Central Intergrated Scheduled Waste Treatment and Disposal Facility</li> <li>• Inter-agency Technical Committee on Banned &amp; Severely Restricted Chemicals (PIC Committee)</li> <li>• Malaysia-Singapore Joint Committee on the Environment to control transboundary movement between both countries</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>• RA 6969 ,Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990</li> <li>• DAO 29/1992, Implementing Rules and Regulation of RA 6969</li> <li>• DAO 28/1994, Interim Guidelines for the Importation of Recyclable Materials Containing Hazardous Substances</li> </ul>
Singapore	<ul style="list-style-type: none"> <li>• Hazardous Waste (Control of export, import and transit Act and its regulations)</li> </ul>
Thailand	<ul style="list-style-type: none"> <li>• Hazardous Substances Act. B.E. 2535 (1992)</li> <li>• Chemical Wastes in the Notification of Ministry of Industry on List of Hazardous Substance B.E. 2543 (2000) issued under the Hazardous Substance Act. B.E 2535 (1992)</li> <li>• Notification of the Ministry of Industry No. 6 B.E. 2540 (1997) issued pursuant to the Provisions in the Factory Act. B.E. 2535 (1992)</li> <li>• Notification of the Ministry of Industry No. 1 B.E. 2541 (1998) issued pursuant to the Provisions in the Factory Act. B.E. 2535 (1992)</li> <li>• The Environmental Fund is established for the Environmental Sound Management Activities "Environmental Fund" of the Enhancement and conservation of the National Environment Quality Act B.E. 2535 (1992)</li> <li>• Establishment of disposal/recovery facilities, central hazardous waste disposal facilities, central infectious waste incinerators, recovery/recycling/reuse facilities</li> <li>• The Royal Thai Government has a policy to ban the import of hazardous waste for final disposal and strictly controls the import of hazardous wastes for recovery under the decision on "Banning the import of used lead-acid batteries for either disposal or recovery" (1993) and the decision on "Strict control on the import of used plastic scraps for recovery"(1994). Decisions have been made to limit export of hazardous wastes and other wastes for final disposal (of PCBs) and recovery (of sludge from electronics factories).</li> <li>• The Royal Thai Government has a policy to strictly control the transit, import and export of the hazardous wastes in accordance with the provisions of the Basel Convention and the national law, e.g. ban the import of used lead-acid batteries and restrict the import of plastic waste with special conditions.</li> <li>• Enact notification for the amendment of the list of hazardous wastes to be controlled for import and export according to new wastes listed in Annex VIII of Basel Convention in 2000.</li> <li>• The Pollution Control Committee appointed a Sub-Committee for the Implementation of the Basel Convention in 1999 comprising representatives from 9 relevant agencies. This Sub-committee is responsible for formulating appropriate legal and technical measures for the implementation of the convention, consideration and arrangement for the ratification of the Protocol and the Amendments of the Convention, and cooperation among the relevant government and private agencies to implement the Convention.</li> <li>• Conduct projects on the implication of the implementation of the Basel Convention and the ratification of its Ban Amendment in Thailand with technical and financial support from DANCED.</li> <li>• Organize training and workshops in order to support environmentally sound management of hazardous wastes within the country.</li> </ul>
Viet Nam	<ul style="list-style-type: none"> <li>• Implementation by the Decree of the Prime Minister on the Management of Hazardous wastes.</li> </ul>

*Source: Compiled from UNEP website and respective governments*





apply initially to twelve chemicals, namely eight pesticides (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, mirex, and toxaphene), two industrial chemicals (PCBs and hexachlorobenzene which is also a pesticide), and two by-products of combustion and industrial processes (dioxins and furans). Control of DDT is exempted for those developing countries requiring it for malaria eradication. AMCs have already taken steps to reduce the use of the twelve chemicals but need to review more fully the implications of compliance.

### International Tropical Timber Agreement

The International Tropical Timber Organisation (ITTO) administers the International Tropical Timber Agreement (ITTA) and supervises its operation. The ITTA was adopted in November 1983. It entered into force in April 1985<sup>7</sup> and has the following objectives:

- To provide an effective framework for cooperation and consultation between countries producing and consuming tropical timber;
- To promote the expansion and diversification of international trade in tropical timber and the improvement of structural conditions of the tropical timber market;
- To promote and support research and development to improve forest management and wood utilisation; and
- To encourage the development of national policies aimed at sustainable utilisation and conservation of tropical forests and their genetic resources, and at maintaining ecological balance in the regions concerned.

The AMC members of ITTO are Indonesia, Malaysia, Myanmar, the Philippines and Thailand. Table 9.8 summarises actions taken by AMC members to implement the ITTA.

**Table 9.8** – Actions Taken by selected Participating AMCs to Implement ITTA

Country	Action
Indonesia	<ul style="list-style-type: none"> <li>• Indonesian Tropical Forest Action Plan in 1991</li> <li>• Indonesian Forestry Action Plan in 1992</li> <li>• Decree of the Minister of Forestry and Plantations No. 252/Kpts - II/1993 on the Criteria and Indicators of Natural Production Forest Sustainability at the National Level</li> <li>• Decree of the Director General of Forest Utilization No.208/Kpts/IV-Set/1993 on Technical Guidelines for the Implementation of Criteria and Indicators For the Sustainable Management of Natural Production Forests at the Management Unit (Concessionaire)</li> <li>• Establishment of the Indonesian Ecolabel Institute in 1994</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>• Revised National Forestry Policy and amended National Forestry Act</li> <li>• The National Committee on Sustainable Forest Management was formed in early 1994 to formulate criteria, indicators and activities required to ensure sustainable management, conservation and development of Malaysia's forest resources.</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>• The Master Plan for Forestry Development was adopted in 1990</li> <li>• EO 263, adopting community-based forest management as the national strategy to ensure the sustainable development of forestlands, resources and providing mechanisms for its implementation (19 July 1995)</li> </ul>

Source: UNEP website



As the volume of tropical timber exported represents only about 5% of all trees removed from tropical forests, the ITTA has limited influence in addressing tropical deforestation. However, it is for the present the only international agreement dealing with the conservation and management of forests. As such, the ITTO provides a unique forum for forest management policy discussion between producer and consumer countries, and has become a vehicle for project activities, especially those geared toward reforestation and conservation.

### Law of the Sea

Although not strictly a global environmental treaty, the 1982 United Nations Convention on

Law of the Sea (UNCLOS) plays a prominent role in issues relating to the protection and preservation of the marine environment. UNCLOS provides a legal basis upon which to pursue the protection and sustainable development of the marine and coastal environment and its resources. It has established the International Seabed Authority, the International Tribunal for the Law of the Sea, and a Commission on the Limits of the Continental Shelf. The following eight AMCs have ratified UNCLOS<sup>8</sup>: Brunei Darussalam (5 November 1996), Indonesia (3 February 1986), the Lao PDR (5 June 1998), Malaysia (14 October 1996), Myanmar (21 May 1996), the Philippines (8 May 1984), Singapore (17 November 1994), and Viet Nam (25 July 1994).



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- <sup>1</sup> The main ODS are various chlorofluorocarbons (CFCs), gaseous synthetic substances composed of chlorine, fluorine, and carbon. The main sources are from the use of aerosol propellants, refrigerants, solvents, cleaning agents, and foaming agents. CFCs have an atmospheric life of 75 to 110 years.
  - <sup>2</sup> Global CFC production fell from 1.1 million tonnes in 1986 to 160,000 tonnes a decade later; the ozone layer is expected to recover to pre-1980 levels by about 2050 (*Global Environmental Outlook 2000*, UNEP, 1999).
  - <sup>3</sup> Box 10.1 in Chapter 10 explains the provisions of key MEAs, emphasising those with important links with international trade.
  - <sup>4</sup> The main sources for this section are IPCC 1998; three IPCC 2001 reports and *New Scientist*, 2001.
  - <sup>5</sup> EGAT (Thailand's Electricity Generating Authority) estimates that lignite (soft coal) emits 1.35 kg of CO<sub>2</sub> equivalent per kWh of electricity generated, diesel oil 1.03 kg/kWh, bituminous coal 0.84 kg/kWh, heavy fuel oil 0.72 kg/kWh, and natural gas 0.48 kg/kWh. Actual emissions vary with the efficiency of equipment, which varies, but it demonstrates the difference fuel switching can make.
  - <sup>6</sup> In addition, on 11 September 1998, Indonesia and the Philippines signed the 1998 'Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade'.
  - <sup>7</sup> The Agreement was amended in January 1994, with the amendment entering into force on 1 January 1997.
  - <sup>8</sup> The information is from the UNCLOS website ([www.un.org/depts/los](http://www.un.org/depts/los)), accurate as of 24 January 2001.



Nilo A. Pelayo



**A**SEAN Member Countries are heavily dependent on international trade and tourism, and future growth is expected to be fuelled mainly by both these sectors. Increasing globalisation and free trade will bring greater benefits to the ASEAN economies; however AMCs need to be vigilant against the negative consequences as well. For instance, the proliferation of multilateral environmental agreements and their implementation may bring adverse effects on ASEAN trade. The global community recognizes that trade and environment policies should be mutually supportive. However, in terms of implementation, technology, infrastructure, environmental preferences, local conditions, voluntary labelling schemes, standards, testing and certification can place onerous burdens on developing countries and skew international trade. The well endowed eco-tourism sites of ASEAN are a boon to tourists, but unsustainable management of these sites beyond their carrying capacity can bring irreversible damage. This chapter examines trade and tourism issues in the context of their environmental implication for ASEAN.

## ASEAN FACTS AND FIGURES

ASEAN's Share of World Trade		1990	1999
Merchandise Exports (US\$ billions)		\$144b (4.3%)*	\$359b (6.6%)*
Merchandise Imports (US\$ billions)		\$163b (4.7%)*	\$300b (5.2%)*
Growth in International Trade (1990-99)		Exports	Imports
ASEAN	(% per year)	11%	7%
World	(% per year)	5%	6%
Multilateral Environmental Agreements with Trade Implications for ASEAN:		nearly all of them	
ASEAN Tourism in 1999			
Tourist arrivals		33 million (Thailand led with 26%)	
Tourism receipts		US\$20 billion (Thailand led with 30%)	

\* % of world totals





### Importance of Trade to ASEAN Member countries

Global trade in merchandise grew by 5% per year during the 1990s, reaching \$5,473 billion in 1999. As Table 10.1 shows, during the same period ASEAN's exports grew at more than double the world rate, at 11% annually, to \$359 billion in 1999 despite considerable volatility during the economic crisis (Figure 10.1). Global merchandise imports grew 6% per year during the decade to \$5,729 billion in 1999; ASEAN's imports grew slightly more rapidly, 7% per year, to \$299 billion in 1999. ASEAN's share of total world exports increased from only 4.3% in 1990 to 6.6% in 1999; for imports from 4.7% to 5.2%. Trade has clearly been an engine of growth for ASEAN and is increasingly important for future growth. East Asia was the world's fastest-growing region in 2000. After strong recovery in 1999 in most economies, growth accelerated even further in 2000. Exports to the United States alone, which amounted to more than 20% of GDP in Malaysia and 10% in Thailand, played a key role, especially in exports from high-tech sectors (UNCTAD, 2001).

ASEAN has five major external trading partners: the United States, Japan, the European Union, China and Korea. Changes to trade policies, consumer preferences and economic conditions in these partners are of considerable importance to ASEAN.

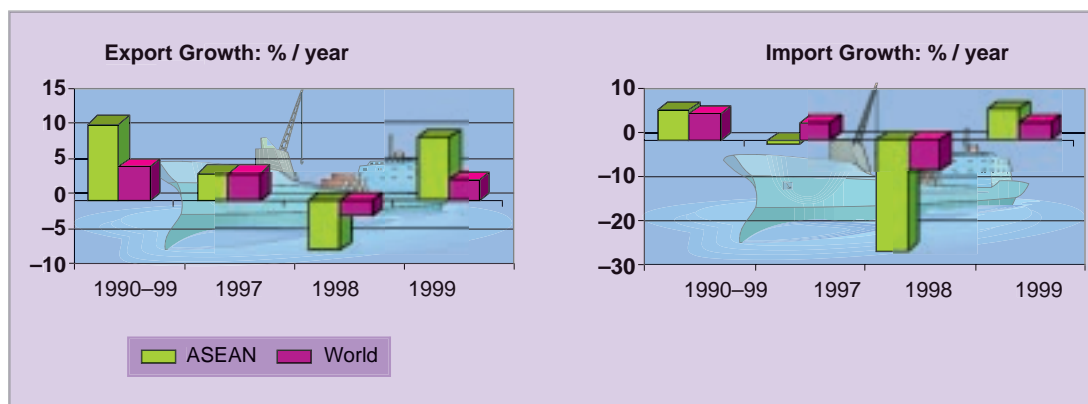
Foreign direct investment (FDI) is a major component of resource flows to AMCs, averaging 40% from 1990–1997 as shown in Figure 10.2. FDI for Malaysia, Myanmar and Viet Nam exceeded 50% of net resource flows. Until the economic crisis, the ASEAN region consistently recorded a high percentage of FDI

**Table 10.1 – ASEAN Merchandise Trade (US\$ Billions)**

Country	Exports		Imports	
	1990	1999	1990	1999
Indonesia	25.7	48.7	21.8	24.0
Malaysia	29.4	84.5	29.3	65.0
Philippines	8.1	36.6	13.0	32.6
Singapore <sup>a/</sup>	52.7	114.7	60.9	111.1
Thailand	23.1	58.4	33.4	50.3
Other Five	5.1	15.8	4.4	16.5
<b>All ASEAN</b>	<b>144.1</b>	<b>358.7</b>	<b>162.8</b>	<b>299.5</b>

**Source:** *International Trade Statistics 2000* (WTO, 2000)  
**Note:** <sup>a/</sup>Singapore includes significant re-exports.

**Figure 10.1 – Growth of Merchandise Trade for ASEAN Member Countries 1990–1999**

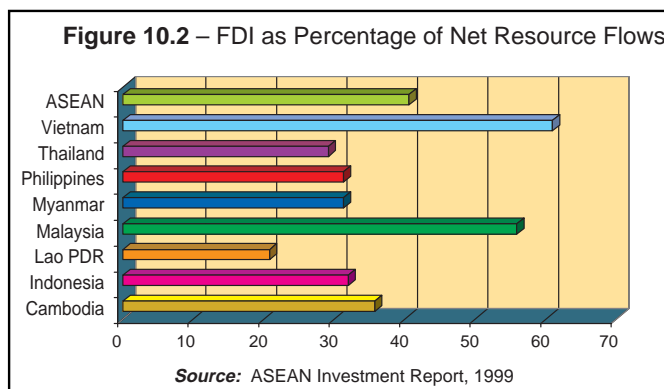


**Source:** World Trade Organisation, 2000



to gross fixed capital formation and FDI stock to GDP, compared to the world or developing countries averages, although figures varied widely among ASEAN Member countries.

Five AMCs were in the top twenty developing-country recipients of FDI capital flows in 1997 and 1998. Between 1993 and 1998, ASEAN received 17% of the US\$60 billion in cumulative global net FDI flows to developing countries. Over the same period, ASEAN received an annual average of US\$22 billion in net FDI flows, compared with an annual average of US\$8 billion from 1986–1991. FDI



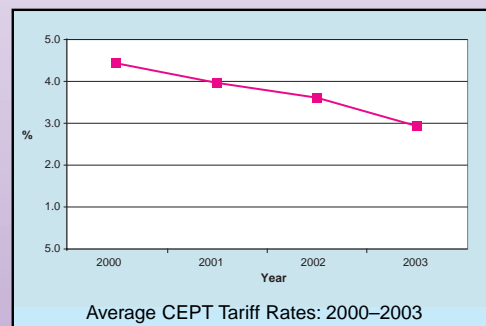
flow to AMCs increased on average by 14% annually from 1996 to 1998, while FDI stock within the AMCs grew ten-fold from US\$24 billion in 1980 to US\$234 billion in 1998.

An important catalyst for improving the

#### Box 10.1 – The ASEAN Free Trade Area

In 1992, the ASEAN Heads of State/Government decided to establish the ASEAN Free Trade Area (AFTA). The objective was to increase ASEAN's competitive advantage as a production base geared for the world market. A vital step in this direction is the liberalisation of trade through the elimination of tariffs and non-tariff barriers among ASEAN member countries. This serves as a catalyst for greater efficiency in production and long-term competitiveness. Moreover, the reduction of barriers to intra-regional trade provides the ASEAN consumer with wider choices and better quality consumer products. The Agreement on the Common Effective Preferential Tariff (CEPT) Scheme for AFTA requires that tariffs levied on a wide range of products traded within the region are reduced to 0–5%. Quantitative restrictions and other non-tariff barriers are to be eliminated. Although originally scheduled to be realised by 2008, the target of a free trade area within ASEAN has been continuously moved forward. With some flexibility, AFTA will now be completed by 2002 for Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand. The new

members of ASEAN have up to 2006 (Viet Nam), 2008 (Lao PDR and Myanmar) and 2010 (Cambodia) to comply. The average CEPT tariff rate in AMCs was 12.76% in 1993. This will be reduced to 3.96% in 2001 and 3.57% in 2002. In a landmark decision at their Summit in 1999, ASEAN Heads of State / Government agreed to eliminate all import duties by 2010 for the six original members of ASEAN; and to 2015 for the new members of ASEAN, but allowing some flexibility for sensitive products. This will create a truly integrated market with free flow of goods within the region.



Source: ASEAN Secretariat



competitiveness of AMCs in foreign trade has been the ASEAN Free Trade Area (AFTA) described in Box 10.1.

Limited recent data, shown in Table 10.2, suggest that FDI inflows have not yet recovered to pre-crisis levels. Japan, the United States, and the European Union are the largest sources of FDI in the ASEAN region. As with general trade policies, any change in consumer preference, rules, or FDI restrictions from these countries, can have a great impact on ASEAN. The next section considers evolving environment-trade linkages and their possible implications for ASEAN.

### Trade and The Environment <sup>1</sup>

Box 10.2 summarises those key Multilateral

**Table 10.2** – Foreign Direct Investment (net) in selected ASEAN Member Countries: 1997–2000 (US\$billion)

Country	1997	1998	1999	2000 <sup>al</sup>
Cambodia	0.2	0.1	0.1	0.1
Indonesia	4.7	-0.4	-2.7	-4.6
Malaysia	3.8	3.0	2.6	2.7
Philippines	1.2	1.7	1.1	1.0
Thailand	2.3	8.1	6.0	3.2
Viet Nam	2.0	0.8	0.7	0.6
<i>Six countries</i>	<i>14.2</i>	<i>13.3</i>	<i>7.8</i>	<i>3.0</i>

Source: *East Asia Update* (World Bank, March 2001)

Note: <sup>al</sup> estimated

Environmental Agreements (MEAs) which have impacts on trade in goods and services. MEAs can ban, restrict or control international trade in certain sectors, for example manufacturing of ozone depleting substances, exports of certain

#### Box 10.2 – The Principal MEAs Relevant to International Trade

***The Convention on International Trade in Endangered Species.*** The earliest of the key MEAs, CITES was drawn up in 1973 and entered into force two years later. It seeks to control trade in endangered species and products made from them. Three annexes list species identified by the Conference of Parties (on scientific advice) as being endangered to various extents. It establishes trade controls, ranging from a complete ban to a partial licensing system. CITES has long been known for the unusually active participation of NGOs – scientific and advocacy organisations in particular – in its deliberations. (146 parties).

***The Vienna Convention on Substances that Deplete the Stratospheric Ozone Layer, with the Montreal Protocol.*** The Montreal Protocol establishes a regime of control for several classes of industrial chemicals now known to harm the stratospheric ozone layer. The result has been a ban on the production and use of several of them, together with severe limitations on others. It has established a fund to assist developing countries in their transition from dependency on controlled

substances. Its principal enforcement tool is the control of trade in ozone-depleting substances (ODS) and trade in products containing controlled substances. (Vienna Convention: 173 parties; Montreal Protocol: 172 parties).

***The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal.*** The Basel Convention resulted from the concern of developing countries that they could become the dumping ground for hazardous wastes that could no longer be disposed of in the developed world. Developing countries and NGOs have continued to play a significant role in developing the regime. The Basel Convention has been marked by disputes over the most appropriate strategy for controlling the movement of hazardous waste (regional bans versus prior informed consent) and the technical difficulty in establishing unambiguous distinctions between wastes and materials for recycling. Parties have adopted amendments banning the export of hazardous waste from mainly OECD to non-OECD countries. (131 parties, 3 signatories, not ratified).



**Convention on Biological Diversity.** Opened for signature at the 1992 Rio Conference, the Convention aims to conserve biological diversity, promote the sustainable use of its components and ensure the fair and equitable sharing of the benefits arising from the use of genetic resources. The Convention has not been easy to operationalise. The very concept of 'biodiversity' is a research construct developed in the past 20 years to better help us understand the natural environment. Protecting a research construct, as opposed to something tangible such as a species or specific habitat, is not straightforward. There are potential conflicts between the CBD and the WTO TRIPS Agreement (135 parties, 12 signatories, not ratified)

**Framework Convention on Climate Change.** The 1992 FCCC is grappling with the most complex of all environmental issues, and the one with greatest potential for economic impacts. Since greenhouse gas emissions can rarely be limited with technical, 'end-of-pipe' technologies, the principal strategy of the FCCC must be to change the pattern of future investment in favour of activities that generate less GHGs. In December 1997 the Kyoto Protocol was adopted creating two classes of countries – those with greenhouse gas limitation commitments and those without – and several institutions governing their relations. Although neither the FCCC nor the Kyoto Protocol includes trade measures, it is highly likely that the parties, in fulfilling their Kyoto obligations, will adopt trade-restrictive policies and measures (180 parties).

**Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.** Many domestically banned or severely limited goods are traded internationally. For years there was controversy over the procedures to ensure that the appropriate authorities in the importing country were informed promptly. Indeed, a GATT working group devoted several years of negotiation to this topic, without achieving a generally acceptable result. UNEP (responsible for arrangements for managing potentially toxic substances) and the FAO (concerned with pesticide use) had a strong interest in developing a uniform system of notification. This needed to offer adequate assurance that information would be provided quickly, but also that it would reach the necessary

authorities when needed. And it needed to create a system that permitted developing countries to stop the import of certain substances if they felt a need to do so. This goal has been served by the Rotterdam Convention (62 signatories).

**Cartagena Protocol on Biosafety.** This Protocol to the CBD covers transboundary movement in most forms of 'living modified organisms' (LMOs) and the risks they may present to biodiversity. It creates an advanced informed agreement system for LMOs destined to be introduced to the environment (such as micro-organisms and seeds), and a less complex system for monitoring those destined for use as food, animal feed or processing. It sets out a procedure for countries to decide whether to restrict imports of LMOs, spelling out, for example, the type of risk assessment that must be carried out. In allowing such decisions to be taken even where the risks are unknown, the Cartagena Protocol operationalises the precautionary principle perhaps more clearly than any other international agreement to date. Opened for signature in May 2000, it will enter into force when ratified by 50 countries.

**The Stockholm Convention on Persistent Organic Pollutants** was concluded in May 2001. Like the Montreal Protocol, the POPs Convention establishes an international regime for the control and, in many cases, the banning of certain pollutants that persist in the environment and can accumulate in the food chain, or that are suspected of disrupting hormones.

**Emerging Regimes.** Several other international environmental regimes exist, which are still being negotiated, or which are likely to remain based on a less formal understanding between the interested parties. The *international forest regime* remains controversial and poorly articulated, and most observers doubt that it will coalesce into a multilateral agreement in the near future. A *private regime for sustainable fisheries* may emerge, the result of collaboration between producers and environmental NGOs on labelling for sustainable practices. Both of these regimes will be highly relevant for trade, since both involve widely traded commodities.

*Source:* Modified from *Environment and Trade: A Handbook* (UNEP, 2000) and updated



hazardous materials, sales of endangered species, or the use of genetically modified organisms in agricultural products. However, the environment-trade links are far stronger than this. Environment and trade are fundamentally related. International trade constitutes a growing portion of the growing scale of global and ASEAN economic activity, making it increasingly important as a driver of environmental change.

As economic globalisation proceeds and the global nature of many environmental problems becomes more evident, there will also be friction between the different multilateral systems of law governing environment and trade. Trade law is embodied in such structures as the World Trade Organisation (WTO) and regional trade agreements. Environmental law is embodied in the various MEAs, regional agreements such as those being negotiated for haze prevention within ASEAN, and national regulations. As illustrated in Box 10.3, the WTO has to increasingly deal with environmental aspects of trade. International environmental law, too, increasingly defines how countries will structure their economic activities. The Kyoto Protocol will, when eventually implemented, involve massive changes in some national economic investment and production decisions in order to cut greenhouse gas emissions to agreed limits. International trade law increasingly defines how countries should amend domestic laws and policies in areas such as intellectual property rights, investment policy and environmental protection.

There are numerous trade-environment linkages of increasing relevance to ASEAN. These include eco-labelling, environmental management certification, sector specific

certification and 'process and production methods':

- Environmental labels (or ecolabels) tell the consumer about the environmental impacts of producing or using a product. Although voluntary, in some markets they are becoming an important competitive factor. Labelling programmes can be run by governments, private companies and NGOs. The Geneva-based International Organisation for Standardization (ISO) is establishing ecolabel standards.<sup>2</sup>
- Environmental Management System certification tells consumers something about the companies that produce the products. They assess a company's overall handling of environmental issues but do not imply anything about the actual environmental impacts of the products. Rather, they require companies to follow preset environmental principles and guidelines which they set themselves. The ISO 14001 EMS series is an important international example which helps companies track, understand and improve their environmental management. It does not require specific principles or guidelines to be followed; companies can self-certify compliance although most seek independent verification. ISO 14001 says nothing about a company's environmental performance, addressing only the effectiveness of its environmental management system.
- Sector specific certification is somewhere between an ecolabel and an EMS certification. Examples of particular relevance to ASEAN are those for the forestry, fisheries, organic agriculture, and tourism sectors. A





company obtains certification if an independent auditor finds that it satisfies principles and criteria set out for that industry. An industry or sector focus allows guidance to be more specific than a generic system like ISO 14001. Certification typically allows an exporter to place what amounts to an ecolabel on its product, certifying compliance.

- A Process and Production Method is simply the way in which a product is made. Products can go through numerous stages (and therefore numerous PPMs), before they are marketed. Making paper requires trees to be grown and harvested, wood to be processed, and pulp perhaps to be bleached. Various processes to do this have different

environmental impacts on biodiversity, wildlife, human health, air pollution, energy use, etc.

Each of these has possible implications for future ASEAN trade. A legitimate concern of AMCs, for example, is that PPMs could be used by developed countries as barriers to trade under a pretext of environmental protection.

Ecolabels and EMS certification give consumers information to make environmentally sound purchasing decisions, but they may also create problems for developing nation exporters. Most ecolabelling schemes are national programmes, developed for domestic economic and environmental realities. They consider only

### Box 10.3 - The WTO Committee on Trade and Environment

The WTO's Committee on Trade and Environment is responsible, among other things, for identifying "the relationship between trade measures and environmental measures in order to promote sustainable development" and for making "appropriate recommendations on whether any modifications of the provisions of the multilateral trading system are required, compatible with the open, equitable and non-discriminatory nature of the system." The Committee covers the following topics, all relevant to ASEAN member countries:

- The relationship between trade rules and trade measures used for environmental purposes, including those in Multilateral Environmental Agreements.
- The relationship between trade rules and environmental policies with trade impacts:
  - (a) between trade rules and environmental charges and taxes, and
  - (b) between trade rules and environmental requirements for products, including packaging, labelling and recycling standards and regulations.
- Trade rules on the transparency (i.e. full and timely disclosure) of trade measures used for environmental purposes, and of environmental policies with trade impacts.
- The relationship between the dispute settlement mechanisms of the WTO and those of MEAs.
- The potential for environmental measures to impede access to markets for developing country exports, and the potential environmental benefits of removing trade restrictions and distortions.
- The issue of the export of domestically prohibited goods.
- The relationship between the environment and the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement.
- The relationship between the environment and trade in services.
- WTO's relations with other organisations, both non-governmental and inter-governmental.

*Source: Environment and Trade; A Handbook (UNEP & IISD, 2000)*



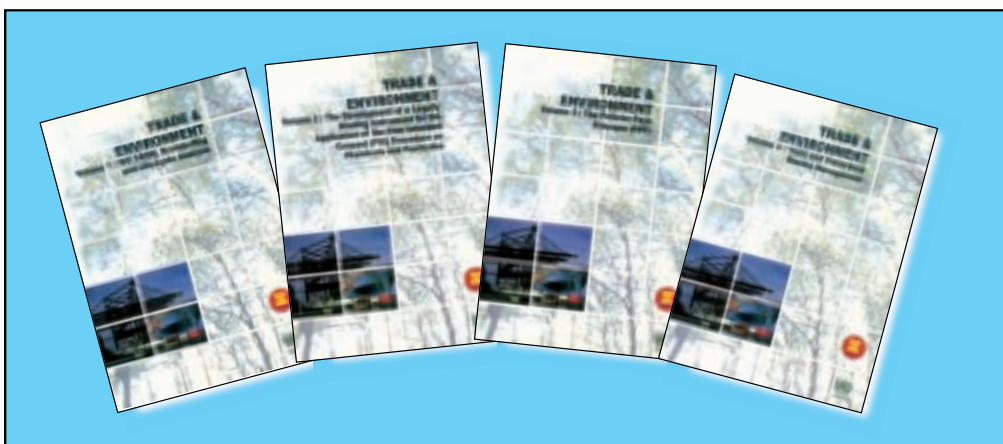
domestic environmental preferences so the criteria may be irrelevant to the environmental and social priorities of other countries. For example, forest conservation may be a priority for a wood importing country where regrowth is slow. A national ecolabel meant to promote recycled paper might disqualify ASEAN made products where the climate allows for profitable and sustainably managed forest plantations whose product content is 100% virgin pulp. Procedures for ecolabel or EMS certification may require technologies, infrastructure and expertise that are unavailable or expensive within AMCs. Market opportunities apparently offered by an ecolabel that specifies a product as free of genetically modified organisms might be more limited in reality if AMCs do not have the certified testing facilities and procedures. Finally, the EMS certification processes frequently lacks transparency. As a result, international standardising bodies could potentially become fora where developed countries could act strategically to protect their dominant market positions.

ASEAN countries need to be well aware of both opportunities and possible constraints for

trade based on genuine or ostensibly environmental grounds. International negotiations which lead to new trade agreements need to be characterised by more balanced and equitable participation of developed and developing countries, if those agreements are to accurately reflect the needs and conditions in all countries. A challenge for ASEAN will be to adequately protect the interests of its people and also its environmental integrity in emerging trade and MEA negotiations.

The ASEAN Senior Officials on the Environment (ASOEN) launched a programme to conduct training on issues pertaining to trade and environment. The ASEAN Secretariat with funding support from the United Nations Development Programme (UNDP), organized four training seminars for key government officials, representatives from NGOs, business, industry and professional associations. The details of the seminars held are as follows:

- Singapore's Ministry of Environment, supported by the ASEAN Working Group on Environmental Management, co-hosted a training seminar on ISO 14000, Ecolabelling





and Life Cycle Analysis from 12–13 August 1997 in Singapore.

- A seminar on the Development of a Legally Binding Instrument for the Application of the Prior Informed Consent (PIC) Procedure on Chemicals and Pesticides was held in Bangkok on 18–19 August 1997, co-hosted by the Pollution Control Department of Thailand's Ministry of Science, Technology and the Environment.
- The Environment Management Bureau of the Philippine Department of Environment and Natural Resources, co-hosted a seminar on the Polluter Pays Principle (PPP) from 21–22 August 1997 in Manila.
- The Indonesian State Ministry of Environment co-hosted a seminar on Toxic and Hazardous Wastes Management from 26–27 August 1997 in Jakarta.

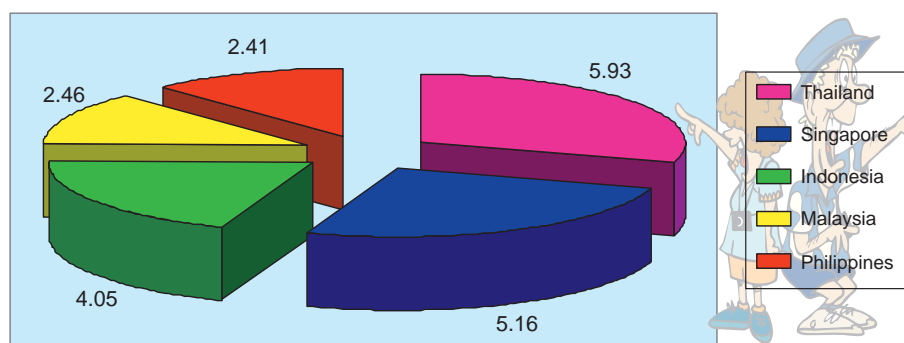
The seminars enhanced the participants understanding of the issues pertaining to trade and the environment. A recurring point made during the seminars was that ASEAN

governments needed to do much more to consider trade and environmental issues together in their policy making. To this end, the trade and environment officials of each ASEAN member country appreciated the need to meet and consult each other regularly. The participants resolved to further enhance consultations at the national level through similar reviews at the ASEAN level.

### Tourism and The Environment

The ASEAN region is a major world tourist attraction due to its rich endowment of natural beauty and cultures. The tourism resource base, coupled with government policies and measures to promote tourism, has resulted in phenomenal growth of tourist arrivals, an average annual increase of 8.3% from 1980–1999. ASEAN had 33.3 million tourist arrivals in 1999 of which Thailand received 26%, Malaysia 24%, Singapore 21%, and Indonesia 14%.<sup>3</sup> In 1999, as shown in Figure 10.3, Thailand led the region with tourist receipts (US\$5.9 billion) followed by Singapore (US\$5.2 billion), Indonesia (US\$4.0 billion), Malaysia (US\$2.5 billion) and the Philippines (US\$2.4 billion). The value of tourist

**Figure 10.3** – Tourism Receipts in ASEAN, US\$ billions (1999)



Source: ASEAN Secretariat



Teo Yong Kang

*Eco-tourism potential (above and below)*

receipts relative to exports was highest for Cambodia (19%), the Lao PDR (16%), Thailand (9%), Indonesia (7%) and the Philippines (6.5%).

Ecotourism has received increasing attention and vigorous promotion as a strategy for balancing tourism and environmental protection. It is estimated that 6 million tourist visits to East Asia per year are nature based, earning the countries a total of \$5.5 billion (Lindberg *et al.*, 1997). The World Wildlife Fund for Nature (WWF) defines ecotourism as “travelling to undisturbed natural areas to study or just to admire and enjoy the scenery and its wild plants and animals as well as their exotic cultures”. Ecotourism

capitalises on naturally endowed environmental and ecological resources and aims at involving local people in protecting their environmental and ecological resources for their economic benefits. Ecotourism programmes are in principle designed to focus the attention of tourists on the biodiversity of the region’s flora and fauna, interesting terrestrial marine life and the wealth of its cultural heritage. Ecotourism sites in ASEAN tend to be concentrated in protected forests and coastal areas in the region.

Ecotourism has been heralded as one of the most promising tools for conservation of natural habitats for the last 15 years. Adventure tourism and travel to natural attractions are on the upswing, and a growing number of countries have come to depend on tourism as a source of foreign exchange. According to Conservation International (website, 2001), a recent poll of travel magazine readers found that 67% of travellers preferred to spend their money



WWF/David Bowden



Box 10.4 : Major Ecotourism Sites of ASEAN Member Countries

Country	Ecotourism Sites
Brunei Darussalam	<ul style="list-style-type: none"> <li>- The Ulu Temburong National Park</li> <li>- Berakas Forest Recreation Park</li> <li>- The Sepilok Mangrove Reserve Park</li> <li>- The Lake Merimbun</li> </ul>
Cambodia	<ul style="list-style-type: none"> <li>- Phnom Penh – Siem Reap (Angkor)</li> <li>- Sihanoukville</li> <li>- Kirirom –Rattanakiri</li> </ul>
Indonesia	<ul style="list-style-type: none"> <li>- Java/Borobudur</li> <li>- Pulau Seribu/Jakarta</li> <li>- Sumatra/North Sumatra</li> <li>- Kalimantan/South Kalimantan</li> </ul>
Lao PDR	<ul style="list-style-type: none"> <li>- Luang Prabang/Mount Phousi</li> <li>- Xieng Khouang/Plain of Jars</li> <li>- Pakse/The Boloven Plateau</li> <li>- Pakse/Hill Tribes – Luang Prabang/The Pak – Ou Caves</li> </ul>
Malaysia	<ul style="list-style-type: none"> <li>- Kinabalu National Park</li> <li>- Kuala Gula Bird Sanctuary</li> <li>- Bako National Park</li> <li>- Gunung Mulu National Park</li> <li>- Taman Negara</li> </ul>
Myanmar	<ul style="list-style-type: none"> <li>- Mount Poppa National Park</li> <li>- Nat–ma Taung National Park</li> <li>- Moyingyi Wetlands Wildlife Sanctuary</li> <li>- Pyin – Oo – Lwin Botanical Garden</li> <li>- Yangon Zoological Garden</li> </ul>
Philippines	<ul style="list-style-type: none"> <li>- Palawan/Coron Island</li> <li>- Pangasinan</li> <li>- Mactan Island</li> <li>- Moalboal</li> <li>- Olango Wildlife Sanctuary</li> </ul>
Singapore	<ul style="list-style-type: none"> <li>- Jurong Bird Park</li> <li>- Singapore Zoological Gardens</li> <li>- Bukit Timah Nature Reserve</li> <li>- Singapore Botanic Gardens</li> </ul>
Thailand	<ul style="list-style-type: none"> <li>- Angthong Marine National Park</li> <li>- Khao Yai National Park</li> <li>- Phuket/Nai Yang, Rawai and Patong Beach</li> <li>- Chiang Rai/The Golden Triangle</li> </ul>
Vietnam	<ul style="list-style-type: none"> <li>- Bac Lieu Bird Sanctuary</li> <li>- Cuc Phuong National Park</li> <li>- Bara Mountain –Thoi Son Island</li> </ul>

Source: AMCs





### Box 10.5 – ASEAN Cooperation in Tourism

The objectives of ASEAN cooperation in the tourism sector are:

- (a) To develop and promote ASEAN as a single and collective tourist destination with world class standards, facilities and attractions;
- (b) To enhance cooperation in the tourism sector among Member Countries, involving both public and private sectors, in order to achieve facilitation of intra-ASEAN travel and free trade and investment in tourism services; and
- (c) To provide a common forum for discussion of major issues and developments in travel and tourism.

The following activities are being carried out to enhance cooperation in ASEAN tourism:

- (a) Exchange of information and experiences; coordination and/or harmonization of tourism policies and programmes; marketing, training, research and information dissemination; facilitation of intra-ASEAN travel.
- (b) Promotion of tourism incentives to facilitate the development of tourism infrastructure and other related travel and tourism facilities;
- (c) Promotion of private sector participation and enhancing public-private sector collaboration;
- (d) Closer cooperation with ASEAN Dialogue Partners and other emerging markets to promote tourism to ASEAN; and
- (e) Joint approaches in addressing international and regional tourism issues in areas of common interest.

Taking cognisance of the above opportunities, the 6<sup>th</sup> Meeting of the ASEAN National Tourism Organizations (NTOs) held from 17–18 July 1997 formulated the Plan of Action for ASEAN Cooperation in Tourism. The Plan was approved by ASEAN Tourism Ministers on 10 January 1998. This Plan of Action aims to promote greater tourism interaction and cooperation and bind ASEAN countries into a more cohesive regional alliance. The Plan of Action contains five strategies:

- Strategy 1: Marketing the ASEAN region as a single tourist destination with multi-faceted attractions and world class standards and facilities
- Strategy 2: Encouraging Tourism Investments under a More Competitive Regime
- Strategy 3: Developing a Critical Pool of Tourism Manpower
- Strategy 4: Promoting Environmentally Sustainable Tourism
- Strategy 5: Facilitating Seamless Intra-ASEAN Travel

The five strategies and intended actions are elaborated in the Tourism Plan of Action which is available at the ASEAN Secretariat.

*Source: ASEAN Secretariat*

in ways that support conservation of cultural and natural environments at their destinations. Ecotourism has contributed to conservation and economic well-being, but it also has the potential to destroy the very resources it seeks to protect. Attaching the 'ecotourism' label to poorly planned projects has often left many local populations in AMCs and elsewhere grappling with social tensions and environmental degradation, while

tourists' experiences have fallen far short of expectations. A recent ASEAN workshop (*Report of Workshop on Agenda 21 with Emphasis on Ecotourism*, Bangkok, Sept. 2000) listed numerous weaknesses of ecotourism ventures in the region including poor understanding of the concept by the public and within the local communities, inadequate land use control and zoning in Protected Areas,



ineffective marketing, insufficient training for ecotourism guides, insufficient funding, and conflicting mandates of government agencies.

Properly planned and developed, however, ecotourism can be used as a strategy for sustainable incomes, increased local environmental awareness, and community participation in environmental management. In addition, by its nature it involves small scale and dispersed development. Many tourist destinations in AMCs marketed for ecotourists (Box 10.4) are highly vulnerable to uncontrolled visits.

AMCs recognize the strategic role of the tourism sector for economic growth and sustaining the rich and diverse social, cultural and historical image of ASEAN. ASEAN countries have therefore closely cooperated in tourism since 1976 with the formation of the Sub-Committee on Tourism (SCOT) under the ASEAN Committee on Trade and Tourism. Recognizing the importance of promoting ASEAN as a single and collective tourist destination, the ASEAN Ministers responsible for Tourism adopted a Plan of Action for ASEAN Cooperation in Tourism in 1998 (Box 10.5).

<sup>1</sup> This section draws extensively from *Trade and Environment: A Handbook* (UNEP & IISD, 2000)

<sup>2</sup> There are three types of ecolabels under the ISO system: *Type I* compares products with other similar products based on life-cycle environmental impacts using criteria set by an independent body and monitored by a certification or auditing process; *Type II* is based on environmental claims made by manufacturers, importers or distributors but not independently verified; and *Type III* is similar to nutrition labels on food products, i.e. they do not judge or rate the environmental impact of products but leave that to consumers.

<sup>3</sup> Total tourist arrivals were not available for Brunei Darussalam for all of 1999 but from January – September 2000, totalled 636,605. If this rate of arrivals continued throughout the year, Brunei Darussalam would account for 2.5% of the ASEAN total.



## Chapter 11

# ASEAN Environmental Management Framework



**A**SEAN has one of the richest and most varied natural environment in the world, and the judicious use of these resources plays a big part in the continued well being of its people. Along with the rich and varied resource mix comes the challenge of caring and nurturing. Chapters 2–10 described the conditions and status of the environment and natural resources in ASEAN member countries, including the socio-economic settings and the external pressures that impinge on the environment. While it falls upon national governments to take actions to address and manage environmental problems, ASEAN has long recognized the synergistic benefits in addressing common problems on a regional basis. This is becoming even more imperative as many environmental problems transcend not only national boundaries, but are increasingly becoming global and complex in nature. This chapter describes ASEAN's environmental management framework – the institutional structure, the policy framework, and major regional programmes and activities that are being undertaken by ASEAN to address the environmental problems and to improve the quality of life of people in the region.

## ASEAN FACTS AND FIGURES

Policy Framework for Environmental Cooperation in ASEAN ( <i>derived from</i> )	ASEAN Vision 2020, (December 1997)
Environmental Objectives and Strategies in ASEAN ( <i>based on</i> )	Ha Noi Plan of Action, (December 1998)
Environmental Programmes and Activities in ASEAN	Strategic Plan of Action on the Environment, 1999–2004
Most Recent Ministerial Declaration on the Environment	The Kota Kinabalu Resolution on the Environment, (October 2000)



## ASEAN Institutional Framework For Environmental Management

Recognising the benefits of collective action to address environmental problems, ASEAN formulated a framework for ASEAN co-operation on the environment within the first few years of its establishment. An early initiative was the preparation of an ASEAN Sub-regional programme (ASEP) in 1977 with the assistance of the United Nations Environment Programme (UNEP). In the following year, the newly established ASEAN Experts Group on the Environment (AEGE) adopted the first of what became a series of ASEPs. ASEP I was endorsed by the First ASEAN Ministerial Meeting on the Environment in 1981. Subsequent Ministerial Meetings on the Environment endorsed ASEP II and ASEP III.

**Figure 11.1** describes the current institutional framework for environmental co-operation in ASEAN. A formally instituted structure exists in ASEAN where environmental issues are considered at various levels up to the ASEAN Heads of State/Government. At these Summit Meetings, the ASEAN Heads of State / Government provide the vision and broad thrust for ASEAN co-operation in various sectors, including co-operation in the field of environment. The ASEAN Ministers for the Environment are primarily responsible for policy matters related to the environment. The Environment Ministers meet once every three years on a formal basis, and since 1994 have met on an informal basis annually in between these formal meetings. Deliberations of the Environment Ministers are also considered by the Foreign Ministers at their ASEAN Ministerial Meetings, especially in terms of enhancing co-ordination and synergy in the various other sectors of co-operation.

The ASEAN Senior Officials on the Environment (ASOEN) meet annually and are responsible for formulation, implementation, and

monitoring of regional programmes and activities on the environment. ASOEN comprises heads of environmental ministries/departments/agencies (secretaries general/permanent secretaries of ministries, or directors-general of departments / agencies) who are responsible for environmental matters in their respective countries. ASOEN members also serve as the national ASOEN Chairman and focal points for promoting ASEAN activities in their respective countries. ASOEN is assisted by 4 subsidiary bodies namely the Working Group on Coastal and Marine Environment, the Working Group on Multilateral Environmental Agreements, the Working Group on Nature Conservation and Biodiversity and the Haze Technical Task Force. The ASEAN Secretariat coordinates and reports to ASOEN on all other activities that do not fall within the purview of the respective working groups.

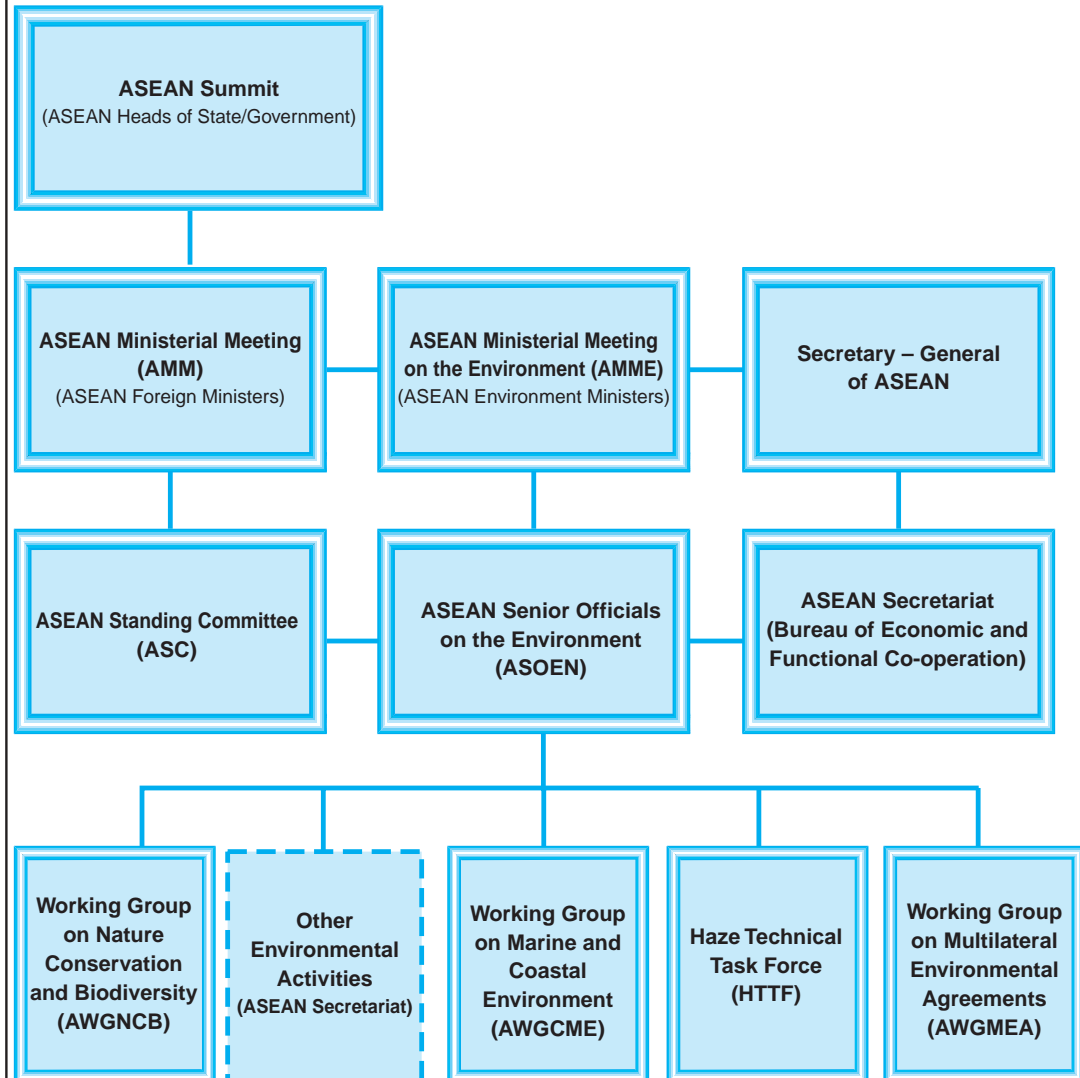
ASOEN was restructured in 1998 (Box 11.1) to enable it to be more responsive to emerging issues at the regional and national levels and to focus on key strategic areas.

The ASEAN Secretariat provides support for all of these institutional bodies. In particular, the ASEAN Secretariat acts as a resource base, providing advice and information. The ASEAN Secretariat also co-ordinates the implementation of regional activities and programmes, in addition to servicing the meetings of the ASEAN bodies. The ASEAN Secretariat ensures proper co-ordination between activities of various other sectoral areas so as to promote synergy and avoid duplication. Another important role played by the ASEAN Secretariat is the co-ordination between ASEAN bodies and its programmes with those of dialogue partners and other international organisations in terms of resource mobilisation, programme implementation and in general enhancing institutional linkage. The Bureau of Economic and Functional Co-operation, in particular the Environment Unit, handles all matters related to environment.





**Figure 11.1 – ASEAN Institutional Framework for Environmental Co-operation**



*Source: ASEAN Secretariat*

### Policy Framework

ASEAN co-operation in general is guided by the vision and broad strategic thrusts provided by the Heads of State/Government. In 1998, the ASEAN Heads of State/Government, after reviewing the last three decades of successful regional solidarity and co-operation, promulgated the ASEAN Vision 2020. The Vision

renews ASEAN's commitment to regional co-operation, taking into account past achievements, present realities and future opportunities.

Among the various priority areas of concern addressed by the ASEAN Heads of State/Government, environment is addressed in an integrated manner to help realize their Vision



of ASEAN as 'a concert of Southeast Asian Nations, outward looking, living in peace, stability and prosperity, bonded together in partnership in dynamic development and in a community of caring nations'. The Leaders envisioned 'a clean and green ASEAN with fully established mechanism for sustainable development to ensure the protection of the region's environment, sustainability of its natural resources, and high quality of life for its people'.

To ensure the realization of ASEAN Vision 2020, the Heads of State/Government adopted the Ha Noi Plan of Action (HPA) outlining specific courses of action for implementation. The HPA identifies several priority areas of concern, such

as strengthening macroeconomic and financial co-operation, promotion of science and technology, development of human resource, and the maintenance of regional peace and stability.

On environment, the HPA sets out 15 objectives addressing areas of primary concern to ASEAN and detailing specific thrust areas for implementation. (Box 11.2)

In April 2000, the ASEAN Environment Ministers adopted the Strategic Plan of Action on the Environment (SPA) 1999–2004, which translates the 15 objectives of the HPA on environment into specific projects and activities based on set time frames and targets.

#### Box 11.1 – ASEAN Senior Officials on the Environment (ASOEN)

ASEAN co-operation on the environment started in 1978 with the establishment of an ASEAN Experts Group on the Environment (AEGE) under the ASEAN Committee on Science and Technology (COST). The expert group was elevated in 1989 to become the ASEAN Senior Officials on the Environment (ASOEN). ASOEN meets once a year to consider the reports of its Working Groups, which also meet annually, and provide operational policy guidance on the various environmental programmes being pursued. As a matter of procedure, the reports of ASOEN meetings are considered by the ASEAN Standing Committee which in turn reports to the ASEAN Ministerial Meeting (AMM) comprising the ASEAN Foreign Ministers.

The co-operative programmes and projects of ASOEN are guided by the ASEAN Strategic Plan of Action on the Environment and until 1998, was carried out through the following six Working Groups (in addition to the Haze Technical Task Force established in 1995):

- (i) Environmental Management
- (ii) Environmental Economics
- (iii) Nature Conservation
- (iv) ASEAN Seas and Marine Environment

- (v) Transboundary Pollution; and
- (vi) Environmental Information, Public Awareness and Education

At the Ninth ASOEN Meeting held in Singapore in September 1998, a decision was made to restructure and streamline the ASOEN working groups in order to be more responsive to emerging regional and international environmental issues. As a result, only three working groups were established:

- (i) Nature Conservation and Biodiversity, chaired by the Philippines;
- (ii) Coastal and Marine Environment, chaired by Thailand; and
- (iii) Multilateral Environmental Agreements, chaired by Malaysia.

The Haze Technical Task Force, chaired by Indonesia, was retained in view of the need to continually address the transboundary haze pollution. The 1998 ASOEN meeting also agreed on The Terms of Reference and specific issues, programmes, and activities to be addressed by the new working groups. The meeting also agreed to rotate the chairmanship every 3 years.

*Source: ASEAN Secretariat*



### Box 11.2 – The Ha Noi Plan of Action

The Ha Noi Plan of Action (HPA) was adopted by the ASEAN Heads of State / Government in Ha Noi on 15 December 1998 to begin implementing ASEAN Vision 2020 through specific objectives and strategies for the period 1999–2004. The HPA addresses environmental protection and sustainable development through the following fifteen objectives.

1. Fully implement the ASEAN Co-operation Plan on Transboundary Pollution with particular emphasis on the Regional Haze Action Plan by 2001;
2. Strengthen the ASEAN Specialised Meteorological Centre with emphasis on its ability to monitor forest and land fires and provide early warning of transboundary haze by the year 2001;
3. Establish the ASEAN Regional Research and Training Centre for Land and Forest Fire Management by the year 2004;
4. Strengthen the ASEAN Regional Centre for Biodiversity Conservation by setting up networks of relevant institutions and carry out collaborative training and research activities by the year 2004;
5. Promote regional coordination to protect the ASEAN Heritage Parks and Reserves;
6. Develop a framework and improve regional coordination for the integrated protection and management of coastal zones by the year 2001;
7. Strengthen institutional and legal capacities to carry out Agenda 21 and other international environmental agreements by the year 2001;
8. Harmonise the environmental databases of member countries by the year 2001;
9. Implement an ASEAN regional water conservation programme by the year 2001;
10. Establish a regional centre or network to promote environmentally sound technologies by the year 2004;
11. Formulate and adopt an ASEAN Protocol on access to genetic resources by the year 2004;
12. Develop a Regional Action Plan for the Protection of the Marine Environment from Land-based and Sea-based Activities by the year 2004;
13. Implement the Framework to Achieve the Long-term Environmental Goals for Ambient Air and River Water Qualities for ASEAN countries;
14. Enhance regional efforts in dealing with climatic change; and
15. Enhance public information and education to promote awareness of, and participation in environmental and sustainable development issues.

*Source: ASEAN Secretariat*

While ASEAN Vision 2020 and the Ha Noi Plan of Action define the broad strategic and policy framework for environmental co-operation in the ASEAN Region, the Environment Ministers at every scheduled formal meeting issue declaration/resolution on the environment and sustainable development. These declarations, among others, assess the current status and developments both regionally and globally, articulate ASEAN's concerns and responses in addressing these issues, and provide Senior Officials with policy guidance on future work and

initiatives. The Ministers have issued 8 declarations/resolutions since 1981 (Box 11.3), the most recent one being the Kota Kinabalu Resolution on Environment and Development issued in October 2000.(Box 11.4).

### Major Regional Programmes and Activities

Since 1998, regional initiatives on the environment were guided by ASEAN Vision 2020



### Box 11.3 – Declarations issued by the ASEAN Environment Ministers

1. **Manila Declaration on the ASEAN Environment**, Manila, 30 April 1981
2. **Bangkok Declaration on the ASEAN Environment**, Bangkok, 29 November 1984
3. **Jakarta Resolution on Sustainable Development**, Jakarta, 30 October 1987
4. **The Kuala Lumpur Accord on Environment and Development**, Kuala Lumpur, 19 June 1990
5. **Singapore Resolution on Environment and Development**, Singapore, 18 February 1992
6. **Bandar Seri Begawan Resolution on Environment and Development**, Bandar Seri Begawan, 26 April 1994
7. **Jakarta Declaration on Environment and Development**, Jakarta, 18 September 1997
8. **Kota Kinabalu Resolution on the Environment**, Kota Kinabalu, Sabah, Malaysia, 7 October 2000

Source: ASEAN Secretariat

### Box 11.4 – The Kota Kinabalu Resolution on the Environment

CONCERNED that the issues on environment are becoming more complex and challenging;

AWARE that to meet these challenges, there is a need to strengthen the institutional and organisational capacity within ASEAN member countries;

REALISING that the Rio+10 Conference on Environment and Development will provide new driving force for achieving environmentally sound and sustainable development;

EMPHASISING the need for enhancing ASEAN cooperation to address common environmental problems, promote technology transfer, information networking and to deal with the negative impacts of globalisation; and

RECOGNISING that the ASEAN Strategic Plan of Action on the Environment shall continue to be the guiding document for present and future initiatives toward achieving balance between environmental protection and economic development.

WE, THE ASEAN MINISTERS FOR THE ENVIRONMENT HEREBY AGREE TO:

- Synergise the *ASEAN Strategic Plan of Action on the Environment* with the *Regional Action Plan for Environmentally Sound and Sustainable Development, 2001–2005 for Asia and the Pacific Region* with a view to optimising the utilisation of limited resources in the implementation of the planned activities;
- Adopt the approach of overcoming environmental pollution by working in collaboration with cities such as Kitakyushu which has successfully controlled pollution;
- Adopt and implement the *ASEAN Environmental Education Action Plan 2000–2005* and task ASOEN to implement the Plan;
- Accelerate our efforts in the realisation of the *Regional Action Plan for the Protection of the Marine Environment from Land and Sea-based Activities* by the year 2004;
- Initiate the process of negotiation on the *ASEAN Agreement on Transboundary Haze Pollution*;
- Continue and further enhance our collaboration to implement the *Regional Haze Action Plan (RHAP)* coherently and effectively;
- Sustainably manage and wisely use our diverse biological resources and exchange information on biodiversity conservation issues including biosafety and access to biological and genetic resources;
- Stand firm on the common understanding that the developed countries must fulfil their commitment under the *United Nations Framework Convention on Climate Change* and subsequently the *Kyoto Protocol*;
- Intensify our cooperation in enhancing national capacities in the negotiation and implementation of the Multilateral Environmental Agreements;
- Reiterate ASEAN's support of the proposal by Indonesia to host the "Rio + 10" Conference on Environment and Development, as stipulated at



the 9<sup>th</sup> Environmental Congress for Asia and the Pacific (ECO ASIA 2000) on 3<sup>rd</sup> September 2000 and the Ministerial Conference on Environment and Development in Asia and the Pacific in Kitakyushu, Japan, 4–5 September 2000;

- Support the proposal of Cambodia to host an Asia Pacific regional preparatory meeting in the run-up to the “Rio + 10” Conference on Environment and Development;
- Enhance environmental co-operation between ASEAN and the three East Asian countries

namely, China, Japan and the Republic of Korea;

- Task ASEAN Secretariat to explore the possibility of establishing environmental cooperation between ASEAN and Central Asian countries;
- Support the proposal to organise an international forum on fire hazards arising from large-scale biomass burning; and
- Explore the possibility of setting up an ASEAN Emergency Response and Rescue Institute.

*Source: ASEAN Secretariat*

and the 15 objectives set out in the Ha Noi Plan of Action. The Strategic Plan of Action on the Environment (SPAЕ) sets out specific and measurable actions for each of the 15 objectives of the HPA. Demonstrable progress has been made in planning and implementing activities to enhance environmental cooperation in the region. These activities are discussed below based on the mandate of the ASOEN subsidiary bodies namely (a) Transboundary Haze Pollution; (b) Nature Conservation and Biodiversity; (c) Coastal and Marine Environment; (d) Global Environmental Issues; and (e) Other environmental issues.

As environmental issues are interdisciplinary and cross-sectoral in nature – with regional and global impacts – concerted efforts are continuously undertaken to coordinate activities with other sectoral bodies of ASEAN, and with regional and international institutions. Similarly, environmental considerations have been incorporated into the development plans of other sectors to ensure the goals of environmentally sound and sustainable development are achieved. The ASEAN Secretariat plays an important coordinating and enabling role in integrating environmental factors into other development activities of ASEAN.

### Transboundary Haze

Transboundary haze pollution arising from land and forest fires continues to be the most prominent and pressing environmental problem facing ASEAN today. Though the region was spared of transboundary haze pollution in the period under review, ASEAN member countries continued to be vigilant and undertook short and medium term measures to prevent or control any occurrence of land and forest fires. Member countries recognize that it only takes a short spell of dry weather for the haze to occur as in August 2000.

The HPA addresses the transboundary haze issue through the following objectives, namely:

- (i) to fully implement the ASEAN Cooperation Plan on Transboundary Pollution with particular emphasis on the Regional Haze Action Plan (RHAP) by year 2001;
- (ii) strengthen the ASEAN Specialised Meteorological Centre with emphasis on the ability to monitor forest and land fires and provide early warning on transboundary haze by year 2001; and
- (iii) establish the ASEAN Regional Research and Training Centre for Land and Forest Fire Management by the year 2004.





Considerable progress has been made in the implementation of the 3 key components of the RHAP namely prevention, monitoring and mitigation.

The Environment Ministers are expected, at their Sixth Informal Meeting in May 2001, to release an ASEAN-ADB joint publication *entitled Fire, Smoke and Haze – the ASEAN Response Strategy* (Box 11.5). The publication reviews fire and haze episodes worldwide, their causes and impacts, the social and economic impacts of the

1997–98 haze episode, and the ASEAN Response Strategy, particularly with regard to the short, medium and long term strategy of the RHAP.

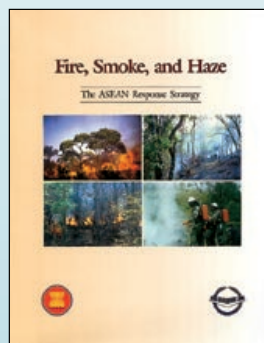
#### **Immediate Action Plans**

The Immediate Action Plans (IAPs) are designed to help district and local government, and community groups in developing comprehensive action plans for forest fire management. The IAP for West Kalimantan was successfully completed, with funding and

### **Box 11.5 – Fire, Smoke, and Haze: The ASEAN Response Strategy**

“1997 and 1998 were crisis years for the Association of Southeast Asian Nations (ASEAN). The financial turmoil that hit ASEAN countries’ economies during this period was compounded by the haze that enveloped a good part of the region. The pernicious practice of burning forests to clear land for commercial purposes and the unusually dry weather that caused even the earth to catch fire combined to produce a pall of catastrophic proportions. The loss in terms of agricultural production, transportation, tourism, and other economic endeavours has been estimated at more than \$9 billion. The cost to human health, loss of biodiversity, destruction of forests, and general environmental degradation is immeasurable.

ASEAN’s response was swift. ASEAN Ministers met frequently to draw up measures to deal with the problem. They adopted a Regional Haze Action Plan (RHAP), with corresponding national action plans and implementation measures, prescribing urgent action on three fronts - monitoring, prevention, and mitigation. Resources were mobilised and action undertaken to carry out these plans. The ASEAN Specialised Meteorological Centre in Singapore has been strengthened to



more effectively detect hotspots, predict weather, and provide early warning of fires. Fire fighting mechanisms have been organised in fire-prone areas and operational exercises have been carried out. Meetings with plantation owners and forest concessionaires have been organised to impress upon them the seriousness of the zero burning policy that ASEAN has adopted. And the ASEAN Secretariat has set up a special unit to coordinate efforts to deal with the haze problem. Meanwhile, in the long term, the ASEAN Environment Ministers have agreed to work on an ASEAN Agreement on Transboundary Haze Pollution. This publication, a joint effort of ADB and ASEAN, brings together the current knowledge about land

and forest fires, examines their causes and impacts with particular reference to Southeast Asia, and suggests what could happen in the future. It describes and assesses ASEAN’s response to the haze phenomenon and the role of ADB and other international bodies. Finally, it lays down a blueprint for future national, regional, and global action to deal with the haze problem in Southeast Asia...”

**Rodolfo C. Severino, Jr.**  
Secretary – General of ASEAN



technical support from Australia. The activities carried out were

- (i) Prevention – strengthening public awareness and education, training local extension motivators, and formulation and familiarization of law enforcement guidelines;
- (ii) Monitoring – intensification of the application of the early warning system, strengthening early detection system, and promotion of air quality monitoring system; and
- (iii) Mitigation – preparation of fire suppression mobilization plans (FSMPs), and field simulation exercise of FSMPs at provincial and district/local levels.

An IAP Phase 2 was also implemented for the Riau Province, with funding support from the Asian Development Bank. The activities included

- (i) drafting and socialisation of the Governor's decree on PUSDALKARHUTLA (land and fire management structure) in Riau Province;
- (ii) development of a ten-year capacity building plan for effective functioning of PUSDALKARHUTLA and its relevant agencies;
- (iii) development of a Forest Fire Management Plan with Standard Operating Procedures (SOP), including a glossary of technical terms; and
- (iv) development of an integrated provincial FSMP for the Riau Province.

The experiences gained from these pilot IAP activities will be further institutionalized and implemented in the identified key fire prone areas namely South Sumatra, Jambi, Lampung (under the purview of SRFA Sumatra), and Central Kalimantan, South Kalimantan and East Kalimantan (under the purview of SRFA Borneo). Funding and technical support are being sought from collaborating institutions for the implementation of these activities.

#### **Public Corporate Awareness**

In April 1999, ASEAN adopted the “zero-

burning” policy and urged all Member Countries to adopt and implement the necessary laws and regulations to enforce this policy. ASEAN convened a number of dialogue sessions with plantation companies as part of the effort to promote the zero burning policy among plantation owners and timber concessionaires. These dialogue sessions sought to inform and raise awareness on zero burning practices and techniques among plantation companies, and establish a regular forum in sustaining the activities with plantation companies.

ASEAN plans to organise more of such dialogue sessions regularly to further raise awareness and share experiences on zero burning practices. ASEAN encourages the private sector, especially plantation companies to undertake voluntary initiatives to control fires, and in this respect supported the formation of the Haze Prevention Group (HPG) of Indonesian Forestry and Plantation industries.

Apart from these initiatives, ASEAN has implemented public/community awareness programmes in fire-prone areas. A workshop was recently conducted in West Kalimantan Province to explore traditional values of the Dayak and Melayu tribes in managing fires (Box 11.6). This pilot activity was very successful as the community leaders came to an agreement on the need to further strengthen their traditional values based on scientific fire management methods. Follow-up action include establishment of community groups at the village level to prevent and control land and forest fires, and launching of public awareness programmes highlighting the impact of haze on health.

#### **Monitoring of Fire and Haze**

The centrepiece of RHAP's monitoring activities is a network of national- and regional-level institutions that include the ASEAN Specialised Meteorological Centre (ASMC),



### Box 11.6 – Traditional Values in Managing Land and Forest Fires

Traditional communities practising slash-and-burn agriculture have often been blamed for the occurrence of transboundary haze episodes. However, at a workshop that was convened in West Kalimantan, it was learnt that the traditional community has established tribal laws and practices to protect their areas and minimise damage resulting from fires. About 30 community leaders from the Melayu and Dayak tribes attended this workshop to discuss the various traditional techniques and methods they have been using for decades. These included techniques to predict the

coming of dry seasons, and to control the fires and minimise the impacts, and sanctions for community members who practise uncontrolled burning. At the end of the workshop, the community leaders came to an agreement on the need to further strengthen their existing values for fire-and-haze control. Follow-up actions included establishment of community groups at the village level to further prevent and control land and forest fires, and launching of community awareness programmes highlighting the impact of haze on health.

*Source: Adapted from West Kalimantan's report on the workshop*



national meteorological agencies, and other related agencies in the region. The ASMC, which is based in Singapore, has been designated to play a lead role in long-range climatological forecasting, early warning activities, and detection and monitoring of fires and haze in the region. Since April 2000, meteorological services from Brunei Darussalam, Indonesia, Malaysia and Singapore have been meeting regularly to discuss regional climate forecasts and address meteorological issues related to fires and smoke haze. Over the past year, the Sub-Regional Climate Review (SRCR) Meeting convened four times. The latest meeting was held on 29 September 2000 in Singapore.

ASEAN Secretariat's RHAP-Coordination and Support Unit continuously monitors the haze

situation region-wide on a day-to-day basis and shares its findings through its website: the *ASEAN Haze Action Online* ([www.haze-online.or.id](http://www.haze-online.or.id)). The sources of information for the website are derived from reports of ASEAN meetings, relevant central and provincial government agencies of ASEAN member countries, NGOs, relevant websites, and the mass media.

#### **ASEAN Agreement on Transboundary Haze Pollution**

Recognizing the need to further enhance regional cooperation on transboundary haze pollution, the ASEAN Environment Ministers have agreed to commence negotiations on an ASEAN Agreement on Transboundary Haze



Pollution. Four Intergovernmental Negotiation Meetings are scheduled to be held in 2001 and the Agreement expected to be signed by the end of 2001. The draft Agreement is expected to address policy and technical issues regarding monitoring, assessment, prevention, mechanisms for coordination, lines of communication, and simplified customs and immigration procedures for immediate deployment of people and goods across borders in case of an environmental disaster. UNEP is providing legal advice in the development of the Agreement and, in cooperation with the Hanns Seidel Foundation, is providing financial support for the holding of these negotiations.

#### ***Other related activities***

A GIS database for Sumatra, Kalimantan and Malaysia has been completed. The GIS database strengthens the capacity of the ASEAN member countries to use spatial data layers for forest fire prevention, planning, early warning, monitoring and assessment. It contains six thematic layers (elevation, hydrology, geology, settlement, land use and infrastructure). The database will be incorporated into CD-ROMs and training workshops held to disseminate the database and train end users.

An ASEAN Fire Danger Rating System (FDRS), supported by CIDA is being developed. The FDRS will provide quantitative measurements of the level of risk of fire and haze to which a particular geographic area is exposed. The activities focus on implementing FDRS at national level and strengthening regional fire network systems.

A Video Conferencing Facility has been commissioned and is fully operational. The Facility provides a multi-way video conferencing among the ASEAN Secretariat and the SRFA members: Brunei Darussalam, Indonesia,

Malaysia and Singapore. It facilitates more frequent, more effective, and less expensive consultations and meetings among these countries.

#### **Nature Conservation And Biodiversity**

The ASEAN Regional Centre for Biodiversity Conservation or ARCBC (Box 11.7), an ASEAN flagship project carried out in collaboration with the EU, implemented various activities to enhance the capacity of ASEAN in strengthening biodiversity conservation in ASEAN, through networking, applied research, database and information management, training and technical assistance.

ARCBC activities intensified during 2000. Four major workshops were held on the following topics:

- (i) Formulation of an ASEAN Framework Agreement on Access to Genetic Resources (Singapore);
- (ii) Regional Workshop on Biosafety of Genetically Modified Organisms (Malaysia);
- (iii) Data Information Standards and Data Sharing (Indonesia); and
- (iv) ASEAN Heritage Reserves Programme (Thailand).

In addition, ARCBC assisted in several other workshops in the region including:

- (i) Description and Delineation of Biodiversity Districts of Sarawak;
- (ii) Conservation Priority Workshop of the Philippines,
- (iii) Annual Meeting of Wildlife Conservation of Philippines; and
- (iv) National Training Needs Assessment Meetings (Vietnam, Philippines, Thailand).

Progress was made on the development of several training/awareness materials, including:



### Box 11.7 – The ASEAN Regional Centre For Biodiversity Conservation

The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) was launched in 1999, as a cooperative activity between ASEAN and the European Union. The Philippines Department of Environment and Natural Resources acts as the executing agency on behalf of ASEAN. The objectives of the ARCBC are to:

1. Establish an intra-ASEAN and ASEAN/EU network of institutional links;
2. Foster collaborative partnership between ASEAN and European institutions in training, research and information management;
3. Assess and strengthen human resources capability;
4. Assess and improve flow of information;
5. Analyse, document and disseminate information on regional biodiversity conservation;
6. Establish and maintain an appropriate database and information referral system;
7. Assist institutions and stakeholders in policy analysis;
8. Formulate proposals to coordinate regional initiatives on biodiversity issues; and
9. Assist in improving curricula on biodiversity conservation

To realize these objectives, the ARCBC in close consultation with the Member Countries is developing an integrated programme involving

networking and institution building. These institutions play a key role in linking the mosaic of regional scientific knowledge and promoting information exchange on biodiversity related areas. Activities includes developing partnerships with international organisations which are conducting research and developing biodiversity databases, developing and implementing exchange programmes for professors and researchers in ASEAN, and inviting European experts to facilitate transfer of knowledge and experience. The programme has enrolled 110 ASEAN experts and 13 EU experts. The ARCBC institutional links known as National Biodiversity Reporting Units in ASEAN include:

1. The Department of Forestry, Brunei Darussalam
2. The Research and Development Centre for Biology, Indonesia
3. The Ministry of Science, Technology and the Environment, Malaysia
4. The Protected Areas and Wildlife Bureau, the Philippines
5. The National Parks Board, Singapore
6. The Office of Environmental Policy and Planning, Thailand
7. The National Environmental Agency, Viet Nam

*Source: ASEAN Secretariat*

- (i) Protected Area Managers' Handbook and Training Manual;
- (ii) Protected Area Rangers' Handbook and Training Manual;
- (iii) ASEAN Mammals Identification Training Pack;
- (iv) Review of Marine Protected Areas Systems of ASEAN countries;
- (v) ARCBC Source Book: Biodiversity Guidelines for Development in Coastal and Rural Areas; and
- (vi) Biodiversity Database Users' Training Manual.

Activities for creation and maintenance of electronic repositories of sources of biodiversity data for ASEAN and EU scientific institutions, and establishment of links to other international databases have commenced following the Workshop on Standardization of Biodiversity Reporting and Information Sharing. The Biodiversity Information Monitoring System (BIMS) software was installed at the focal agencies of Philippines, Vietnam and Indonesia. The Web/Windows version was developed and is being pilot tested. Training in the use of software supplied was given in several countries,





including one international training course held in the Philippines.

ASEAN is currently formulating a Framework Agreement on Access to Biological and Genetic Resources in order to derive optimum benefits and ensure adequate protection for its rich biodiversity resources from bioprospectors.

On ASEAN Heritage Parks and Reserves, the Guidelines and Criteria for the Selection and Establishment of ASEAN Heritage Parks and Reserves was reviewed at a workshop held in Ha Noi in September 2000. The Guidelines will be used to designate further Heritage Parks and Reserves in ASEAN. Collaboration was also established with UNESCO to facilitate designation of one cluster and one transborder Natural Heritage Sites in ASEAN.

To promote applied research in ASEAN member countries, two tranche of research grants were approved in phases, the first tranche comprising 21 projects valued at Euro 1,190,993 in June 2000, and the second tranche comprising 15 projects valued at Euro 1,312,996 in February 2001. The research grants enable applied research on specific issues on biodiversity conservation in ASEAN member countries so as to enhance their conservation and sustainable utilization.

#### **Coastal and Marine Environment**

In an effort to protect coastal and marine resources and their environment, ASEAN has moved to strengthen regional cooperation with the appointment of the National Focal Points for seven subject areas: coral reef, sea grass and mangroves; oil sludge from tankers and ballast water; management of solid and liquid wasters; coastal erosion; eco-tourism; coastal wetlands, including protected marine areas; and clean technology. The focal point mechanism is vital to facilitate coordination of activities and the

exchange of information among the member countries and other organizations. Greater efforts have been made to enhance surveillance and follow-up action against illegal discharge, and to develop criteria for designating areas to protect coastal marine habitats and resources.

ASEAN continued to assess the possibility of collaborating with other organizations undertaking relevant activities. A project on "Regional Coordination for Integrated Protection and Management of Coastal and Marine Environment" has been prepared for further discussion and consultation with those potential partners.

#### **Global Environment Issues**

ASEAN continued to play an active role in the on-going negotiations of several multilateral environmental agreements. These include the

- (i) Framework Convention on Climate Change and its Kyoto Protocol,
- (ii) the Convention on Biological Diversity and its Cartagena Protocol on Biosafety,
- (iii) the Basel Convention on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal,
- (iv) Montreal Protocol on the Substances that Deplete the Ozone Layer,
- (v) Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (the Rotterdam Convention), and
- (vi) the Stockholm Convention on Persistent Organic Pollutants.

ASEAN continued to promote common position or understanding in the negotiations at these fora. These are done at three levels namely, the ASEAN Working Group on Multilateral Environmental Agreements (ii) Special Session or Workshops prior to the Convention Meetings and (iii) during the



Convention Sessions. In view of the importance of the on-going negotiations on climate change issues, and at the request of the Environment Ministers of ASEAN, the ASEAN Secretariat attended the 6th Conference of the Parties to the Climate Change Convention, where ASEAN consultative meetings were held concurrently to foster common understanding on the issues. ASEAN has designated lead countries for each MEA to ensure effective coordination and implementation of Convention obligations among ASEAN member countries. Training workshops are being held to promote understanding and facilitate implementation of the Conventions.

In view of the commonality and overlapping issues under MEAs, ASEAN has embarked on promoting synergies among these MEAs. A Workshop was held in February 2001 to identify issues and modalities for synergies among MEAs, and an ASEAN case study is planned to facilitate such synergistic approach in member countries. ASEAN is collaborating with the United Nations University in this endeavour.

### Other Environmental Activities

#### **ASEAN Environment Year 2000**

The ASEAN Environment Year 2000 (AEY 2000), which focussed on the theme *Our Heritage, Our Future* was successfully held during the year 2000. The campaign included seminars, training and workshops, exhibits and competitions, public relations and promotional activities. AEY 2000 helped to achieve the following aims:

- (a) Raise awareness of environmental issues at all levels of societies in ASEAN;
- (b) Create better informed and environmentally sensitive societies in order to enhance capacities for the attainment of the goals of sustainable development;
- (c) Highlight ASEAN achievements in the field of environment;
- (d) Promote government-private sector partnership and active involvement of major groups in environmental initiative; and
- (e) Stimulate regional activities in the

#### **Box 11.8 – LOGO for the ASEAN Environment Year 2000**



##### **The Logo.**

The ASEAN Environment Year (AEY) 2000 Logo incorporates the ASEAN emblem set in a green tree canopy which

forms the number 2000, designating the year in which this AEY was celebrated. The greenery also represents the natural environment. The trunk of the trees are shaped as built structures to represent the built environment. The three tree trunk structure also represents AEY being held once every three years. As a whole both features, in abstract form,

represent a tree. This also symbolises that development and environment can co-exist in harmony so as to ensure the sustenance and enhancement of environmental quality for the present and future generations of ASEAN. The round base of the tree coloured golden brown represents land, the blue ring surrounding it represents water while the horizontal blue and light blue lines represent air. These are important components of the ecosystem that are necessary to support life. Both the living component and the non-living component of the environment found in the logo representing the trees (living) and air, land, and water (non-living) constitute ASEAN's heritage that needs to be preserved.

**Source:** Ministry of Development, Brunei Darussalam, as host of ASEAN Environment Year 2000.



environmental arena. Similar activities were held in each ASEAN member country, including incorporating elements of the AEY theme in the national level environmental awareness campaigns (Boxes 11.9 & 11.10)

These activities highlighted AMCs environmental challenges and the need to address them in a collective manner. Through the participation of all sectors of the society, AEY 2000 aimed to inculcate a sense of stewardship of the environment among the peoples of ASEAN and placed emphasis and urgency on the fact that their future well-being including that of the planet lay in their hands. It is hoped that the launching of AEY 2000 at the beginning of a new millennium has served as a beacon to the ASEAN community, showing the way towards a more sustainable path of development for the future.

### ***ASEAN Environmental Education Action Plan 2000–2005***

The ASEAN Environment Ministers at their 8<sup>th</sup> Formal Meeting in October 2000 adopted the ASEAN Environmental Education Action Plan (AEEAP), which was formulated with financial assistance from the Hanns Seidel Foundation and UNEP (Box 11.11). ASEAN Vision 2020 envisions a clean and green ASEAN with its rich human and natural resources contributing to its development and shared prosperity. The AEEAP aims to translate that Vision by ensuring that its rich cultural traditions (the values and practices of the people) are in accord with the rhythm and harmony of nature; with citizens who are environmentally literate, imbued with environmental ethic, and are willing and capable to contribute to the sustainable development of the region through environmental education and public participation efforts.

#### **Box 11.9 – HO CHI MINH CITY'S “ACTION MONTH FOR GREEN, CLEAN AND BEAUTIFUL ENVIRONMENT” IN THE YEAR 2000**

The City's “Action Month for Green, Clean and Beautiful Environment” is a annual event launched to celebrate the World Environment Day. For the year 2000, it was held from May 5<sup>th</sup> to June 5<sup>th</sup>, 2000 aimed to strengthen the City's ongoing implementation of National Week for Clean Drinking Water Supply and Environmental Sanitation, and National Week for Tree Planting in Memory of the President – Uncle Ho.

The Action Month's objectives were to strengthen social security, improve environmental sanitation, make the City a good tourist destination, and continue the implementation of ten agreements on street's sanitation and civilized lifestyle. The activities included organising contests for green, clean and beautiful environment, and building civilized, clean and beautiful offices.

On the first day of the Action Month, garbage dumps from 165 apartments, 453 residential areas, and 86 roads were collected and disposed of; sewers and canals were cleaned up; and trees were planted by 50,000 members of Youth Unions coming from 139 schools, 262 districts and 879 wards. In District No. 1, illegal street markets were removed; 47 apartments were cleaned up in ten wards, and a number of green clubs established in public schools.

Awareness campaigns to celebrate the World Environment Day were carried out through publications of 181 posters, 157 slogans, and 60,000 leaflets.

*Source: Government of Viet Nam*



### Box 11.10 – Singapore Celebrates 10<sup>th</sup> Anniversary of ‘Clean & Green Week’

“Clean & Green. That’s the Way We Like It.” Ten years of Singaporean national environmental progress was celebrated during the “Clean & Green Week 10<sup>th</sup> Anniversary – A Decade Past, A Millennium Ahead” when “Clean & Green Week 1999” was celebrated in Singapore.

Two thousand trees were planted along scenic Marina Bay and the Marina South coastlines. Led by Prime Minister Goh Chok Tong, constituency advisors and Singaporeans from all walks of life participated enthusiastically in a mass tree planting effort. “Clean & Green Week”, an annual environmental campaign first organized in 1990, aims to raise Singaporeans’ awareness of

environmental issues and motivate them to do their part in taking care of the environment.

During this period a variety of themes were addressed: “Green for Life” (1990), “Resource and Nature Conservation” (1991); “Commitment and Responsibility: (1992); “Awareness and Action” (1993); “A-Better Living Environment” (1994); “Clean and Green for a Better Quality of Life” (1995); “A Gracious Society Cares for the Environment and Its Neighbourhood” (1996 & 1997); “Our Neighbourhood, Our Concern, Our Pride” (1998).

*Source: Government of Singapore*

The Plan not only serves as a collaborative framework for ASEAN cooperation, but more importantly also guides regional and international organizations to collaborate in a coherent manner in this important endeavour. The AEEAP is a collaborative framework for ASEAN cooperation. It enhances manpower capability and initiates mass-based action in managing the environment through information, education and communications campaigns. There are four target areas: i) formal education, ii) informal education, iii) manpower capacity building, and iv) networking, collaboration and communication. The Action Plan recommends, among others, appropriate strategies and actions to boost environmental knowledge and awareness in the region. It outlines priority activities that can be implemented successfully by agencies concerned at the national and regional levels. Various mechanisms to promote and establish effective networking and collaboration among the Member Countries are also delineated.

Initial activities planned to implement the

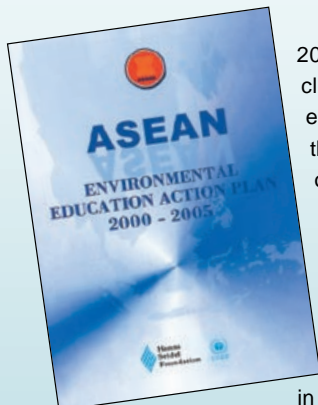
AEEAP include an inventory of environmental education resources in ASEAN, and a stakeholders’ workshop to gain support and collaboration for the implementation of the AEEAP.

#### **Promotion of Cleaner Production Technologies**

There have been several ASEAN activities and publications on environment-friendly technologies for cleaner production. One of the successful cleaner production activities of ASEAN is a ‘Waste Water Treatment Technology Transfer and Cleaner Production Demonstration Project’ – a A\$5.2 million (Australian dollar) activity under the ASEAN-Australia Economic Cooperation Programme. The primary goal is to foster environmentally sustainable development through use of cleaner production technologies and improved waste water treatment in the textiles, food processing and distilling industries. The project began work on-site in late 1997 and is scheduled for completion in June 2001 at two industrial sites each in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam.



### Box 11.11– The ASEAN Environmental Education Action Plan



“ASEAN Vision 2020 aims for a clean and green environment for the entire region of Southeast Asia. This can only be achieved if people are aware of their important role in protecting the environment and participate actively in keeping it clean - in their homes, streets, communities and all their surroundings. This is the thrust of the ASEAN Environmental Education Action Plan that was adopted by the Environment Ministers of ASEAN in October 2000 - to ensure that citizens develop from their own social and cultural values a sense of civic responsibility to care for the environment. Environmental protection and sustainable development depend greatly on public awareness and understanding of the environment and its vital link to cultural, social and economic development. The ASEAN Environmental

Education Action Plan aims to empower people through formal and non-formal education, so that they can acquire the necessary values and skills that will enable them to participate in the development of an ecologically sustainable community. ASEAN has long recognized the vital importance of environmental education through numerous ministerial declarations. The Plan integrates all these aspirations and puts in place a coherent strategy to invigorate environmental education in the region, building upon national, regional and international efforts. The Plan serves not only as a collaborative framework for ASEAN cooperation, but also as a reference guide for other regional and international organizations to work together in environmental education. It recommends appropriate strategies and actions to enhance environmental knowledge and awareness in the region and outlines priority activities that can be undertaken at the regional and national levels. It includes mechanisms to promote and establish effective networking arrangements among ASEAN member countries....”

*Rodolfo C. Severino, Jr.*  
Secretary – General of ASEAN

Project activities have included preliminary workshops, technology demonstrations and technology transfer. The workshops were held to plan auditing and the demonstration and technology awareness programmes. Technology demonstrations were conducted at each project site with process design assisted by Australian experts. Awareness activities were conducted in parallel with the demonstrations including workshops to bring participating countries to the same level of understanding regarding cleaner production, environmental management systems and wastewater treatment issues.

The project has been very successful in accomplishing significant operational improvements at each site and in demonstrating







that substantial gains can be realised in each industry by applying principles of cleaner production, coupled with improved waste water treatment. Sustainability is expected to be improved through demonstration, extensive training, and comprehensive high-quality project documentation. Private industry has responded positively; several of the companies involved have subsequently decided to fund several of the project initiatives themselves, by providing new treatment facilities at their industrial sites

***State of the Environment Reporting and Data Harmonization***

The Second ASEAN State of the Environment Report 2000 (SoER 2000) was published in July 2001. This is the second in the series of state of the environment reporting of ASEAN. The first Report was published in 1997. SoER takes stock of environmental conditions and their impact and interrelationship with other sectoral areas in ASEAN, and serves as a basis for policy intervention to address or promote sustainable development in ASEAN. SoER 2002, the third in

this series, is due to be published in time for the World Summit on Sustainable Development 2002 (Rio +10). SoER 2002 will serve an additional purpose as an ASEAN regional response to the issues to be addressed at the Summit, and is therefore expected to be much more analytical in nature in terms of assessing the progress of environmental protection over the past decade, and offering insights into future global and regional framework for environmental cooperation.

As a long-term measure, the HPA mandates the harmonisation of environmental databases of ASEAN member countries. Towards this end, ASEAN will establish harmonized quantitative information databases at both the national and regional levels to support environmental analysis, modelling and forecasting of issues for use in the state of the environmental assessment and reporting. The harmonized system will be useful not only for comparability of data and information at the national and regional levels, but will also provide significant contribution to the global environmental assessment process.



**8th ASEAN MINISTERIAL MEETING ON THE ENVIRONMENT  
6–7 October 2000, Kota Kinabalu, Sabah, Malaysia.**



**Environment Ministers or representatives (sitting from left to right):**

H.E. Pengiran Indera Wijaya Pengiran Dr. Haji Ismail bin Pengiran Haji Damit (Brunei Darussalam), H.E. Dr. Mok Mareth (Cambodia), H.E. Dr. Alexander Sonny Keraf (Indonesia), H.E. Dr. Souli Nanthavong (Lao PDR), Ambassador U Than Tun (representing H.E. U Win Aung of Myanmar), H.E. Dato Law Hieng Ding (Malaysia), Dato Chong Kah Kiat, Minister of Tourism Development, Environment, Science and Technology, Sabah, Malaysia, (Host), Dr. Ramon J.P. Paje (representing H.E. Heherson T. Alvarez of the Philippines), H.E. Mr. Lim Swee Say (Singapore), Mr. Porntep Techapaibul (representing H.E. Sontaya Kunplome of Thailand), H.E. Dr. Chu Tuan Nha (Viet Nam), Dato' Ahmad Mokhtar Selat (representing H.E. Rodolfo C. Severino, Jr. Secretary-General of ASEAN).

**ASEAN Senior Officials on Environment (standing from left to right):**

Dato Zakaria Noordin (Brunei Darussalam), Dr. Khieu Muth (Cambodia), Mr. Effendy A. Sumardja (Indonesia), Mr. Soukata Vichit (Lao PDR), Mr. Thant Kyan (Myanmar), Mr. Ng Kam Chiu (Malaysia), Mr. Edgar Thomas Q. Auxilian (Philippines), Mr. Tan Gee Paw (Singapore), Dr. Sunthad Somchevita (Thailand), Dr. Nguyen Ngoc Sinh (Vietnam), Dr. Raman Letchumanan (ASEAN Secretariat).



# Towards Sustainable Development



**A**SEAN's dynamic economic growth in the last two decades has heightened concern for sustainable development. Member countries have moved to protect the environment and to control the rate of exploitation of natural resources. ASEAN countries continue to cope with the challenge of balancing environmental concerns with the imperatives of development. Environmental degradation continues to roil the region. Increasingly, such problems are exacerbated by external pressures beyond the region. Any further prolonged recovery from the recent economic crisis may divert much needed resources from environmental protection to other critical sectors. But while environmental conditions remain problematic, the socio-political setting in ASEAN has become friendlier and much more committed to bold approaches to environmental management. The prospects are such that ASEAN can – and will – act quickly to meet them as a matter of the highest priority. This chapter reviews the overall environmental situation of ASEAN, critical emerging areas where ASEAN needs to devote attention to enhance environmental protection, and the prospects for environmentally sound sustainable development.

## ASEAN FACTS AND FIGURES

“..... We envision a clean and green ASEAN with fully established mechanisms for sustainable development to ensure the protection of the region's environment, the sustainability of its natural resources and the high quality of life of its people...”

*ASEAN Heads of State/Government  
Kuala Lumpur, 15 December, 1997  
(excerpted from ASEAN Vision 2020)*



## Overview of the Current State of the Environment in ASEAN

The previous chapters presented a portrait of the status of environmental conditions and natural resources in ASEAN, the external pressures that exert on them, and a glimpse of the regional initiatives to ameliorate any adverse effects and enhance the environment. The introductory chapter highlighted four key challenges facing ASEAN as it entered the 21<sup>st</sup> century; namely the continuing effects of the economic crisis, the impact of global environmental issues and international codes of conduct related to environment, increasing region-wide environmental problems, and realising the aspirations of ASEAN Vision 2020. Chapter 2 described the geographical influence on the nature and characteristics of environmental issues in each country, and concluded that, despite the diversity, many national and regional environmental problems were best addressed at the regional level. Chapter 3 noted that the continued population growth and rapid urbanization, despite a general trend in declining rates of population, could have significant environmental impacts unless addressed by appropriate policy responses. Chapter 4 showed the strength and vitality of ASEAN's economies and the effect of the blip in the growth trend caused by the economic crisis of the late 1990's, noting however, that expenditures on environmental protection have

not recovered alongside renewed economic growth especially to pre-crisis levels. Chapter 5 noted that the quality of life has improved for most of ASEAN people while highlighting that inequality, in terms of income distribution and poverty, continue to be a serious problem. These people are especially vulnerable to environmental health and natural disaster hazards. Chapters 6 through 8 documented the richness and diversity of aquatic and terrestrial ecosystems and showed how the imperative of economic growth and provision of basic human needs continue to outpace environmental initiatives to protect these resources. Chapters 9 and 10 demonstrated how events external to ASEAN could greatly affect development aspirations. ASEAN members are highly vulnerable, for example, to predicted climate change; continued growth in trade and tourism depend on changing policies and consumer preferences in many developed countries. Chapter 11 summarised the institutional, and policy framework and key regional activities of ASEAN to assist member countries in effectively addressing a broad range of environmental concerns. Despite discernable progress on many fronts, socio-economic development in ASEAN will not be sustainable if recent trends in land degradation and deforestation, the degree of inequality and poverty, and the general deterioration in the terms of trade and the negative impacts of globalisation continue. This final chapter looks at efforts ASEAN member

***The experience and know-how we have acquired so far will serve as useful lessons for us in the new millennium which will bring new and possibly more complex environmental challenges at national, regional or global levels. It would be prudent for ASEAN member countries to tackle these challenges collectively with possibly differentiated responsibilities.***



H.E. PENGIRAN INDERA WIJAYA  
PENGIRAN Dr. HAJI ISMAIL BIN PENGIRAN HAJI DAMIT  
Minister of Development  
Brunei Darussalam

*Extracted from Message for AEY2000*





countries are currently undertaking and key areas that are being emphasized to shift towards more sustainable development paths.

## Sustainable Development

The global community has generally accepted the concept of 'sustainable development' based on the definition of the 1987 Brundtland report (Box 12.1) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." However the point of agreement ends here. Differences abound in terms of interpretation, more so to operationalize the concept of sustainable development. The International Institute for Sustainable Development (IISD web site; April 2001) characterises it as "a fluid concept that will continue to evolve over time but common characteristics underlie its many streams of thought. Sustainable development emphasises the need for:

- (i) concern for equity and fairness – ensuring the rights of the poor and of future generations;
- (ii) a long term view – applying the precautionary principle; and
- (iii) systems thinking – understanding the inter-connections between the environment, economy and society.

### Box 12-1: Sustainable Development

Sustainable development goes further than showing concern for the environment. It aims to improve the human condition and seeks to achieve it in an environmentally sustainable way. According to the Brundland Commission report, *Our Common Future*, sustainable development is defined as:

*"development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:*

- *The concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *The idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs."*

*Source: Our Common Future (World Commission on Environment & Development)*

Accordingly, sustainable development will never be a detailed and fixed plan of action; solutions will differ among different countries based on their capacities and aspirations for the future. Among countries, the global community has accepted the principle of *common but differentiated responsibility*, embodying the principle that all countries share a common

***In order to ensure environmentally sound sustainable development in ASEAN, one must examine closely the needs of member countries, the mechanisms that exist for cooperation and find ways to willingly and generously help one another. This is because to protect the global environment as a whole, we need to work as a team. I sincerely believe that ASEAN countries will go forward hand in hand for the mutual benefit of all.***



**H.E. Dr. MOK MARETH**  
Minister for Environment  
Royal Kingdom of Cambodia

*Extracted from Message for AEY2000*



concern for the environment, but each group (typically the developed and developing countries) has differentiated responsibility based on their contribution (historical and current) to global environmental problems, and the financial and technical capacity to ameliorate them. As noted in the earlier chapters, ASEAN member countries do not significantly contribute to global environmental problems (in most cases much less than other developing countries) but nevertheless they continue to share a disproportionate burden of its impacts. Within ASEAN member countries themselves, the different socio-economic conditions dictate the extent of intervention in environmental protection. However, all ASEAN member countries collectively share common aspirations for environmental protection and strive to ensure a balanced approach towards socio economic development and environmental protection.

### ASEAN's Commitment to Sustainable Development

ASEAN shares and believes in the global vision for sustainable development. Their commitment to international cooperation for the protection and enhancement of the environment was embodied in the Singapore Resolution on Environment and Development adopted as early as February, 1992. Among others, ASEAN has actively supported and participated in the

international initiatives on the protection of the ozone layer, biological diversity, and climate change, among others.

At the national level, ASEAN member countries have aligned their development goals and plans with Agenda 21 – an extremely ambitious 300-page outline plan for achieving sustainable development in the 21<sup>st</sup> century – which was adopted by Heads of State/Government during the June 1992 Rio “Earth Summit.” Shortly afterwards, in December 1992, a UN Commission on Sustainable Development (CSD) was established to facilitate follow-up, to monitor progress and to report on implementation of Agenda 21 and other Earth Summit agreements at local, national, regional and international levels.

As shown in Table 12.1, AMCs have established interagency committees and other more formal institutions to implement Agenda 21 at the national level. Agenda 21 reports (national sustainable development strategies and similar national environmental action plans) have been useful in guiding national thinking on environmental management. However, support from the international community for implementing Agenda 21 has been disappointing and progress has been limited.

At the regional level, ASEAN Vision 2020 and

***ASEAN cooperation is indeed very crucial for the continued management of the global environment. In the future this cooperation will hopefully increase rapidly while issues relating to law enforcement and institutional capacity building are addressed.***



**H.E. Dr. A. SONNY KERAF**  
State Minister for the Environment/  
Head of Environmental Impact Management Agency  
Republic of Indonesia

*Extracted from Message for AEY2000*

**Table 12.1** – ASEAN Member Countries' Agenda 21 Arrangements

Country	Responsible Institution	Key Documents
Brunei Darussalam	National Committee on the Environment	National Environment Strategy; 7 <sup>th</sup> National Development Plan, 1996–2000
Cambodia	Ministry of Environment	National Environmental Action Plan, 1996
Indonesia	Ministry of State for Environment	Agenda 21 Indonesia, 1997
Lao PDR	Science, Technology and Environment Agency	State of Environment Report, 2001 <sup>a/</sup>
Malaysia	Economic Planning Unit, Prime Minister's Department	7 <sup>th</sup> Malaysia Plan, 1996–2000 & various reports
Myanmar	National Commission for Environmental Affairs	Myanmar Agenda 21
Philippines	Philippine Council for Sustainable Development (chaired by National Economic and Development Authority; also 21 Local Councils for Sustainable Development)	Philippine Strategy for Sustainable Development, 1989; Philippine Agenda 21, 1997
Singapore	Ministry of Environment	Singapore Green Plan Action Programme
Thailand	Agenda 21 Subcommittee of National Environment Board; (Local Agenda 21, Dept of Environmental Quality Promotion)	Policy and Prospective Plan, 1997–2016 <sup>b/</sup>
Viet Nam	National Environment Agency. Ministry of Science, Technology and Environment	various reports

**Source:** Report of ASEAN Workshop on Agenda 21 (ASEAN Secretariat, 2000)

**Note:** <sup>a/</sup> Being finalized; <sup>b/</sup> Full title: Policy and Prospective Plan for the Enhancement and Conservation of National Environmental Quality, 1997-2016

the strategies of the Ha Noi Plan of Action (HPA) are based on a conceptualisation of sustainable development, consistent with the Brundtland Commission and Agenda 21 approaches. ASEAN Vision 2020 calls for a “clean and green ASEAN with fully established mechanisms for sustainable development to ensure the protection of the region’s environment, the sustainability of its natural resources, and the

high quality of life of its peoples.” The HPA contains a comprehensive set of specific objectives to begin to implement the Vision during the initial six years, including (among many others):

- equitable economic development and reduced poverty and socio-economic disparities;

***The adoption of ASEAN Vision 2020, the Ha Noi Plan of Action and the ASEAN Strategic Plan of Action on Environment – which are outstanding guides for our management – express clear commitments of all concerned countries for sustainable development. The Lao PDR, as a new member country of ASEAN, has the firm belief that ASEAN will increasingly be “clean and green” and will join the global movement for sustainable development.***



**H.E. Prof. Dr. SOULI NANTHAVONG**  
Minister to the Prime Minister's Office,  
in charge of Science, Technology and Environment.

*Extracted from Statement at 8th AMME*



**ASEAN has been very successful in the environment sector where we have worked together to address many environmental issues such as the transboundary haze problem. Much can be done to make ASEAN an exemplary model of international co-operation. ASEAN countries could also explore ways to enhance collaboration especially in building capacity in areas of common concern such as conservation of shared resources, and in implementing multilateral environmental agreements.**



**H.E. Dato LAW HIENG DING**  
Minister of Science, Technology and the Environment  
Malaysia

*Extracted from Message for AEY2000*

- adequate levels of food within ASEAN and food accessibility during instances of food shortage;
- energy security and sustainability of energy supply, efficient utilisation of natural energy resources in the region and the rational management of energy demand, with due consideration to the environment;
- measures taken to protect the most vulnerable sectors of our societies;
- framework for ensuring the survival, protection and development of children;
- promotion and protection of human rights and fundamental freedoms;
- equal access to basic, general and higher education;
- a regional water conservation programme;
- protection of the marine environment from land-based and sea-based activities;
- improved ambient air and river water quality; and
- enhanced regional efforts in addressing climate change.

Therefore ASEAN Vision 2020 and the operational Ha Noi Plan of Action, in incorporating social and economic development goals with environmental protection goals, provide a seamless integration of interrelated activities that help to enhance the quality of life of individuals, and environmental protection and socio-economic growth of the region.

**ASEAN nations have rich natural and cultural resources that are essential for promoting the quality of life. Conservation of these rich heritage is an important task for the present generation to ensure better life for future generations to come. Today, the world at large is besieged with environmental problems resulting from mismanagement of environmental resources. Fortunately, there was an unprecedented rise in global environmental awareness over the past few decades that has brought environmental issues to the top of the international agenda.**



**H.E. U WIN AUNG**  
Minister of Foreign Affairs and Chairman of the  
National Commission for Environmental Affairs,  
Union of Myanmar

*Extracted from Message for AEY2000*



The World Bank (*Quality of Growth*, 2000) argues that natural capital – the environmental capital on which we depend for vital life support, production of our goods and services, and as a sink for our wastes – tends to be especially badly abused during periods of rapid economic growth. Meeting the goals of the Vision 2020 and the HPA require both further rapid economic growth within ASEAN and improved protection of the environment. Specific policies and programmes therefore need to be developed and carried out to counter this tendency of environmental abuse (as pursued historically by the industrialized countries) to ensure that Vision 2020 and HPA aspirations are met in practice: growth is more equitable, balanced and environmentally sustainable. Herein lies the challenge for ASEAN member countries: how to avoid the historical developmental path of industrial countries of rapid economic growth with neglect for the environment, while at the same time attain developed nation status with the quality of the environment intact if not enhanced.

A considerable number of such policies and programmes have been developed and are continually being refined in line with the developmental goals as enshrined in ASEAN Vision 2020. Most of these regional initiatives have been discussed in the earlier chapters, particularly Chapter 11.

### Emerging Issues that may impact on Sustainable Development

Although the current regional activities are commendable, ASEAN realizes that more needs to be done to ensure consistent long-term sustainability. *Asian Environment Outlook 2001* suggests that three factors must operate to support a shift from environmental decline to environmental vigour, namely

- (i) policy integration to infuse national environmental objectives into national economic development plans and processes;
- (ii) development by design at all levels to ensure integration of environmental dimension into development planning; and
- (iii) an abiding political will to translate environmental rhetoric into action. An implicit message is that these factors each require additional financial resources and access by the public and decision-makers to reliable information on the effects of various policies.

Commitment and political will for integrating environmental consideration into development planning is well established in ASEAN both nationally and regionally. Furthermore, specific actions and intervention have been built into all

***The launching of ASEAN Environment Year 2000 at this auspicious time is a significant event. While the first AEY in 1995 saw the firming-up of ASEAN cooperation on the environment, AEY 2000 as a Flagship Project signals a new chapter of cooperation. Through collective effort and sense of responsibility, we envision ASEAN in the 21<sup>st</sup> Century to be greener and more hospitable to life. This will be our legacy, which we bequeath today for the future to enjoy.***



**H.E. ANTONIO H CERILLES**  
**Secretary, Department of Environment**  
**and Natural Resources**  
**Republic of the Philippines**

*Extracted from Message for AEY2000*





development goals and strategies. However, implementation of the strategies depends on a number of key factors, among them financial and technical resources, emerging critical issues, the global trade and financial infrastructure, and most importantly sharing the burden of global environmental well being based on the principle of common but differentiated responsibility. Some of these emerging issues, which do impact on the sustainable development framework of ASEAN, are the following:

**Financial resources allocated to environmental management.** Rapid economic growth makes more resources available for investment in natural capital – protection of biodiversity, protection of mangroves and coral reefs, and provision of clean air and water, among others – but by-and-large, ASEAN member countries need to make adequate investments at least as fast as their economies grow. Annual depletion of natural capital in less developed countries overall averages nearly 6% of GDP but AMCs appear to have had considerably higher than average rates of degradation (*Quality of Growth*, WB, 2000). There cannot be sustainable development without considerably more investment in appropriate policies and programmes and their implementation and enforcement.

**Indicators of sustainability.** ASEAN is developing a harmonised system of environmental information and databases to improve environmental analyses and reporting. Internationally, considerable work has gone into the development of indicators of sustainable development at the national level in recent years. Better measurement helps decision-makers and the public define social goals, link them to clear objectives and targets, and assess progress toward meeting those targets. It provides an empirical basis for evaluating performance, for calculating the impact of activities on the environment and society, and for connecting past and present activities to attain future goals. Just as governments currently measure economic growth based on GDP/GNP, green accounting makes it possible for social and environmental goals to become part of the mainstream political and economic debate. The ASEAN harmonised environmental database should be developed in such a manner that it can be used for sustainable development indicators.

**Support for the newer ASEAN Member Countries.** Imbalances within regions should be reduced as much as possible if all countries in that region were to act collectively based on common aspirations to attain regional goals. Recognizing this, ASEAN launched the Initiative

***ASEAN has demonstrated its resilience in tackling various regional environmental challenges. Our collective experience in managing regional environmental disasters shows that prevention is far less painful and expensive than the ensuing remedy. The ASEAN populace should learn from these experiences and appreciate better the linkages between human actions and environmental outcomes. The region's businesses must learn to act more responsibly to prevent further environmental degradation.***



H.E. LEE YOCK SUAN  
Minister for the Environment  
Republic of Singapore

*Extracted from Message for AEY2000*



for ASEAN Integration (IAI) to narrow the gaps within ASEAN and provide a framework for regional cooperation through which the more developed ASEAN members could help those member countries that most need it, under the principle of *prosper thy neighbour*. The pace at which this imbalance could be achieved has important environmental implications. Considering the similarity in terms of climatic conditions, environmental resources, and economic activities, a unique opportunity exists for the more developed ASEAN members to share their experiences in environmental management, namely in terms of environmental policy and institutional planning, interventions in specific areas such as toxic and solid waste management, air pollution control, sustainable management of biodiversity, and generally make available technical expertise over a range of environmental initiatives.

#### **Changing Consumption Patterns.**

Changing current consumption patterns is a key strategic element of sustainable development because consumption induces production and influences the characteristics and quantities of wastes that are returned to the environment. In the global context, ASEAN member countries are not major consumers of products that pollute the environment, such as emissions of greenhouse gasses, toxic wastes etc. However, ASEAN member countries do face three

interrelated challenges in this respect. The growing population requires more consumption of natural resources to meet basic needs. Secondly, the unfair terms of trade especially for commodities – where international prices do not include the real costs of environmental resources and the services of ecosystems that are utilised in the production and disposal of wastes resulting from production and consumption – can lead to increased exploitation to maintain the same level of income. Thirdly, environmental preferences in consuming countries may affect trade from developing countries, in the form of eco-labelling, among others.

**Sustainable Energy.** Energy use is ubiquitous: human activities in all sectors require the extraction, conversion, and use of energy in myriad forms and the disposal of their many waste products. The rapid growth in fossil fuels consumption has been a major cause of urban air pollution in ASEAN along with its associated, and very costly, impacts on human health. Energy and energy-intensive sectors (such as transport) require massive public and private capital investments in the short term which can largely predetermine for decades the broad patterns of energy use, the quantities of energy required and emissions. The ASEAN Centre for Energy (ACE web site; information updated 15 February 2001) has estimated that the goals of

***The implementation of ASEAN Environment Year 2000 is a great opportunity for Thailand and other ASEAN member countries to share experiences and approaches in environmental management and to strengthen regional participation in order to protect our invaluable environment. I would like to hereby reaffirm the commitment of the Royal Thai Government to making our utmost effort during the ASEAN Environment Year and beyond.***



**H.E. Dr. ARTHIT OURAIRAT**  
**Minister of Science, Technology and Environment**  
**Royal Kingdom of Thailand**

*Extracted from Message for AEY2000*



ASEAN Vision 2020 and the HPA will require an investment of over US\$180 billion from 2000–2010. This includes \$46 billion for improved energy efficiency which would pay off handsomely, saving \$87 billion or nearly \$2 for every dollar invested. The proposed investment in new and renewable energy is very modest, \$3.6 billion or only 2% of the total. Numerous studies have shown there is a huge potential in ASEAN for more sustainable energy and transport if appropriate institutional reforms accompany the capital investments. Appropriate energy development should be a fundamental and practical component of ASEAN's sustainable development efforts.

***Sustainable Agricultural Production.***

Agricultural production patterns are intimately related to environmental resource use and abuse, particularly forest, land and soil resources, and water pollution due to agricultural runoff. They are also closely linked to rural poverty as agricultural production is the major source of household income in rural areas. Agricultural production patterns are crucial to sustainable development. The promotion of commercial agriculture for export has resulted in environmental degradation, particularly the conversion of inland forests for cassava, sugar

cane and maize production, and the conversion of mangrove forests and coastal ecosystems for prawn production. Commercial agriculture is often based on monoculture which is highly vulnerable to pests and extracts excessive soil nutrients; it requires the intensive application of pesticides and chemical fertilisers. Inadequate knowledge of soil management has resulted in soil degradation and environmental pollution caused by chemical residues. However, there are examples where a commitment to sustainable development has revived interest in integrated farming, particularly in the small and medium farms which prevail in ASEAN. Thailand has developed a farming model based on integrated on-farm management of water and soil resources and appropriate mix of cropping, aquaculture and livestock production, mainly pigs and chickens. This model represents one approach to more sustainable agriculture and to addressing rural poverty.

***Poverty Alleviation.*** In rural areas, poverty drives landless farmers to attempt to eke out a living from marginal forest resources, or to migrate to cities to seek better opportunities. In urban areas, poverty is associated with marginal settlements with poor sanitation and overcrowded conditions. Poverty alleviation is a

***Entering the new millennium, Viet Nam as well as other ASEAN countries must face several serious environmental challenges, including international and regional problems. I hope that the ASEAN Environment Year 2000 will set the stage for renewed co-operation for environmental protection in the new millennium among all the ASEAN member countries. Vietnam would continue to play a positive and leading role in all regional efforts in this direction. I am sure that together we can realise our vision of a more prosperous, beautiful, cleaner and greener ASEAN.***



H. E. Dr. CHU TUAN NHA  
Minister of Science, Technology and the Environment  
Socialist Republic of Viet Nam

*Extracted from Message for AEY2000*



strategic element of sustainable development. The HPA includes a number of programmes to reduce poverty and protect the most vulnerable members of society. The goal of poverty alleviation by 2020 requires, among many other measures, additional investment in education today so ASEAN's children have equitable access to education and its long term benefits. A genuine shift toward sustainable development requires new policies and more funds.

**Sustainable Mega-cities.** The three ASEAN mega-cities – Bangkok, Metro Manila and Jakarta – share a myriad of environmental problems including severe air, water, and noise pollution, marginalised settlements, traffic congestion, and solid waste disposal that have affected the quality of life. If not effectively addressed, these problems will make the cities unsustainable. However, these cities are also the intellectual, cultural, political and economic powerhouses of their respective countries with the resources and capability to progressively shift them towards sustainability. There has been positive actions. To relieve traffic congestion, Bangkok and Metro Manila have invested in urban mass transit systems (particularly rail) and built extensive networks of new and elevated

expressways. Such measures require further market based instruments. Singapore, for example, has implemented a successful system of competitive bidding for permits to own private cars while improving public transportation to discourage private car ownership. Bangkok is drafting a Sustainable City Development Plan – a sustainable city is defined as one with high “liveability”, high productivity and run by an efficient and transparent administrative body. Practical measures by ASEAN member countries to make their major cities cleaner, more equitable, more liveable and more sustainable will be an appropriate indication of real determination to turn ASEAN Vision 2020 into reality.

### Prospects for Sustainable Development

ASEAN's economic dynamism in the last two decades has raised the concern for sustainable development into a higher plane. Although countries in the region have taken measures to protect the environment and to control the rate of exploitation of resources, they continue to face difficulties in the wake of institutional limitations, inadequate manpower and technological

***ASEAN is dedicated, now more than ever before, to working together in dealing with problems that cut across national boundaries and affect the region as a whole. No area is more regional in character than the protection and preservation of the environment; nowhere is regional cooperation more necessary and more urgent. We need to remind ourselves – our people, our societies, our governments – that our common regional environment binds us, in many ways, in a common destiny as a region. This should be self-evident, just as it should be obvious that the integrity of the environment and the wise use of our natural resources are intertwined with people's lives and livelihoods, and must therefore be the responsibility to their families and their countries, to their neighbours, and to the future of their children.***



**H.E. RODOLFO C. SEVERINO, Jr.**  
Secretary – General of ASEAN

*Extracted from Message for AEY2000*



capacities, and financial constraints. Prospects for sustainable development in the wake of continued growth will depend on the ability of ASEAN countries to overcome these constraints and respond to the challenges of sound environmental management.

The principle of sustainable development as a shared commitment of ASEAN is clearly embodied in ASEAN Vision 2020, and the Ha Noi Plan of Action. By integrating all socio-economic and development actions, it ensures that there is proper intergration between socio-economic and environmental protection goals. The HPA presents a responsive integrated policy framework that weaves together demographic dynamics, social development, economic growth, natural resource use and environmental protection and other development initiatives. The ASEAN Strategic Plan of the Action on the Environment translates those environmental strategies of the HPA into specific time bound

measurable programmes and activities. Institutionally, the ASEAN Environment Ministers, and officials responsible for the environment in each member country meet regularly to chart, review, implement and forge regional cooperation on the environment.

ASEAN countries continue to cope with the challenge of balancing environmental concerns with the imperatives of development. Environmental degradation continues to roil the region. Increasingly such problems are exacerbated by external pressures beyond the region. Any further prolonged recovery from the recent economic crisis may divert much needed resources from environmental protection to other critical sectors. But while environmental conditions remain problematic, the socio-political setting in ASEAN has become friendlier and much more committed to bold approaches to environmental management. The prospects are such that, ASEAN can – and will – act quickly to meet them as a matter of the highest priority.



# Appendices

## Appendix I

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### Acronyms and Abbreviations

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#### A

ACE	ASEAN Centre for Energy (Indonesia) *
ADB	Asian Development Bank
ASEAP	ASEAN Environmental Education Action Plan (2000 –2005)
AEY	ASEAN Environment Year
AFTA	ASEAN Free Trade Area
AIPO	ASEAN Inter-Parliamentary Organisation
AMCs	ASEAN Member Countries
AMME	ASEAN Ministerial Meeting on the Environment
APEC	Asia Pacific Economic Cooperation
ARCBC	ASEAN Regional Centre for Biodiversity Conservation (Philippines)
ARIC	Asia Recovery Information Centre
ASEAN	Association of Southeast Asian Nations
ASMC	ASEAN Specialised Meteorological Centre (Singapore)
ASOEN	ASEAN Senior Officials on the Environment
AusAID	Australian Agency for International Development

#### B

BAN	Basel Action Network
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#### C

CEPT	Common Effective Preferential Tariff (within AFTA)
CI	Conservation International
CIEL	Centre for International Environmental Law
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO <sub>2</sub>	Carbon Dioxide
CZERMP	Coastal Zone Environmental and Resource Management Project (ASEAN and AusAID)

#### D

ENB	Earth Negotiations Bulletin (IISD)
ESCAP	Economic and Social Commission for Asia and the Pacific (UN)

#### E

ENSO	El Niño Southern Oscillation
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#### F

FAO	Food and Agriculture Organisation (UN)
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#### G

GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas(es)
GNP	Gross National Product

#### H

HDI	Human Development Index (UNDP)
HPA	Ha Noi Plan of Action

#### I

IAI	Initiative for ASEAN Integration
IAMME	Informal ASEAN Ministerial Meeting on the Environment

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\* Where a country is indicated for an ASEAN centre, it denotes the location of the centre.

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<b>I</b>	IIEC	International Institute for Energy Conservation
	IIED	International Institute for Environment and Development
	IISD	International Institute for Sustainable Development
	ILO	International Labour Office
	IPCC	Intergovernmental Panel on Climate Change
	ISO	International Organisation for Standardisation
	ISRIC	International Soil Reference and Information Centre
	IUCN	World Conservation Union (formerly International Union for the Conservation of Nature)
<b>M</b>	MEA	Multilateral Environmental Agreement(s)
	MRLC	Mekong Region Law Centre (Bangkok)
<b>N</b>	NASA	National Aeronautics and Space Administration
	NGO	Non Governmental Organisation
<b>O</b>	OECD	Organisation for Economic Cooperation and Development
<b>P</b>	PA	Protected Area
	PEMSEA	Partnerships in Environmental Management for the Seas of East Asia (GEF)
	POPs	Persistent Organic Pollutants
	PPP	Purchasing Power Parity (referring to GNP, GDP)
	PSI	Pollution Standards Index (USEPA)
<b>R</b>	RHAP	Regional Haze Action Plan (ASEAN)
<b>S</b>	SEAFDEC	Southeast Asian Fisheries Development Centre
	SOE 2000	State of the Environment 2000 (for Asia; ADB & ESCAP)
	SoER	ASEAN State of the Environment Report(s)
	SPAE	ASEAN Strategic Plan of Action on the Environment, 1999–2004
<b>T</b>	THW	Toxic and/or hazardous wastes
<b>U</b>	UN	United Nations
	UNCTAD	United Nations Conference on Trade and Development
	UNDESA	United Nations Department for Economic and Social Affairs
	UNDP	United Nations Development Programme
	UNEP	United Nations Environment Programme
	USEPA	United States Environmental Protection Agency
<b>W</b>	WB	World Bank
	WCMC	World Conservation Monitoring Centre
	WMO	World Meteorological Organisation
	WPP 2000	World Population Prospects 2000 (UNDESA)
	WRI	World Resources Institute
	WTO	World Trade Organisation

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## Appendix II

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### Sources and Reference

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Cambodia, 1999	<i>Environment: Concepts and Issues, A Focus on Cambodia</i> (Ministry of Environment, with UN Environmental Technical Assistance Programme (ETAP); edited by Noelle O'Brien; Phnom Penh)
Indonesia, 2000	<i>Draft State of the Environment Report, Indonesia 2000</i> (Ministry of State for Environment; Environmental Impact Agency; Jakarta; March)
Indonesia, 2000	<i>Update of the First ASEAN SoE Report</i> (Tables from Ministry of State for Environment; Environmental Impact Agency; Jakarta; 22 March)
Lao PDR, 2000	<i>Data Tables for the Second SOER</i> (Department of Environment; Vientiane; February)
Malaysia, 1998	<i>Compendium of Environmental Statistics for Malaysia 1998</i> (Department of Statistics; Kuala Lumpur; October)
Malaysia, 1998	<i>Framework for Development of Environmental Statistics in Malaysia</i> (Department of Statistics; Kuala Lumpur; March)
Malaysia, 1998	<i>Malaysia Environmental Quality Report 1998</i> (Department of Environment; Ministry of Science Technology and the Environment; Kuala Lumpur)
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Viet Nam, 2000	<i>Environmental database</i> (Ministry of Science, Technology & Environment; Ha Noi; undated Excel file)

#### 2 Other Reports and Materials

ACE, 2001	<i>ASEAN energy data tables and forecasts</i> (ASEAN Centre for Energy; tables updated in February-and March 2001; downloaded* from ACE)
ADB, 2000a	<i>Asian Development Outlook Updates</i> (for Indonesia, Malaysia, Philippines, Singapore, Thailand & Viet Nam; updated Sept. 2000; downloaded from ADB)
ADB, 2000b	<i>Energy 2000</i> (Manila; downloaded from ADB)
ADB, 2000c	<i>Key Indicators of Developing Asian and Pacific Countries</i> (Manila)
ADB, 2000d	<i>Sustainable Development in Asia</i> (Douglas V Smith and Kazi F Jalal; Manila)
ARIC, 2001	<i>Data tables on poverty and unemployment</i> (downloaded from ARIC)
ASEAN & ADB, 2001	<i>Smoke, Fire and Haze: The ASEAN Response Strategy</i> (forthcoming; Jakarta and Manila)

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ASEAN, 1997	<i>First ASEAN State of the Environment Report</i> (with UNEP; Jakarta)
ASEAN, 1999a	<i>ASEAN Into the Next Millennium</i> (with the ASEAN Vision 2020 of December 1997 and the Ha Noi Plan of Action of December 1998; Jakarta)
ASEAN, 1999b	<i>Trade and Investment Report</i> (Jakarta)
ASEAN, 2000a	<i>Annual Report for 1999–2000</i> (Jakarta)
ASEAN, 2000b	<i>Briefing Paper on Environment</i> (Jakarta)
ASEAN, 2000c	<i>Report of the ASEAN Workshop on Agenda 21 with Emphasis on Eco-tourism</i> (Department of Environmental Quality Promotion; Ministry of Science, Technology and Environment; Thailand; Bangkok; 26–29 Sept)
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Economist, 2000	<i>Pocket World in Figures 2000</i> (London)
Economist, 2001	<i>Orang-utans on the Brink</i> (London; March 10–17 issue)
ESCAP, 1995	<i>Guidebook to Water Resources, Use and Management in Asia and the Pacific; Volume 1: Water Resources and Water Use</i> (Bangkok)
ESCAP & ADB, 2000	<i>State of the Environment in Asia and the Pacific 2000</i> ( Bangkok and Manila)
FAO, 2000	<i>State of the World's Fisheries and Aquaculture 2000</i> (Rome; downloaded from FAO)
FAO, 2001	<i>Global Forest Resources Assessment 2000</i> (Rome; data updated 1 March; downloaded from FAO)
Gleick, Peter, 2001	"Making Every Drop Count" (Scientific American, Vol. 284, No. 2, Feb.)
Greenpeace, 1999	<i>Opening Pandora's Box: A Catalogue of 50 POPs Hotspots Worldwide</i> (September; downloaded from Greenpeace)
IIEC, 1999	<i>Renewable Independent Power Producers: Restructuring the Southeast Asian Electricity Sector Using Renewable Energy</i> (prepared for Greenpeace International by IIEC-Asia, July)
IISD, 2001	<i>Summary of the Seventeenth Session of the IPCC: 4–6 April 2001</i> (Earth Negotiation Bulletin of 9 April; downloaded from <a href="http://www.iisd.ca/climate">www.iisd.ca/climate</a> )
IISD, undated	<i>Hazardous Waste Trade</i> (downloaded from <a href="http://iisd1.iisd.ca/trade/haz.htm">http://iisd1.iisd.ca/trade/haz.htm</a> on 26 March 2001)
ILO, 2000	<i>Yearbook of Labour Statistics</i> (Geneva)
IPCC, 1999	<i>Special Report on the Regional Impacts of Climate Change: An Assessment of Vulnerability</i> (Geneva; downloaded from IPCC)
IPCC, 2001a	<i>Summary for Policymakers of IPCC Working Group 1, Third Assessment Report</i> (Shanghai; January; downloaded from IPCC)

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IPCC, 2001b	<i>Climate Change 2001: Impacts, Adaptation and Vulnerability: Summary for Policy makers</i> (February; downloaded from IPCC)
IPCC, 2001c	<i>Summary for Policymakers of IPCC Working Group III, Third Assessment Report</i> (Approved at 6 <sup>th</sup> Session of WGIII; Accra; Ghana, 28 March; downloaded from IPCC)
ISO, 1998	<i>ISO 14000: Meet the Whole Family</i> (Geneva, downloaded from www.iso.ch)
ISRIC & UNEP, 1997	<i>Assessment of Human Induced Soil Degradation in South and Southeast Asia</i> (International Soil Reference & Information Centre)
ITTO, 2000	<i>Malaysia on Track – But Trade Barriers Still Loom</i> (Tropical Forest Update Vol. 10, No. 4; Tokyo; downloaded from ITTO)
IUCN & WCMC, 1997	<i>A Global Overview of Forest Protected Areas on the World Heritage List: A Contribution to the Global Theme Study of World Heritage Natural Sites</i> (Prepared by Jim Thorsell and Todd Sigaty; IUCN, Gland; September)
Lindberg, K., B. Furze, M. Staff & R. Black, 1997.	<i>Ecotourism and other Services derived from forest in the Asia-Pacific Region: Outlook to 2010</i> (Working Paper No: APFSOS/WP/24, FAO/US Forest Service; Rome & Bangkok)
MacKinnon, John, 2001	<i>The Status of Biodiversity in Asia and Challenges for the new Millennium</i> (draft of forthcoming paper prepared for IUCN)
MRLC, 1997	<i>Southeast Asia Handbook of Treaties and Other Legal Instruments in the Field of Environmental Law</i> (MRLC/UNEP/DANIDA; Bangkok)
SBS, 2000	<i>SBS World Guide: The Complete Fact File on Every Country</i> (Eighth Edition; Hardie Grant, Victoria, Australia)
Singapore Meteorological Service, 2000	<i>Hot Spots and Smoke Haze as Observed by Meteorological Satellites</i> (Meteorological Service, Changi airport, Singapore)
UNCTAD, 2001	<i>Trade and Development Report 2001</i> (Internet Edition; available from UNCTAD web site)
UNDESA, 2000	<i>World Population Prospects 2000</i> (United Nations, New York; downloaded from UNDESA at www.un.org)
UNDP, 1999	<i>Human Development Report 1999</i> (New York)
UNDP, 2000	<i>Human Development Report 2000</i> (New York; available for downloading)
UNEP & IISD, 2000	<i>Environment and Trade: A Handbook</i> (downloaded from IISD)
UNEP, 1999	<i>Global Environmental Outlook 2000</i> (Earthscan; London)
US Govt., 2001	<i>International Energy Outlook</i> (Energy Information Administration; March; downloaded from www.eia.doe.gov/oiaf/ieo/index.html)
WCED, 1987	<i>Our Common Future</i> (World Commission on Environment and Development, Oxford University Press)
WCS, 2000	“Orangutan Numbers Plummeting Worldwide; Species May Vanish from the Wild in Ten Years” (Wildlife Conservation News; 26 Feb.; downloaded from WCS)
World Bank, 1998	“Environment in Crisis: A Step Back or A Way Forward”, Chapter 6 of <i>East Asia: The Road to Recovery</i> (Washington, DC; downloaded from WB)
World Bank, 1999a	“Sustaining Natural Capital”, Chapter 4 of <i>The Quality of Growth</i> (Oxford University Press; New York; Sept.; downloaded from WB)
World Bank, 1999b	<i>Environmental Implications of the Economic Crisis and Adjustment in East Asia</i> (Executive Summary, Discussion Paper Series No. 01, January; downloaded from WB)
World Bank, 2000a	<i>Greening Industry: New Roles for Communities, Markets, and Governments</i> (Washington, DC; downloaded from www.worldbank.org/)
World Bank, 2000b	<i>Regional Overview: East Asia’s Recovery: Maintaining Momentum</i> (Washington, DC; 30 November; downloaded from WB)

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World Bank, 2000c	<i>Regional Overview: East Asia's Recovery: Gathering Force</i> (Washington, DC; September; downloaded from WB)
World Bank, 2000d	<i>The Asia Alternative Energy Program: Partnership for Innovation</i> (Washington, DC; February; downloaded from WB)
World Bank, 2000e	<i>The Quality of Growth</i> (published by Oxford University Press; downloaded from WB)
World Bank, 2000f	<i>World Development Report 2000–2001: Attacking Poverty</i> (Washington, DC; data tables downloaded from <a href="http://www.worldbank.org/poverty">www.worldbank.org/poverty</a> )
World Bank, 2001a	<i>East Asia Update</i> (with Special Focus on Environment; March; downloaded from WB)
World Bank, 2001b	<i>The World Bank and the East Asia &amp; Pacific Region</i> (Washington; updated 29 August 2001; downloaded from WB)
WRI & WB, 2000	<i>Countries at A Glance: Agriculture, Natural Resources and Environment</i> (for Cambodia, Indonesia, Loa PDR, Malaysia, Myanmar, Philippines, Thailand and Vietnam; downloaded from WRI)
WRI, 1998	<i>Reefs at Risk: A Map-Based Indicator of Potential Threats to The World's Coral Reefs.</i> (Lauretta Burke, <i>et al</i> ; World Resources Institute, Washington, D.C., 1998).
WRI, 1999	<i>World Resources: 2000–2001</i> (Washington, DC; data tables downloaded from World Resources institute)
WRI, 2001	<i>Pilot Analysis of Global Ecosystems: Coastal Ecosystems</i> (Washington, DC; April; available for downloading from WRI)
WTO, 2000	<i>International Trade Statistics 2000</i> (Geneva; available from WTO web site)

### 3 A Note on Internet Web Sites Used

When the 1997 ASEAN *State of the Environment Report* was prepared, there was relatively little information available from the Internet. For this second report, a considerable amount of information was downloaded from the following web sites:

<i>Organisation</i>	<i>Internet address</i>	<i>Information downloaded</i>
ASEAN Centre for Energy (ACE)	<a href="http://www.ace.org.ph">www.ace.org.ph</a>	energy data
ASEAN Haze Action On-line	<a href="http://www.haze-online.or.id">www.haze-online.or.id</a>	haze, air pollution
ASEAN Regional Centre for Biodiversity Conservation (ARCBC)	<a href="http://www.arbc.org.ph">www.arbc.org.ph</a>	biodiversity
ASEAN Secretariat	<a href="http://www.aseansec.org">www.aseansec.org</a>	various topics
Asia Recovery Information Centre (ARIC)	<a href="http://aric.adb.org/indicators">http://aric.adb.org/indicators</a>	poverty; unemployment
Asian Development Bank (ADB)	<a href="http://www.adb.org">www.adb.org</a>	economic development; environment
Basel Action Network (BAN)	<a href="http://www.ban.org">www.ban.org</a>	toxic wastes; waste trade
Conservation International (CI)	<a href="http://www.conservation.org">www.conservation.org</a>	biodiversity
Food and Agriculture Organization (FAO)	<a href="http://www.fao.org">www.fao.org</a>	forestry; fisheries
Friends of the Earth International	<a href="http://www.foei.org">www.foei.org</a>	trade and environment
Greenpeace International	<a href="http://www.greenpeace.org">www.greenpeace.org</a>	toxic wastes, esp. POPs; energy
Intergovernmental Panel on Climate Change (IPCC)	<a href="http://www.ipcc.ch">www.ipcc.ch</a>	climate change
International Institute for Sustainable Development (IISD)	<a href="http://www.iisd">www.iisd</a>	climate change; global environmental negotiations
International Tropical Timber Organization (ITTO)	<a href="http://www.itto.or.jp/newsletter">www.itto.or.jp/newsletter</a>	timber trade
New Scientist magazine	<a href="http://www.newscientist.com">www.newscientist.com</a>	climate change
Singapore Meteorological Service	<a href="http://www.gov.sg/metsin">www.gov.sg/metsin</a>	satellite haze imagery
United Nations Conference on Trade and Development (UNCTAD)	<a href="http://www.unctad.org/en/docs">www.unctad.org/en/docs</a>	global trade issues
United Nations Development Programme (UNDP)	<a href="http://www.undp.org/dpa/publications">www.undp.org/dpa/publications</a>	Human Development Index, miscellaneous environmental indicators
United Nations Educational and Cultural Organisation (UNESCO)	<a href="http://www.unesco.org/whc">www.unesco.org/whc</a>	World Heritage convention
United Nations Environment Programme (UNEP)	<a href="http://www.unep.org">www.unep.org</a>	miscellaneous
United Nations Secretariat	<a href="http://www.un.org">www.un.org</a>	population forecasts from UNDESA
US National Aeronautics and Space Administration (NASA)	<a href="http://earthobservation.nasa.gov">http://earthobservation.nasa.gov</a>	satellite & other images
Wildlife Conservation Society (WCS)	<a href="http://www.wcs.org">www.wcs.org</a>	biodiversity
World Bank (WB)	<a href="http://www.worldbank.org">www.worldbank.org</a>	economics, environment & energy
World Conservation Monitoring	<a href="http://www.unep-wcmc.org">www.unep-wcmc.org</a>	ocean biodiversity
World Resources Institute (WRI)	<a href="http://www.wri.org">www.wri.org</a>	environmental data & trends
World Trade Organisation (WTO)	<a href="http://www.wto.org">www.wto.org</a>	trade statistics
Worldwide Fund for Nature (WWF)	<a href="http://www.panda.org">www.panda.org</a>	fisheries; coral; seas

\* The annotation "downloaded" means that the data or report is available for free downloading from the web site indicated within the source.

## Regular ASEAN Meetings on the Environment: 1998–2000

### 1 ASEAN Ministerial Meeting on the Environment (AMME)

1. Eighth ASEAN Ministerial Meeting on the Environment (8<sup>th</sup> AMME) 6–7 October 2000, Malaysia
2. Fifth Informal ASEAN Ministerial Meeting on the Environment (5<sup>th</sup> IAMME) 4 April 2000, Brunei Darussalam
3. Fourth Informal ASEAN Ministerial Meeting on the Environment (4<sup>th</sup> IAMME) 20 November 1998, Viet Nam

### 2 ASEAN Ministerial Meeting on Haze (AMMH)

1. Eighth ASEAN Ministerial Meeting on Haze (8<sup>th</sup> AMMH) 26 August 1999, Singapore
2. Seventh ASEAN Ministerial Meeting on Haze (7<sup>th</sup> AMMH) 6 July 1999, Malaysia
3. Sixth ASEAN Ministerial Meeting on Haze (6<sup>th</sup> AMMH) 16 April 1999, Brunei Darussalam
4. Fifth ASEAN Ministerial Meeting on Haze (5<sup>th</sup> AMMH) 30 July 1998, Malaysia
5. Fourth ASEAN Ministerial Meeting on Haze (4<sup>th</sup> AMMH) 19 June 1998, Singapore
6. Third ASEAN Ministerial Meeting on Haze (3<sup>rd</sup> AMMH) 4 April 1998, Brunei Darussalam

#### Members

1. *Brunei Darussalam*  
H.E. Pengiran Indera Wijaya Pengiran Dr. Haji Ismail Bin Pengiran Haji Damit  
Minister of Development
2. *Cambodia*  
H.E. Dr. Mok Mareth  
Minister for the Environment
3. *Indonesia*  
H.E. Dr. Alexander Sonny Keraf  
State Minister for the Environment and Chairman of Environmental Impact Management Agency  
  
H.E. Panangian Siregar  
State Minister for the Environment and Chairman of Environmental Impact Management Agency  
(until 4<sup>th</sup> IAMME and 8<sup>th</sup> AMMH)  
  
H.E. Juwono Sudarsono  
State Minister for the Environment and Chairman of Environmental Impact Management Agency  
(until 3<sup>rd</sup> AMMH)  
  
H.E. Sarwono Kusumaatmaja  
State Minister for the Environment and Chairman of Environmental Impact Management Agency  
(until 2<sup>nd</sup> AMMH)
4. *Lao PDR*  
H.E. Dr. Souli Nanthavong  
Minister to Prime Minister's Office in charge of Science, Technology and the Environment
5. *Malaysia*  
H.E. Dato Law Hieng Ding  
Minister of Science, Technology and the Environment

6. *Myanmar*  
H.E. U Win Aung  
Minister of Foreign Affairs and Chairman of the National Commission for Environmental Affairs  
  
H.E. U. Ohn Gyaw  
Chairman of the National Commission for Environmental Affairs, Ministry of Foreign Affairs  
(until 2<sup>nd</sup> AMMH)
7. *The Philippines*  
H.E. Mr. Heherson T. Alvarez  
Secretary, Department of Environment and Natural Resources  
  
H.E. Mr. Antonio H. Cerilles  
Secretary, Department of Environment and Natural Resources
8. *Singapore*  
H.E. Mr. Lim Swee Say  
Acting Minister for the Environment  
  
H.E. Mr. Lee Yock Suan  
Minister for the Environment  
(until 5<sup>th</sup> IAMME and 8<sup>th</sup> AMMH)  
  
H.E. Mr. Yeo Cheow Tong  
Minister for the Environment  
(until 6<sup>th</sup> AMMH)
9. *Thailand*  
H.E. Mr. Sontaya Kunplome  
Minister of Science, Technology and the Environment  
  
H.E. Dr. Arthit Ourairat  
Minister of Science, Technology and the Environment  
(until 5<sup>th</sup> IAMME)

- H.E. Mr. Suwit Khunkitti  
Minister of Science, Technology and the Environment  
(until 4<sup>th</sup> IAMME)
10. *Viet Nam*  
H.E. Prof. Chu Tuan Nha  
Minister of Science,  
Technology and the Environment

11. *ASEAN*  
H.E. Mr. Rodolfo C. Severino, Jr  
Secretary-General of ASEAN

### 3 ASEAN Senior Officials on the Environment (ASOEN)

1. Eleventh Meeting of ASEAN Senior Officials on the Environment (11<sup>th</sup> ASOEN) 1–3 August 2000, Viet Nam
2. Tenth Meeting of ASEAN Senior Officials on the Environment (10<sup>th</sup> ASOEN) 15–16 September 1999, Thailand
3. Ninth Meeting of the ASEAN Senior Officials on the Environment (9<sup>th</sup> ASOEN) 23–25 September 1998, Singapore

#### Members

1. *ASOEN Chairman*  
Mr. Sunthad Somchevita  
Permanent Secretary, Ministry of Science,  
Technology and Environment, Thailand  
  
Mr. Tan Gee Paw  
Permanent Secretary, Ministry of Environment,  
Singapore (until 9<sup>th</sup> ASOEN)
2. *Brunei Darussalam*  
Dato Paduka Haji Zakaria bin Haji Noordin  
Permanent Secretary, Ministry of Development  
  
Dato Paduka Haji Othman bin Haji Yaakub  
Ministry of Development (until 10<sup>th</sup> ASOEN)
3. *Cambodia*  
Mr. Khieu Muth  
Director General, Ministry of Environment
4. *Indonesia*  
Mr. Effendy A. Sumardja  
Assistant Minister for Global Environmental  
Affairs, State Ministry for the Environment
5. *Lao PDR*  
Mr. Soukata Vichit  
Director General, Department of Environment  
and Quality Promotion  
Science, Technology and Environment Agency
6. *Malaysia*  
Mr. Ng Kam Chiu  
Secretary General  
Ministry of Science, Technology and Environment  
  
Dato Cheah Kong Wai  
Secretary General  
Ministry of Science, Technology and Environment  
(until 10<sup>th</sup> ASOEN)

7. *Myanmar*  
U Aung Bwa  
Secretary of National Commission for  
Environmental Affairs  
  
U Kyaw Tint Swe  
Secretary of National Commission for  
Environmental Affairs (until 9<sup>th</sup> ASOEN)
8. *Philippines*  
Mr. Ramon J. P. Paje  
Undersecretary for Policy and Technical Services  
Development, Department of Environment and  
Natural Resources  
  
Mr. Elmer S. Mercado  
Under Secretary for Environment and  
Programme Development,  
Department of Environment and Natural  
Resources (until 9<sup>th</sup> ASOEN)
9. *Singapore*  
Mr. Tan Gee Paw  
Permanent Secretary, Ministry of the  
Environment
10. *Thailand*  
Mr. Kasem Snidvongs  
Permanent Secretary  
Ministry of Science Technology and Environment  
(until 9<sup>th</sup> ASOEN)
11. *Viet Nam*  
Dr. Nguyen Ngoc Sinh  
Director General, National Environmental Agency  
Ministry of Science Technology and Environment
12. *ASEAN Secretariat*  
Dr. Azmi Mat Akhir  
Director, Bureau of Economic and Functional  
Cooperation  
  
Dr. Filemon A. Uriarte, Jr.  
Director, Bureau of Economic and Functional  
Cooperation (until 9<sup>th</sup> ASOEN)



#### 4 Working Group on Coastal and Marine Environment (AWGCME)

1. Second Meeting of the ASEAN Working Group on Coastal and Marine Environment (2<sup>nd</sup> AWGCME) 8–9 June 2000, Viet Nam
2. First Meeting of the ASEAN Working Group on Coastal and Marine Environment (1<sup>st</sup> AWGCME) 23–25 June 1999, Thailand
3. Seventh Meeting of ASEAN Working Group on Seas and Marine Environment (7<sup>th</sup> AWGSME) 8–9 September 1998, Indonesia (before restructuring of ASOEN in 1998)

##### Members

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|--|---|
| <ol style="list-style-type: none"> <li>1. <i>Chairman</i><br/>Mr. Jarupong Boon-Long (Thailand)<br/>Deputy Director-General,<br/>Pollution Control Department<br/><br/>Mr. Dana A. Kartakusuma (Indonesia)<br/>State Ministry of the Environment<br/>(until 7<sup>th</sup> AWGCME)</li> <li>2. <i>Brunei Darussalam</i><br/>Haji Mohamad Zakaria Hj Sarudin<br/>Head of Environment Unit,<br/>Ministry of Development</li> <li>3. <i>Cambodia</i><br/>Mr. Vann Momyneath<br/>Head of Coastal Coordinating Unit,<br/>Ministry of Environment</li> <li>4. <i>Indonesia</i><br/>Mr. Sudariyono<br/>Deputy Assistant Minister for Marine Resources,<br/>State Ministry for the Environment</li> <li>5. <i>Lao PDR</i><br/>Mr. Soukata Vichit<br/>Department of Promotion and Development of<br/>Environment Quality, Science, Technology and<br/>Environment Agency</li> </ol> | <ol style="list-style-type: none"> <li>6. <i>Malaysia</i><br/>Dato' Cheah Kong Wai<br/>Secretary General, Ministry of Science,<br/>Technology and the Environment</li> <li>5. <i>Myanmar</i><br/>Dr. Swe Thwin Professor,<br/>Department of Marine Science, University of<br/>Mawlamyine, Ministry of Education</li> <li>8. <i>The Philippines</i><br/>Dr. Ramon J.P. Paje<br/>Undersecretary for Policy and Technical Services<br/>Department of Environment and Natural<br/>Resources</li> <li>9. <i>Singapore</i><br/>Mr. Khoo Seow Poh<br/>Head, International Environment and Policy<br/>Department, Ministry of the Environment</li> <li>10. <i>Viet Nam</i><br/>Prof. Nguyen Chu Hoi,<br/>Director of Haiphong Institute of Oceanology</li> <li>11. <i>ASEAN Secretariat</i><br/>Mr. Apichai Sunchindah<br/>Assistant Director, Environment</li> </ol> |
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#### 5 Working Group on Multilateral Environmental Agreements (AWGMEA)

1. Third Meeting of the ASEAN Working Group on Multilateral Environmental Agreements (3<sup>rd</sup> AWGMEA) 6–7 July 2000, Malaysia
2. Second Meeting of the ASEAN Working Group on Multilateral Environmental Agreements (2<sup>nd</sup> AWGMEA) 18–19 November 1999, Malaysia
3. First Meeting of the ASEAN Working Group on Multilateral Environmental Agreements (1<sup>st</sup> AWGMEA) 17–18 May 1999, Malaysia

##### Members

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| <ol style="list-style-type: none"> <li>1. <i>Chairperson</i><br/>Hajah Rosnani Ibarahim (Malaysia)<br/>Director General, Department of Environment</li> <li>2. <i>Brunei Darussalam</i><br/>Haji Mohamad Zakaria Hj Sarudin<br/>Head of Environment Unit,<br/>Ministry of Development</li> </ol> | <ol style="list-style-type: none"> <li>3. <i>Cambodia</i><br/>Mr. Pao Sophal<br/>Assistant to the Minister (Planning, Cooperation<br/>and ASEAN Affairs) Ministry of Environment</li> <li>4. <i>Indonesia</i><br/>Mr. Effendy A. Sumardja<br/>Assistant Minister for Global Environment Affairs<br/>State Ministry of the Environment</li> </ol> |
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| <p>5. <i>Lao PDR</i><br/>Mr. Soukata Vichit<br/>Department of Promotion and Development of Environment Quality, Science Technology and Environment Agency</p> <p>6. <i>Myanmar</i><br/>Ms. Daw Yin Yin Lay<br/>Director, National Commission for Environmental Affairs</p> <p>7. <i>The Philippines</i><br/>Dr. Ramon J.P. Paje,<br/>Undersecretary for Policy and Technical Services,<br/>Department of Environment and Natural Resources</p> | <p>8. <i>Singapore</i><br/>Mr. Khoo Seow Poh<br/>Head, International Environment and Policy Department, Ministry of the Environment</p> <p>9. <i>Thailand</i><br/>Dr. Wanee Samphantharak<br/>Deputy Secretary General, Office of Environmental Policy and Planning</p> <p>10. <i>Viet Nam</i><br/>Prof. Nguyen Chu Hoi,<br/>Director of Haiphong Institute of Oceanology</p> <p>11. <i>ASEAN Secretariat</i><br/>Mr. Apichai Sunchindah<br/>Assistant Director, Environment</p> |
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### 6 Working Group on Nature Conservation and Biodiversity (AWGNCB)

1. Tenth Meeting of ASEAN Working Group on Nature Conservation and Biodiversity (10<sup>th</sup> AWGNCB) 29–30 June 2000, Indonesia
2. Ninth Meeting of ASEAN Working Group on Nature Conservation and Biodiversity (9<sup>th</sup> AWGNCB) 25–27 May 1999, Viet Nam
3. Eighth Meeting of ASEAN Working Group on Nature Conservation and Biodiversity (8<sup>th</sup> AWGNCB) 1–3 July 1998, Singapore

#### Members

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|---|---|
| <p>1. <i>Chairman</i><br/>Mr. Reynaldo C. Bayabos (Philippines)<br/>Director, Protected Areas and Wildlife Bureau<br/>Department of Environment and Natural Resources</p> <p>Mr. Wilfrido S. Pollisco (<i>until 9<sup>th</sup> AWGNCB</i>)<br/>Director, Protected Areas and Wildlife Bureau<br/>Department of Environment and Natural Resources</p> <p>2. <i>Brunei Darussalam</i><br/>Haji Mohd Zakaria Hj Sarudin<br/>Head of Environment Unit, Ministry of Development</p> <p>3. <i>Cambodia</i><br/>Mr. Pao Sophal<br/>Assistant to the Minister, (Planning, Cooperation and ASEAN Affairs), Ministry of Environment</p> <p>4. <i>Indonesia</i><br/>Mr. Widodo S. Ramono<br/>Director of Conservation Areas,<br/>Directorate General for Nature Protection and Conservation</p> <p>5. <i>Lao PDR</i><br/>Mr. Soukata Vichit<br/>Director General, Department of Environment, Science Technology and Environment Agency</p> | <p>6. <i>Malaysia</i><br/>Mr. Abd Rashid Samsudin<br/>Department of Wildlife and National Parks,<br/>Ministry of Science Technology and Environment</p> <p>7. <i>Myanmar</i><br/>U Uga<br/>Director, Nature and Wildlife Conservation Division, Forest Department</p> <p>8. <i>Singapore</i><br/>Dr. Lena Chan<br/>Assistant Director (Nature Conservation Branch)<br/>Singapore Botanical Gardens, National Parks Board</p> <p>9. <i>Thailand</i><br/>Dr. Saksit Tridech<br/>Secretary General, Office of Environmental Policy and Planning</p> <p>10. <i>Viet Nam</i><br/>Dr. Vu Quang Con<br/>Director, Institute of Ecology and Biological Resources</p> <p>11. <i>ASEAN Secretariat</i><br/>Mr. Apichai Sunchindah<br/>Assistant Director, Environment</p> |
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## 7 ASOEN Haze Technical Task Force (HTTF)

1. Seventeenth Meeting of ASOEN Haze Technical Task Force (17<sup>th</sup> HTTF) 5 October 2000, Malaysia
2. Sixteenth Meeting of ASOEN Haze Technical Task Force (16<sup>th</sup> HTTF) 1 August 2000, Viet Nam
3. Fifteenth Meeting of ASOEN Haze Technical Task Force (15<sup>th</sup> HTTF) 3 April 2000, Brunei Darussalam
4. Fourteenth Meeting of ASOEN Haze Technical Task Force (14<sup>th</sup> HTTF) 25 August 1999, Singapore
5. Thirteenth Meeting of ASOEN Haze Technical Task Force (13<sup>th</sup> HTTF) 5 July 1999, Malaysia
6. Twelfth Meeting of ASOEN Haze Technical Task Force (12<sup>th</sup> HTTF) 15 April 1999, Malaysia
7. Eleventh Meeting of ASOEN Haze Technical Task Force (11<sup>th</sup> HTTF) 19 November 1998, Viet Nam
8. Tenth Meeting of ASOEN Haze Technical Task Force (10<sup>th</sup> HTTF) 3 September 1998, Philippines
9. Ninth Meeting of ASOEN Haze Technical Task Force (9<sup>th</sup> HTTF) 29 July 1998, Malaysia
10. Eighth Meeting of ASOEN Haze Technical Task Force (8<sup>th</sup> HTTF) 18 June 1998, Singapore
11. Seventh Meeting of ASOEN Haze Technical Task Force (7<sup>th</sup> HTTF) 3 April 1998, Brunei Darussalam

### Members

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| <ol style="list-style-type: none"> <li>1. <i>Chairman</i><br/>Mr. Effendy A. Sumardja (Indonesia)<br/>Assistant Minister for Global Environmental Affairs, State Ministry for the Environment (8<sup>th</sup> – 11<sup>th</sup> HTTF; 16<sup>th</sup> HTTF – present)<br/><br/>Mr. Aca Sugandhy (Indonesia)<br/>Assistant Minister for Natural Environment Management/ Deputy for Environmental Degradation Control<br/>State Ministry for the Environment (12<sup>th</sup> – 15<sup>th</sup> HTTF)<br/><br/>Mr. Surna T. Djajadiningrat (Indonesia)<br/>Assistant Minister for Coordination<br/>State Ministry for the Environment (until 7<sup>th</sup> HTTF)</li> <li>2. <i>Brunei Darussalam</i><br/>Dato Paduka Haji Zakaria bin Haji Noordin<br/>Permanent Secretary, Ministry of Development<br/><br/>Dato Paduka Haji Othman bin Haji Yaakub<br/>Permanent Secretary, Ministry of Development (until 15<sup>th</sup> HTTF)</li> <li>3. <i>Cambodia</i><br/>Mr. Pao Sophal Director General, Ministry of Environment</li> <li>4. <i>Lao PDR</i><br/>Mr. Soukata Vichit<br/>Director General, Department of Promotion and Development of Environment Quality Science, Technology and Environment Agency</li> <li>5. <i>Malaysia</i><br/>Mr. Ng Kam Chiu<br/>Secretary General, Ministry of Science, Technology and Environment<br/><br/>Dato' Cheah Kong Wai<br/>Ministry of Science, Technology and Environment (until 15<sup>th</sup> HTTF)</li> </ol> | <ol style="list-style-type: none"> <li>6. <i>Myanmar</i><br/>U Kyaw Tint Swe<br/>Secretary, National Commission for Environmental Affairs</li> <li>7. <i>Philippines</i><br/>Dr. Ramon J.P. Paje<br/>Undersecretary for Policy and Technical Services Development, Department of Environment and Natural Resources<br/><br/>Mr. Elmer S. Mercado<br/>Under Secretary for Environment and Programme, Development<br/>Department of Environment and Natural Resources (until 11<sup>th</sup> HTTF)</li> <li>8. <i>Singapore</i><br/>Mr. Tan Gee Paw<br/>Permanent Secretary,<br/>Ministry of the Environment (until 17<sup>th</sup> HTTF)</li> <li>9. <i>Thailand</i><br/>Mr. Sunthad Somchevita<br/>Permanent Secretary, Ministry of Science, Technology and Environment</li> <li>10. <i>Viet Nam</i><br/>Dr. Nguyen Ngoc Sinh<br/>Director General, National Environmental Agency<br/>Ministry of Science Technology and Environment<br/><br/>Dr. Truong Manh Tien<br/>Deputy Director General, National Environmental Agency, Ministry of Science Technology and Environment (until 10<sup>th</sup> HTTF)</li> <li>11. <i>ASEAN Secretariat</i><br/>Dr. Azmi Mat Akhir<br/>Director, Bureau of Economic and Functional Cooperation<br/><br/>Dr. Filemon A. Uriarte, Jr.<br/>Director, Bureau of Economic and Functional Cooperation (until 10<sup>th</sup> HTTF)</li> </ol> |
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### 8 ASEAN Working Group on Sub-Regional Fire-fighting Arrangements (SRFA)

1. Fourth Joint Meeting of the Working Groups on Sub-Regional Fire-fighting Arrangements for Borneo and Sumatra (4<sup>th</sup> Joint SRFAs), 18–19 September 2000, Malaysia
2. Ninth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (9<sup>th</sup> SRFA-Borneo), 13 June 2000, Indonesia
3. Thirteenth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (13<sup>th</sup> SRFA-Sumatra), 13 June 2000, Indonesia
4. Eighth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (8<sup>th</sup> SRFA-Borneo), 2 April 2000, Brunei Darussalam
5. Twelfth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (12<sup>th</sup> SRFA-Sumatra), 2 April 2000, Indonesia
6. Seventh Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (7<sup>th</sup> SRFA-Borneo), 19 January 2000, Indonesia
7. Eleventh Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (11<sup>th</sup> SRFA-Sumatra), 19 January 2000, Indonesia
8. Sixth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (6<sup>th</sup> SRFA-Borneo), 23 September 1999, Malaysia
9. Tenth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (10<sup>th</sup> SRFA-Sumatra), 23 September 1999, Malaysia
10. Fifth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (5<sup>th</sup> SRFA-Borneo), 28 June 1999, Brunei Darussalam
11. Ninth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (9<sup>th</sup> SRFA-Sumatra), 27 May 1999, Singapore
12. Eighth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (8<sup>th</sup> SRFA-Sumatra) (Urgent meeting), 16 April 1999, Brunei Darussalam
13. Second Joint Meeting of the Working Groups on Sub-Regional Fire-fighting Arrangements for Borneo and Sumatra (2<sup>nd</sup> Joint SRFAs), 26 February 1999, Singapore
14. Fourth Working Group Meeting on Sub-Regional Fire Fighting Arrangement for Borneo (4<sup>th</sup> SRFA-Borneo), 25 February 1999, Singapore
15. Seventh Working Group Meeting on Sub-Regional Fire-fighting Arrangement for Sumatra (7<sup>th</sup> SRFA-Sumatra), 25 February 1999, Singapore
16. Joint Meeting of the Working Groups on Sub-Regional Fire Fighting Arrangements for Borneo and Sumatra (1<sup>st</sup> Joint SRFAs), 16 December 1998, Indonesia
17. Third Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (3<sup>rd</sup> SRFA-Borneo), 15 December 1998, Indonesia
18. Sixth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (6<sup>th</sup> SRFA-Sumatra), 15 December 1998, Indonesia
19. Fifth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (5<sup>th</sup> SRFA-Sumatra), 15 October 1998, Singapore
20. Second Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Borneo (2<sup>nd</sup> SRFA-Borneo), 16 September 1998, Indonesia
21. Fourth Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (4<sup>th</sup> SRFA-Sumatra), 2 September 1998, Philippines
22. First Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Kalimantan (1<sup>st</sup> SRFA-Borneo), 25 July 1998, Brunei Darussalam
23. Third Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (3<sup>rd</sup> SRFA-Sumatra), 16 July 1998, Singapore
24. Second Meeting of the Working Group on Sub-Regional Fire-fighting Arrangement for Sumatra (2<sup>nd</sup> SRFA-Sumatra), 5 June 1998, Singapore

#### Members

1. *Chairperson SRFA-Sumatra*  
Ms. Hajah Rosnani Ibarahim (Malaysia)  
Director General, Department of Environment  
Ministry of Science, Technology and the  
Environment

2. *Chairman SRFA-Borneo*  
Dato Paduka Haji Zakaria Haji Noordin (Brunei  
Darussalam)  
Permanent Secretary, Ministry of Development  
  
Dato Paduka Haji Othman bin Haji Yaakub,  
Permanent Secretary, Ministry of Development  
(until 5<sup>th</sup> Joint SRFAs)

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| <p>3. <i>Indonesia</i><br/>Mr. Effendy A. Sumardja,<br/>Assistant Minister for Global Environmental<br/>Affairs, State Ministry for the Environment<br/>(until 4<sup>th</sup> SRFA-Borneo and 7<sup>th</sup> SRFA-Sumatra;<br/>9<sup>th</sup> SRFA-Borneo and 13<sup>th</sup> SRFA-Sumatra to<br/>present)</p> <p>Mr. Aca Sugandhy,<br/>Assistant Minister for Natural Environment<br/>Management/ Deputy for Environmental<br/>Degradation Control, State Ministry for the<br/>Environment (8<sup>th</sup> SRFA-Sumatra to 8<sup>th</sup> SRFA-<br/>Borneo and 12<sup>th</sup> SRFA-Sumatra)</p> | <p>4. <i>Singapore</i><br/>Mr. Tan Gee Paw<br/>Permanent Secretary, Ministry of the<br/>Environment<br/>(until 5<sup>th</sup> Joint SRFAs)</p> <p>5. <i>ASEAN Secretariat</i><br/>Dr. Somsak Pipoppinyo<br/>Senior Officer, Environment</p> |
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### 9 Sub-Regional Climate Review Meeting (SRCR)

1. Fifth Sub-Regional Climate Review Meeting (5<sup>th</sup> SRCR) 29 September 2000, Singapore
2. Fourth Sub-Regional Climate Review Meeting (4<sup>th</sup> SRCR) 1 September 2000, Indonesia
3. Third Sub-Regional Climate Review Meeting (3<sup>rd</sup> SRCR) 11 July 2000, Singapore
4. Second Sub-Regional Climate Review Meeting (2<sup>nd</sup> SRCR) 7 June 2000, Singapore
5. First Sub-Regional Climate Review Meeting (1<sup>st</sup> SRCR) 28 April 2000, Singapore

#### Members

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| <ol style="list-style-type: none"> <li>1. <i>Chairman</i><br/>Mr. Woon Shih Lai (Singapore)<br/>Director, ASEAN Specialised Meteorological<br/>Centre (ASMC)</li> <li>2. <i>Brunei Darussalam</i><br/>Mr. Muhamad Husaini Aji<br/>Acting Chief, Meteorological Officer<br/>Brunei Meteorological Service</li> </ol> | <ol style="list-style-type: none"> <li>3. <i>Indonesia</i><br/>Mr. R Sri Diharto<br/>Director General, Meteorological and Geophysics<br/>Agency (BMG)</li> <li>4. <i>Malaysia</i><br/>Dr. Lim Joo Tick<br/>Director General, Malaysian Meteorological<br/>Service</li> </ol> |
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### 10 SRFA Legal Group on Law and Enforcement (LGLE)

1. First Meeting of SRFA Legal Group on Law and Enforcement (1<sup>st</sup> LGLE) 28 August 2000, Malaysia

#### Members

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| <ol style="list-style-type: none"> <li>1. <i>Brunei Darussalam</i><br/>Mr. Pg Shambahy Pg Dato Paduka Haji Mustapha<br/>Environment Officer, Environment Unit, Ministry<br/>of Development</li> <li>2. <i>Indonesia</i><br/>Mr. Antung Deddy Radiansyah<br/>Head of Centre for Emergency Response and<br/>Readiness for Environmental Disaster,<br/>Environmental Impact Management Agency<br/>(BAPEDAL)</li> </ol> | <ol style="list-style-type: none"> <li>3. <i>Malaysia</i><br/>Ms. Muslina Sulaiman<br/>Principal Assistant Director,<br/>International Affairs Unit<br/>Department of Environment</li> <li>4. <i>Singapore</i><br/>Mr. Bin Chee Kwan<br/>Chief Engineer (Regional Policy)<br/>Ministry of the Environment</li> <li>5. <i>ASEAN Secretariat</i><br/>Ms. Adelina Kamal<br/>Senior Officer, Haze</li> </ol> |
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## Appendix IV

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# Reviewers for the Preparation of the Second ASEAN State of the Environment Report

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### (A) Designated Focal Points

1. *Brunei Darussalam*  
Haji Mohd Zakaria Hj Sarudin  
Environment Unit, Ministry of Development
2. *Cambodia*  
Mr. Chuon Chanrithy  
Department of Natural Resources Assessment and Environmental Data Management  
Ministry of Environment
3. *Indonesia*  
Ms. Sri Hudyastuti  
Center for Environmental Data and Information  
Environmental Impact Management Agency (BAPEDAL)
4. *Lao PDR*  
Mr. Singsavanh Singkavonxay  
Integrated Resources Mapping Center  
Science, Technology and Environment Agency
5. *Malaysia*  
Ms. Zainab Zubir  
Information Services Unit; Department of Environment
6. *Myanmar*  
Ms. Daw Yin Yin Lay  
National Commission for Environmental Affairs
7. *Philippines*  
Jaime P. Mallare  
Statistical Coordination Division  
Department of Environment and Natural Resources
8. *Singapore*  
Mr. Khoo Seow Poh  
International Environment and Policy Department  
Ministry of Environment
9. *Thailand*  
Mr. Apichai Chvajareernpun  
Office of Environmental Policy and Planning  
Ministry of Science, Technology and Environment
10. *Viet Nam*  
Mrs. Duong Thi To  
Database Division, National Environment Agency
11. *ASEAN Secretariat*  
Dr. Raman Letchumanan  
Assistant Director (Environment)  
Bureau of Economic and Functional Cooperation

**(B) Planning and Review Meeting (Bangkok, 25-27 September 2000)**

<i>ASEAN Secretariat</i>	1. Dr. Raman Letchumanan (Chairman) 2. Mr. Kesrat Sukasam
<i>Brunei Darussalam</i>	1. Mr. Eddie Dato Paduka Haji Sunny 2. Ms. Norharniah Haji Jumat
<i>Cambodia</i>	1. Mr. Tim Many 2. Mr. Chuon Chanrithy
<i>Indonesia</i>	1. Mr. Effendy A. Sumardja 2. Ms. Sri Hudyastuti
<i>Singapore</i>	1. Ms. Wong Hou Jih 2. Ms. Chia Pou Ching
<i>Thailand</i>	1. Mrs. Nisanat Sathirakul 2. Mrs. Porntip Jaisin
<i>Viet Nam</i>	1. Mrs. Duong Thi To 2. Mrs. Nguyen Hoang Yen

**(C) ASEAN Secretariat Personnel involved in the preparation of the Second ASEAN State of the Environment Report**

1. Dr. Azmi Mat Akhir  
Director, Bureau of Economic and Functional Cooperation
2. Dr. Raman Letchumanan  
Assistant Director ( Environment)
3. Mr. Kesrat Sukasam  
Senior Officer
4. Ms. Adelina Kamal  
Senior Officer
5. Ms. Wiryanti Wiryono  
Technical Officer
6. Ms. Riena Prasiddha  
Technical Officer
7. Ms. Gayatri Probosasi  
Technical Assistant
8. Ms. Vinca Safrani  
Technical Assistant