

# Chapter 4

## Environmental Issues in Southeast Asia

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**Abstract** This region has continued to experience economic growth since the 1980s, driven by the expansion of direct investment from other countries. However, this growth has also brought with it a host of environmental issues, including deforestation, air pollution, and water pollution. This chapter provides an overview of the economic status, environmental regulations, and other aspects of Southeast Asia, which require a coordinated response amid economic integration, including those that encompass several countries, such as cross-border air pollution. It discusses the initiatives that have been implemented so far and examines the remaining challenges of dealing with regional-level environmental issues.

**Keywords** Southeast Asia • Haze • Biodiversity • Mekong River • Trade and the environment

### 4.1 Introduction

Southeast Asia comprises the 11 countries of Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. The per capita GDP (purchasing power parity) among these countries varies considerably, from USD 70,000 in Singapore, a very high level, to USD 1,200 (or lower) in East Timor.

Despite these economic disparities, the Association of Southeast Asian Nations (ASEAN) was established in 1967 and has been gradually moving toward economic integration. Integration is also proceeding in social aspects, including politics and the environment. Currently, East Timor is the only Southeast Asian nation excluded from ASEAN.

This region has continued to experience economic growth since the 1980s, driven by the expansion of direct investment from other countries. However, this growth has also brought with it a host of environmental issues, including deforestation, air pollution, and water pollution. In its report summarizing economic development in ASEAN countries through to 2030, and related issues, the Asian

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Development Bank Institute highlighted environmental and resource issues (Asian Development Bank Institute 2014). Some of the challenges highlighted for sustainable development include the prevention of air pollution and water pollution, energy issues, the sustainable use of renewable resources such as forests, and the protection of biodiversity.

In this book, Chaps. 1, 2, and 3, as well as 5, discuss the individual environmental issues and environmental policies in the Asian countries. This chapter provides an overview of the economic status, environmental regulations, and other aspects of Southeast Asia, in the next section. I then discuss the environmental problems that require a coordinated response amid economic integration, including those that encompass several countries, such as cross-border air pollution. Here, I introduce the initiatives that have been implemented so far and examine the remaining challenges of dealing with regional-level environmental issues.

## **4.2 Diverse Southeast Asian Countries and Their Environmental Issues**

The Southeast Asian countries differ significantly from one another in terms of income levels and industrial structure. Table 4.1 shows the population, per capita GDP, manufacturing sector share of GDP, and governance indices of each country. Indonesia accounts for 40 % of the population of Southeast Asia, with 240 million people. The Philippines and Vietnam each have a population of approximately 90 million, and Thailand approximately 70 million. Then, Singapore has by far the highest per capita GDP, with a level of purchasing power parity higher than that of Japan. In addition, Malaysia's per capita GDP is approximately USD 16,000, a level that admits membership to the OECD, the so-called club of advanced nations. The country with the highest manufacturing sector share of GDP is Thailand (36 %), while Malaysia and the Philippines stand at 24 %.

Generally, as a country's manufacturing sector develops and per capita income increases, environmental issues, such as water and air pollution, emerge, prompting the implementation of pollution regulations. Table 4.2 summarizes the legal system relating to the environment in each country. Singapore, Malaysia, Thailand, Indonesia, and Vietnam appear to have basic legal systems in place, but there are no adequate systems in the other countries.

Moreover, even if regulations are in place, in situations in which there is insufficient monitoring or rampant corruption, pollution regulations are not properly enforced. The governance indices highlight whether the government is effective and corruption is under control. In this case, Singapore has a high general governance capacity. In countries with low per capita income levels, corruption is generally evaluated as not being under control. Therefore, there is a high possibility that, even if regulations exist, they will not be functioning effectively. Furthermore, another condition for advancing pollution countermeasures is that victims of

**Table 4.1** Southeast Asian countries macro indices

	Population (2012, millions)	GDP (2012, million US dollars)	Per capita GDP (2012, US dollars, PPP)	Government effectiveness (2012)	Regulatory quality (2012)	Corruption control governance index (2012)
Singapore	5.3	286,908	75,913	2.15	1.96	2.15
Brunei	0.4	16,953	72,917	0.83	1.16	0.64
Malaysia	29.2	305,032	22,280	1.01	0.55	0.30
Thailand	66.7	365,965	13,976	0.21	0.23	-0.34
Indonesia	246.8	876,719	9,009	-0.29	-0.28	-0.66
Philippines	96.7	250,182	6,109	0.08	-0.06	-0.58
Vietnam	88.7	155,820	4,998	-1.53	-0.68	-0.56
Laos	6.6	9,386	4,464	-0.88	-0.84	-1.04
Cambodia	14.8	14,054	2,839	-0.83	-0.35	-1.04
Myanmar	52.7	n.a.	n.a.	-0.29	-1.87	-1.12
East Timor	1.1	1,355	1,179	-1.19	-1.02	-0.98

Source: World Bank *World Development Indicators* website and *World Governance Index* website  
 Note 1: PPP purchase power parity. Using exchange rates based on price level

**Table 4.2** Environmental laws in Southeast Asian countries

	Basic law	Air pollution control	Water pollution control	Waste management	Environmental impact assessment
Singapore	○	○	○	○	
Brunei					
Malaysia	○	○	○	○	○
Thailand	○	○	○	○	○
Indonesia	○	○	○	○	○
Philippines	○	○	○	○	○
Vietnam	○	○	○	○	○
Laos	○		○		
Cambodia		○	○	○	
Myanmar	○				
East Timor	○				

pollution speak out and that their voices are recognized as important political issues. The economic and social conditions relating to the enforcement of pollution regulations are further aspects in which diversity is evident among the Southeast Asian nations.

Table 4.3 is an environmental performance index collated by Yale University. Twenty indices are used, covering the nine fields of health impacts, air quality, water sanitation, water resources, agriculture, forest, fisheries, biodiversity and habitat, and climate and energy. By assigning the best performing countries on

**Table 4.3** Environmental performance index (2014)

	Overall ranking	Overall	Air quality	Water and sanitation	Water resource	Forests	Biodiversity and habitat
Singapore	4	81.78	98.33	100	99.65		46.33
Brunei	37	66.49	94.62	73.93	37.84	36.46	100
Malaysia	51	59.31	90.54	77.21	8.64	1.68	93.37
Thailand	78	52.83	67.67	57.62	16.00	25.34	70.19
Indonesia	112	44.36	75.31	24.29	0.02	7.75	78.08
Philippines	114	44.02	81.53	37.35	0.53	31.35	64.67
Vietnam	136	38.17	51.32	43.15	0.14	17.25	43.39
Laos	127	40.37	29.23	17.5	0	13.28	93.85
Cambodia	145	35.44	64.8	10.52	0	0	78.93
Myanmar	164	27.44	47.68	30.69	0	24.47	28.62
East Timor	132	39.41	69.33	12.22	0.3	31.35	60.43

Source: Yale University *Environmental Performance Index* <http://epi.yale.edu/>

the relative index a score of 100, and the worst performing countries a score of 0, the different indices are integrated into a single index. Table 4.3 adds the five indices of air quality, water sanitation, water resources, forest, and biodiversity and habitat to the integrated index and gives a ranking score among 178 countries. The highest scoring Southeast Asian country on the integrated index is Singapore, which ranks fourth. The lowest scoring country is Myanmar, which ranks 164th. Environmental issues and countermeasures in Southeast Asia are often mentioned in the context of a single region, but in fact, they vary considerably between the countries.

### 4.3 Environmental and Resource Issues and International Cooperation

In Southeast Asia, there is a need for capacity development to implement environmental countermeasures for each country. At the same time, many problems require the relevant countries to cooperate, including cross-border environmental pollution, international river water use, and the maintenance of ecosystems. Other areas will require systems to be aligned as economic integration proceeds, such as chemical substance regulations, energy-saving standards for products, and recycling systems. This section gives an overview of these issues and introduces the kinds of initiatives that have been promoted in Southeast Asia.

### 4.3.1 Mekong River

The Mekong River is an international river originating in China, and the river basin spans Myanmar, Laos, Thailand, Cambodia, and Vietnam. The development of shipping and hydropower using the Mekong River was first proposed just after the Second World War, but various international conflicts and other issues meant there was little real progress until the mid-1990s. In 1991, the civil war in Cambodia ended, and the focus returned gradually to the development of the Mekong basin. However, concerns have arisen over the impact of dams and other developments on ecosystems and human livelihood, water shortages in downstream regions, and so forth.

In 1995, Thailand, Laos, Cambodia, and Vietnam concluded a four-nation agreement, the Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (Mekong Agreement), establishing the Mekong River Commission. The Mekong Agreement define the notification and consent scheme, depending on the main river, tributaries, and rainy and dry seasons, with respect to use within the basin and division of water outside the basin. Three cases are indicated: cases requiring the commission be notified, cases in which prior consultation must be held to form a consensus in the commission, and cases in which the agreement of the commission must be obtained (see Table 4.4). Water usage that requires notification, prior consultation, and agreement includes irrigation, hydro-power, navigation, flood control, fisheries, timber floating, recreation, and tourism, thereby covering a wide range of river usage. The item garnering the strongest interest in connection with environmental issues is dam development. According to the provisions of the Mekong Agreement, dams built on the main river require international consultation prior to construction, while for dams built on tributaries, notification alone is sufficient.

**Table 4.4** Stipulations on notification and agreement on Mekong River usage in basin and water division outside of basin

	Mekong River tributaries including the Tonlé Sap		Mekong River main river	
	Use in the river basin	Water division outside the basin	Use in the river basin	Water division outside the basin
Rainy season	Notification to the commission		Notification to the commission	Prior discussion by the commission aimed at forming a consensus
Dry season			Prior discussion by the commission aimed at forming a consensus	Consensus in the commission

Source: Created based on Article 5 of the *Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin*

There are concerns over the impacts of dam construction, such as the destruction of ecosystems and the losses of people whose livelihoods depend on ecosystems. Ziv et al. (2012) analyzed the impact of existing and planned dams on water resources in the lower Mekong basin (the so-called Golden Triangle, bordering Thailand, Laos, and Myanmar), including 11 dams on the main river and 78 dams on tributaries. They conducted a scenario analysis, starting with a baseline in 2015, that included 41 tributary dams and 0 main river dams. In their analysis, they compare a scenario in which all 78 dams planned on tributaries are built by 2030 and a scenario in which no tributary dams are built, but 6 dams are built on the main river. As a result, they estimate that water resources would be reduced by 19.1 % in the former case and 6.9 % in the latter case. On the other hand, they also estimate that the amount of electricity supplied would increase by 24 TWh/year in the former case and 35.8 TWh/year in the latter.

However, a study focusing on dam construction in the lower Mekong basin alone does not entail a comprehensive study of the impacts on the Mekong River and its ecosystems. The reason is that dam construction is also occurring upstream, in China. Matsumoto (2005) and International Rivers (2013) pointed out that dam construction in China's Yunnan Province may have potentially negative impacts on the Mekong Delta. First, the amount of earth and sand flowing to the lower Mekong basin may decrease. Second, the water level during the dry season may increase, preventing the riverbank cultivation practiced during the dry season. Third, there are potential issues surrounding a sudden rise or fall in water levels.

One of the problems with the Mekong River Commission is that the upstream countries, China and Myanmar, do not participate, although dialog between these two countries and the Commission does occur. In 1996, there were talks between the Mekong River Commission and Myanmar and China. In 2002, an agreement was reached with China in which the commission would receive flow data and water level data, collected at two locations in China. The background to this development was a flood of the Mekong River in 2000 (MRC website: <http://www.mrcmekong.org>). Nevertheless, there is no framework for evaluating the environmental impact of dams constructed in China and Myanmar or discussing these with countries in the lower basin. Thus, the agreement could not function sufficiently from the perspective of comprehensive management of the Mekong River basin.

### ***4.3.2 Forest Fires and Smoke Pollution (Haze)***

Major forest fires in Indonesia have a history stretching back to 1982–1983 (Gillert 1998). In that forest fire, 3.2 million hectares of forest burned in eastern Kalimantan. Thereafter, forest fires occurred in 1989, 1991, 1994–1995, and 1997–1998. Forest fires release massive quantities of air pollutants into the atmosphere, causing haze. In recent years, forest fires have been occurring every year, and the resulting haze is becoming an issue. The impacts of haze are wide ranging, including respiratory and eye diseases associated with atmospheric pollution, problems in

transport systems such as delays in airline schedules and flight cancellations, a decline in the number of tourists, and so on. The resulting damage from these fires affects the country where the forest fire occurred, as well as neighboring countries such as Singapore and Malaysia. Glover and Jessup (1999) estimated the damage from forest fires and haze in 1997 to have reached USD 4.5 billion. Of this, damage caused directly by the forest fire (e.g., damage to agriculture and forestry) amounted to USD 3.1 billion, and damage to short-term health and to the tourism sector amounted to USD 1.4 billion. Damage inside Indonesia was estimated to be USD 3.8 billion, while the combined damage to Singapore and Malaysia was estimated to be USD 0.7 billion.

Forest fires have also been indicated as a significant contributor to global warming. Silvius et al. (2006) estimated that CO<sub>2</sub> emissions in 1997, 1998, and 2002, when major forest fires occurred, ranged from 3.0 billion to 9.4 billion tons. Here, 9.4 billion tons corresponds to 40 % of the global emissions of CO<sub>2</sub>.

Large-scale forest fires are attributed primarily to natural factors and human. Natural factors include a decline in rainfall due to weather fluctuations such as El Niño or the existence of subterranean peat layers. Human factors include slash-and-burn cultivation, dehydration of forests due to forest thinning, and burn-off associated with converting forest into agricultural land for the development of palm plantations or rice paddies. In recent years, the burn-off for palm plantation development has been attracting particular criticism.

Initiatives at ASEAN entered full swing in 1997. The ASEAN Ministerial Meeting on the Environment formulated the Regional Haze Action Plan. Then, in 1999, the Regional Haze Action Plan Coordination and Support Unit responsible for haze was established within the ASEAN Secretariat. In 2002, the ASEAN Agreement on Transboundary Haze Pollution was finalized and signed. By 2003, the agreement had been ratified by six countries, Malaysia, Singapore, Brunei, Vietnam, Myanmar, and Thailand, and was later ratified by Laos, Cambodia, and the Philippines. In 2014, Indonesia finally ratified the agreement. Currently all of ASEAN countries have ratified the agreement.

The agreement defines haze as “smoke resulting from land and/or forest fire which causes deleterious effects of such a nature as to endanger human health, harm living resources and ecosystems and material property and impair or interfere with amenities and other legitimate uses of the environment.” Moreover, “land and/or forest fires” are defined as “fires such as coal seam fires, peat fires, and plantation fires.”

Signatory countries are required to mandate the prevention of land and/or forest fires in law. For example, Section 9a requires signatory countries to promote a zero-burning policy.

*Developing and implementing legislative and other regulatory measures, as well as programmes and strategies to promote zero burning policy to deal with land and/or forest fires resulting in transboundary haze pollution.*

In 2003, the guideline for the Zero Burning Policy was formulated (ASEAN Secretariat 2003). Tacconi et al. (2008) point out that it is not necessary to stop all burn-off, as stipulated in the ASEAN Agreement on Transboundary Haze Pollution.

Instead, it would be better to focus on preventing burn-off of peat layers. It seems there is a need to perform a verification analysis to determine which activities need to be stopped and to then implement relevant countermeasures. Furthermore, Wetland International (2006) note out that it is important to restore wetlands at low cost.

Various initiatives are proceeding in parallel with the haze agreement. The ASEAN Peatland Management Initiative has been operational since 2003 and focuses on peatland by raising awareness and promoting sustainable peatland management. The ASEAN Peatland Management Strategy 2006–2020 was created in 2005 and updated in 2013 (ASEAN 2013).

In May 2012, the ASEAN-Wide Fire Danger Rating System was established. Indices such as humidity and ease of fire spread were created and published on the ASEAN Haze Action Online website (<http://haze.asean.org/>). The ASEAN Specialized Meteorological Center was also established, with its website publishing satellite image information, such as areas where a forest fire is occurring and/or haze is occurring, as well as the wind direction in the respective areas.

Forest fires in Indonesia have been studied and monitored for some time, but in 2011, the Sub-Regional Ministerial Steering Committee on Transboundary Haze Pollution in the Mekong Sub-Region was established and held its first meeting. This was more in response to reports of haze occurring in regions bordering the three countries of Thailand, Laos, and Myanmar, such as northern Thailand and north-eastern Myanmar.

Despite the various initiatives that have been implemented, the issue of forest fires and haze has failed to reach a resolution after nearly 20 years. The key to forest fire countermeasures going forward will be moving beyond establishing international frameworks, including companies developing palm plantations in approaches for sustainable development. Furthermore, there is a need to look beyond central governments to find ways to involve local governments and communities in creating an effective framework.

### ***4.3.3 Initiatives Related to Biodiversity Protection***

Countries in Southeast Asia participate in international frameworks that protect biodiversity, such as ratifying the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and other biodiversity protection agreements. At the same time, they are also developing a framework for regional cooperation aimed at protecting biodiversity in Southeast Asian countries.

The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security program was established in 2007 to respond to the crisis concerning coral reefs and marine resources.<sup>1</sup> The participants include four countries from Southeast

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<sup>1</sup> <http://www.coraltriangleinitiative.org/>



Asia—Indonesia, Malaysia, the Philippines, and East Timor—as well as Papua New Guinea and the Solomon Islands. The initiative has its secretariat in Jakarta. The Coral Triangle region accounts for only 1.6 % of the planet's ocean area, but includes some 600 types of coral, corresponding to 76 % of known varieties, and 2,500 species of coral-dwelling fish or 37 % of known varieties. However, excessive harvesting of marine products and pollution from land are believed to be putting the ecosystem at risk.<sup>2</sup> In response, training manuals have been created, and capacity-building programs are being implemented that target regional governments.

The Heart of Borneo Initiative is a three-nation initiative by Indonesia, Malaysia, and Brunei to protect biodiversity on the island of Borneo.<sup>3</sup> In 2007, the countries designated an area called the Heart of Borneo (HoB) as a biodiversity preservation initiative. In 2009, the HoB Strategic Action Plan was formulated. The action plan calls for a variety of capacity-building activities related to biodiversity, collaboration on research into the sustainable development of the HoB by forming links with research institutions, raising awareness to prevent further loss of forest biodiversity, and other such programs. The total area of Borneo is approximately 725,000 km<sup>2</sup>, of which 200,000 km<sup>2</sup> has been designated as the HoB.

The ASEAN Center for Biodiversity was formally established in 2005 as a continuation of the ASEAN Regional Center for Biodiversity Conservation project, which had run from 1999 with support from the European Commission. The center is headquartered in the Philippines and holds workshops on topics such as biodiversity in urban areas, climate change, and biodiversity. It also performs GAP analyses related to marine reserves.

#### ***4.3.4 Cross-Border Products and Environmental Regulations on Products***

In Southeast Asian countries, various environmental regulations now apply to products when shipping them to markets. This is an attempt to control global warming and chemical pollution and is based on regulations in advanced countries, such as those in Europe.

Environmental product regulations related to energy saving include Minimum Energy Performance Standard (MEPS) as minimum performance standards for each product and energy-saving labels to show a product's energy-saving performance in a multistep fashion. The MEPS has spread gradually from the Philippines in 1993 to Indonesia in 2004. Energy-saving labels are an ongoing initiative, with

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<sup>2</sup> Refer to the Coral Triangle Initiative website (<http://www.coraltriangleinitiative.org/>).

<sup>3</sup> Refer to the Heart of Borneo Initiative website (<http://www.hobgreeneconomy.org/en/about/>).

Thailand being the first to achieve the No. 5 energy-saving label.<sup>4</sup> The initiative started in 1995. Then, from around 2005, other Southeast Asian countries strengthened their energy-saving label initiatives, with energy-saving labels being introduced in Malaysia (2005), Singapore (2008), and Vietnam (2013). However, the initiative has many discrepancies, including different methods of measuring energy-saving performance and different reference values used for labels.

Regulations on lead, cadmium, and other chemical substances included in electrical products were introduced in Thailand in 2009 and in Vietnam in 2012. Thailand uses a similar approach to Japan in that they require labels showing the degree to which chemical substances are included in a product, as compared to a designated standard. Vietnam uses a system similar to the European RoHS system, requiring designated substances to be below a certain standard. However, when different regulations have to be applied to the same products, then the products must comply with the respective markets, increasing the burden on manufacturers (Michida 2014).

Southeast Asian countries are grappling with issues related to urban waste, such as insufficient collection services, pollution from landfill processing sites, and difficulties in situating landfill processing sites. In response, there are moves to introduce extended producer responsibility, obliging manufacturers and importers to collect and recycle used products in the same way as in advanced countries. In Vietnam, a prime ministerial decision, announced in August 2013, will see extended producer responsibility applied from 2015 to 2018 on used products such as batteries, electrical products, lubricant oil, tires, motorcycles, and cars. New product categories will be added in stages. In Malaysia, a regulation is being prepared to extend producer responsibility of discarded electronics and electrical equipment. Indonesia is planning to promote autonomous business initiatives while phasing in extended producer responsibility over a 10-year period. As the cross-border movement of people and products increases while, at the same time, there are different systems in place for applying extended producer responsibility, situations in which the responsibility for used products is not clear will become increasingly likely.

In applying the abovementioned energy-saving standards, chemical substance regulations, and extended producer responsibility, there has, thus far, been no systematic coordination between Southeast Asian countries. Energy-saving standards and chemical substance regulations can place unnecessary economic burdens on producers, for example, in product design and calculations. In addition, extended producer responsibility certainly has the potential to create systemic distortions when used products move across borders and producers must fulfill their responsibilities. Therefore, there is a need for better coordination among ASEAN countries, including adopting unified standards.

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<sup>4</sup>The Philippines was the first country in Southeast Asia to establish an energy-saving law. The initiative began in the early 1980s, but with the collapse of the Marcos government (1986), the initiative ceased to operate.

## 4.4 Southeast Asian Economic Integration and Environmental Issues

There are plans to liberalize trade among ASEAN countries toward the end of 2015. Various measures are planned to promote economic integration, including opening the markets of the service industry sector by allowing people to move more freely and so forth.

As this kind of economic integration proceeds, there is a possibility that factories will relocate to areas where environmental regulations are weaker, and investments that cause environmental problems may increase. The problems of haze and the management of the Mekong River basin, introduced in Sect. 4.2, have both been affected by economic integration in Southeast Asia. With regard to the haze issue, there is significant investment by Malaysia and Singapore in palm plantation development in Indonesia. Water transport on the Mekong River supports part of the trade between countries in the Mekong River basin. Moreover, electricity generated by hydropower stations in the Mekong River basin, particularly in Laos, is sold to other Southeast Asian countries. Increased economic integration carries the potential to make these problems even more serious.

The EU and NAFTA have adopted countermeasures to ensure that environmental problems do not grow more serious as economic integration progresses. The United States, Canada, and Mexico concluded the North American Agreement on Environmental Cooperation at the same time as they concluded the NAFTA. To ensure that environmental issues do not grow worse with the liberalization of trade, a commission was established comprising the ministers for the environment of the three countries (Commission for Environmental Cooperation). Moreover, the secretariat for the commission prepares public announcements of environmental information and environmental terminology in English, French, and Spanish. The EU has established an organization called the Implementation and Enforcement of Environmental Law. Initiatives are now underway to maintain a unified standard of enforcement of environmental regulations by undertaking capacity building for countries that subsequently joined the EU and by conducting joint investigations into the status of cross-border movement of waste products (Kojima and Michida 2011).

In ASEAN, official and unofficial meetings of the environmental ministers and high-level summit meetings have been held every year, such as the first ASEAN Ministerial Meeting on the Environment in 1981. The Blueprint adopted in 2007 calls for the creation of joint bodies, not only for economic issues but also for political, health and safety, and social and cultural issues. Environmental issues are positioned within the ASEAN Social-Cultural Community (ASCC). The Blueprint presents the following 11 priority items in a section on Ensuring Environmental Sustainability:

1. *Addressing global environmental issues*
2. *Managing and preventing transboundary environmental pollution (transboundary haze pollution and transboundary movement of hazardous wastes)*
3. *Promoting sustainable development through environmental education and public participation*

4. *Promoting environmentally sound technology*
5. *Promoting quality living standards in ASEAN cities/urban areas*
6. *Harmonizing environmental policies and databases*
7. *Promoting the sustainable use of coastal and marine environment*
8. *Promoting sustainable management of natural resources and biodiversity*
9. *Promoting the sustainability of freshwater resources*
10. *Responding to climate change and addressing its impacts*
11. *Promoting sustainable forest management*

The progress on the Blueprint from 2009 to 2012 was summarized in a midterm review (ASEAN Secretariat 2014), which detailed initiatives in each of the above areas. However, there was no detailed discussion of areas such as those given in Sect. 4.3. Moreover, the report states that the various effects of the initiatives take time to become apparent and that there was no clear trend to indicate whether the environment had improved between 2009 and 2012.

Of the themes highlighted in Sect. 4.3, product environmental regulations and recycling systems are not included in the aforementioned 11 priority items. However, in the high-level summit on the environment for ASEAN held in January 2013, the notion of sustainable production and consumption was gaining importance, there was a proposal to expand for “environmentally sound technology” (ASEAN Secretariat 2014) to include “Sustainable Production and Consumption.” Therefore, it seems likely that this will become an ongoing ASEAN initiative.

Ideally, when various environmental countermeasures are promoted, each country should bear a fair portion of the cost and receive a benefit. However, as noted in Sect. 4.1, the different countries in Southeast Asia have very different levels of income, economic scale, environmental laws, and so forth. There is a need for each country to bear costs in line with its capability to do so and to provide appropriate support to those countries with weaker environmental management capabilities. In addition, donors from outside the region also play an important role.

Furthermore, based on the agreement of each country, there is a need to increase the capacity of government and research institutions with respect to gathering environment-related statistical data and the status of policies. Much of the research cited here has been carried out by researchers outside of the region. In particular, with cross-border environmental issues with a certain level of apparent consensus in scientific knowledge, it is difficult to get all the countries to cooperate on promoting countermeasures. There is a need to foster exchanges between the researchers of Southeast Asian countries, to have them share scientific knowledge, and to promote discussion among scientists and policymakers from each country.

## 4.5 Conclusion

Economic growth and the advance of economic integration in Southeast Asian countries are beginning to cause cross-border and environmental and resource issues. Moreover, the introduction of local environmental product regulations by

each country could place an overly heavy burden on companies supplying products within the ASEAN region as the economies continue to integrate.

On the other hand, with regard to haze, Mekong River management, and biodiversity protection, agreements have been formed and frameworks established for environmental protection and resource management. However, not all relevant countries are participants in these frameworks, including countries from outside the region. For this reason, activities based on international frameworks are limited to those such as raising awareness and sharing information.

To address these issues, the EU and NAFTA initiatives described in Sect. 4.4 offer a useful model. ASEAN countries need to implement more comprehensive initiatives and to cooperate in dealing with environmental and resource issues in the region.

The basis of comprehensive initiatives is the accumulation of scientific knowledge. It is important for countries in the region to promote efforts to grasp the actual status of environmental and resource issues and to study and share countermeasure technologies.

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