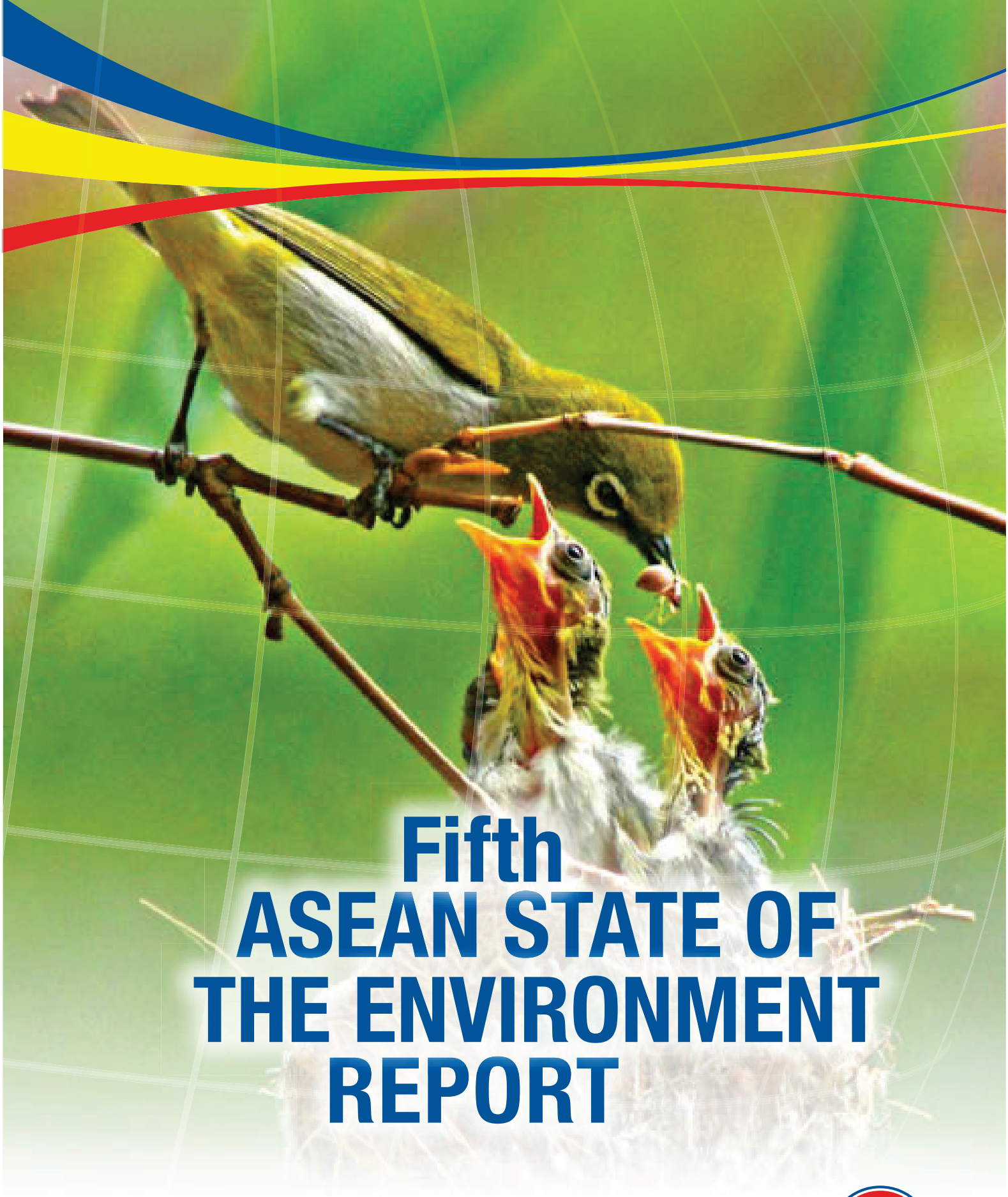

Fifth ASEAN STATE OF THE ENVIRONMENT REPORT

ASEAN 50
2017

asean

one vision
one identity
one community

The ASEAN Secretariat
Jakarta

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967. The Member States are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.
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ASEAN: A Community of Opportunities

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[illegible]

[illegible]

SOER5 is part of ASEAN's continuous efforts to build [illegible] identifies challenges and opportunities for ASEAN to contribute to addressing global [illegible]

[illegible] population and rapid urbanisation, continue to pose significant pressures on socio- [illegible] commitment and significant progress have been made to promote and ensure balanced social development and environmental protection for the benefit of the people in our [illegible]

[illegible]

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[illegible]

[illegible] (Viet Nam) and Nguyễn Bích Loan (Viet Nam).

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[illegible]	[illegible]
AJCSD	ASEAN-Japan Chemical Safety Database
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
ASCC	ASEAN Socio-Cultural Community
[illegible]	[illegible]
ASPA-WRM	ASEAN Strategic Plan of Action on Water Resources Management
[illegible]	[illegible]
[illegible]	[illegible]
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HMS ASEAN Sub-regional Haze Monitoring System

IUU Illegal, Unreported, and Unregulated [fishing]

OECD Organization for Economic Co-operation and Development

PCEEP Philippines-Chiller Energy Efficiency Project

UN-Habitat	United Nations Human Settlements Programme
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
WTE	Waste-to-Energy

[illegible]

[illegible] the ASEAN region has undergone significant changes. These changes have happened not only in economic sense, but also socio-demographic and physical (environmental) [illegible]

With Gross Domestic Product (GDP) of US$2.4 trillion, today ASEAN is the sixth-largest [illegible] since 2010, after recovering from the global and regional financial crisis in 2008. With an [illegible] market and production base, with a free flow of goods, services, labour, investments [illegible]

[illegible]

ASEAN's regional climate is influenced by maritime wind systems, which originate in both the South China Sea and the Indian Ocean, therefore the ASEAN region is affected [illegible] and causes wide-ranging changes in weather patterns. Also given its location on the [illegible] seasonal episodes of both floods and droughts. In fact, in ASEAN, the most common disasters are floods, tropical storms and landslides. During the dry summer season, the ASEAN region experiences intense smoke haze and air pollution that is heavily influenced by the monsoon wind patterns. The frequency and intensity of hydro, meteoro- and [illegible] particularly in Thailand and the Philippines. For example, Thailand suffered over US$ 45 billion in economic loss and damage as a result of the prolonged, nation-wide, flood in [illegible]

These changes have posed significant pressures to various natural resources and [illegible] attempts to capture these changes and its impacts to reflect on the state of the environment in this region. SOER5 follows the drivers-pressures-states and trends-

impacts-responses model (DPSIR). This model states that the pressure from human
thus requiring a response that affects human activities and the state of the environment

carbon dioxide emissions and it is predicted that energy-related CO2 emission levels could rise in the ASEAN region by 61% from 2014 to 2025. As significantly urbanising
to urgently seek low-carbon economies, infrastructure and transport. There is also a
Transboundary haze pollution resulting from land and forest fires in the ASEAN region is
transboundary smoke haze in ASEAN is linked to peat fires related to expansion of large-

other forest types. This is of significant concern for climate change mitigation due to the

world's 34 biodiversity hotspots and three mega-diverse nations. Biota and ecosystems
and other land-use changes, habitat degradation and alteration, invasive alien species, genetic erosion, and over-exploitation of certain wildlife species. The economic growth-
and well-being in the region. The importance of ecosystem and biodiversity conservation

increase by about one-third by 2025 and double during the latter half of the 21st century,
ASEAN Member States (AMS) have made significant progress in improving access to

of the built environment into flood-prone areas and serious degradation of catchments. [illegible] frequency and intensity of extreme flood and drought events in the region. It also causes alteration of river flow regimes, loss of wetlands and floodplains, and salinity intrusion [illegible]

[illegible] currently under pressure as they are overfished and degraded. Key ecosystems such as [illegible] and climate change. Coastal development is increasingly affecting the health of the seas; marine debris pollution is a serious issue alongside climate change and overfishing. Climate change and subsequent sea-level rise will have deep impacts on the productivity of coasts and oceans in ASEAN, affecting the well-being of coastal inhabitants while poverty among the rising coastal populations continues to be of significant concern. [illegible] management, no-take reserves and community-based coastal resources management [illegible]

[illegible] an increasingly unsustainable trend across the ASEAN region. Although efficiency and [illegible] poses a serious challenge for most AMS, especially plastic bags, e-waste and food waste. Landfill is still the main disposal method, however 3Rs and waste-to-energy have [illegible] address issues in production and consumptions in ASEAN such as green/sustainable public procurement (GPP/SPP) and ecolabeling, and these need to be expanded and [illegible]

[illegible] framework, made significant efforts in responding to the environmental challenges. [illegible] that promotes social development and environmental protection through effective [illegible] to ensure: 1) enhanced cross-sectoral/cross-pillar/integrated coordination mechanisms; 2) effective and timely monitoring and evaluation systems; 3) better prioritization and [illegible]

[illegible][1] [illegible]

[illegible]

[illegible]

[illegible] trends in regional socio-economic and environmental issues, and highlights the potential [illegible]

[illegible]

[illegible]

[illegible]

[illegible] the state (condition) of the environment to change thus requiring a response that affects [illegible]

[illegible] and policy framework for ASEAN to effectively implement its mandate, ensure better [illegible] and support regional efforts for coordinated actions at the national level to realize the [illegible]

[illegible] trends of social, economic and environmental conditions and looking in-depth at six [illegible]

[illegible]

[illegible] region, and identifies gaps in policy and implementation and opportunities for change.

[illegible]

[illegible] quality and pollution in the ASEAN region and describes efforts to reduce air pollution [illegible] industrialization, transport and energy, is causing long-term and wide-ranging health [illegible]

the drivers and pressures in the ASEAN region that affect their quality and availability. A

are facing a number of challenges related to water quality and sanitation, water-related

increase by about one-third in 2025 and double during the later half of the 21

ocean resources and the threats posed by overfishing and degradation caused by

reefs and seagrass beds, alongside a productive fisheries industry.

of sustainable production and consumption focusing on resource efficiency, process efficiency, waste management, and chemicals management.

by the regional environment sector in a more concerted, effective and timely manner.

comprising three pillars, namely ASEAN Political-Security Community (APSC), ASEAN Economic Community (AEC), and ASEAN Socio-Cultural Community (ASCC) that

of a five-decade long effort of community building since the signing of the Bangkok

charts the future direction of the ASEAN Community into the next decade. It is a forward-

ASCC Blueprint 2025, which envisions 'an ASEAN Community that engages and benefits the

The ASEAN region comprises two sub-regions i.e. mainland Southeast Asia (SEA) and

Thailand and Viet Nam, is known as the Mekong region, due to a significant part of it being located in the extensive Mekong river basin. The mainland SEA features north-

as low-land, most of the islands in the Maritime SEA are volcanic in origin (ASEAN

Located in the fringes of the Indian and the Pacific Oceans, the SEA region has

and two gulfs (i.e. the Gulf of Tonkin and the Gulf of Thailand) which offer diverse

1. http://asean.org/the-asean-declaration-bangkok-declaration-bangkok-8-august-1967/
2. http://asean.org/?static_post=declaration-of-asean-concord-ii-bali-concord-ii
3. http://asean.org/storage/2016/01/ASCC-Blueprint-2025.pdf

marine and mineral resources for fishery, tourism and trade. The region hosts some of the busiest international shipping channels (Hand, 2015) that includes the well-

the Pacific Ocean.

The regional climate

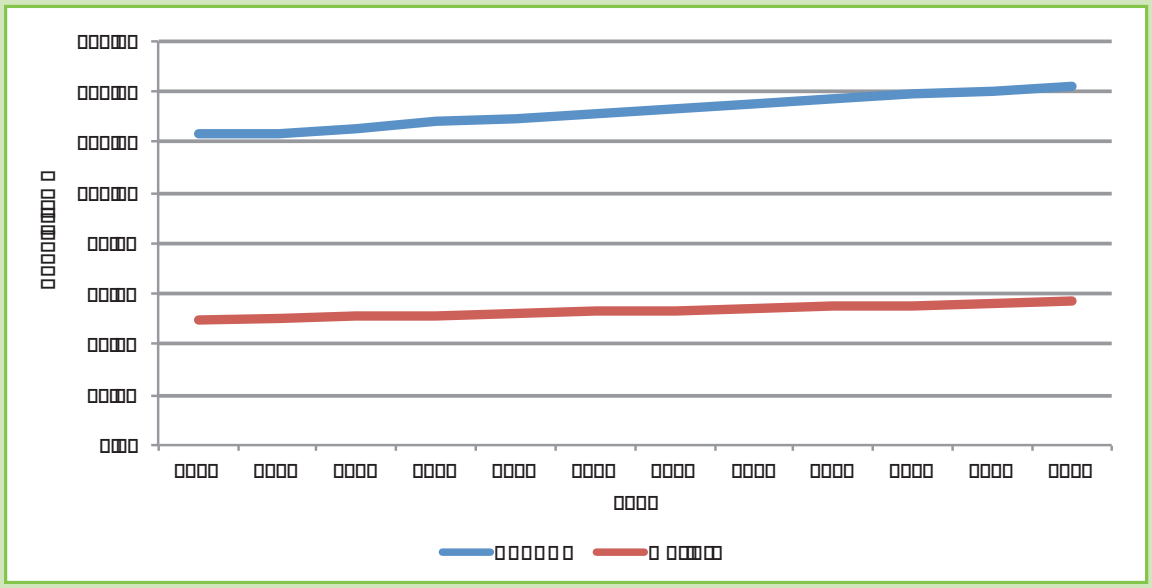
The regional climate is influenced by maritime wind systems, which originate

particularly at risk of being affected by typhoons or cyclones during this time of the

Due to its geographical location, the ASEAN region is affected by the El Niño and La Niña phenomena that often alter the seasonal monsoon cycle and cause wide-ranging floods and droughts. During the dry summer season, the ASEAN region experiences intense smoke haze caused by land and forest fire and air pollution that is exacerbated

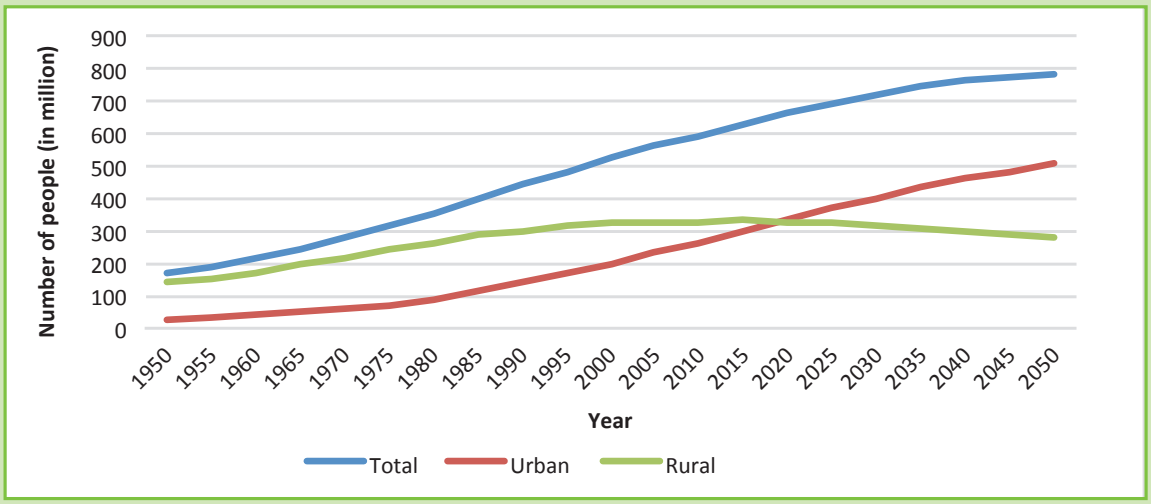
With a combined GDP of US$2.4 trillion, ASEAN is the sixth-largest economy in the world. However, the regional association includes economies with vast differences: at ca. 5% annually since 2010, after recovering from the global and regional financial

4. http://data.worldbank.org/indicator



The ASEAN region has cities of different sizes: megacities of over 10 million (such as Jakarta), large cities with 5 million - 10 million (such as Kuala Lumpur), medium-sized cities with 1 million-5 million (such as Yangon) and small cities with populations ASEAN is home to 20 medium-sized and 21 small cities. This reflects a global trend

smaller urban areas accounts for 47% of the total population. The figure is expected



Effects of urbanization

- outpacing their efforts to improve city infrastructure. Public transport systems have fledgling subway and elevated rail transport (Li, 2017). At the same time, building infrastructure to meet the growing demands for inner-city transport further worsen air

Unsustainable urbanization also has disastrous effects on global ecosystems. The threaten biodiversity and affect ecosystem productivity by causing loss of habitat,

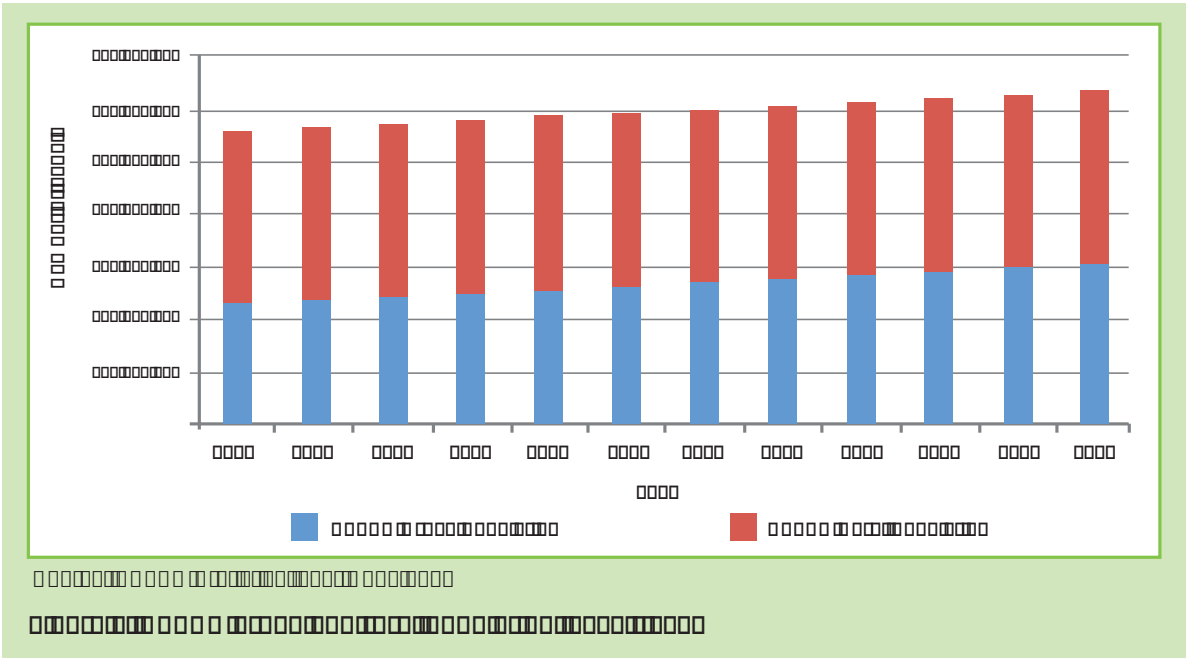
- from 1.23 in the 1990s to 1.42 in the mid-2000s. In the Philippines, the urban–rural account for the urban-centred economic development, such as the different pace of human capital accumulation in urban and rural areas, market-driven urbanization and

Between-AMS inequality is a further aspect of inequality in the ASEAN region, i.e. the stark difference in development between developed and middle-income AMS,

Rapid economic growth leads to the expansion of the middle-class. The middle-class
2013), which is an estimate of 300 million people. The rise of the middle-class and
their materialism, consumption power and "wasteful behaviour" cause increasing

It is projected that environmental problems will worsen because the middle-class
unlikely to change, as it signifies success and modernization (Sheng, 2011).

- East Asia nations – China, Republic of Korea and Japan on finance, tourism, agriculture



- agriculture sector (rice farming, forestry and fisheries) to find work elsewhere, such

Rates of internal migration predominantly from rural to urban areas, as well as intra-

	-			
	-			
	-			
			N/A	
				N/A

** Data is dated by mid-2015 , provided by Brunei Darussalam

Besides internal rural-urban migration, intra-ASEAN migrants, formal and informal,

5. http://www.iom.int/world-migration

The efforts of AMS to improve wealth distribution have been far less successful. [illegible] between the rich and the poor. Cambodia's Gini coefficient[6] [illegible] However, the trend is opposite in Indonesia and Malaysia where the Gini coefficient [illegible][7] [illegible]

Table 3. Gini Coefficient of Select ASEAN Member States, 2000 - 2014

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	-
[illegible]	[illegible]	[illegible]	-	[illegible]	-	[illegible]	-	[illegible]	-	-

[illegible]

[illegible]

[illegible][8] for the period 1990-2014 (Figure 5) shows an insignificant change in the living standards, health and knowledge of citizens of AMS, reflecting a plateau in the well-being after a remarkable progress during the previous two decades (1990-2010).

[illegible]

[illegible]

6. The Gini coefficient is a statistical measure of the degree of variation or inequality represented in a set of values, used [illegible]

7. Malaysia's Gini coefficient is for the period between 2007-2009

[illegible]

trade and investment. For instance, the growing skilled-labor market is dominated by men. Women tend to find employment only in low-skilled sectors such as clerical and

One of the key reasons why women tend to work in the more labor-intensive areas high-skilled employment. Table 5 shows the gender gaps in education and women's women working in vulnerable fields of employment, such as garments, agriculture, self-employment and unpaid labor contributing to the family and household, is higher also have less opportunity to access well-paid work and social protection (ASEAN

Gender inequalities in the labor market affects national productive capacity and

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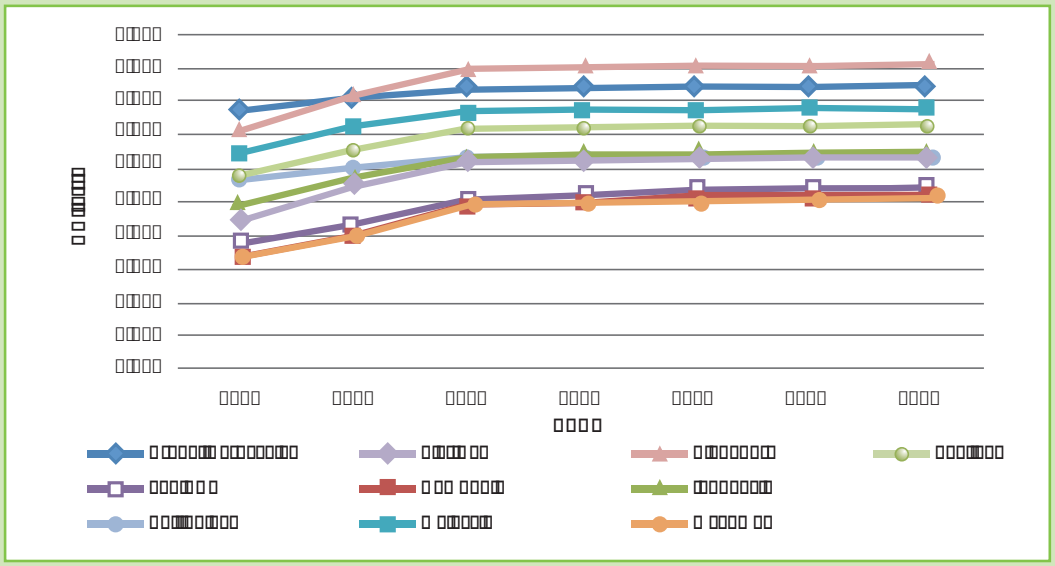


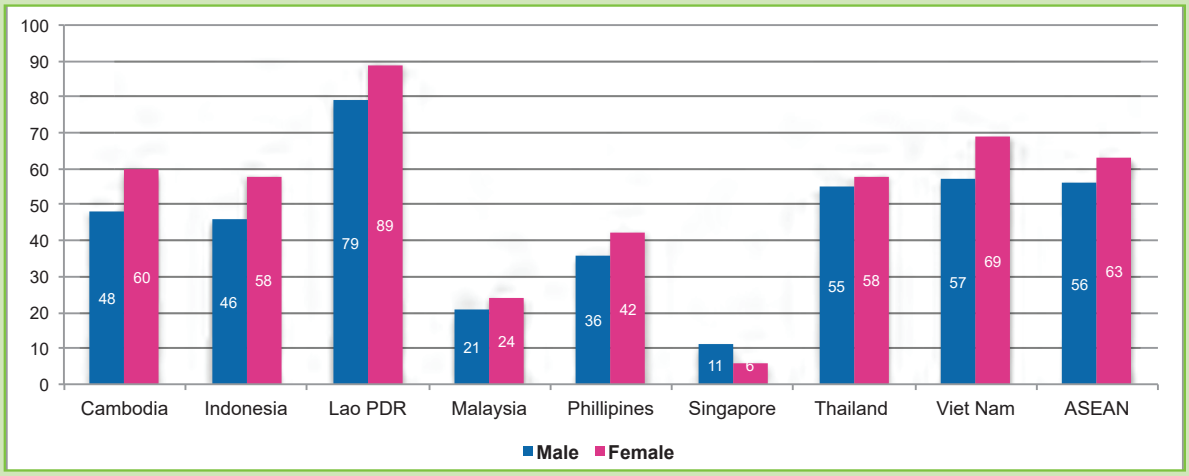
all key drivers of agriculture-based and export-led economic growth of many AMS. Coupled with the changing socio-economic circumstance in ASEAN, these factors

Regional economic integration has boosted the trade flow among AMS, with intra-ASEAN trade value having doubled between the period 2005-2014, and accounting

The expansion of agriculture-based export has significant implications not only on the movement of labor but poses many concerns for land-use and natural resources

The period 2009-2015 witnessed a remarkable leap in Foreign Direct Investment (FDI) in the agriculture, forestry and fishery sectors in the ASEAN region (Figure 7). Most

of the investment came from within AMS, e.g. 84% in 2015. Land-constrained AMS such as Singapore and Malaysia have been encouraging their agribusiness firms to invest in other land-abundant and low labor-cost AMS (ASEAN Secretariat, 2013). A significant proportion of Viet Nam's investment in AMS is on hydropower, agriculture



The three "economic corridors" supported by the Asian Development Bank (ADB),

The expansion of commercial agriculture including large-scale land concessions is resulting in a number of social and ecological impacts such as land conflicts,

The clearing of tropical forests for large-scale commercial agriculture and medium- to small-scale farming, has resulted in significant carbon emissions. The cheapest and smallholder agriculturists and agro-industrial companies such as oil palm plantations

- of land acquisition by agri-business threatens biodiversity, ecosystem services and

- increase in flood risks (Hooijer et al., 2015). It can often also cause fires which result in generation of smoke haze with its concomitant adverse effects. Against the canvas of weak governance, unsecured land rights and ambiguous land classification, land leading to land conflicts and threatening livelihoods of smallholder farmers (Borras &

  Expansion of agro-fuel crops affects traditional landowners and indigenous communities with land scarcity, land conflicts and rising land prices (Colchester & created opportunities for the industry to encroach upon communal lands. Such "de-culturalisation of production practices" are insensitive to traditional farming system

- include habitat fragmentation and pollution, all of which contribute to significant of communities of ground-dwelling ants in different plantations in Sabah, Malaysia,

- different coastal and marine resources abound, including coral reefs, mangroves, seagrass beds, pelagic fisheries, demersal fisheries, and seabed minerals. The hazards and physical processes, in particular, affecting the many major towns and

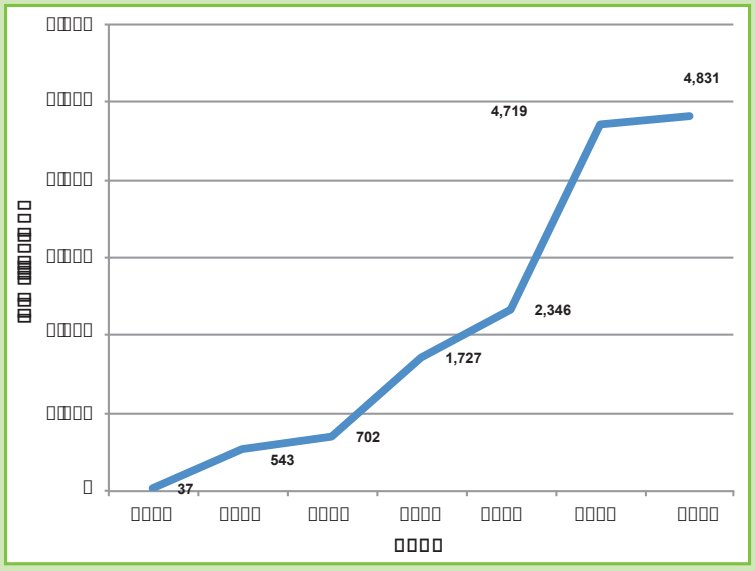


Figure 8. FDI in agriculture, forestry and fishery

coal and oil, is expected to rise in the coming 25 years. Specifically, the demand for

given that they are in the top five coal producing nations, with annual pro-duction

Despite being controversial for its significant impacts on river ecosystems, on fisheries biodiversity and on local livelihoods as well as resettlement concerns,

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]

Renewable energy and energy efficiency

[illegible]

[illegible]

Energy production in the ASEAN region has also become more efficient. The amount [illegible] energy-efficient technologies and appliances (IEA 2015).

Industrialization and materials consumption

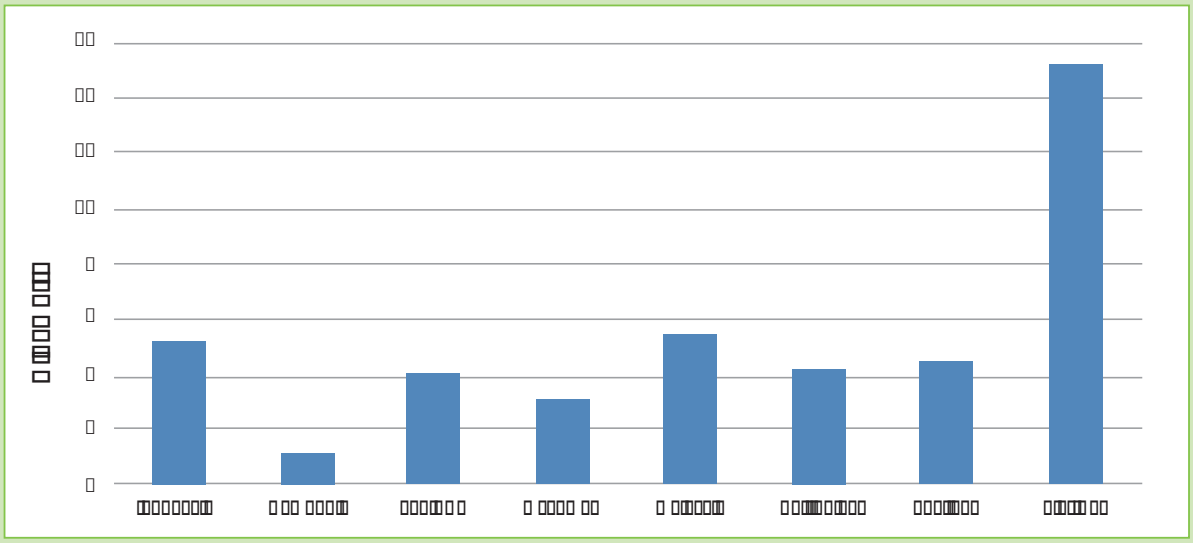
[illegible]

11. http://www.globalforestwatch.org

water, food, energy, transport and infrastructure for solid waste management. Efforts

The consumption of materials such as biomass, fossil fuel, metal ores and non-
Northeast Asia, particularly China and Japan, the expanding middle-class in ASEAN
inefficiently. It takes 3.5 kg of materials to produce one US$ of GDP in ASEAN,

9 shows while water-use intensity[1]
in the AMS, indicating improvements in efficiency of use primarily in agriculture and



level rise (1-3 mm per year) (UNISDR, 2010). Coastal flooding poses the greatest

- are sensitive to variation in temperate and rainfall. Climate change effects on plants plant species would be affected by greenhouse gas emissions (see chapter 2.2 Land). and oceans in ASEAN, as well as affecting the well-being of coastal inhabitants (see

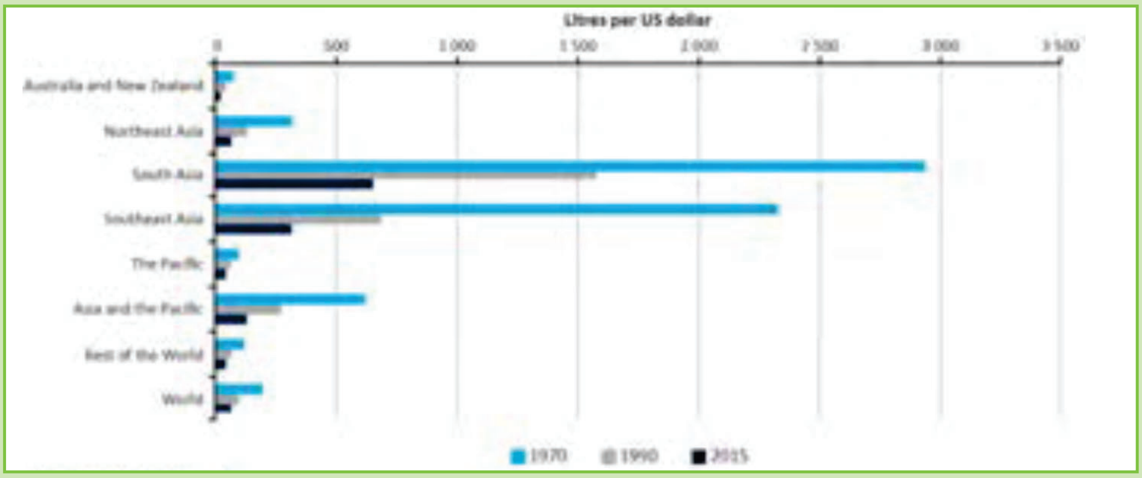
  Freshwater resources are expected to be significantly affected by climate change well as leading to increasing frequency of extreme flood and drought events in the ASEAN region. Climate change also causes alteration of river flow regimes, along with the degradation or loss of wetlands and floodplains as well as salinity intrusion

  The El Niño-Southern Oscillation (ENSO) is an important global climatic phenomenon which affects the ASEAN region and which is likely to be exacerbated by climate and atmosphere in the Equatorial Pacific Ocean, influences global temperatures and precipitation, and can therefore significantly impact human societies and ecosystems. across parts of Africa, North and South America, Australia, Asia, and the Pacific.

- changes have historically had large-scale social and economic impacts on millions of people across the affected regions, including in parts of the ASEAN region (UNESCAP,

  During 2015-2016, there was a very strong El Niño with serious effects on water El Niño event is now considered as one of the strongest since 1950, with its effects expected to last into 2017. It has affected the lives and livelihoods of millions of drought by drying up rivers, creeks and streams as well as massive flooding in many areas. As crops are damaged and livelihoods suffer, malnutrition rates go up, and there are increased disease outbreaks. More importantly, the long-term impact of the 2015-2016 El Niño is yet to be fully assessed. The World Meteorological Organization (WMO) in its El Niño/La Niña Update of 28 April estimated that there is a 50-60%

- floods (hydrological hazard type), tropical storms and heat waves (meteorological hazards), droughts and wildfires (climatological hazards), earthquakes, tsunamis, are floods, tropical storms and landslides (see Figure 10).



The frequency and intensity of hydro-, meteoro- and climato-logical disasters has

demographic change and urbanization, unsustainable natural resources and eco-

13. A disaster is included in the EM-DAT database when either ten (10) or more people are reported as killed, one hundred (100) or more people are reported as affected, a state of emergency is declared, or there is a call for international assistance

exposed to extreme multi-hazard

caused significant loss of life

human security and well-being,

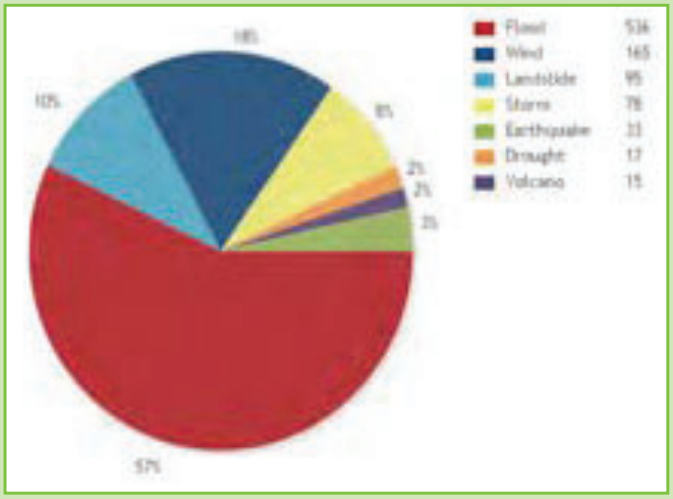
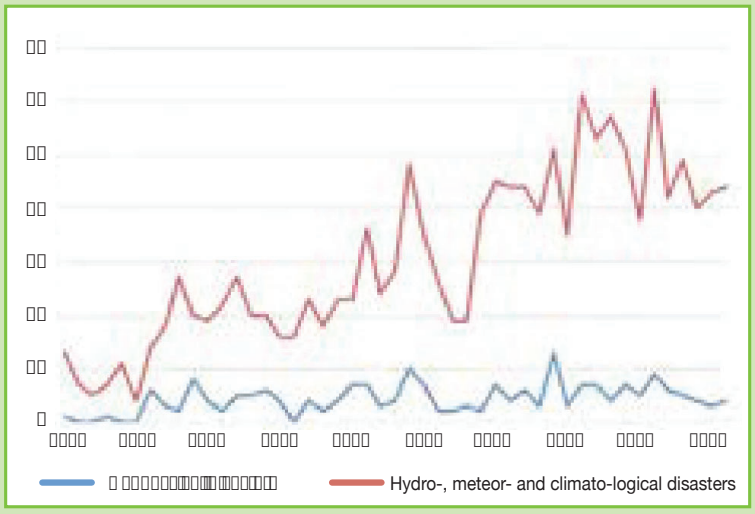


Figure 11. The number of hazard events by hazard type



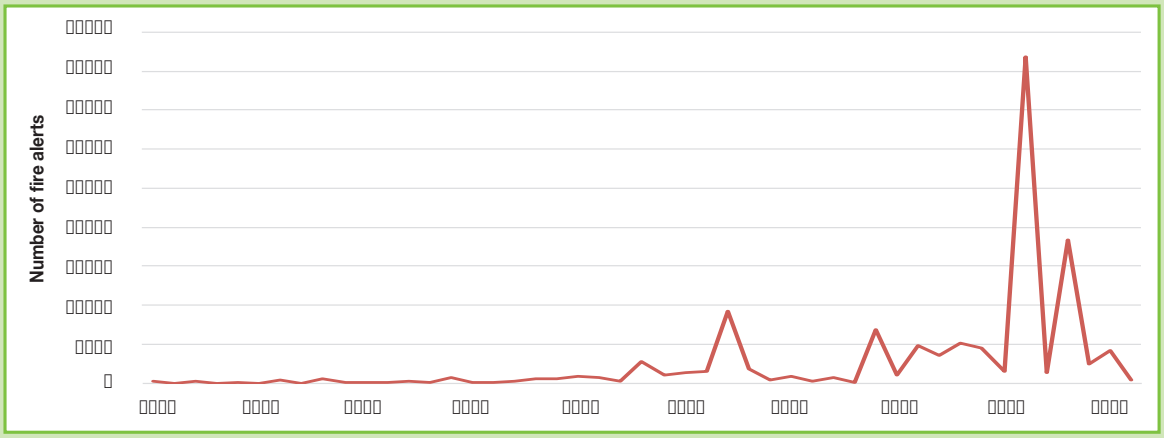
Thailand suffered over

nation-wide, flood in 2011

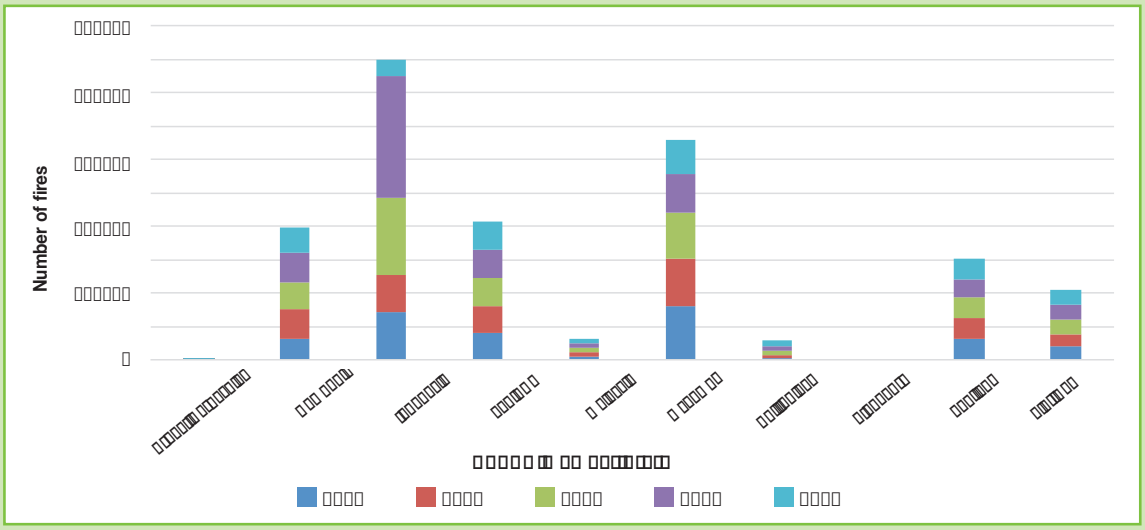
official records, meaning these figures are likely

Transboundary haze

caused largely by deliberate land and forest fires to clear land for agriculture crops and tree plantations. Indonesia is the number one fire hotspot in the ASEAN region



There have been efforts to tackle the haze pollution problem, including the full ratification of the ASEAN Agreement on Transboundary Haze Pollution (AATHP)



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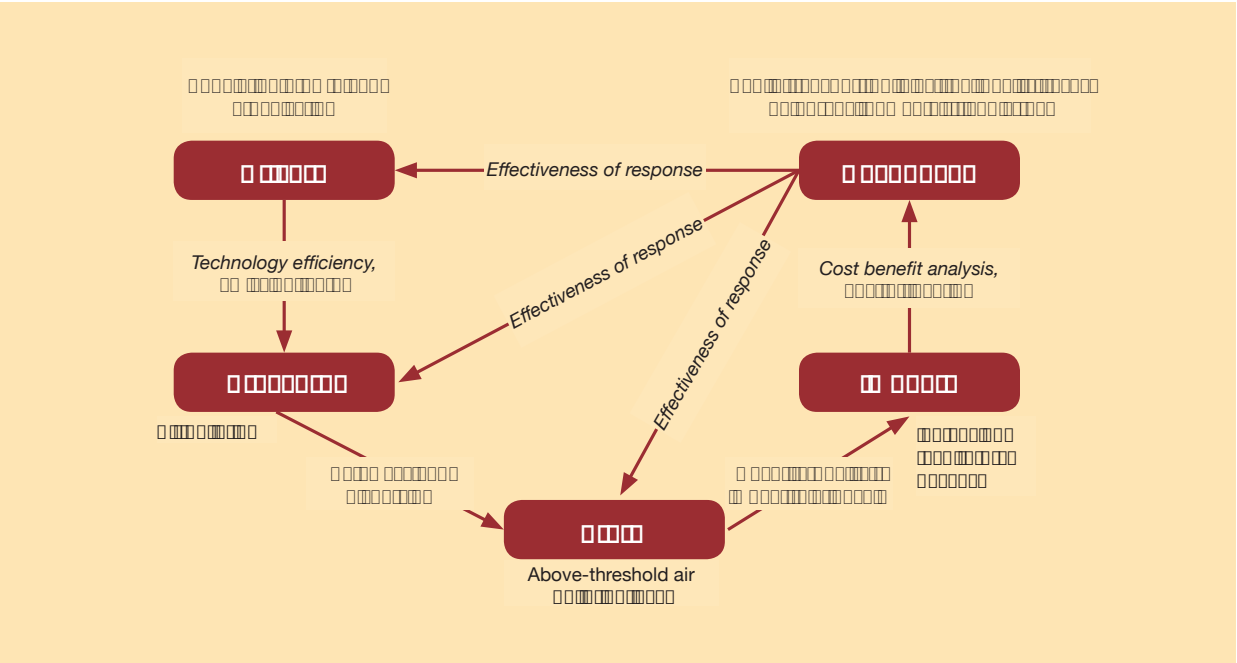


offers a causal framework for describing the interactions between society and the

and consequences of environmental problems. Compared to PSR (Pressure-State-
interlinkages among various factors affecting natural resources and environment. The
framework, which more accurately reflects the complexity of the environmental systems.

the 'Pressures' by economic activities is a function of the efficiency of the technology and related systems in use, with less 'Pressures' coming from more 'Drivers' if efficiency is improving. Similarly, the relationship between the 'Impacts' on humans or eco-
effectiveness of the Response.

Poor air quality is causing long-term and wide-

Photo Credit: "Traffic in Ho Chi Minh City (Saigon) - Viet Nam" by Esin Üstün licensed under CC BY 2.0

[illegible]

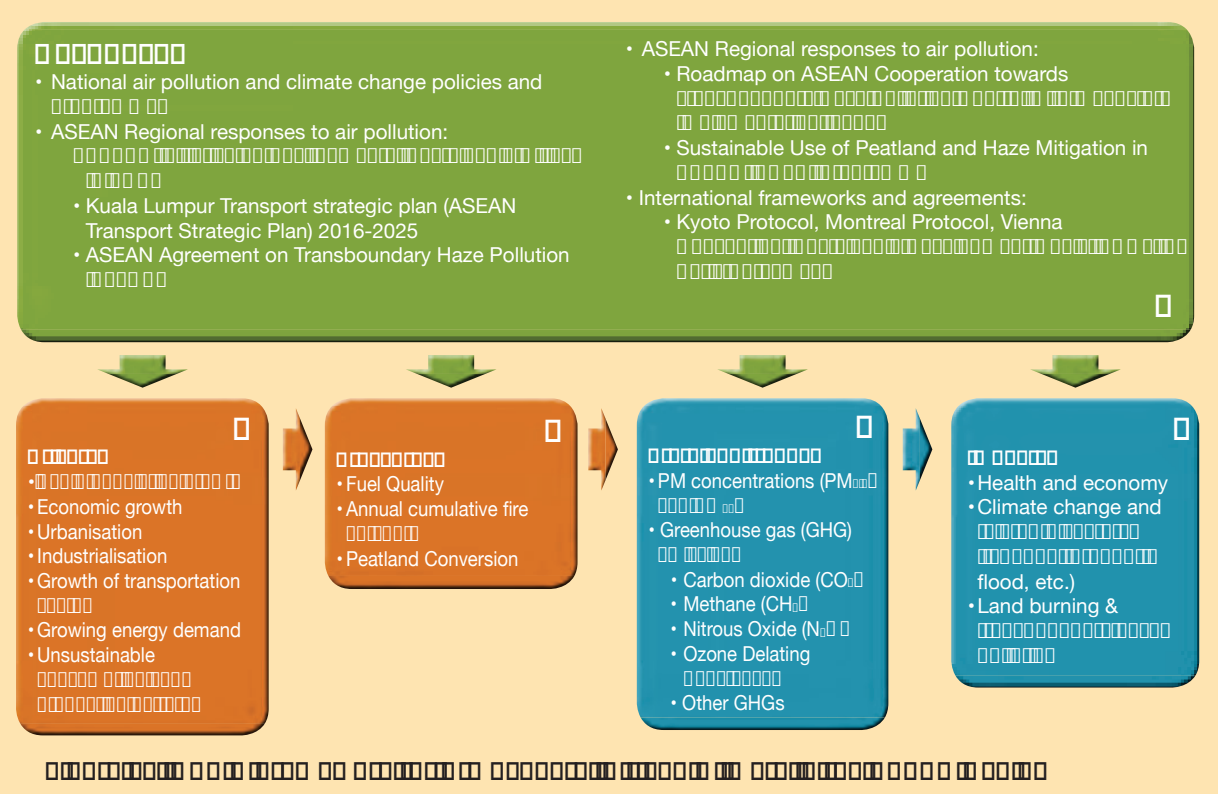
[illegible]

- Air pollution levels are increasing in the region with the energy sector being responsible for the largest carbon dioxide (CO_2) emissions; it is predicted that energy-related CO_2 emission [illegible]
- As major sources of greenhouse gases, cities across the ASEAN region need to urgently seek low-carbon economies, infrastructure and transport.
- Transboundary haze pollution resulting from land and forest fires in the ASEAN region is [illegible] transboundary smoke haze in ASEAN is linked to peat fires related to expansion of large- [illegible]
- There is a need for improved air quality monitoring and standards which are consistent [illegible]

[illegible]

Efforts to satisfy socio-economic development demands in the ASEAN region are posing [illegible] livelihoods and well-being of our global citizens. Changing trends and patterns of activity [illegible] experienced in the ASEAN region. This is being further amplified by additional pressures [illegible]

[illegible] in low- and middle-income countries are particularly affected, where 98% of cities (with population >100,000) do not meet WHO air quality guidelines (WHO 2016a). On a [illegible] urban air pollution, as records show that annual mean levels often exceed 5-10 times the WHO limits and more than two-thirds of cities in the region have seen levels rise by up [illegible]



Poor air quality is causing long-term and wide-ranging health and economic impacts hydro-meteorological hazard-based disasters.

and adaptation measures. AMS are also engaging in international efforts to reduce air

Transboundary haze pollution resulting from land and forest fires in the ASEAN region efforts to tackle the haze pollution problem, including the full ratification of the ASEAN

[illegible]

[illegible]

Industrialization, global-market driven production and international trade and exports [illegible] and carbon-intensive lifestyles and practices (IPCC 2014; UNEP 2016). As a result, [illegible] despite the region also demonstrating big improvements in efficiency levels (IPCC 2014). [illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible] to 112.9 million in the 10-year period (ibid.). Among all categories of motor vehicles, [illegible] increased nine-fold between 2004 and 2014, followed by Myanmar, seeing a five-time increase, and Lao PDR and Viet Nam, both seeing approximately a four-fold increase [illegible] more affordable. Between 2004 and 2014, domestic passenger traffic increased from 88 million to 206 million passengers a year, and international passenger traffic increased [illegible]

Road transportation generates about 89% of total transport-related emissions in the [illegible]

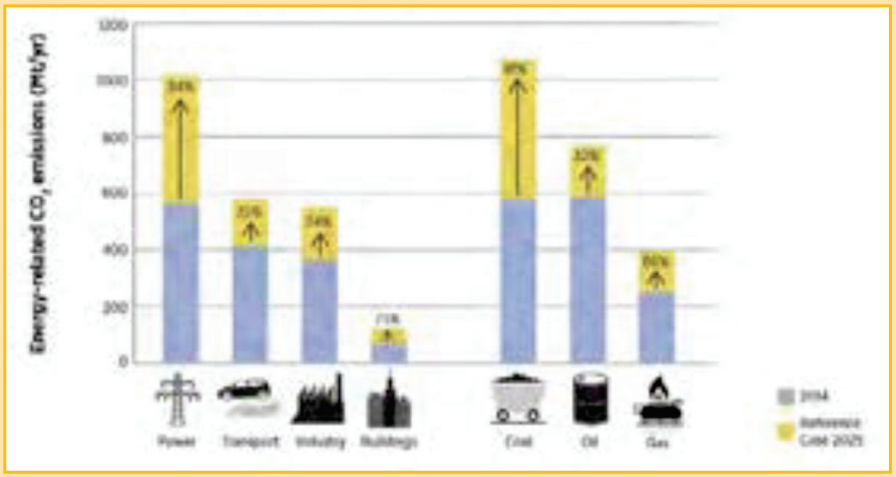
a business-as-usual scenario, with 2050 values being 3.4 times the 2005 values (ITPS

ASEAN Member States	2013		Total
	Rural	Urban	
Brunei Darussalam	N/A	N/A	<5
Indonesia	>95	50	88
Lao PDR	>95	92	>95
Malaysia	<5	<5	<5
Myanmar	>95	81	93
Philippines	71	34	54
Singapore	N/A	N/A	<5
Thailand	31	13	23
Viet Nam	61	16	47

Source: WHO, 2013

a high reliance (>95%) on solid fuels

and have a range of health-damaging properties.



predicted that energy-related CO_2

[illegible] however a significant growth in renewables and bioenergy is foreseen (IRENA and ACE [illegible]

[illegible]

[illegible]

[illegible] trends and associated developments in the region, are fuel quality and standards, fire [illegible] transboundary smoke haze in ASEAN is linked to peat fires related to expansion of large- [illegible]

Fuel quality

[illegible]

Annual cumulative fire hotspots

[illegible] could likely indicate serious fire [illegible] four-level alert system (Table 9) in [illegible]

[illegible] ASEAN Specialized Meteorological Center

Level 0	Stand down.
Level 1	Dry season.
Level 2	Exceeding 150 hotspots in 2 consecutive days with dense smoke plumes; dry weather persisting; and prevailing winds blowing towards ASEAN countries.
Level 3	Exceeding 250 hotspots in 2 consecutive days with dense smoke plumes; dry weather persisting; and prevailing winds blowing towards ASEAN countries.

Source: ASEAN Specialized Meteorological Center 2016

reduce haze pollution. Efforts include close and continuous monitoring of hotspots, and sector and local communities, to prevent and suppress land and forest fires (see section hence actual figures may be higher than recorded.

	-	-	-	-	-	-	-
	-	-	-	-	-	-	-

Source: (ASEAN Specialized Meteorological Center 2016) NOAA-18 satellite (2010-2015) and NOAA-19 for 2016

Land use conversion

problem caused by land and forest fires, mostly to clear vegetation to establish

values and benefits to AMS, many peatlands areas are being affected by increased Southeast Asia (Thailand, Myanmar, Cambodia, Lao PDR and Viet Nam), improper land- burning are increasing the number of fires and transboundary smoke haze events in the region, causing major concerns both regionally and globally due to their wide-ranging

In fact, up to 90% of transboundary smoke haze in ASEAN is linked to peat fires (NEA including extensive fires in mid-2013 and 2015 resulting in transboundary haze pollution that spread across the south of the region affecting Indonesia, Malaysia, Singapore,

Particulate Matter (PM) concentrations ($PM_{2.5}$ and PM_{10})

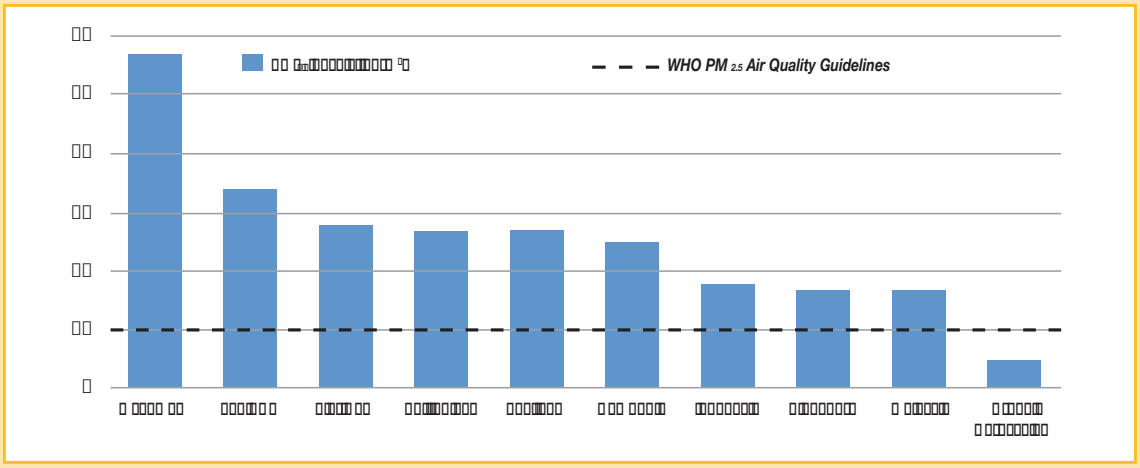


Figure 18. Annual mean concentrations of fine particulate matter ($PM_{2.5}$

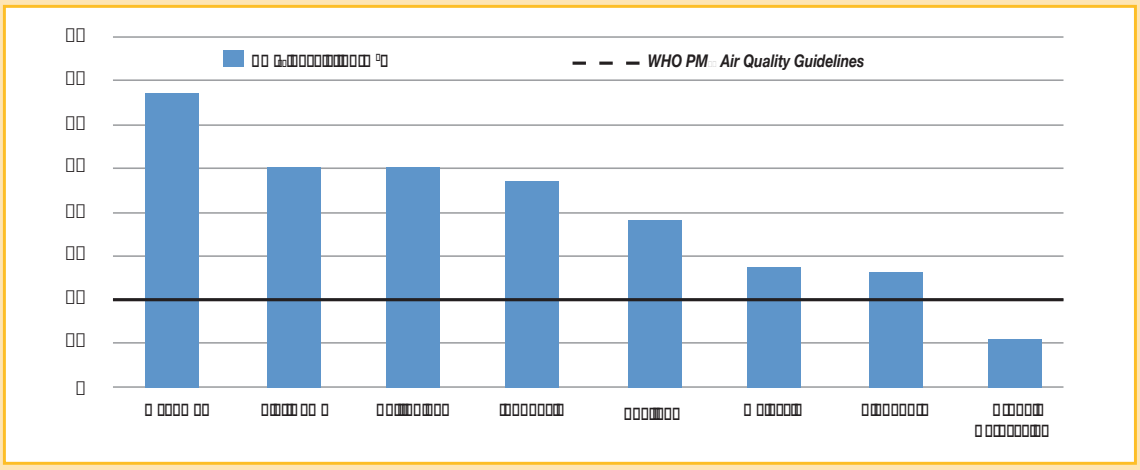


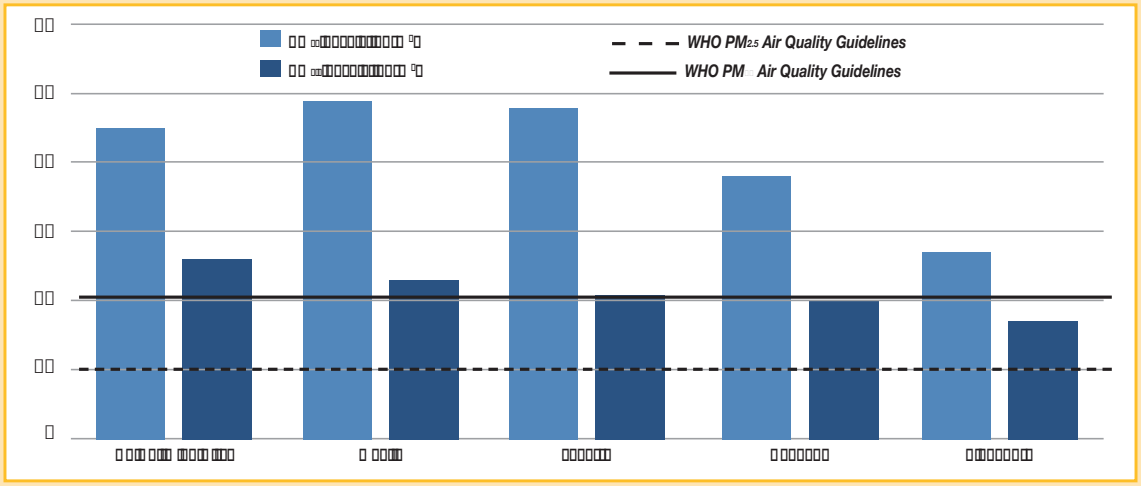
Figure 19. Annual mean concentrations of fine particulate matter ($PM_{2.5}$

and fires, or form as a result of a reaction between chemicals (e.g. SO_2

[1] to no more than 10 µg/m³

Myanmar (57 μg/m³), Viet Nam (28 μg/m³), and Thailand and the Philippines (both 27 μg/
m³ level at 5 μg/m³

guidelines of 20 μg/m³



(Thailand) are over the recommended levels by two-fold or more, and PM

Greenhouse gas (GHG) emissions

or from land-used change and domestic waste. Major GHGs include carbon dioxide (CO
O), chlorofluorocarbons (CFCs), and hydrofluorocarbons (HFCs).

including those from land-use change and forestry (LUCF) in ASEAN amounted to 3,414

[illegible]

[illegible]

[illegible]	[illegible]				
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: ASEAN Specialized Meteorological Center, 2016); Figures from NOAA-18 satellite (2010-2015) and NOAA-19 [illegible]

On a sector level, the largest areas of emission growth have been due to energy-using [illegible]

[illegible] saw the biggest proportional increase in emissions from energy-using activities of over 44% across the five-year period. This could be due to Myanmar recently opening up [illegible]

[illegible] 2013, the largest of any sectors, which may reflect the increasing industrial development [illegible]

[illegible] fire events cause major emissions (ibid.). Other AMS saw a reduction in GHG emission [illegible]

		-					-
		-					-
						-10.85	
						-139.91	
						-60.32	
						-7.02	
						-17.67	

is the most significant GHG in Earth's atmosphere, produced mainly through the

specifically of carbon.

, also known as a short-lived climate pollutant (SLCP), and

** Other greenhouse gas emission refer to hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride;TtCO*

Table 15. Ozone-Depleting Substances Consumption in ASEAN Member States between

	Ozone-Depleting Substance Consumption (ODP Tons)				

ODP Tons = Metris tons of ODS weighted by their Ozone Depletion Potential (ODP)

Source: UNEP Ozone Secretariat, 2017

recognized as a major ozone-depleting substance (ODS) and, due to its rising levels

man-made halocarbon refrigerants, solvents, and propellants, are also responsible for

[illegible]

Health and economy

The degrading air quality in ASEAN is causing long-term and wide-ranging impacts on [illegible] specifically, the mortality rate [illegible]

[illegible] attributed specifi- [illegible] in the transport sector, such as traffic patrollers, as well as car drivers, passengers and [illegible]

[illegible]

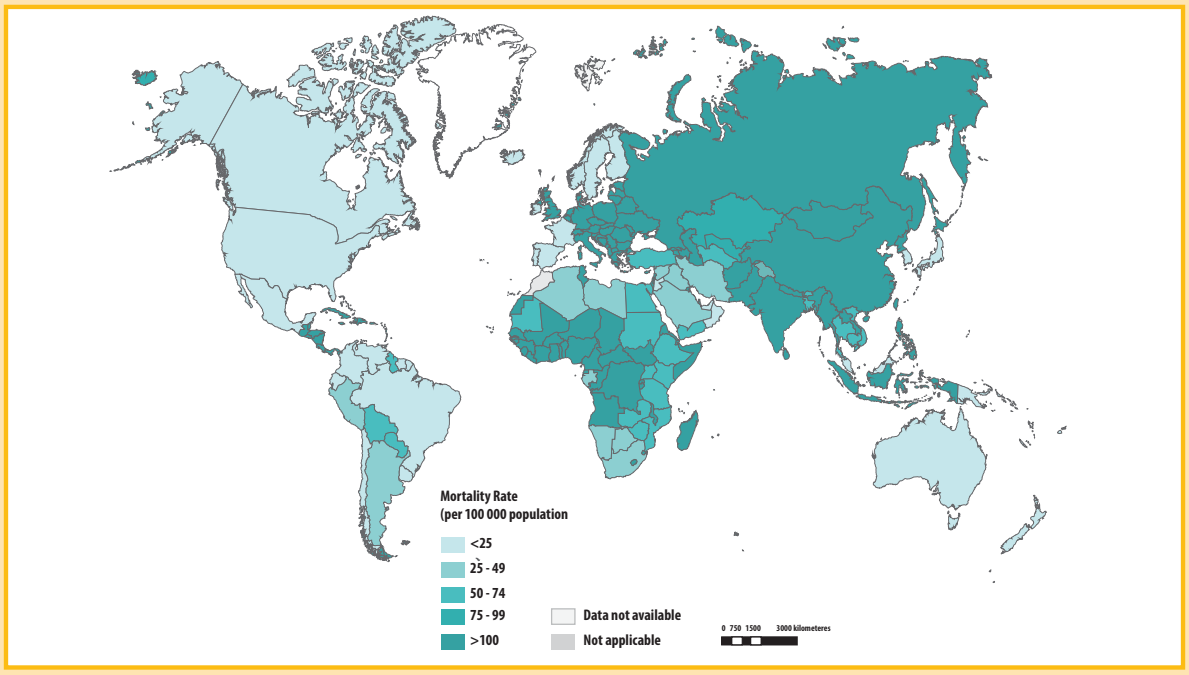
[illegible]

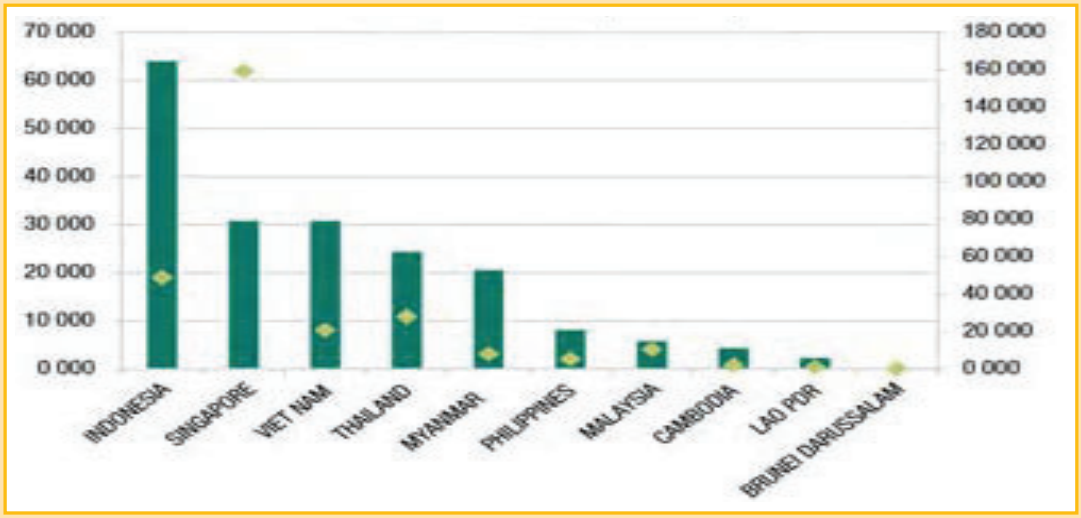
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

18. One DALY can be thought of as one lost year of "healthy" life. The sum of these DALYs across the population, or the burden [illegible]





Note: Pollution includes ambient PM10 pollution and ambient ozone pollution; costs based on the value of a statistical life using

Climate change and related disasters

and heavy rainfall events, cases of coral bleaching and ocean acidification (IPCC 2014;
pollution and its health effects (ibid.).

Average temperature trends in Southeast Asia have been increasing, rising by 0.1-0.3°C per decade over the last five decades (USAID 2010). Temperature projections show that temperatures will continue to rise, potentially reaching 2-4°C by the end of the century,

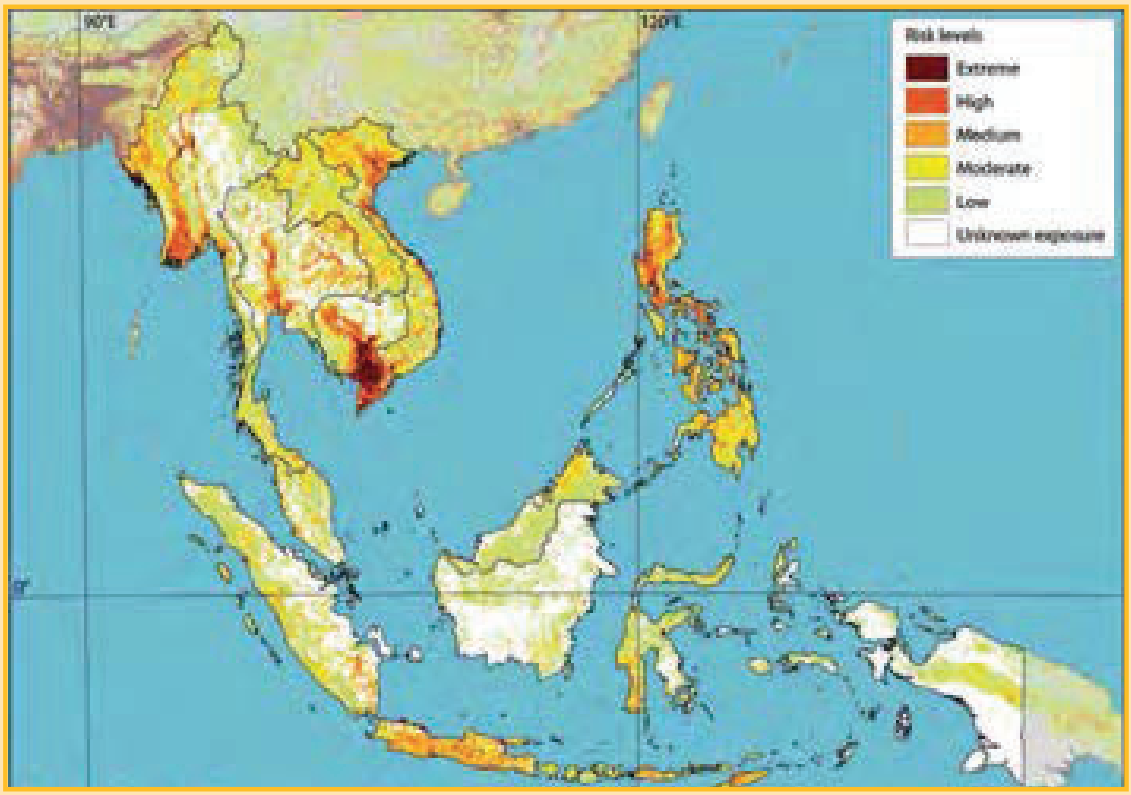


Figure 23. Mortality risk distribution of selected hydro-meteorological hazards (tropical cyclone, flood, rain-triggered landslide) in Southeast Asia

climatological and hydro-meteorological hazard-based disasters (IPCC 2012). Climate

level rise, and increasing intensity of floods, tropical cyclones and droughts (ibid.).

the Philippines (UNEP 2014). Specific multi-hazard hotspots (particularly hydro-meteo-

particularly during the harvest or post-harvest stages, has led to crop and land damage,
in the region, and higher risks of wildfires and smoke exposure as well as associated

Box 2. Impacts of land burning and transboundary haze pollution in ASEAN

Fires and smoke haze have caused the ASEAN region to suffer serious economic losses,
adversely affected. Road travel, flights and marine traffic are usually disrupted due to
suffers damages to agricultural productivity, and affects the livelihoods of millions of people

The 1997-1998 fire and haze episode in Indonesia had major economic impacts on the
286.2 million, with greatest losses occurring in the tourism sector (US$ 136.6 - 210.5 million), followed by recreation (US$ 23.2 - 71.2 million) and health sectors (US$ 3.8 - 4.5 million)
to 20 billion (Islam et al. 2016). Tourism greatly suffered in Indonesia following the event, as many popular tourism spots were affected by the fire and haze. Kalimantan suffered more than six million hectares (ha) of damage from the fires, including Kutai National Park in East

Forest fires and haze pollution has caused ecological impacts in the region, by damaging
Additionally, forest fires contribute to climate change due to emissions of GHGs and other
significantly contributes to the global warming trends, contributing to as much as 10% of

asthma, and can have immediate and delayed effects on mortality, particularly of children
figure is more than double that of the episode in 2006. Other health impacts include skin

occurred were the 2011 floods in Thailand, which caused over US$ 45 billion worth of
climatological and hydro-meteorological hazards owing to climate change in the region,

Land burning and transboundary haze pollution

Forest fires and burning biomass, and the resulting smoke haze, has had serious direct

In the effort to tackle the drivers and impacts of air quality degradation, including the

National responses to air pollution and climate change in selected AMS

Additionally, recent notable efforts to reduce exhaust emissions from the motor vehicles
vehicle emissions through the adoption of sustainable transport and innovative efforts to

vehicles through testing vehicle emissions and monitoring traffic and air quality (Ministry
Evaluation, and Rating (PROPER), a national-level public environmental reporting initiative
technology", was successful in lowering air pollution and GHG emission levels from 65

drained peatland damaged by fire in Indonesia, which was major source of air pollution

Since the enactment of the "Philippine Clean Air Act of 1999" (RA 8749), the Department
to support international efforts of addressing climate change (ibid.). Additional efforts
new vehicle emission limits for EURO 4/IV and standards (effective 1 January 2016); the use of alternative fuels, such as the use of compressed natural gas (CNG) and liquefied

Energy Development Plan (2008-2021), which sets renewable energy targets and promotes tariff schemes for renewable energy generation, the Energy Efficiency Development Plan (2011-2030), which aims to reduce Thailand's energy consumption, and the creation of the National Carbon Fund, which provides technical and financial assistance to Clean
Management Plan (2012-2016), supports strategies aimed at tackling the degradation of

Singapore is working hard to increase its fleet of cleaner and greener vehicles. To reduce

aims to encourage Category C diesel vehicles owners to switch their older and higher-
to Euro 4-compliant vehicles. An extension on the scheme was announced in March 2017 with plans to provide incentives for vehicles owners with Euro 2/3 emissions standards to turnover to Euro 6 (or equivalent) vehicles. As of the end of 2016, about 27,000 Pre-Euro/ Euro 1/2/3 vehicles have been replaced under the scheme.

Also in 2013, the Government introduced the Carbon Emissions-based Vehicle Scheme
/km of carbon emissions. There

Type of Vehicle	Current Standard	Date
Diesel Vehicle	Euro V	1 January 2014
	Euro VI	(expected: 1 September 2017)
Petrol Vehicle	Euro IV	1 April 2014
	Euro VI	(expected: 1 September 2017)
Motorcycle and Scooters	Euro III	1 October 2014

which have better fuel efficiency and emit lower carbon emissions.

specific to climate change, for example, Viet Nam's National Climate Change Strategy (2011-2020) and Action Plan for Adaptation to Climate Change in the Agriculture and Rural Development Sector (2008-2020) (Nachmany et al. 2014), and Myanmar's Climate Change Strategy and Action Plan (2016-2030) (MoNREC 2016).

ASEAN regional responses to air pollution and climate change

Collective efforts by AMS to tackle air pollution and air quality degradation are also [illegible] energy efficiency and the use of cleaner fuels. For example, under the ASEAN Project on [illegible] technical support was provided to medium-sized cities in ASEAN in the development [illegible] development (ASEAN-German Technical Cooperation 2015) (for more details on other [illegible] Transport Strategic Plan) 2016-2025, AMS have agreed to actively pursue sustainable [illegible] supporting low carbon modes of transport, energy efficiency, user friendly transport [illegible] More specifically, to reduce emissions from the transportation sector, ASEAN aims to [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible] Forest for Large Scale Forest and/or Land Fires [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	Enhancing Public Awareness and Cross-Sectoral [illegible]
[illegible]	Securing Adequate Resources from Multi- [illegible]
[illegible]	[illegible]

[illegible] **Haze Pollution Control with Means of** [illegible]

[illegible] Force (under the ASEAN Senior Officials [illegible] and mitigate fires and haze especially the [illegible] has been ratified by all 10 AMS and [illegible] significant progress in the implementation [illegible] including concrete on-the-ground activities such as multi-national cooperation to fight fires; and implementation of the ASEAN Peatland Management Strategy (2006-2020) [illegible]

Meeting of the Conference of the Parties (COP-12) in August 2016 (ASEAN Secretariat 2016c). The Roadmap serves as a strategic, action-oriented and time-bound framework for the implementation of collaborative actions actions to prevent and control forest and/or land fires (p. 2, ASEAN Secretariat 2016c).

Management of Peatland Ecosystems (APSMPE; 2014-2020). For instance, the 2016-2019), a joint ASEAN-EU initiative, is focusing on improving sustainable peatland management, managing risks of forest fires and reducing transboundary haze in ASEAN,

with Focus on Sustainable Solutions for Peatland Fires and Haze" at COP-21 in 2015 and *Sustainable City through Sufficient Ways and Climate Change Challenges*" at COP-22

In addition, ASEAN is working with key dialogue partners on several climate change- building multi-stakeholder partnerships and platforms to promote awareness, exchange to address climate resilience, for example, the USAID-funded CityLink Pilot Partnership, EU Support to Low-Carbon, Environmentally Sustainable and Climate Resilient ASEAN

ASEAN-India Project on Enhancing Climate Change Adaptation in Southeast Asia, which and the ASEAN-India Project on Climate Change Projections and Assessment of

Achieving internationally agreed environmental goals

(MEAs). All have ratified the Kyoto Protocol under the UNFCCC that commits State
Layer (a protocol to the Vienna Convention), which directs efforts on protecting the
example, all AMS have significantly reduced the use of ozone depleting CFCs to less than
deadlines to end the production and consumption of ozone-depleting substances (ibid.).

emission-reduction techniques and renewable energy generation, as well as moves towards a low-carbon society (UNEP 2016). Some of the relevant goals

Goals	Targets
3. Ensure healthy lives and promote well-being for all at all ages (air pollution)	3.9 By 2030, substantially reduce the number of deaths and illness from hazardous chemicals and air, water and soil pollution and contamination
7. Ensure access to affordable, reliable, sistainable and modern energy for all (energy efficienacy)	7.2 By 2030, increase substantially the share of renewable in the global energy mix 7.3 By 2030, double the global rat of improvement in energy efficeinacy 7.4 By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy techonolgy.
11. Make cities andhuman settelements inclusive, safem resilient and sustainable (sustainable cities)	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
12. Ensure sustainable comsumption and production pattern (fuel sibsidies)	12.c Rationalise inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumtances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into acoount the specific needs and condtions of developing countries and minimising the possible adverse impacts on their development in a manner that protects the poor and the affected communities
13. Take urgent action to combat climate change and its impact	13.2 Integrate climate change measures into national policies, strategies and planning 13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annualy by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the FGreen Climate Fund through its capitalization as soon as possible

mitigation, adaptation and finance, was an important moment for the world in recognizing
2016). As of June 2017, nine of the ten AMS have fully ratified the Agreement, with Myanmar still in the process of ratification. All AMS have submitted INDCs and a range
actions for low GHG emission development. This is a significant milestone particularly for Lao PDR, Myanmar and Cambodia, as this is their first time to develop strategies that support efforts to reduce GHG emission levels (ASFN and NTFP-EP 2016). Of the

	-	27% (+land use, land-use		
			BAU (2010-)	
			2000-2015	2015-2030
Sectors are identified for mitigation but without specific emition targets				
	-		BAU (2000-)	
			BAU (2005-)	
			BAU (2010-)	

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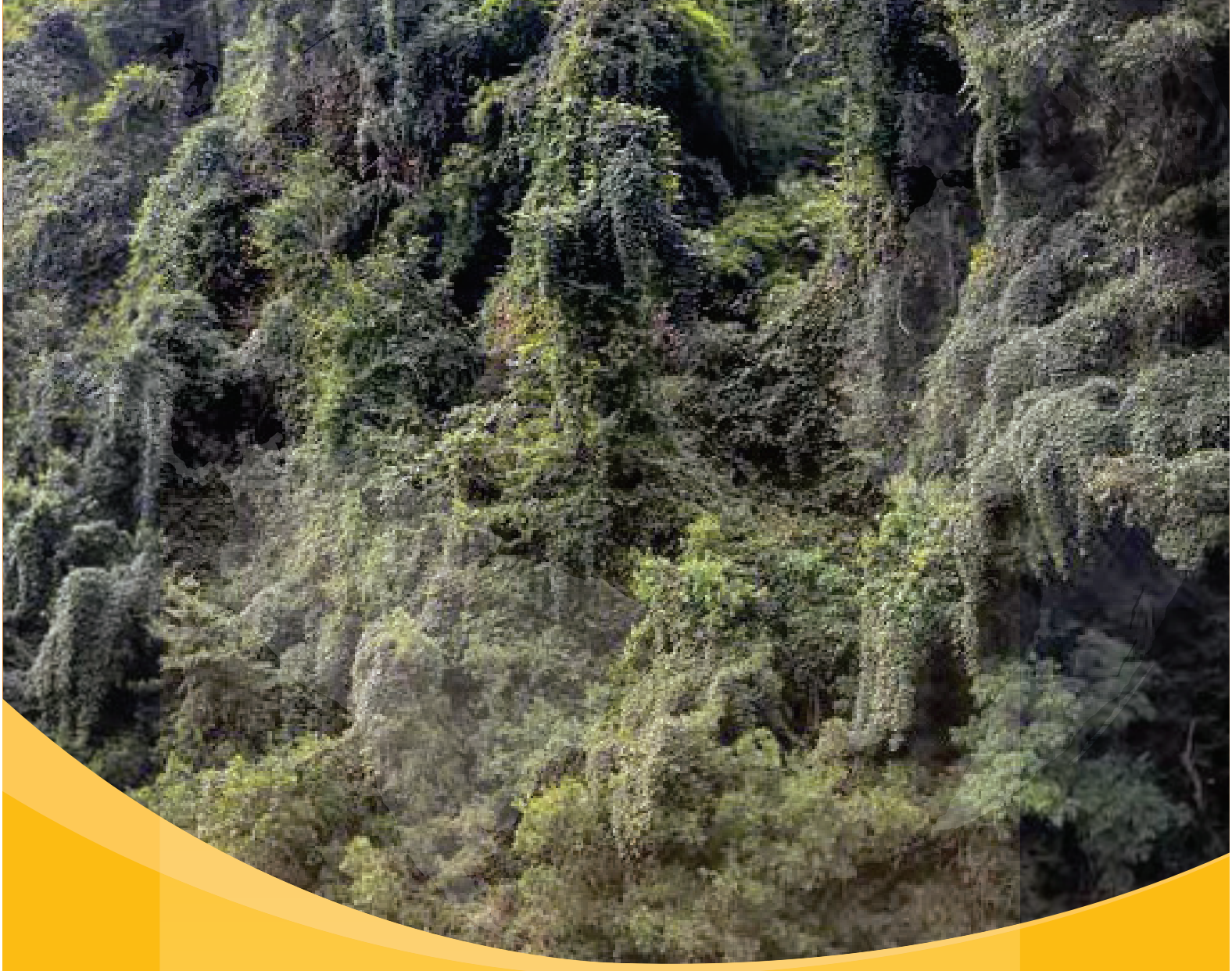


understand factors affecting the land's status by exploring how global and regional consumption trends for food, fiber

Photo Credit: "Jungle" Lao PDR by Collin Key licensed under Creative Commons BY-NC-SA 2.0

[illegible]

[illegible]

- Between 1990 and 2012, most ASEAN Member States (AMS) experienced a decline in [illegible]
- Peat and mangrove forests are the most vulnerable forest types and are disappearing at a faster rate than other forest types. This is of significant concern for climate change mitigation [illegible]
- Growing demand for forest and agriculture products like rubber and palm oil has led to poor [illegible]
- There is an increase in soil degradation caused by deforestation and agricultural expansion. [illegible]

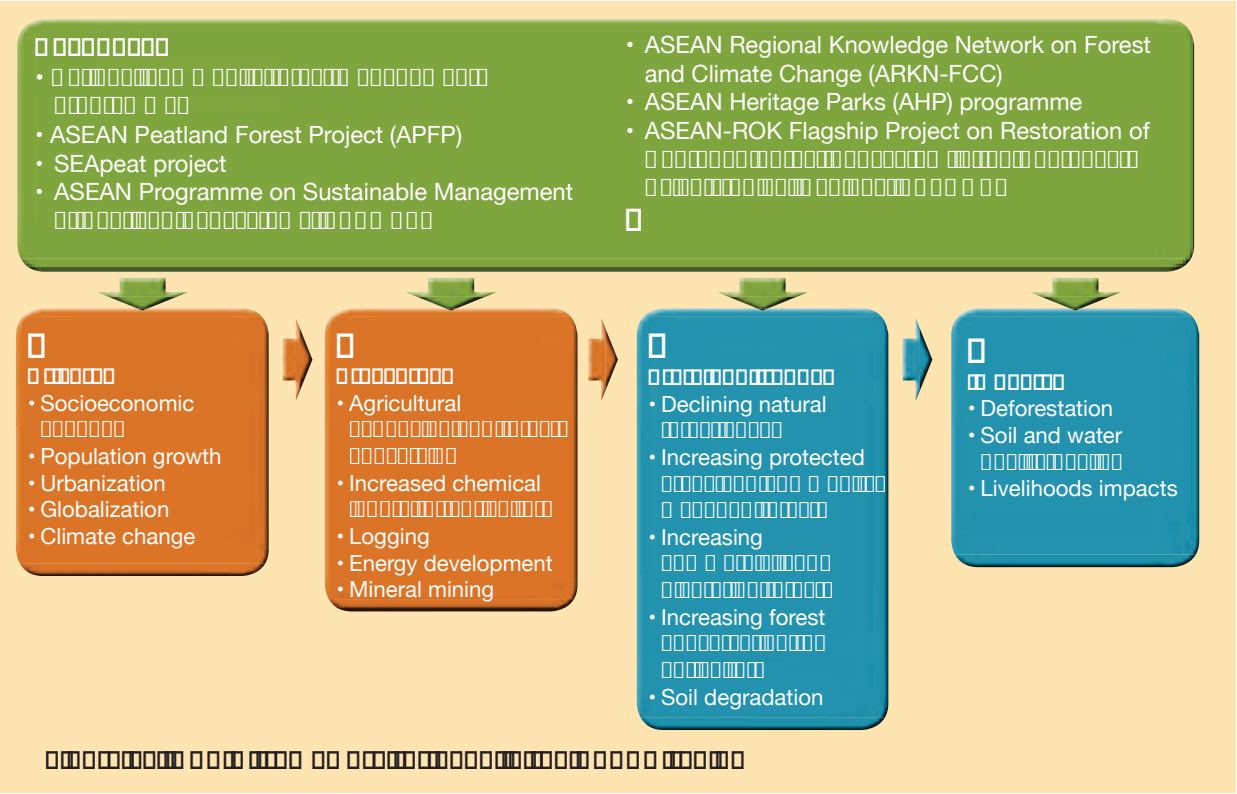
[illegible]

[illegible] pressures in the ASEAN region which significantly affect the quality and availability [illegible]

Pressures upon land resources within the ASEAN region cause land-use changes primarily [illegible] efforts have reversed forest clearing trends in some areas, it is unable to reverse the [illegible]

[illegible]

[illegible]

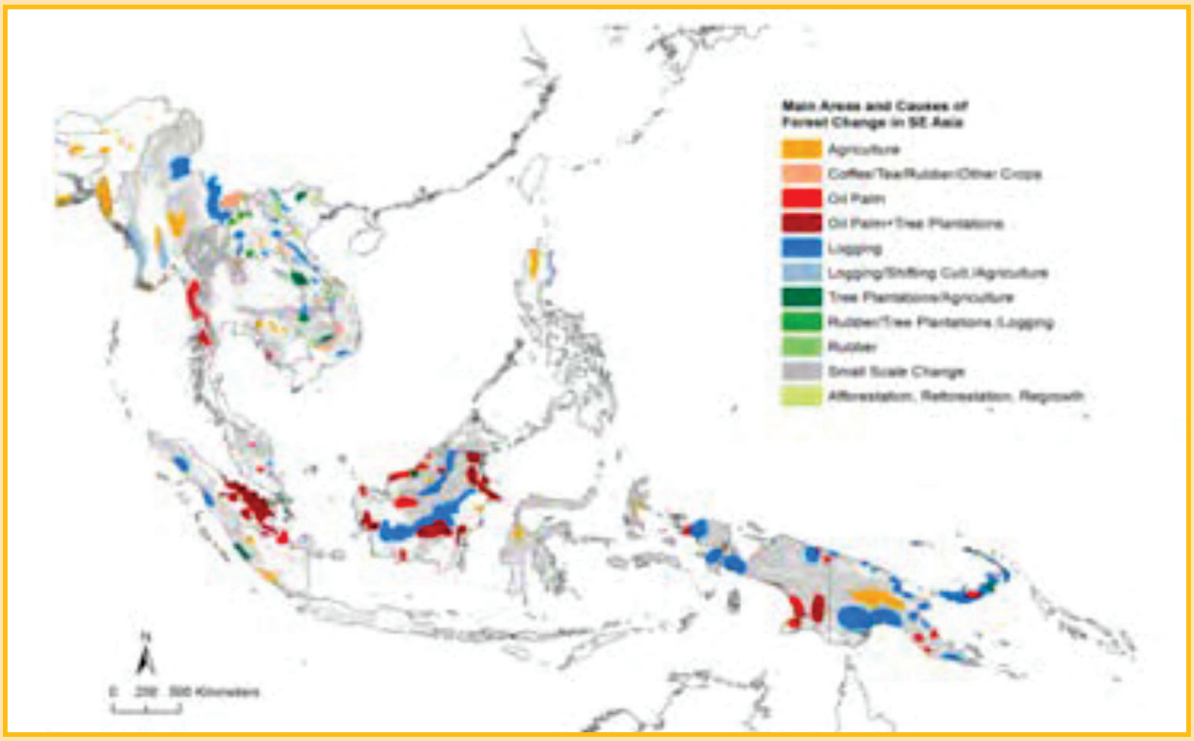


issues through better forest management, conservation finance schemes such as technical and financial assistance and through local programs such as community

Land Use

The most significant drivers of land-use changes are demographic and socio-economic globalization that increase the consumption of food, fuel and fibre products (Figure 25). Additionally, socio-economic changes such as an increased middle-income population

fuel and fiber. Within the ASEAN region, protein and fat supply have risen steadily since 1993 (FAO 2014). From 2010-2014, the growth rate of sheep and chickens were the



in rainfall patterns and rainfall intensity, the onset of drought, floods and storms and cover due to variation in temperature, rainfall, floods, droughts, forest fires and storms (ASFN 2014). Additionally, the productivity of some species of plants may be affected by may also potentially affect soils as it impacts the inputs of carbon to soil from vegetation which is sensitive to the effects of climate change (Karmakar et al. 2016).

The growing demand caused by the increasing consumption of more food, fuel, fiber and

Agricultural expansion

The changing socio-economic circumstances in ASEAN are leading to a greater

The region has a long-standing history of forest to agricultural conversion. Since the
Now, across the ASEAN region agroforestry is undertaken at different scales mainly for

Table 19. Use of fertilizers and pesticides in selected ASEAN Member States in metric tons

			-			

practices. For example, plantations such as rubber and oil palm depend on large-scale

in rice fields in AMS shows that a huge area of total rice cultivated area, respectively,

Energy development

and goods from production to refinery sites. These include large networks of roads, railways and transmission lines. The East-West Economic Corridor supported by the
while developing energy infrastructure, tourism and tele-communications within AMS

between Lao PDR, Thailand and Malaysia (LTM Project) and the Trans-ASEAN Gas

favored for charcoal production (Miettinen et al. 2014). However, rural electrification,

Mineral mining

Forests

access to land and its related resources (UN-Habitat 2014). Without secure land tenure, commercial pressures for land conversion (UN-Habitat 2014).

Within the ASEAN region, tenure security in rural areas is affected by a decreasing availability of agricultural land (UN-Habitat 2015). As agricultural land becomes more scare, and land insecure people such as smallholder farmers, lose their share of land to large-scale commercial farmlands. In Lao PDR for example, land conflicts have arisen over lost access sectors across the region (UN-Habitat 2015).

Moist evergreen tropical rainforest is the predominant forest type in the insular/maritime

							-0.5
							-1.5
							-1.3
							-0.6
							-0.5
							-0.2
							-0.2
							-0.2

[illegible]

[illegible]

[illegible]

[illegible] Between 2008-2014, Brunei [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible] that are designated by national authorities as scientific nature reserves or wildlife [illegible] Marine areas, unclasified areas, littoral (intertidal) areas, and sites protected under local [illegible] Brunei Darussalam figure in 2008.

[illegible]

[illegible] forest in the ASEAN region has increased significantly from 38% in 1990 to 49% in 2010 [illegible] forest area. Production forests are further differentiated into limited production forest [illegible]

[illegible]

22. FAO defines a terrestrial protected area as a "totally or partially protected area of at least 1000 ha that is designated as scientific reserves." These areas have limited public access and are tightly managed (The ASEAN Secretariat 2016b).

carbon, making them the most important carbon sink in the region (APFP-SEAPeat 2014).

burning (APFP-SEAPeat 2012). ASEAN records estimate that 13 million ha of peat have

natural buffers for coastal areas and reduce the risk of floods and tsunamis. They also serve as major sources of fish protein for local communities (Hughes (2017). Mangroves also act

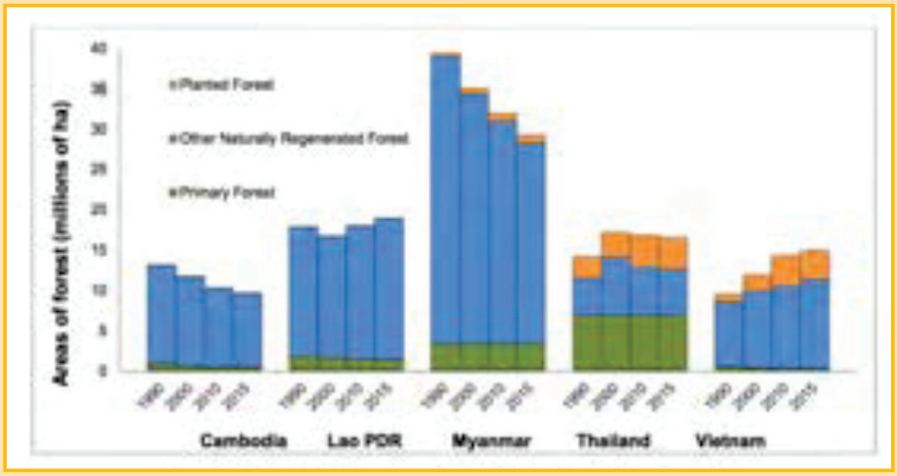
Despite their importance, mangrove forests are cleared at rates three to five times higher

aquaculture, and sea-salt production (Hughes 2017).

Figure 27 shows the changes in forest types under FAO's classifications of "Planted Forest", "Other Naturally Regenerated Forest" and "Primary Forest" in Cambodia, Lao

23. FAO defines production forest as "forest area designated primarily for production of wood, fiber, bio-energy and/or non-wood forest products."(FAO 2012).

highest in Thailand and Viet Nam and accounted for 85% of all planted forests in the five



Agricultural land

oil palm, sugarcane, tea, coffee, cashew nuts and cacao (Stibig and Stolle 2007). The
Table 23 shows that between 2000-2012, an estimated 30-80% of the deforestation in
agriculture. The majority of this conversion was illegal, constituting an estimated 43-90%

	40 - 80 %		
		43.4 - 86.7 %	55-75%; 82% (Estimate)
		43.4 - 86.7 %	
	40-80%	43.4 - 86.7 %	

area is used for oil palm (Stibig and Achard 2014). Between 2011 and 2013, private firms

commercialization of coffee and tea has caused forest land conversion in Lao PDR, Viet

Soils

The chemical inputs used in processes and to increase agricultural production affect
rapidly leaches nutrients from the soil and soil can become nutrient deficient (FAO 2015).
Globally, the over-use of nitrogen chemicals accelerates decomposition of soil organic matter and soil acidification which leads to soil degradation (FAO 2015).

A 1991 assessment of soils in Asia found that human induced soil degradation affected
degradation of different soil types in Asia found that water erosion was the greatest contributor to soil degradation affecting 58% of the total land area, followed by chemical
at 10%. For example, in the Philippines, water erosion affected 38% of the total area. In 2010, the Philippines classified 24% of its total land area as degraded
extreme, affecting 15% of the land area in Thailand and 10% in Viet Nam (FAO 2015).

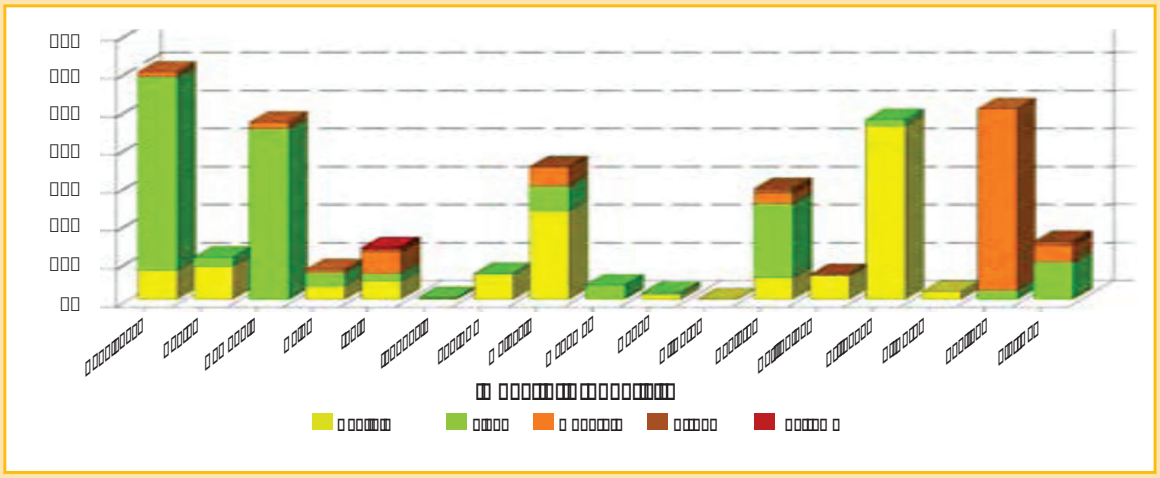
identified as a widespread concern in Asia (Syers 1997). In 1997, 53% of Thailand's total land area was affected by soil fertility loss, of which 50% was classified as having a strong impact on productivity (Limtong 2012). In Cambodia, 42% of soils suffered fertility
suffered fertility loss and 4% had strong impact on productivity (Van Lynden and Oldman 1997) (Figure 28). A more recent figure from Thailand in 2012 found 31 million ha or 60% of land was classified as having low levels of organic matter with declining fertility (Limtong 2012). Deforestation, agricultural activities and over-grazing were identified as

which indicates the amount of organic matter in soils (Clemens et al. 2010; Griffin 2016).
poses a serious issue as around 30% of cultivated land is affected (Government of

ASEAN region are affected by salt because of the use of brackish water in irrigation and

27. There is no data available for the period 2011-2016.

in Asia are impacted by soil compaction mainly due to loss of, or insufficient, top soil



affect soil and water quality. In artisanal and small-scale mining (ASGM) for instance,

impacts (IEA 2015). Coal mining for example causes massive landscape-scale changes

consequence of hydropower development is the loss of forests due to the flooding of

at a rate of approximately 1,000-2,000 ha per annum (Thomas 2015). Similarly, the

forest habitat of different species and land degradation. The scale of impact of plantation

pulpwood and palm oil plantations in Borneo between the periods 1973-2015 were sourced from species-rich old growth forests (Gaveau et al. 2016). A major consequence

kg of nitrogen fertilizers/ ha in the first five years, leads to extreme soil and water pollution

to emissions from the ASEAN region. In 2015, fires from the burning of peat released

slopes leads to soil erosion, which in turn causes greater surface water run-off and a de-

More commercialized and large-scale forms of agriculture are changing the livelihoods of

a decline in the number of people employed in the agriculture, fishery and forestry

affects women as 45% of economically active women in the ASEAN region are working

National responses to land issues in selected AMS

Efforts to improve the livelihoods of forest dependent communities have focused on
Community forestry is the management of public forests involving local, forest-dependent
manage forest use through enhanced decision-making (ASFN 2014).

is designated as communal land/forest and 23.7% (3.7 million ha of forest land) of land

A number of afforestation schemes are also taking place throughout the ASEAN region. reforestation efforts and to policies that incentivize community forestry (ASFN 2014).

Regional responses to land issues in selected AMS

AMS have made efforts to improve land management practices, particularly for Facility through the International Fund for Agricultural Development (IFAD) from 2010- was conducted between 2010-2014 and was funded by the European Union through the

Sustainable Management of Peatland Ecosystems (APSMPE). APSMPE is a scaled-up (APMS 2006-2020), namely to promote sustainable management of peatlands through

1. **All peatland areas identified and inventorised;**
2. **Zero-burning uniformly practiced preventing any uncontrolled wildfires on peatlands, and eliminate any widespread smoke haze;**
3. **Fire prone sites rehabilitated by focusing on root causes of fire;**
5. **Peatlands conserved to contribute to significanly reduced emissions of greenhouse gases and**

were identified between 2010 and 2014. In Cambodia, while there were no known peatlands in 2010, -firmed, including 94 ha of floating peatland in Ban Dong, Naxaythong, Vientiane Province. In Myanmar, significant peatland sites were identified, which include unique peat forests on Kauk Ye Island in the

Achieving internationally agreed environmental goals

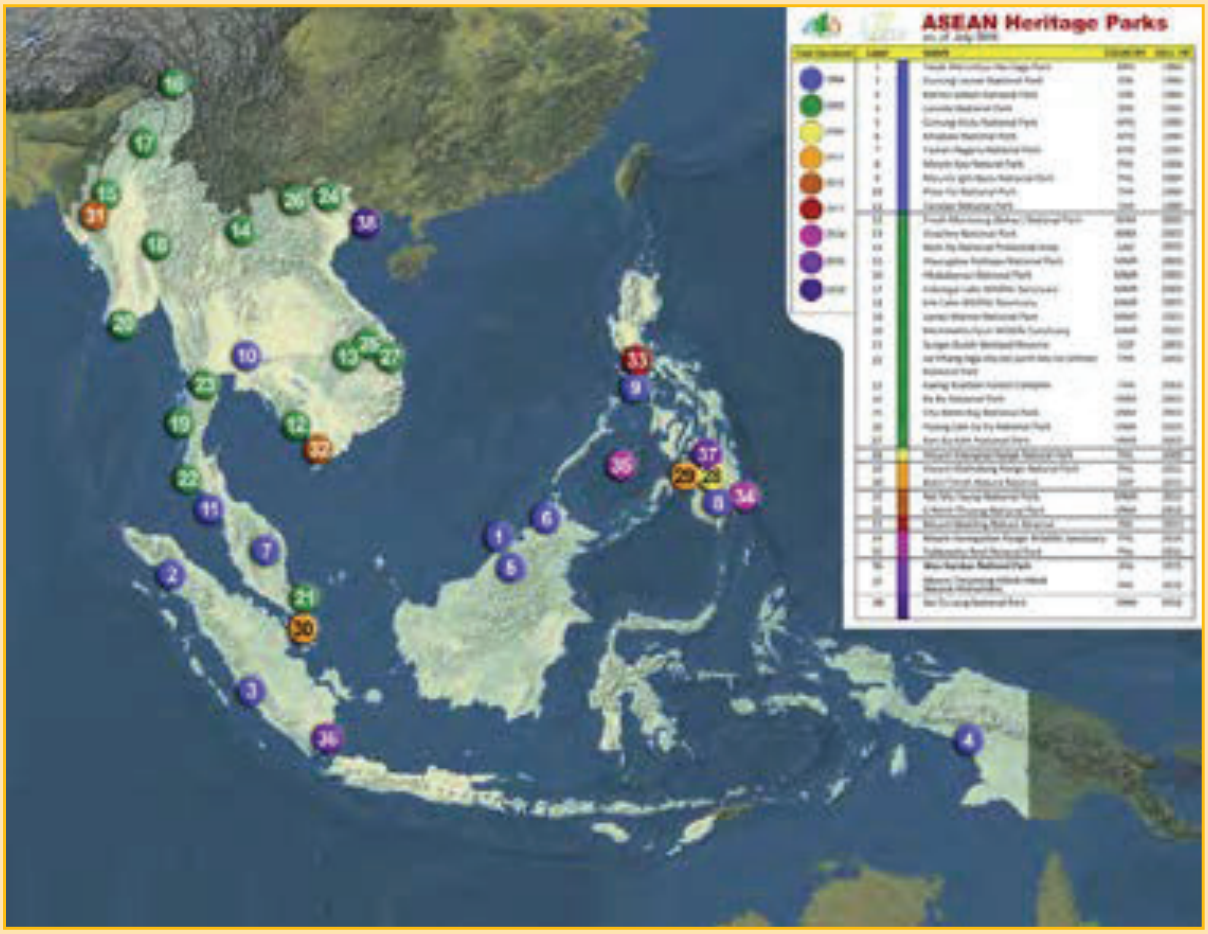
The ASEAN Regional Knowledge Network on Forests and Climate Change (ARKN-FCC) was established in 2008 to undertake joint initiatives on REDD+. The ARKN-FCC's role Emissions in Asia's Forests program, (USAID-LEAF), ARKN-FCC helps to convene deforestation and to understand regional policy issues (USAID-LEAF 2013). Nationally, its forest cover at 60%. Viet Nam is involved with UN-REDD and the Forest Carbon such as UN-REDD and other bilateral and multilateral programs (RECOFTC 2011).

Further, as part of efforts to expand protected areas, ASEAN created the ASEAN Heritage ASEAN Heritage Parks Conference that brings together the heads and staff of protected areas (PAs) and AHP management authorities; officials and representatives of international and local non-government organizations, and other protected area practitioners to share

In 2000, ASEAN also established the ASEAN-Republic of Korea (ASEAN-ROK) Flagship which supports AMS in generating scientific knowledge, sharing information and researchers in related fields (The ASEAN Secretariat 2017).

ASEAN, through inter-ASEAN, multilateral and bilateral programme on forests and [illegible] exemplified by the ASEAN-ROK cooperation programme.

[illegible]



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[illegible]

[illegible] mega-diverse countries. The region's biodiversity and [illegible]

Photo Credit: "Asian Golden Cat" by Karen Stout licensed under Creative Commons BY-SA 2.0

[illegible]

[illegible]

- The ASEAN region is a major contributor to global biodiversity, containing four of the world's 34 biodiversity hotspots and three mega-diverse nations.
- Biota and ecosystems of all types are under threat in the region from various pressures including deforestation and other land-use changes, habitat degradation and alteration, invasive alien species, genetic erosion, and over-exploitation of certain wildlife species. The economic growth-driven development of the ASEAN Member States (AMS) is fueling most [illegible]
- Biodiversity loss and ecosystem degradation have substantial impacts on people's livelihoods, food security, and well-being in the region.
- The importance of ecosystem and biodiversity conservation is increasingly recognized [illegible]

[illegible]

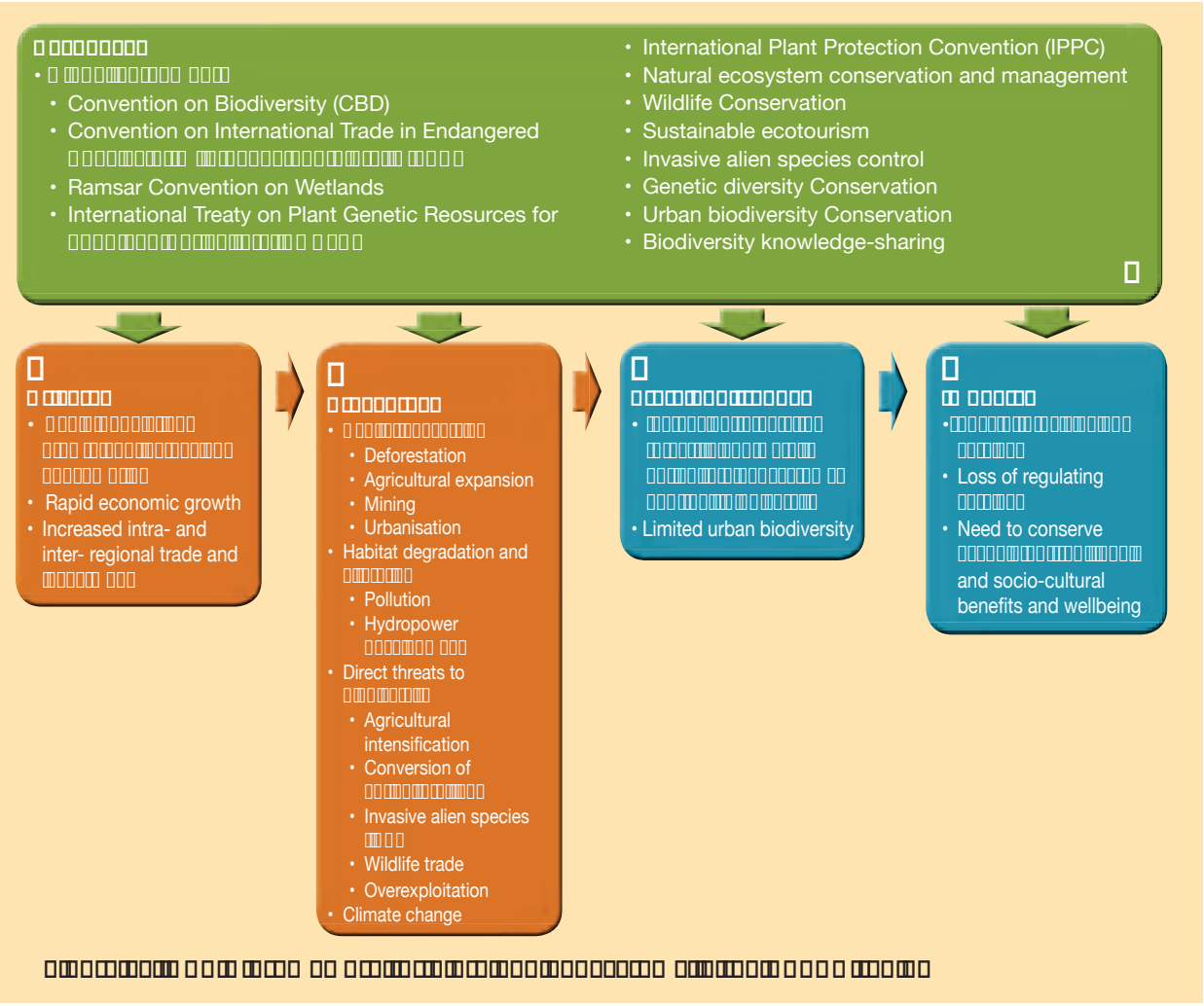
[illegible] 17 mega-diverse nations, which have exceptionally high levels of species endemism. [illegible] environmental well-being of the ASEAN people, contributing to the continued growth [illegible]

[illegible] (coastal and marine ecosystems are covered in Chapter 2-5 of this report).

[illegible]

Growth in population and consumption

[illegible] resources such as timber and wildlife products are affecting ecosystems and biodiversity in adverse ways. The strain on the region's natural resources and ecosystems is affecting [illegible]



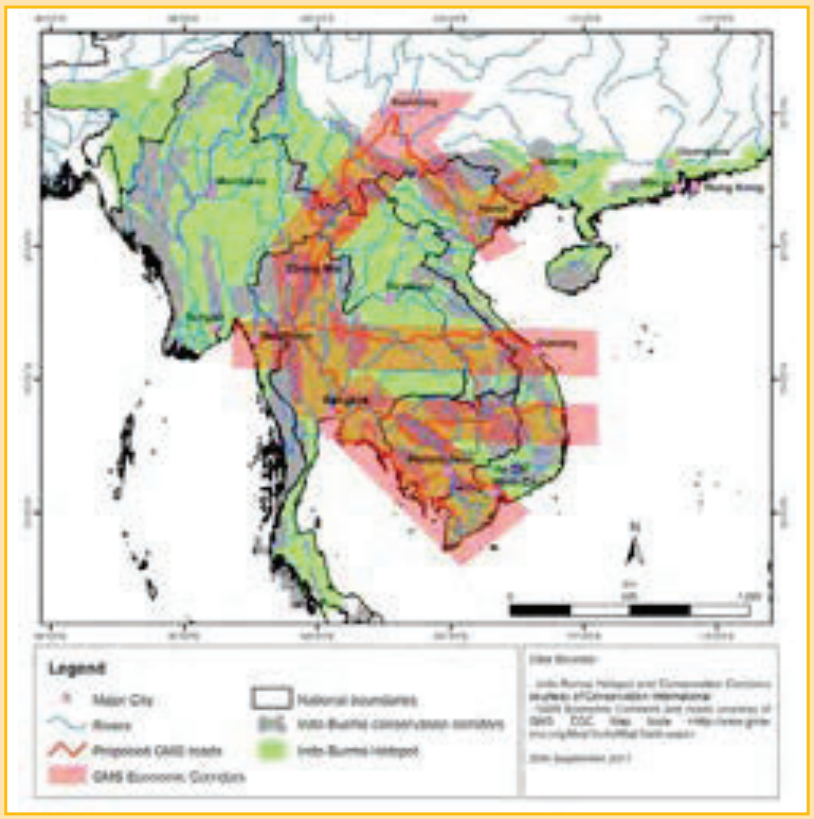
Rural-urban migration and urbanization are vastly expanding urban populations and such as Bangkok, Jakarta and Manila. Industrial development is also a significant

proportion of wildlife trafficked in the region (ASEAN Centre for Biodiversity 2010).

The economic growth-driven development of the AMS is fuelling much of the increase in

the AMS. Agro-industrial plantations of commercial crops such as palm oil, rubber and coffee have rapidly expanded in response to dramatic increases in global commodity agro-industrial products (CEPF 2011).

pits and small-scale artisanal mining (Samdhana Institute 2016a; Samdhana Institute



of millions of tourists every year, a proportion of whom do nature-based tourism, such

Increased intra- and inter-regional trade and investment

Increased cross-border trade investment within ASEAN and between ASEAN and other

flood control and irrigation, has driven hydropower dam development in the Mekong
is also economic incentive for hydropower development. Lao PDR earns significant

described above have induced large-scale land use changes, altered habitats, and introduced direct threats to biota, such as the over-exploitation of certain species. A summary of the numbers of species threatened by different pressures is shown in Table

	Annual and parennial non-timber crops; wood and	
	terrestrial plants; logging and wood harvesting; fishing	
Natural system modifica	Fire and fire suppression; dams and water manage-ment/use; other ecosystem modifications	
	Invasive non-native/alien species/desease; problematic native species/desease	
	military effluents; agricultural and forestry effluents; garbage and solid waste; air-borne pullutants	
	temperatures; storms and flooding	

Habitat conversion

other commercial crop plantations in the region, such as coffee (Viet Nam), cashew and

The mining of limestone karst for cement production is an often-overlooked pressure on biodiversity in the region. Viet Nam and Malaysia are among the world's top five exporters

Urbanization has also led to significant conversion of natural habitat. At the beginning

Habitat degradation and alteration

water ecosystems is caused by agricultural fertilizer and pesticide runoff, domestic from nutrient loading is of particular concern. The over-application of fertilizers from agriculture intensification is the main source of nutrient pollution in aquatic systems. of like algae and other aquatic flora, which depletes the oxygen needed to support most and mercury in small-scale artisanal mining have severely polluted inland waters and

disrupt their natural flooding cycles and sedimentation processes, and change water temperature and quality. Physically, dams block the passage of migratory fish. Dams comprise up to 87% of all fish species that traverse across the basin, and between the hundreds of fish species from accessing their spawning grounds and seasonal habitats construction and operation also indirectly affects connected upstream and downstream levels in the Mekong Delta led to saltwater intrusion into the delta's low-lying areas, that affected 400,000 hectares of farmlands and caused serious environmental and livelihood

Direct threats to biodiversity

As agriculture is still the main land use, agro-ecosystems are an important source of biodiversity in the ASEAN region. However, agricultural intensification is placing great [illegible] the selection of high-yielding crop and livestock varieties, and more intensive use of [illegible]

[illegible] and micro-organisms. Invasive alien species can outcompete native species for food, [illegible]

[illegible]

[illegible]

[illegible] land along the Mekong River into shrub lands unsuitable for cultivation, and affected fish [illegible]

[illegible] (Water Hyacinth), a fast-growing floating plant whose population can double in twelve days. It often crowds certain rivers and lakes, cutting off sunlight and oxygen from the water column, which affects the survival of other aquatic species.

[illegible] feeds on rice seedlings and has destroyed rice fields across the region.

[illegible]

[illegible] ornamentation has led to their over-exploitation (Hughes 2017). The ASEAN region is a [illegible] plants, rare orchids and high-value timber to birds, reptiles and mammals (ASEAN [illegible]

Overfishing is also a growing concern, as the harvesting of freshwater fish in the region [illegible] especially in AMS with important inland fisheries such as Cambodia, Indonesia, Myanmar [illegible]

Climate change

[illegible]

Climate change is exacerbating the negative effects of other anthropogenic pressures
temperature and precipitation will affect many species by changing feeding, breeding
due to floods and water shortages, changes in agricultural land use, and increased

Biodiversity

species (25%) compared to the tropical regions of Meso-America, South America, and sub-Saharan Africa (Sodhi et al. 2010). Indonesia, Malaysia, and the Philippines are three of the world's 17 mega-diverse nations, containing exceptionally high levels

the politically defined "ASEAN Member States") when defining their study area, following biogeographical conventions. Although technically incorrect, the authors of this report have taken the liberty of using the term "the ASEAN region" in place of "Southeast Asia" when referring to the results of these studies, as this report focuses on the AMS. The AMS comprise 10 of the 11 nations of Southeast Asia, excluding Timor-Leste.

- Parafimbrios lao, a rainbow-headed snake, and the 111th snake species documented in
- (Wooly-Headed Bat), a medium-sized bat with thick fur on its head
- , a rare banana species from northern Thailand with fluorescent red flowers and tiny flower structures that are distinct from the rest of the banana family
- (Orange-Eyed Litter Frog), a small frog that lives in the hilly forests of
- (Purple Mouse-Eared Flower), a small purple flower from Mt.

- the Camiguin hawk owl (*Apomys zambalensis* *Platymantis hazelae*
- one new land fish species and four new insect species in the karsts of Indonesia
- the Myanmar Snub-nosed monkey (
- the Yellow Meranti (
- three new species of reptiles in the Cardamom Mountains of Cambodia
-

levels of endemism that are also threatened): Indo-Burma, the Philippines, Sundaland, and Wallacea (Myers et al. 2000). Compared to the tropical regions of Meso-America, South America, and sub-Saharan Africa, the ASEAN region has the highest proportion of

As of 2016, three plant species and five animal species are known to have gone extinct is a grave concern, and in many cases inevitable, due to large-scale deforestation over species might become extinct before they are identified, as many large taxa are still not

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] fish	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

- The [illegible]
- [illegible]
- [illegible]
- ***Plectostoma sciaphilum*** [illegible] limestone karst at Bukit Panching in peninsular Malaysia in the mid-2000s. This species [illegible]
- The **Siamese flat-barbelled catfish** [illegible] fish in the Chao Phraya and Bang Pakong rivers of Thailand in the 1920s, but has not [illegible]
- ***Macrobrachium leptodactylus*** [illegible] urbanization and agricultural intensification.

[illegible]

Ecosystems

[illegible]

[illegible] that remain. Evergreen and semi-evergreen sub-tropical forests still cover the northern

[illegible] species has only been identified through subfossils, indicating it did not go extinct as recently as the other species on the list. These two species were not included in the five extinct animal species in this report.

highlands of Myanmar, Lao PDR and Viet Nam, while evergreen and semi-evergreen rainforests occur on the Thai-Myanmar and Viet Nam-Lao PDR-Cambodia borders,
ASEAN comprises evergreen and semi-evergreen tropical rainforest (Samdhana Institute
chapter 2.2 Land). Deforestation has led to significant habitat loss and declines in species
secondary forests, especially in mega-diverse nations such as Indonesia, threatens many forest-dependent species such as the orang-utan (Koh 2007). One-fifth of all amphibians in the region are threatened primarily by deforestation (Rowley et al. 2010). Large-ranging species are affected by forest fragmentation from activities such as road construction for logging (Hughes 2017). Habitat loss and disruption of ecosystem stability by land-use

The biodiversity of freshwater ecosystems in the ASEAN region is notable. The Indo-Burma hotspot contains over 2,515 freshwater species, over 1,780 of which are freshwater fish species (IUCN 2012; Allen et al. 2012). With a documented 877 fish species, the Mekong River is only second to the Amazon River in level of biodiversity world-wide (Ziv et al.
key stop-over points for migratory birds of the East Asian-Australasian Flyway (Wetlands

Freshwater ecosystems are the most threatened ecosystems in the world. Losses in fish

River and its tributaries, almost one-third of fish species, including up to 103 migrating fish species, and 40% of mollusc species will be threatened over the next decade (Ziv et al. 2012; Allen et al. 2012). Karsts, which are endemism hotspots, are frequently flooded

Many freshwater fish species in the region are threatened by overfishing. Some species critically endangered migratory megafish such as the endemic Mekong Giant Catfish , the world's largest freshwater fish), the Giant Barb ( ), and the Dog-eating Catfish ( )

Agroecosystems

when fully flooded expands to over 13,000 square kilometres (Welcomme et al. 2015). The seasonally flooded plains surrounding the Tonlé Sap are home to swamp forests, dipterocarp

The lake is one of the world's most productive fisheries. Communities living by the lake and its waterways rely on fishing for subsistence and as their source of livelihood. The average per capita consumption of fish can reach 71 kilogrammes per year (compared to a global average of 16 kilogrammes). Increased fishing activity has substantially reduced the stocks of high-value fish species. For example, catches of river catfish were reported fishery affects migrating fish in particular; up to 80% of the 1.6 million fish that migrate from

Communities surrounding the Tonlé Sap floodplain cultivate rice as a major economic activity. The sediments from the Mekong River contribute to the floodplain's fertile soils. Deepwater rice is traditionally cultivated in inundated zones, but the expansion of dry-season rice species such as the Bengal florican (could impact the production of both rice and fish, the two staples of Cambodia (National

seasonally flooded swamp forest and grasslands rich in endemic and diverse species.

economic activities. All private fishing lots were abolished in 2012 to encourage community-based fishery management, and several fish conservation areas have been established. development, and small-scale industrial development (National Biodiversity Steering

The ASEAN region has significant genetic diversity for rice (*Oryza spp* *officinarum* over 10,000 varieties (DENR-BMB 2014; Ministry of Natural Resources and Environment 2015). The ASEAN region has almost 560 livestock breeds, including one-fifth of

the world's buffalo breeds and 14% of the world's duck breeds (ASEAN Centre for

erosion, mainly due to farmer preference for new high-yielding varieties, is causing the
2015). Natural disasters and land-use change also affects native varieties and their wild
infrastructure development has affected rice varieties such as *Oryza ridleyi, O. granulata, O. officinalis, O. nivara* *O. rufipogon*
Forestry 2014). Severe flooding in 2011 in Thailand damaged plantations of many native

There is a similar decline in livestock genetic diversity in the region. The import of high-yielding non-native livestock breeds has displaced traditional breeds in Indonesia,

such as disease and pest resistance, drought tolerance, and flood tolerance; in Thailand,

to have high levels of bacterial diversity. Soil biota in agroecosystems are affected by

Urban ecosystems

It is increasingly recognized that biodiversity can co-exist with urban spaces. Cities can even have high species diversity; Singapore is a key example of a highly-urbanised city-

Singapore is a city-state with a land area of about 719 km2 located within the Sundaland
of birds, 324 species of butterflies, 109 species of reptiles, 85 species of freshwater fish, 65
better planning and co-ordination in the sustainable use, management and conservation

One example of habitat conservation is the transformation of Bishan-Ang Mo Kio Park
gene flow.

NParks has identified 68 species of flora and fauna for recovery efforts, and works alongside
butterfly (Taxilahaquinushaquinus). NParks also engages the community through citizen
science programmes such as the Garden Bird Watch and Butterfly Watch, and enhances

To monitor the progress of these conservation efforts, Singapore applies the Singapore Index on Cities' Biodiversity (SI), a self-assessment tool consisting of 23 indicators designed to help cities to track progress in their biodiversity conservation efforts. The SI measures efforts in three components: Native Biodiversity in the City; Ecosystem Services provided by

and nature reserves, residential areas and city centres, and peri-urban agricultural land, although to differing degrees (Secretariat of the Convention on Biological Diversity
all butterfly species in the city were documented in forest reserves and urban parks (Koh

2012). Among all similarly sized urban regions in the world, the mega-urban regions of

[illegible]

to the economies, livelihoods, food security, and well-being of the ASEAN region's people and communities. These benefits, and the negative outcomes from the loss of

Provision of services

production in the region. Globally, pollination services contribute US$ 235 - 577 billion
are important producers and exporters of pollination-dependent crops such as mango, guava, mangosteen, durian, coconut, and coffee (FAO 2017).The decline in pollinators
In Indonesia, the loss of mangroves has affected bat species and reduced yields of

income is derived from non-timber forest products (Government of Viet Nam 2014).

home to the largest inland fishery in the world. In 2000, 56 million people in the Lower Mekong Basin consumed over 2 million tons of inland fish (Hortle 2009). Communities in the Lower Mekong Basin are particularly dependent on fisheries for protein and food security, consuming an annual average of 29–39 kg of fish and other aquatic animals per person; this comprises 47 - 80% of their total protein intake (Hortle 2007). Hydropower development in the basin is estimated to reduce fish biomass by 0.7–1.6 million tonnes per year, which is worth US$ 2.4–3.0 billion at first-sale value (Barlow et al. 2008). Dams the livelihoods of low-income communities in the basin.

Regulating services

water, erosion, disease, and disasters, which in turn affect human well-being.

response to severe floods, soil erosion and landslides caused by deforestation that claimed many lives, displaced communities, and damaged property (DENR-BMB 2014).

flood damage than new, high-yielding varieties (Talberth and Reytar 2014).

In cities, green spaces are important for reducing urban heat island effects. A study in
built-up land (Estoque et al. 2017). Urban green spaces contribute to the physical,
region's largest cities have much less than the WHO-recommended minimum of nine

Traditional and socio-cultural benefits and wellbeing

consultation with indigenous peoples. 760 plants have been identified as used by the
the utilization of biological and genetic resources (DENR-BMB 2014). In Thailand, over

, a guide for the effective and safe use of herbal medicines in primary health care,

in the region, and are taking actions at different levels, nationally, regionally as well as globally in accordance with various domestic legislations and priority activities, ASEAN-

section describes efforts in a variety of areas.

National responses

AMS are undertaking national-level actions such as increasing protected areas, afforestation, and supporting community-based forest management. Malaysia, plans (Ministry of Natural Resources and Environment 2014; DENR-BMB 2014; Ministry

All ten AMS have developed national wildlife laws and/or policies (Fifth National Reports recently created recovery plans for specific species such as the National Tiger Action Plan (2010-2020) and the National Action Plan for Conservation of Gibbons (2011-2020)

to threats posted by invasive alien species (DENR-BMB 2014). Malaysia adopted the

the Plan of Action on Sub-national Governments, Cities and Other Local Authorities.

biodiversity strategies and action plans. Conservation efforts are also being carried out in some highly-urbanized cities in Metro Manila, Philippines (DENR-BMB 2014). Lao

development plans (Ministry of Environment and Forestry 2014; DENR-BMB 2014;

Regional responses

sharing of benefits arising from the use of such biodiversity in the ASEAN region. The

- Programme development and policy coordination
- Human and institutional capacity development
- Biodiversity information management
- Communication and public affairs
- Organizational management and resource mobilization.

ASEAN flagship programme promoting a regional network of national protected areas

regional knowledge exchange, pilot projects, and regional studies. As a follow-up to the
project that supports sub-national level activities to enhance biodiversity conservation

The Greater Mekong Sub-Region Biodiversity Corridors Initiative (BCI) and the Heart

The ASEAN Wildlife Enforcement Network (ASEAN-WEN) is the region's main mechanism

The ASEAN Clearing-House Mechanism (ASEAN CHM) is ACB's contribution to science-

on the 50th anniversary of ASEAN in 2017 for significant contribution to biodiversity conservation and advocacy efforts in AMS and the ASEAN region.

Achieving internationally agreed environmental goals

Plan for Biodiversity 2011-2020, which include the Aichi Biodiversity Targets. The plan

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity
- Reduce the direct pressures on biodiversity and promote sustainable use
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic
- Enhance the benefits to all from biodiversity and ecosystem services
- Enhance implementation through participatory planning, knowledge management and

plans, and progress towards achieving the Aichi Biodiversity Targets (CBD 2017). Efforts

of terrestrial ecosystems, sustainably manage forests, combat desertification and halt

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DOI:10.1641/0006-3568(2005)055[1041:OOIW]2.0.CO;2.

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Effects of landscape composition

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[redacted]

[redacted] increase by about one-thirds in 2025 and double during [redacted] as water-related disasters and weak governance.

Photo Credit: Siem Reap, Cambodia by SEI Asia. All rights reserved.

[illegible]

[illegible]

- Water demand is expected to increase by about one-third by 2025 and double during the [illegible]
- Most ASEAN Member States (AMS) have made significant progress in improving access to [illegible]
- Low wastewater treatment levels for a growing population, as well as the dumping of [illegible]
- The main threat to water availability and water quality in most AMS is poor management, [illegible] encroachment of the built environment into flood-prone areas and serious degradation of [illegible]
- Climate change adds a level of uncertainty to water availability and leads to increasing frequency and intensity of extreme flood and drought events in the region. It also causes alteration of river flow regimes, loss of wetlands and floodplains, and salinity intrusion in [illegible]

[illegible]

[illegible] two decades. Water demand is, however, expected to increase by about one-third in [illegible]

[illegible] increasing significantly in several AMS, particularly Cambodia, Lao PDR, and Viet Nam. [illegible] of sanitation facilities, sewerage and wastewater treatment results in significant quantities [illegible] particularly extreme flood and drought events, increases vulnerability of freshwater [illegible] affect salinity intrusion in many cities in delta area (see Chapter 5 for more discussion). Weak governance exacerbates these freshwater-related issues, which are summarized [illegible]

To secure water for different needs, freshwater resources in the region need to be [illegible]

38. Internal renewable fresh water resources are computed based on long-term average annual flow of rivers and recharge of [illegible]

and sanitation; managing water resources efficiently and effectively; moving towards
capacities; and moving towards adequate and affordable water services.

				flood					

water quality and quality monitoring systems to increase efficiency in water resources

freshwater resources for equitable access and to provide sufficient water of acceptable

greater than 10 million) are located in Asia-Pacific region (UN-Habitat and UNESCAP

Singapore, cultivation areas have decreased (ASEAN 2015). The intensification and

The development of large-storage hydropower projects will increase flows during the dry season, decrease flows in the wet season and reduce the amplitude of flood peaks

Industrial Joint Venture (AIJV) and the Brand-to-Brand Complementation (BBC) Schemes that will offer more in terms of tariff and non-tariff incentives (ASEAN 2017a). The ASEAN

environmental disasters such as floods, droughts and typhoons. Thailand suffered severe flooding in 2011, the Philippines and Viet Nam suffered from Typhoon Haiyan in 2013 and a severe drought occurred across the Mekong region during 2014-2016 (MOF
Thailand and Viet Nam. Such a rise in sea level would exacerbate flood risk, salinity
change is expected to increase the frequency and severity of droughts and floods as well

[illegible]

and land-use change.

in rainfall patterns and distribution, evaporation, snow melt, river and groundwater flows
large hydropower projects to support energy production are already causing significant alteration of river flow patterns (Piman 2013).

and industrialization as well as agriculture expansion and intensification increase. The

- Untreated sewage from domestic and industrial processes such as poor sanitation
- Agriculture waste that contains pesticides and chemical fertilizers flowing into rivers, lake and reservoirs; Leaching from waste landfills and dumping wastes (i.e. plastic
- Withdrawal of water faster than aquifers are replenished, resulting in seawater seepage

This increase in water pollution is being caused by domestic and non-domestic activities (MOE 2014). The number of rivers in Thailand classified as deteriorated increased from

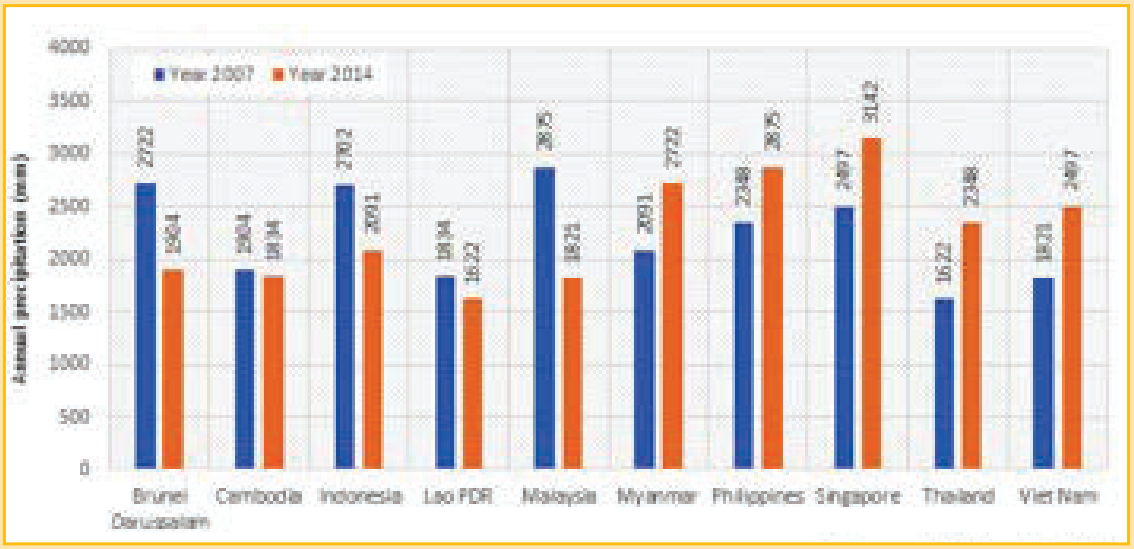
into areas used for agriculture, urbanization and industrial purposes has caused significant

alterations of the catchment water and sediment balance and may influence surface
surface runoff faster than forest areas. Many floodplain areas, particularly in the delta
influence the duration and extent of the inundations and the dynamics of the Cambodia and Viet Nam floodplains in the Mekong delta. They fragment the floodplains and impede the natural flow of water, sediments, nutrients and aquatic life (MRC 2011a).

Water availability

across different parts of the region due to
34). The climate is influenced by maritime

as runoff to rivers and recharge to aquifers (internal flow).



[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Water demands and withdrawals

[illegible] 2014 for the three main water-consuming sectors (agriculture, domestic and industry) [illegible]

Access to safe drinking water and improved sanitation

[illegible]

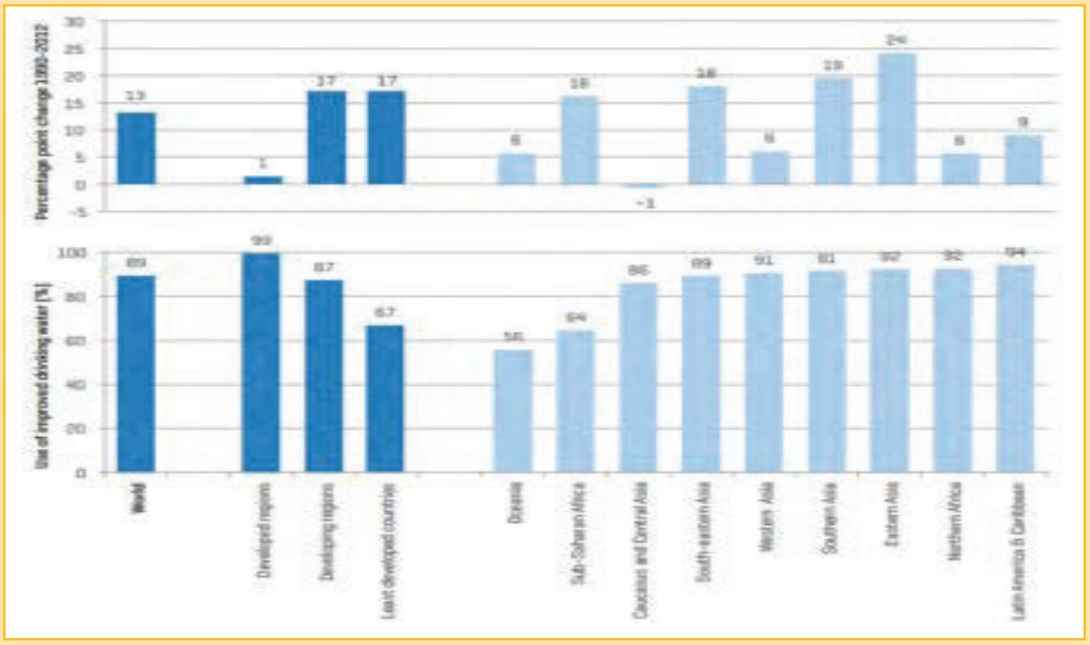
still lack access to improved sanitation facilities. Viet Nam has made significant progress

(in percent)

Access to Safe Drinking Water								
	-							
	-	-	-	-				-
								-
						-	-	-
				-				-
			-					
		-		-				-
Access to Improved Sanitation								
								-
	-	-	-	-				-
								-
				-				-
		-		-				-

Source: AMSs' data submission for ASEAN Stastitical Yerabook and or CPMS Report;
Cambodia - Socio Economic Surey Cambodia, and Cambodia Demographic and Health Survey;
Malaysia - Water Works Department and Rural Environment Sanitation Program (RESP) and Population and Housing Census.
Philippines - National Demographic and Health Survey;
Singapore - Public Utilities Board and administrative records;
Thailand - Population and Housing Cencus;
Viet Nam - Living Standard Survey;
MICS and Multi-purpose Household Survey;
ADB Key Indicators 2006-2014;
UNSD - Demographic and social database, UNESCAP Yearbook 2009

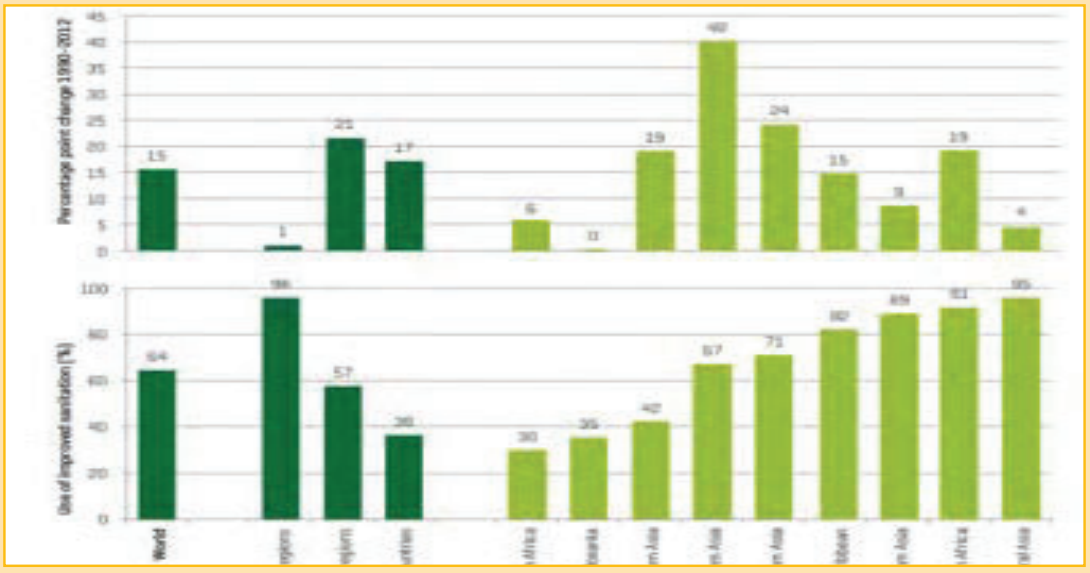
Notes: '-' - not available at the time of publication


Percentage point change 1990-2012
Use of improved drinking water (%)
World
Developed regions
Developing regions
Least developed countries
Oceania
Sub-Saharan Africa
Caucasus and Central Asia
South-eastern Asia
Western Asia
Southern Asia
Eastern Asia
Northern Africa
Latin America & Caribbean

[illegible]

[illegible]

[illegible]


Percentage point change 1990-2012
Use of improved sanitation (%)
World

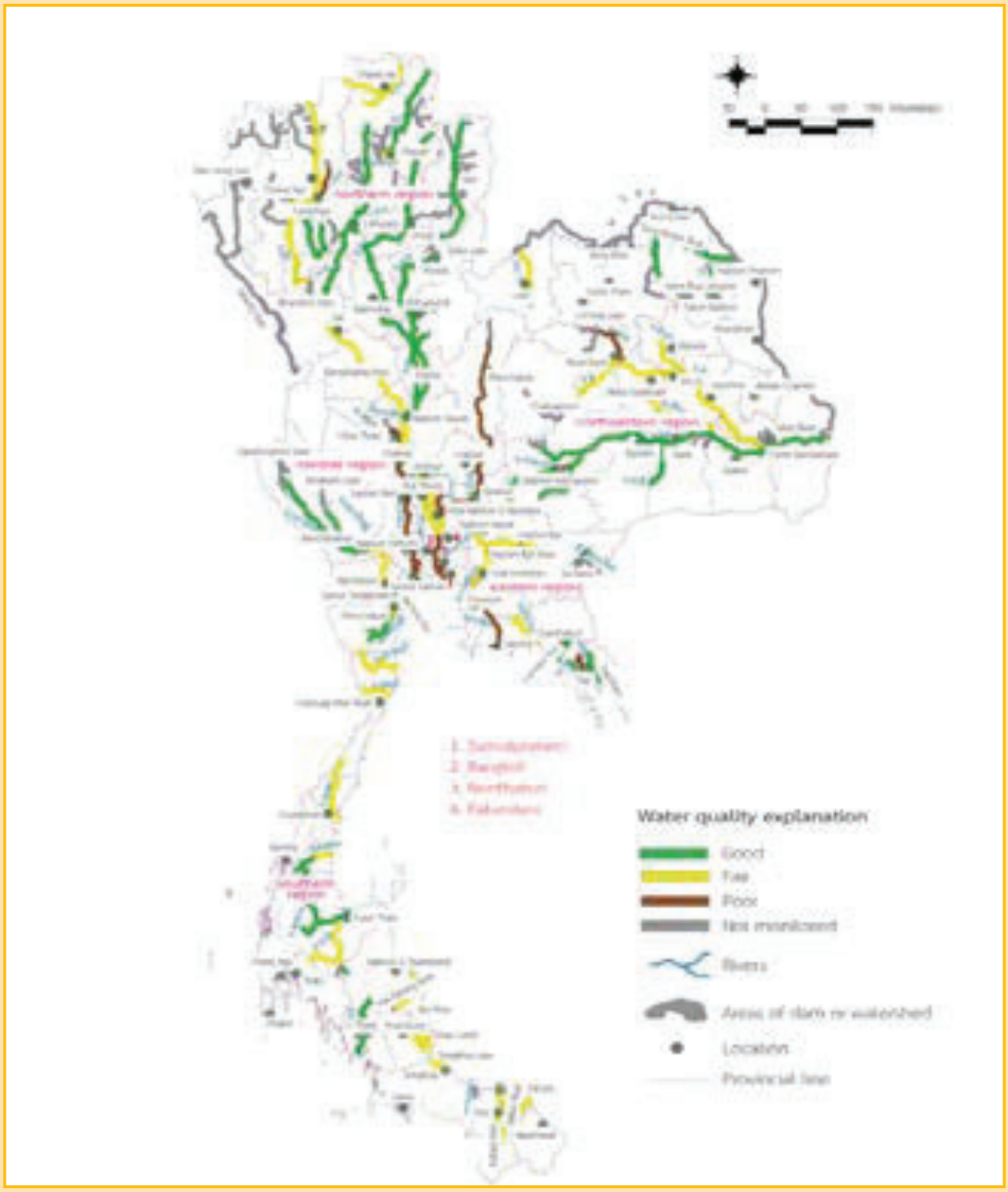
[illegible]

[illegible]

Water quality

maintain the integrity of ecosystems and fisheries. Freshwater is used by different sectors
or failed waste management and agriculture expansion and intensification is threatening
the management of water quality. Data from AMS that have long-term water quality
and Viet Nam shows that the number of rivers and lakes that are classified as having good water quality is decreasing while the number of those classified as having fair
of water uses. However, all AMS have systematized their water source classification and

(MOE) in 2009-2013 shows that 80% of monitoring points were heavily polluted in 2013



require concerted efforts to prevent further deterioration of water quality (EMB 2015).

in major rivers such as the Cau, Nhue-Day and Dong Nai river basins as well as in big

[illegible]

[illegible]

[illegible]

Impact on water resources management

[illegible] timing negatively affects the current operation of existing water infrastructure and water [illegible] in precipitation, extreme floods and droughts, and sea-level rise due to climate change [illegible] for freshwater resources is increasing and this could lead to conflicts between sectoral [illegible]

[illegible]

[illegible]

- Improving access of safe drinking water
- Increasing water quality of drinking water to meet WHO guidelines
- Increasing hours of water supplied per day
- Reducing loss of pressure and leakage in water supply

[illegible]

- Increasing irrigation areas and irrigation water supply
- Improving irrigation efficiency
- Reducing damages from flood and drought
- Improving agricultural production versus water utilization

[illegible]

- Improving early warning and forecasting systems as well as modelling tools
- Developing and operating infrastructure to control stormwater
- Setting up policies, legislation and regulatory agencies in managing stormwater

[illegible]

- Reducing flooded areas and the number of people/households affected by flood
- Improving early flood warning system/real-time flood monitoring system and coverage in flood-prone areas

[illegible]

- Controlling and treating wastewater from domestic, industrial and agriculture uses
- Improving water quality in the rivers to meet a defined ambient river water quality [illegible]
- Improving water quality monitoring programme

[illegible]

- Improving access of safe sanitation in rural and urban areas
- Treating waste discharge

Impacts on biodiversity loss

Poor water quality and changing patterns of natural flow regimes and floodplains affect
water quality leading to mass killings of fish and aquatic animals. Endangered freshwater fish and amphibians also face the risk of extinction (MRC 2011b). For example, water
and tons of fish were found dead. Thanh Hoa's Department of Natural Resources and

fisheries in Southeast Asia, in addition to providing freshwater and carbon storage in

effects of changes in the flow regime and the blocking of sediment and fish migration routes which could lead to adverse impacts on river ecosystems, fish habitat and

Impacts on human health and well-being

Another factor affecting human health from water pollution is the accumulation of heavy

Impacts on the economy

The degradation of freshwater resources, poor sanitation and insufficient wastewater
sufficient water quantity of acceptable quality for production i.e. agriculture and
a huge impact on economic sectors including agriculture, industry, fisheries and tourism (World Bank 2008). Most AMS have experienced severe floods, droughts and storms exacerbated by climate change in recent years, which caused wide-ranging, significant,

The Mekong is one of the world's great rivers, flowing 4,909 km through six nations: China, flow in the world for a river basin of comparable size (Piman et al. 2013). Millions of people of wetland habitats inundated are source of the river's great productivity. The inland fisheries tonnes of fish (Baran et al. 2015). The Tonle Sap Lake and the Sekong, Sesan and Srepok (3S) river system are places of exceptional fish biodiversity by global standards. Fisheries

bringing both benefits and risks to the nations in the basin. There were 16 hydropower

Impacts of hydropower development and operation on river flows and ecosystem services have modified the hydrology of the Mekong River by reducing and delaying wet season flows, and increasing dry season flows and water level fluctuations. The magnitude of these 2014, Piman et al. 2016). Hydropower dams not only constitute obstacles to the free flow of water but also block sediment and nutrient transportation as well as fish migration (Wild and Loucks 2014, Kondolf et al. 2015). This loss of sediments, nutrients and fish habitats will have a serious negative impact downstream on ecosystem services, fish production and

Most of AMS have accepted and/or adopted integrated water resource management implemented at sub-regional and national levels for effective water management in AMS. have put efforts into the improvement of institutional arrangements in order to increase interconnectivity and synergy. This section presents examples of national and sub-

that all of the waste dumped into the river is treated first. Efforts to recover the quality of

adequate and safe water for all, through sustainable use, conservation and effective

under Department of Irrigation and Drainage (DID) to provide the real-time rainfall and water level data from 500 stations across Malaysia as well as flood warning information to support water resources management and flood management. Latest technology was

The Adopt-an-Estero/Water Body Program in the Philippines was launched in 2010 which

healthy state of waterways in the Philippines, and to safeguard the well-being of its

establishments and institutions, non-government organizations or industry associations

the esteros/waterbodies in Metro Manila and other urban cities. The effectivity of the

391 esteros/waterbodies adopted, 67 esteros/waterbodies have exhibited significant improvement either in terms of DO and 68 esteros/waterbodies in terms of BOD (EMB

During the last quarter of 2011, Thailand experienced its worst flooding since 1942. The floods affected almost 14 million people in 65 of Thailand's 77 provinces, with widespread

2011 floods with measures to strengthen flood management in the overall context of

34. http://publicinfobanjir.water.gov.my/

restoration and efficiency improvement of current and planned physical structures; (iv)
(v) response to specific geographical areas; (vi) designation of water retention areas
creation of stakeholder awareness, acceptance, and participation in flood management

due to a small land area of 718 sq km compared with other counties in ASEAN. In an effort
efficiency labelling scheme since 2009 for water fittings and appliances, which include water taps and mixers, urinal equipment, flushing cisterns and washing machines. The scheme is to encourage suppliers to introduce more water efficient products into the market. In June 2015, heavy non-domestic customers with water consumption of 60,000
monitoring consumption, and submit their annual water efficiency management plan
resources to meet future needs and reducing the operation costs. As at end-2015, there were over 180 local and international water companies and 26 water technology-related research institutions operating in Singapore (Research Office, 2016)

of the ASEAN region. ASEAN initially defined its vision for water resources and the key challenges in its ASEAN Long-term Strategic Plan for Water Resources Management
Management (ASPA-WRM), which defined key actions and a set of project activities
and capacity across the ASEAN region (ASEAN, 2005). The ASPA-WRM contains actions
activities support moving towards IRBM and building greater awareness of decision-
four key issues in the ASPA-WRM.

ASEAN IWRM Country Strategy Guidelines/ASEAN IWRM Indicators Framework: the
water management, flood management, water pollution management and sanitation

institutional set-up indicators and management tools indicators (ASEAN 2015). The ASEAN IWRM website (http://aseaniwrm.water.gov.my), which was launched at the 26th [illegible] AMS and articles of water-related news and events in AMS. It is currently hosted by the [illegible]

[illegible]

[illegible] energy security, improved navigation and resilience against sever floods and droughts. The key basin challenges are environmental degradation from developments in water and non- [illegible] 1995 has updated the Basin Development Strategy (BDS) for 2016-2020 to response to [illegible] adaptive planning process linking regional and national planning to achieve the basin-wide [illegible] Basin. The BDS 2016-2020 has defined following 7 basin-wide strategic priorities for basin [illegible]

- Reduce remaining knowledge gaps (i.e. capture fish ecology, biodiversity baseline, [illegible]
- Optimise basin-wide sustainable development and cost and benefit sharing;
- Strengthen the protection of mutually agreed environmental assets;
- Strengthen basin-wide procedures and national implementation capacity;
- Improve national water resources development;
- Enhance information management, communication and tools; and
- Increase cooperation with partners and stakeholders.

[illegible] on Water Resources Management (AWGWRM) held on 17-18 April 2017 in Kuala Lumpur, [illegible] flood and drought management.

[illegible] across the region (http://rhn.water.gov.my/awgwrm/). Key water quality parameters and [illegible]

[illegible]

in AMS. Key issues are insufficient irrigation infrastructure, weakness in legal and policy
conflicts and weakness in community cooperation and farmer's participation.

Risks and impacts from extreme flood events in the ASEAN region: The workshop was organized in 2010 to assess the management of floods and to learn how well each AMS could cope with different flood situations. It identified the required tools and actions to improve the current situation of flood management in AMS, individually and regionally.

information on best practices, and identified required tools and actions to improve the
steps were identified in the workshop to address key gaps on drought management [35]

IWRM, reduce pollution loads from nutrients and other land-based activities, sustain freshwater environmental flows and reduce climate vulnerability through demonstrations

ASEAN-ROK Project on Building Resilience for Sustainable ASEAN from Water-Related
included compilation of national assessment report on the current status of water-related

35. http://environment.asean.org/files/RIEE-Droughts-OnWeb-rev.pdf

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] *Handbook for ASEAN Government Officials on Climate Change and* [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

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Managing flow, sediment, and hydropower regimes
Research, 50, 5141–5157, doi:10.1002/2014WR015457.

[redacted]

[redacted] a productive fisheries industry. This chapter looks at the status of these resources and the threats from overfishing [redacted]

Photo Credit: "Below" Alor, Indonesia by Yves Kubli licensed under Creative Commons BY-NC-ND 2.0

[illegible]

[illegible]

- The rich ocean resources of Southeast Asia are overfished and degraded. Key ecosystems [illegible]
- Coastal development is increasingly affecting the health of the seas; marine debris pollution is a serious issue alongside climate change and overfishing.
- Climate change and subsequent sea-level rise will have deep impacts on the productivity of coasts and oceans in ASEAN, affecting the well-being of coastal inhabitants while poverty among the rising coastal populations continues to be of significant concern.
- Ongoing regional innovations in marine protected area management, no-take reserves and community-based coastal resources management can potentially reverse.
- ASEAN should enable a closer collaboration between the Environment and Fisheries [illegible]
- ASEAN should move swiftly to address the problem of marine litter or debris pollution as it [illegible]
- A coordinated and coherent regional approach is needed, especially those resources that [illegible] fishing is critically needed.
- ASEAN should assist member states to achieve their Aichi targets especially on the creation [illegible]

[illegible]

[illegible]" (ASEAN Centre for Biodiversity [illegible]

[illegible]-dant and well-known for their biodiversity. Different coastal and marine resources [illegible] seagrass beds, pelagic fisheries, demersal fisheries, and seabed minerals. The [illegible]

[illegible] economic zone of ASEAN

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	-	-

[illegible]

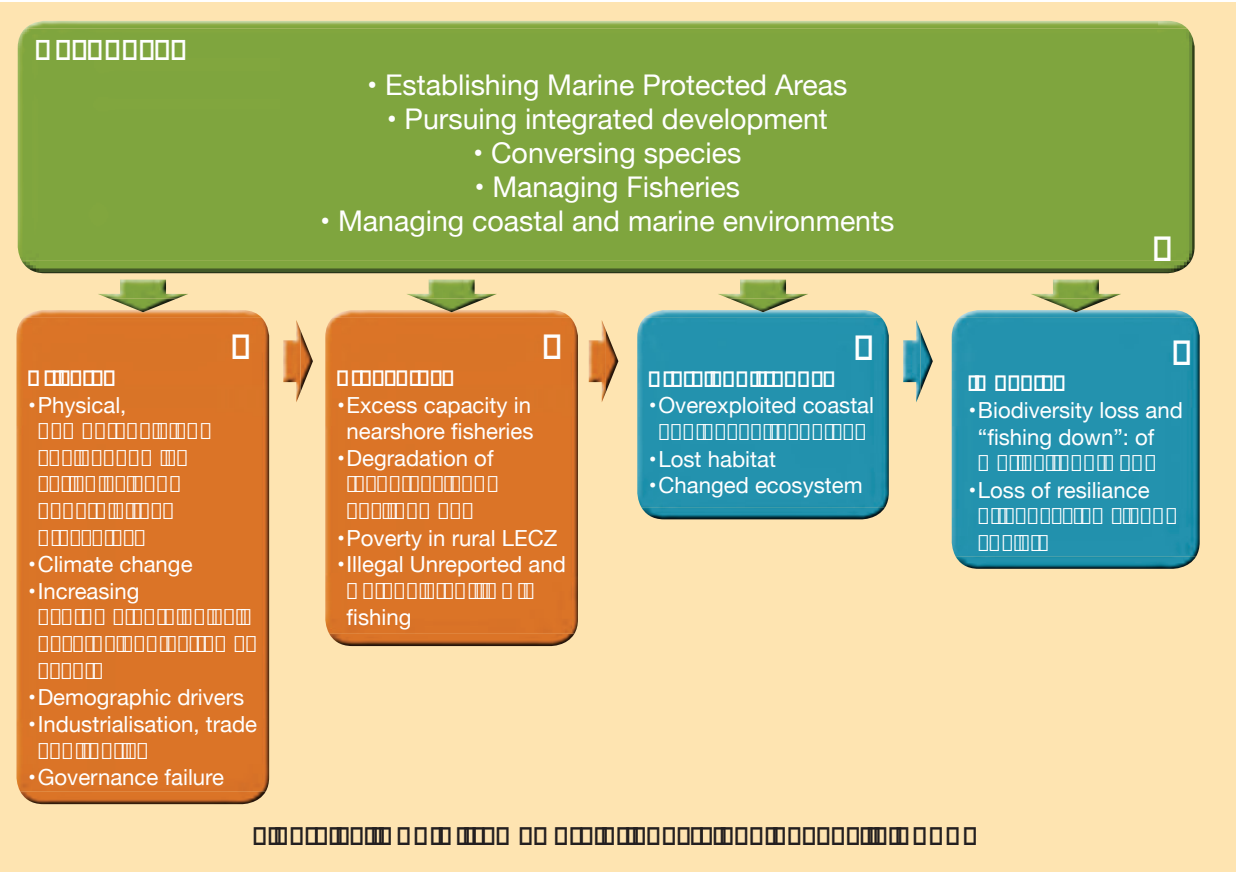
important source of protein in the region, with a per capita fish consumption of 13.1 to

Marine fishery production in the region is an important component of the economies of

resource frontiers waiting to be exploited by a growing population as fishing becomes

This chapter discusses some of the critical issues affecting ASEAN's coasts and oceans.

excess capacity in nearshore fisheries, coastal degradation and poor governance) affecting the status of coasts and oceans in ASEAN. Many coastal fisheries in the region are overfished. The integrity of several coastal ecosystems is threatened. Ocean 'fishing down' of marine food webs, undermining the social and economic well-being of



Low elevation coastal zones in ASEAN

An earlier definition of coastal areas was based on distance from the coastline (up to This definition would practically make much of Southeast Asia coastal. For precision

Table 35. Total land area of ASEAN Member States, their low elevation coastal zones

		-	-

Drivers

Drivers are the physical, demographic and socio-economic processes that lead to

Increasing impacts of a changing climate on the coasts of ASEAN

well as affecting the well-being of coastal inhabitants (Hijioka et al. 2014; Nurse et al. 2014; Rijnsdorp et al. 2009). A coastal impact of climate change is sea-level rise (SLR),

(Table 37). Such level of change is “faster than at any time during human civilization”

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]			[illegible]		
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-2.98	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-7.26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-5.15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

The magnitude of the projected SLR will affect Southeast Asia heavily due to its long low-lying coastlines, large number of islands, location of populations along LECZ, and [illegible]

Galloway 2014). Coastal flooding due to storm surge and inundation are expected to
Indonesia, Viet Nam, Malaysia, Thailand, and Singapore, will be particularly affected. Cities in these countries that will be critically affected by SLR include Bangkok, Ho Chi
shows projected sea level rise estimated by Jevrejeva et al (2016) for different levels of

Land subsidence

The impacts of sea level rise will also be intensified by extensive groundwater withdrawal
have subsidence rates of less than 2 cm/year, but in other coastal provinces (e.g., Samut
subsidence rates of 2 to more than 5 cm/year were observed. They have noted further

In the Mekong delta, the subsidence rate is 1-4 cm per year (Erban et al. 2014). In

In Manila, subsidence rates of 1.7-8.3 cm per year have been recorded (Rodolfo and
authors (World Bank 2010) argued that land subsidence is a far greater cause of flooding
(Woodruff et al. 2013). Some of the recent extensive flooding in Manila, Jakarta and the
World Bank 2010; Jago-on et al. 2009; Taniguchi 2011; Takagi et al. 2016; Erkens et al. 2015; Woodruff et al. 2013).

Demographic drivers

the future of the coastal areas in the region is heavily affected by demographic changes

37. Urbanization as used in this chapter follows the definition provided by Seto et al (2013, p.4) which describes it "as a multidimensional process that manifests itself through rapidly changing human population and changing land cover".

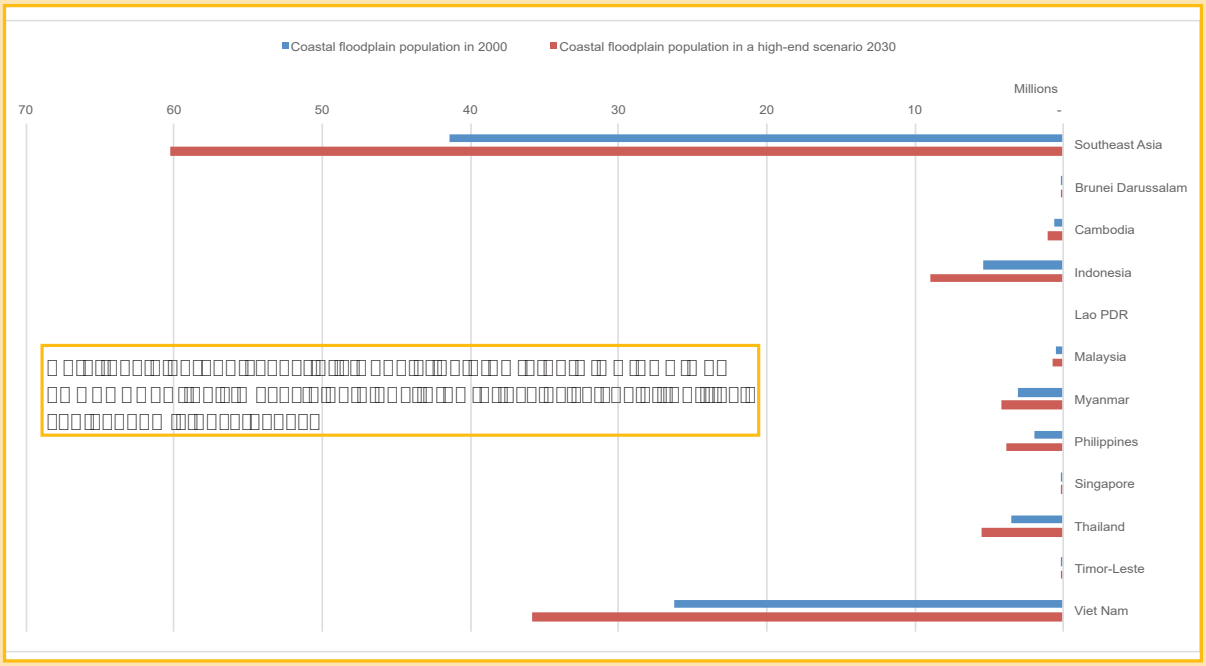


Figure 40. Population of coastal floodplain in ASEAN region in 2000 and 2030

Table 37. Population in low elevation coastal zone in key urban agglomerations in ASEAN based

	zone		

Fifth ASEAN State of the Environment Report

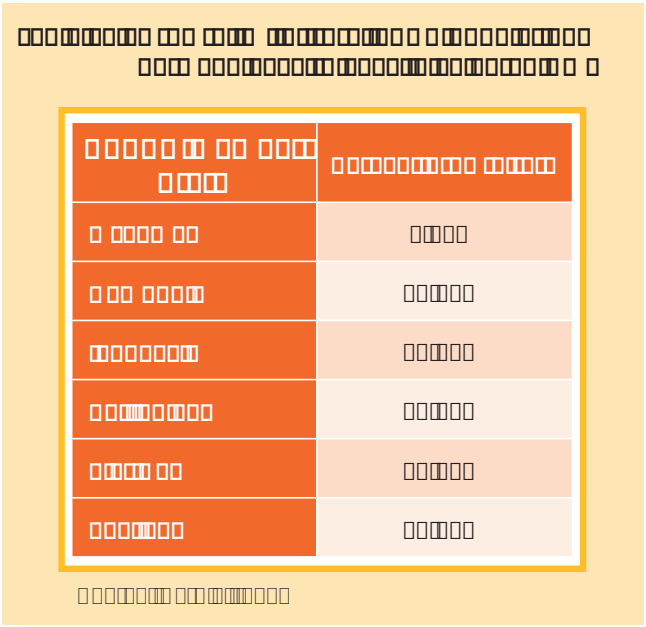
Indonesia and Viet Nam highly exposed to the impacts of sea-level rise (Neumann et al. expand impervious concrete spaces which increase run-off and flooding (Secretariat (UNU-IHDP) 2015). Furthermore, these changes in land use and land cover have made cities warmer than surrounding non-built up areas, leading to the so-called urban heat island effect (Estoque et al. 2017; Li et al. 2017).

exclusive social, political and economic governance. The share of LECZ areas defined
and the urban population will outstrip growth in non-urban areas by 2060 if existing
expansion in LECZ has been set since 1970-2000 where the global average rate of urban

As a result, urbanization has become “the most irreversible and human-dominated form of land use” of all human activities (Seto et al. 2011, p.2). Urbanization is often
1970-2000 (Seto et al. 2011).

the rate of urban land expansion up by 0.829 percentage points compared to non-coastal
factors to consider such as the role of GDP and non-demographic factors including land-use policies, transportation costs and income in fueling urban expansion (Fragkias et al. 2013). Except for Vien-tiane, most capital cities and most of the secondary urban

floodplains from a population of over 41 million in 2000 to more than 60 million in 2030
to a huge population already located along coastal floodplains. Migration into coastal environments from marginal areas such as drylands, mountain areas, and drought-prone



to climate-induced hazards in 2050. In between 80-89% of their population in number of people that will be affected by climate-related impacts followed by

The population of LECZs defined as rural have been growing since 2000, for which highly

Industrialization, trade and tourism

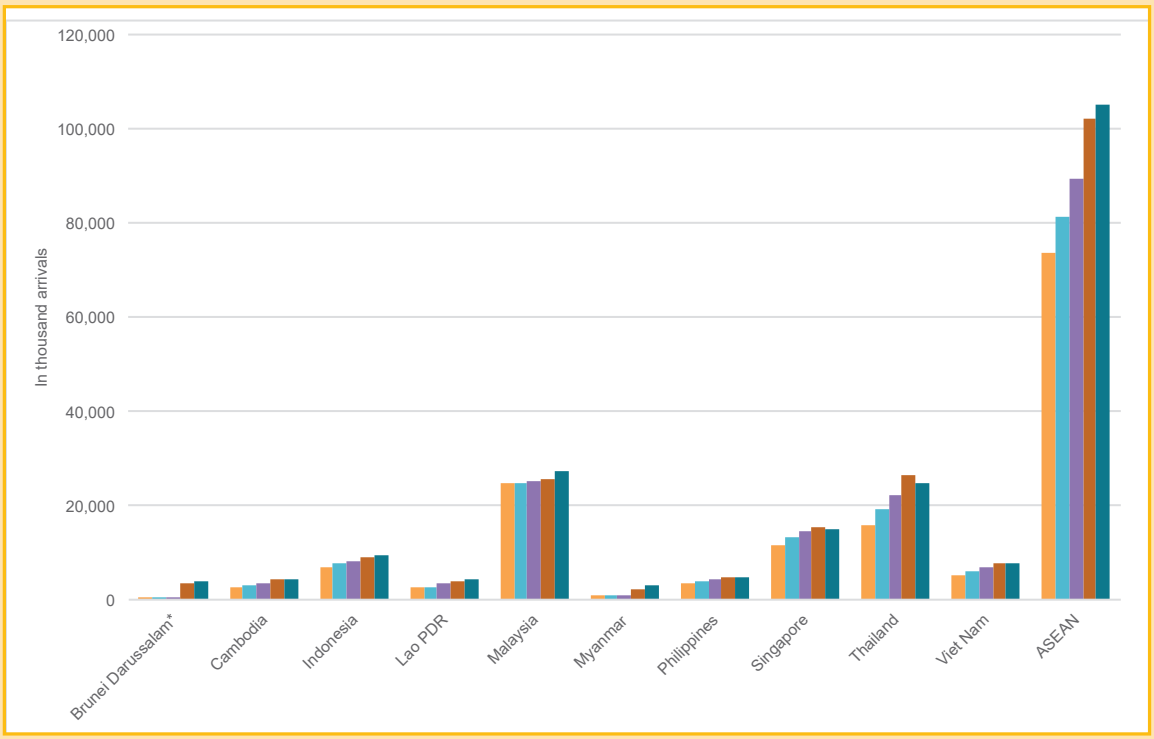
world, where commerce and trade flow in and out of the country. Ports therefore could fifth, respectively, in the world in terms of container traffic (IAPH Secretariat 2015). Table traffic hosted by ports in the region is increasing. The growth of industries in coastal areas and the rise in shipping traffic in the region's oceans means marine pollution and

Rank	Port	Traffic (x 1,000 TEU)					ASEAN Member State
		2010	2011	2012	2013	2014	
1	Singapore	28,431	29,937	31,649	32,240	33,869	Singapore
2	Port Klang	8,870	9,603	10,000	10,350	10,946	Malaysia
3	Tanjung Pelepas	6,530	7,520	7,700	7,628	8,550	Malaysia
4	Tanjung Priok	4,715	5,649	6,460	6,590	6,590	Indonesia
5	Laem Chabang	5,068	5,731	5,830	6,041	6,583	Thailand
6	Ho Chi Minh	3,856	4,815	5,060	5,542	6,390	Viet Nam
7	Manila	3,154	3,467	3,705	3,770	3,650	Philppines
8	Tanjung Perak	3,030	2,643	2,849	3,001	3,106	Indonesia
9	Bangkok	1,453	1,454	1,397	1,509	1,536	Thailand
10	Penang	1,522	1,580	1,580	1,470	1,470	Malaysia

Although Figure 41 does not differentiate between coastal and non-coastal tourism into effect (Thirumaran and Arumynathan 2016). Tourism's environmental impacts on political economy to produce situations where there are differences in income, job planning and ineffective management (Chua 2013). These arise due to several 'institutional traps', defined as inefficient but stable governance practices (Balatsky 2013). Lebel et al (2010) describe five institutional traps: fragmentation, rigidity, scale, elite capture, and different sectoral ministries, departments, offices and authorities. For instance, fisheries

38 Fragmentation refers to the separation of tasks across the different actors in the bureaucracy, giving rise to problems of in the coastal zone by the powerful and politically influential. Finally, crisis refers to reactive policymaking and planning in response to political pressures instead of a more strategic, inclusive and well-thought out policymaking (Lebel et al. 2010).

management could be under the domain of a ministry or department of fishery, but coastal [illegible] natural resources management. Different uses, such as tourism, shipping, hydrocarbon [illegible]



Source: ASEAN statistics of tourism (http://asean.org/?static_post=tourism-statistics-2).
[illegible]

[illegible] indigenous communities in coastal and fisheries management.

ASEAN have had enduring fisheries management practices and institutions such as [illegible]

A crisis in policy-making mentality and without a thorough grounding on the broader [illegible]

where infrastructure fixes in the form of dykes were the main ingredient of post-disaster

[illegible]

over five decades alongside being overfished[39] [illegible] unregulated fishing (Stobutzki et al. 2006). Demersal fisheries are depleted (Sumaila et al. 2010). Pelagic and high seas fisheries are also showing signs of depletion (Cullis-Suzuki and Pauly 2010; Stokke 2001). Some of the overfished fisheries include elasmobranchs [illegible]

Reef fisheries are usually small-scale, artisanal, subsistence and operating in usually remote locations far from regulated landing sites. Reef fisheries[40] also include fishing in [illegible] that there are 6 million reef fishers in 99 reef countries and territories worldwide. At least [illegible] of the world's small-scale fishers fish on coral reefs. Half of these coral reef fishers are found in ASEAN (Figure 42). Indonesia has the most number of reef fishers followed by the Philippines. Other member states have reef fishers but not as substantial as these [illegible]

39. Overfishing is a complicated phenomenon and has many dimensions. Pauly (1987; 1988; 1994) has identified different aspects of overfishing: growth, recruitment, biological, ecosystem, economic, and Malthusian. Growth overfishing happens when fish is caught before they have time to grow. Recruitment overfishing happens when spawning stocks are reduced and are not able to replenish the fishery with new "recruits". Economic overfishing occurs when returns from fishing is not commensurate with the amount of effort. Ecosystem overfishing materializes when an imbalance develops [illegible] depleted species. Finally, Malthusian overfishing arise when too many fishers chase too little fish and have to increase their effort to harvest the usual catch (Pauly 1988). Of these, Malthusian overfishing is easily observable by virtue of its unit of [illegible] 2007). Essentially, various forms of overfishing results from the overexploitation of the reef and the removal of keystone [illegible] illegal, unreported and unregulated (IUU) fishing.

40. Other authors (e.g., Blaber et al. 2000; Ruddle and Hickey 2008; Wedding et al. 2008) use the term nearshore fisheries. [illegible]

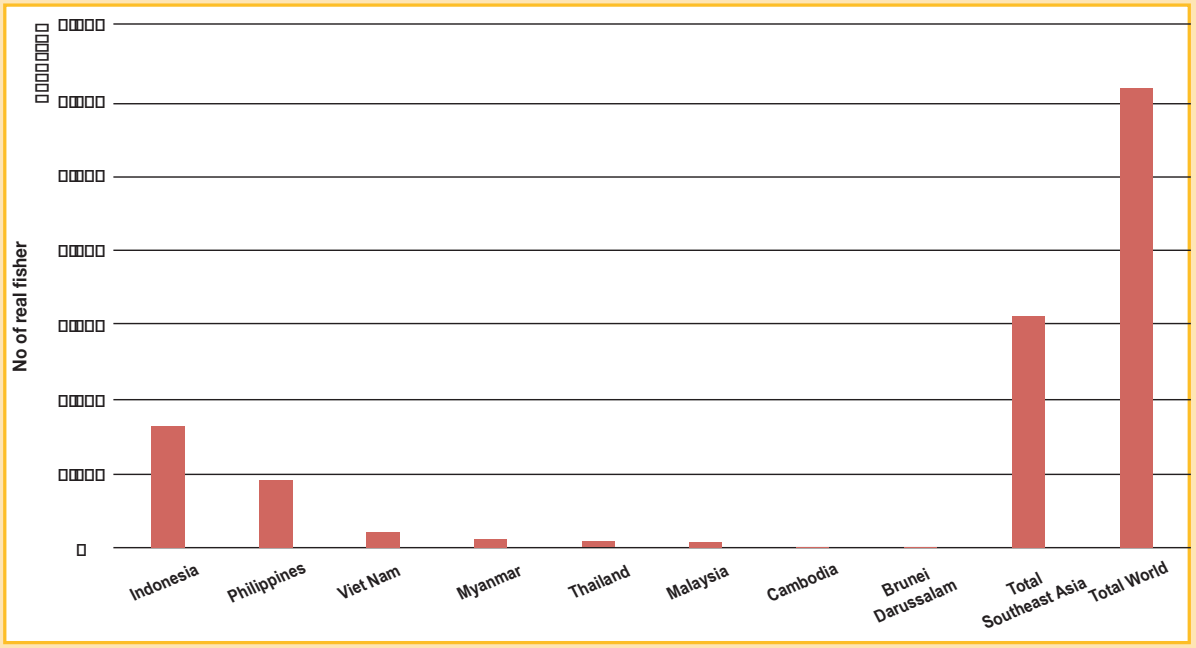


Figure 42. Estimated number of reef fishers among AMS in 2010

41) (Barbier 2015). Thailand's middle-income status could partly explain why poverty is lesser in its LECZ, but higher in other AMS. Clearly, dependence on coastal fisheries, other marine resources, and opportunities in the coastal zone is critical to the well-being

Table 40. Countries with high rural low elevation coastal zone poverty, 2000

Note: High infant mortality is 50 or more deaths within the first year of life per 1000 births (or 500 deaths/10,000 live births). Child
children with a weight-for-age z-score more than two standard deviations below the median of the NCHS/CDC/WHO International

There has been an increase in illegal, unreported and unregulated (IUU) fishing[42] [illegible] laws on fisheries management and conservation in nearshore areas and the high seas. More needs to be done to enable effective monitoring, control and surveillance systems including proper catch documentation and labelling, up-to-date registry of commercial fishing vessels, training of enforcement officers and agencies, and a monitoring and policing infrastructure that befits the purpose. Documentation and reporting of marine fishery production in the region needs to be improved as SEAFDEC data shows that unidentified marine species account for more than half of marine fish catch in 2014 [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] Bluefin, Yellowfin and Bigeye	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] restrelliger mackarels, Queenfishes [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] undentified [illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

[illegible] being decimated through rampant IUU fishing, leading to the degradation of the region's [illegible] 2015). Other marine flora and fauna are now listed in CITES Red List as endangered or [illegible] are causing harmful algal and jellyfish blooms.

[illegible] fish, humphead wrasse, sharks, marine turtles, cucumbers and many more (Cinner 2014; Dirhamsyah 2012; Sadovy 2010; Warren-Rhodes et al. 2003; Johns 2013; Ventura [illegible] illegal and unreported fishing losses worldwide are between US$ 10 billion and 23.5

42. IUU fishing has coastal and ocean components, and involves the following: illegal fishing activities such as fishing with fake or without license, registration; use of prohibited fishing gears and methods; landing of fish in unauthorized ports; and transfer of catch at sea; landing of catch across borders, double flagging; and, poaching in other country's exclusive [illegible]

decline in global marine fish catch from
new fishing grounds and that the only
remaining frontier fishing grounds are
include by-catch and IUU fishing.

	-	-

Coral reefs

Pauly 2017). The region has “the most extensive and diverse coral reefs in the world”,
formed. Biodiversity tapers off further away from this area (Veron et al. 2009). Table

threats including overfishing, destructive fishing practices such as blast and poison fishing, sedimentation and pollution from human settlements and from agriculture, is and expansion of the built-up environment also worsen the situation. Coral reef experts surveyed in a study agreed that overfishing and coastal development are the two key have led to coral bleaching and ocean acidification, respectively (Burke et al. 2011).

additional warming of 2°C. The climatic and non-climatic factors that drive the health of
storms and diminish the environmental features critical to fisheries and tourism. However,
fishing. Even if these options are available, their efficacy will be severely reduced due
to the increase in thermal stress and ocean acidification (IPCC 2014). Of late, "[C]oral
(from 2014 to at least 2016)" claimed one recent study (Heron et al. 2016, p.1). This trend
already has significant ramifications on the status of coral reefs worldwide with reports

threatened in the world", based on a 2011 risk assessment. Around 95% of the reefs
suffer from high to very high categories of local threats (Burke et al. 2011, p.55). In
effectively lost, 20% are in critical conditions, and 25% threatened. Only 15% of the

wrapped up at the time of writing of this chapter under the auspices of Ecofish and
reefs suffered substantially from the coral reef bleaching event in 2010 as did Malaysia

coastal development, dredging and dumping activities, overfishing and expansion of
conducted, long-term monitoring has been made since 1986. These monitoring activities
showed an overall decline in live coral cover and a reduction in the abundance of reef-
assessment of Myanmar's coral reefs is non-existent but some information is available

Mangroves

important breeding and nursery grounds for various fisheries, store carbon and play a

each of these drivers on the rate of deforestation differ across the region and by year

		-	-	-

to the pre-2000 level in 2010 and 2011. Pond conversion is now largely restricted to Kalimantan and Sulawesi in Indonesia. Rice field conversion climbed steadily during

deforestation" (Hamilton and Casey 2016, p.736).

Country (ordered in terms of total mangroves lost)	Aquaculture	Rice	Oil palm	Mangrove forest	Urban	Other category
Indonesia	48.6	0.1	15.7	22.6	1.9	11.2
Myanmar	1.6	87.6	1.1	0.5	1.6	7.6
Malaysia	14.7	0.1	38.2	17.6	12.8	16.7
Thailand	10.8	5.6	40.0	5.1	14.4	24.1
Philippines	36.7	0.9	11.1	7.3	2.7	41.3
Cambodia	27.7	1.5	8.9	9.8	4.6	47.6
Viet Nam	21.0	10.4	0.5	0.6	62.5	4.9
Brunei Darussalam	29.2	-	27.7	12.5	15.9	14.8
Singapore	-	-	-	-	-	-
Total	29.9	21.7	16.3	15.4	4.2	12.3

Source: Richards and Friess, 2016

Seagrass meadows

commercially important species of mollusk, crustacean, and fish while also protecting

associated fauna contribute at least 50% of the fish based food, which is equivalent to

variations across different regions, urban/industrial runoff, urban/port infrastructure development, agricultural runoff and dredging are the primary drivers of destruction of seagrass meadows. The impacts of these largely land-based factors will be amplified

threats (Grech et al. 2012). Climate change, therefore, is a major long-term threat to the

concerted action (Bertelli and Unsworth 2014; Cullen-Unsworth and Unsworth 2013;
due to overfishing and degraded due to pollution and land development. Its regulation services (eg, climate regulation, erosion regulation, and water purification) are also

Marine litter pollution

worldwide specifically in the ASEAN region with reports of floating islands of garbage
ocean floors while some, such as microplastics, are found ingested by zooplanktons (Sussarellu et al. 2016; Hüffer et al. 2017; Pham et al. 2014). It is becoming "one of the fastest-growing threats to the health of the world's oceans", according to the first
acidification (Galloway and Lewis 2016).

disposed of or abandoned in the marine and coastal environment" is considered a
particles weighing 268,940 tons afloat at sea (Eriksen et al. 2014). The lack of proper
problem in the region and one that will have serious ramifications on the health of our

Global Rank	Country	Waste gen. rate [kg/ppd]	% plastic waste	% mismanaged waste	Mismanaged plastic waste [MMT/year]	% of total mismanaged plastic waste	Plastic marine debris [MMT/year]
2	Indonesia	0.52	11	83	3.22	10.1	0.48–1.29
3	Philippines	0.50	15	83	1.88	5.9	0.28–0.75
4	Viet Nam	0.79	13	88	1.83	5.8	0.28–0.73
6	Thailand	1.20	12	75	1.03	3.2	0.15–0.41
8	Malaysia	1.52	13	57	0.94	2.9	0.14–0.37
17	Myanmar	0.44	17	89	0.46	1.4	0.07–0.18

Source: Jambeck et al., 2015

other problems (Wilcox et al. 2015; Kühn et al. 2015). Many more marine life are affected

in by detritus, suspension, and filter feeders which will lead to uptake and transfer of the

fisheries as they bioaccumulate in the food chain (Li, Tse, et al. 2016). For example, the ingestion of microplastics has affected the reproduction of oysters (Sussarellu et al.

mussels (Li, Qu, et al. 2016), and fish (Jabeen et al. 2017).

Country	Direct impacts			
	% of coastal GDP exposed	% of coastal agricultural area exposed	% of coastal wetlands area impacted	Vulnerability to climate change impacts on fisheries
Myanmar	48.90%	22.90%	50.20%	–
Cambodia	2.70%	1.00%	1.50%	High
Indonesia	38.70%	26.10%	27.00%	Moderate
Philippines	52.30%	30.70%	45.00%	Low
Vietnam	31.70%	23.80%	29.40%	High
Thailand	31.60%	11.60%	14.70%	Low

Source: Barbier, 2015

Note: The low elevation coastal zone (LECZ) is the contiguous area along the coast that is less than 10 m above sea level. Data for % of coastal GDP, agricultural area and wetlands exposed to a 1 meter (m) sea-level rise accompanied by a 10% intensification of storm surges are from Dasgupta, S., Laplante, B., Murray, S. and Wheeler, D. 2009. "Sea-Level Rise and Storm Surges: A Comparative Analysis of Impacts in Developing Countries." Policy Research Working Paper 4901, the World Bank, Washington, D.C. April. Data on vulnerability of fisheries from Allison, E.H., Perry, A.L., Badjeck, M-C., Adger, W.N., Brown, K., Conway, D., Halls, A.S., Pilling, G.M., Reynolds, J.D., Andrew, N.L. and Dulvy, N.K., 2009. "Vulnerability of national economies to the impacts of climate change on fisheries." Fish and Fisheries 10:173e196. For the 132 countries, "high" is for the upper quartile (highest vulnerability), "moderate" for the second quartile, "low" for the third quartile, and "very low" for the bottom quartile.

coastal and marine ecosystems and the social and economic well-being of the wider
full utilization of the recreational values of the region's resources remains unfulfilled. The
has led to the over-fished state of coasts and oceans in ASEAN (Teh et al. 2016).

significant direct impacts on the coastal wetlands of these countries and their fisheries,
building measures will be critical to protect their well-being.

Hallegate et al (2013) modelled the impacts of future flood losses due to sea level rise

ASEAN were included. A 100-year flooding, without taking into consideration sea level
20 cm, subsidence, and if no adaptation is made, Bangkok and Jakarta will suffer the
(i.e., coastal defenses), HCMC will suffer more with a mean annual loss of 0.83% of
affected by sea level rise and land subsidence but also its neighbouring Mekong delta,
the region's largest delta and Viet Nam's key agricultural producing area, will also suffer

The rural coastal poor are facing a poverty-environment trap with high rates of infant
coastal erosion and salt-water intrusion will lead to livelihood disruptions, loss of

[illegible]

of the coastal and ocean environments in the region, appropriate and scale-specific
institutional arrangement, financial investment, management measures, stakeholders support, and participation".

[illegible]

Urban Agglomeration	No change in sea level					30cm sea level rise and subsidence (no adaptation)		30 cm sea level rise and subsidence (adaptation at constant probability, adaptation scenario's PD (present day))		
	100-yr exposition (M$)	100-yr losses with no protection (M$)	Protection level in 2005 (return period in years)	Mean annual loss (M$)	Mean annual loss (% city GDP)	Mean annual loss (M$)	Mean increase due to SLR and subsidence	Mean annual loss (M$)	Mean annual loss (% city GDP)	Mean increase due to SLR and subsidence
Bangkok	40,065	16,462	50	696	0.07%	20,779	3387%	734	0.09%	23%
Jakarta	9,577	2,353	10	1,139	0.14%	16,204	1336%	1,750	0.22%	54%
Ho Chi Minh City	42,093	20,216	50	1,743	0.74%	7,335	321%	1,953	0.83%	11%
Hai Phong	14,283	4,720	50	320	0.37%	6,209	941%	382	0.44%	20%
Palembang	2,612	934	10	418	0.39%	4,764	1040%	506	0.48%	21%
Manila	2,339	872	10	254	0.05%	2,846	1019%	329	0.06%	29%
Rangoon	4,177	1,387	10	163	0.17%	1,819	1017%	202	0.21%	24%
Surabaya	727	183	10	80	0.04%	1,052	1222%	110	0.06%	39%
Kuala Lumpur	19,437	8,696	100	56	0.03%	253	356%	63	0.04%	13%
Makassar	150	30	10	11	0.01%	67	515%	12	0.02%	12%
Davao	61	20	10	5	0.01%	56	921%	6	0.01%	7%
Singapore	3,412	2,020	2000	2	0.00%	27	1222%	2	0.00%	3%

Adapted from Hallegatte et al. 2013

Note:

- In 2050, without sea level rise and with 20 cm of sea level rise and subsidence (40cm in cities prone to subsidence)
- With socio-economic change, and city population limited to 35 million inhabitants
- The protection level is taken at its optimistic bound (maximum protection).

Despite the enormity of the problems affecting the coastal and oceanic resources in ASEAN, several efforts are underway to respond to the challenges of coastal and ocean [illegible] the Sulu-Sulawesi Ecoregion under the ASEAN Heritage Parks Programme. Others are set up under the UNESCO-Man and Biosphere, UNESCO World Heritage Convention, [illegible] MPAs have been responsible for replenishing depleted fish stocks in the region. More [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	-	-	-
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	-	-
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

At national levels, efforts, in both policy and project levels, are ongoing to manage the

declared as MPAs so far (IUCN and UNEP-WCMC 2017) (Table 50). Although having

11 to effectively conserve at least 10% of coastal and marine areas by 2020.

regional solutions accordingly. While we can identify challenges, a coherent and effective

first transboundary protected area on sea turtles in the world aiming for the conservation and protection

As of this writing, we are beginning to see regional efforts directed at managing future [illegible] protecting key marine features (Coral Triangle Initiative and Sulu-Sulawesi Marine [illegible] Ocean-Southeast Asia Marine Turtle Memorandum of Understanding for marine turtles); managing fisheries and combatting IUU fishing, and managing the coastal and marine [illegible]

Attention for IUU fishing is gaining momentum and there are several regional initiatives [illegible]

- FAO and Global Environment Facility (GEF) project Strategies for Trawl Fisheries Bycatch Management (REBYC-II CTI)
- ASEAN Food, Agriculture and Forestry, the Vision and Strategic Plan (2016-2025)
- ASEAN Sectoral Working Group on Fisheries
- ASEAN Guidelines for Preventing the Entry of Fish and Fishery Products from IUU [illegible]
- ASEAN Catch Documentation Scheme for Marine Capture Fisheries]
- Joint ASEAN-SEAFDEC Declaration on Regional Cooperation for Combating IUU [illegible]
- ASEAN Level
  - [illegible]
  - o Regional Fishing Vessels Record for Vessels 24 Meters in Length and Over (RFVR-[illegible]
  - [illegible]
  - [illegible]
- USAID Oceans and Fisheries Partnership

What is important to note is that addressing IUU fishing needs collaboration across [illegible] not to duplicate efforts but build on each other's strengths and mandates.

[illegible]

efforts among ASEAN Member States in controlling tanker desludging activities and in

An important response moving forward is to assess how far existing efforts are addressing to ensure that responses sufficiently affect or impact on outcomes. Different policy action is needed to drive the required change forward and to ensure cross-border sharing of information, national and sub-national actors also need to act together to determine

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[illegible]

[illegible] of the ASEAN. Although efficiency and productivity are [illegible]

Photo Credit:" Street market in Yangon" Yangon, Myanmar by Jaume Escofet licensed under Creative Commons BY-NC-SA 2.0

[illegible]

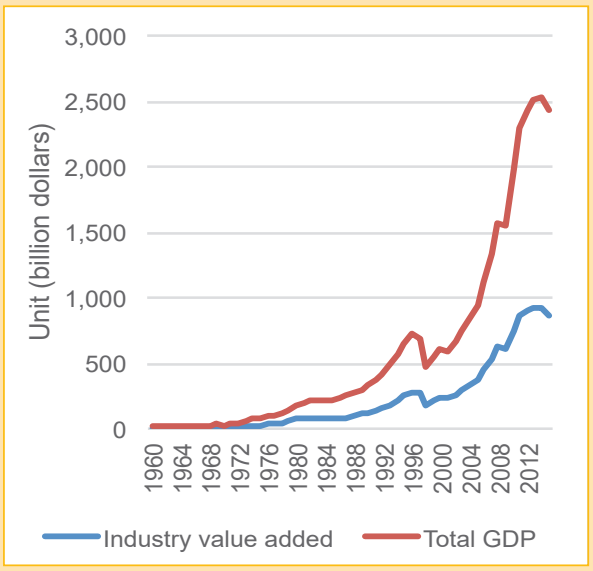
[illegible]

- The patterns of production and consumption show an increasingly unsustainable trend across the ASEAN region. Although efficiency and productivity are increasing, improved [illegible]
- Resource use continues to rise upwards in line with rapid urbanization and industrialization. [illegible]
- Productivity in most ASEAN Member States (AMS) remains at a relatively low level, showing slow economic growth. A shift from demographic-change based growth to more sustainable technology and productivity-driven growth is key to framing successful new development [illegible]
- The rising amounts of waste and its management pose a serious challenge for most AMS, especially plastic bags, e-waste and food waste. Landfill is still the main way to dispose of solid waste, however 3Rs and waste-to-energy have become popular in the region. Plastic bags, e-waste and food waste need special attention and customized actions.
- The use of pesticides continues to rise in the agricultural sector and is one of the biggest [illegible]
- Green finance enables the region, in terms of production, to invest in more resource and process efficient technologies and activities, while green/sustainable public procurement (GPP/SPP) and ecolabelling, green building rating systems and energy labelling schemes come from the consumption/demand side to encourage more sustainable/green production.
- Relevant policies, regulations, infrastructure and facilities are needed to lead greater [illegible]
- Sustainable production and consumption is a cross-cutting issue highly relevant to other [illegible]

[illegible]

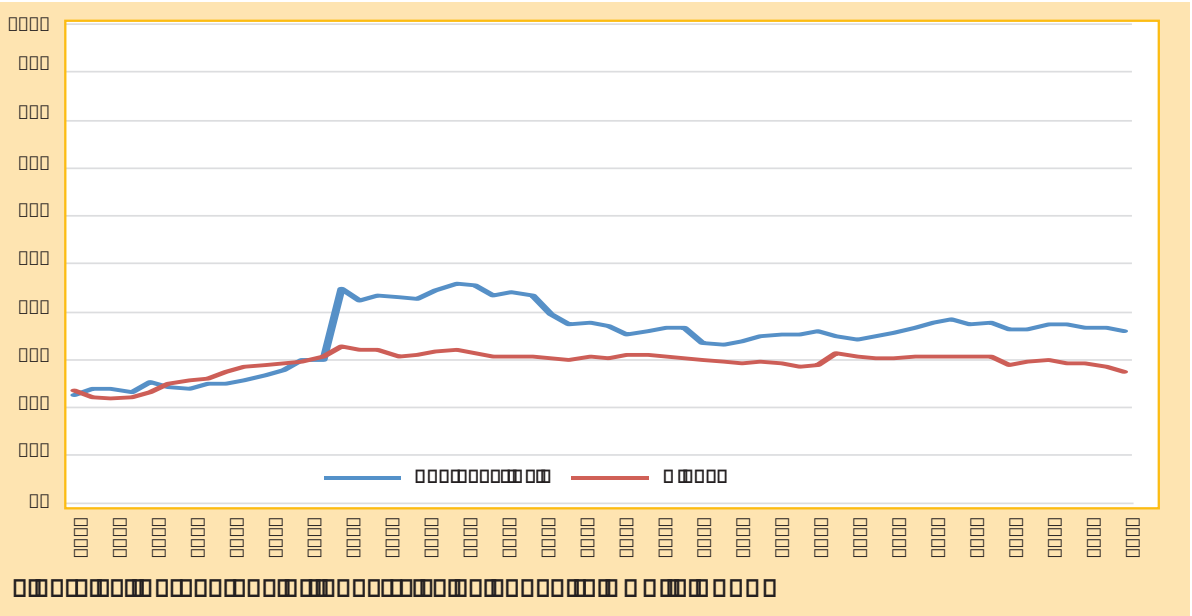
[illegible]

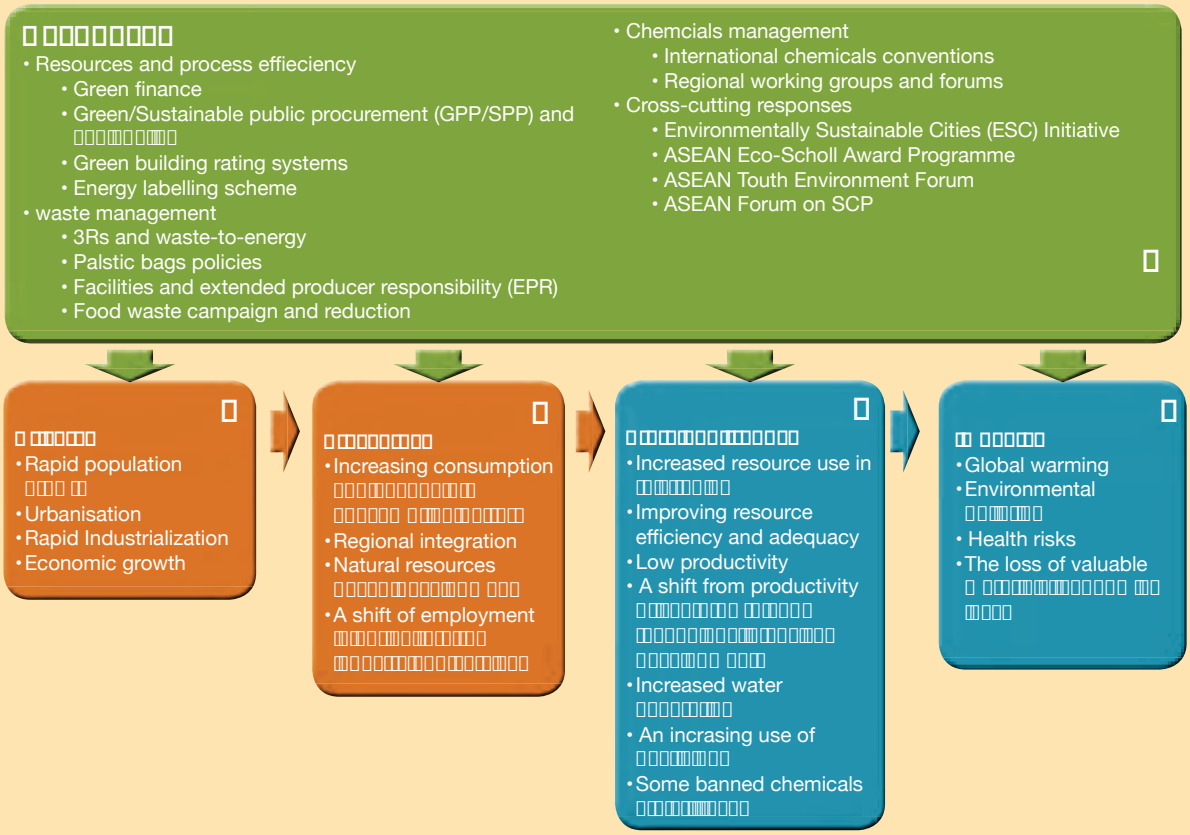
- Resource efficiency. Natural resources are categorized into three areas – material, water and energy (UNEP 2013). The efficiency is analyzed from parameters of total [illegible]
- Process efficiency. The evaluation on process is based on parameters such as gross [illegible]
- Waste management. This section discusses different kinds of waste generation and management: municipal solid waste, food waste, e-waste and disaster waste.
- Chemicals management. This section identifies the key chemical management issues [illegible]



for the last five years. However, some

reached a higher rate of 7%. The middle-

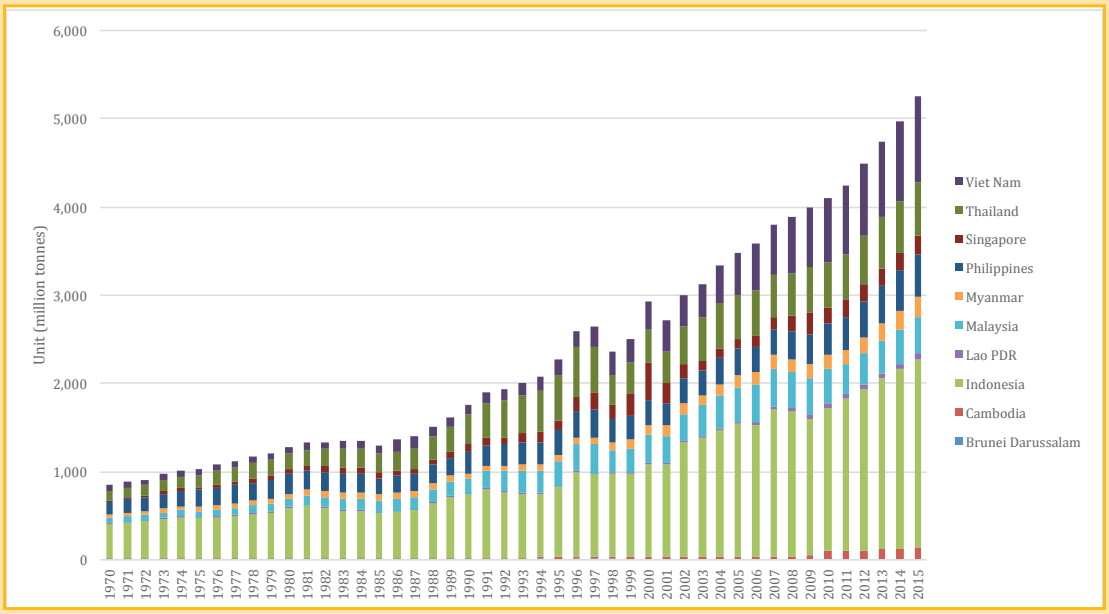


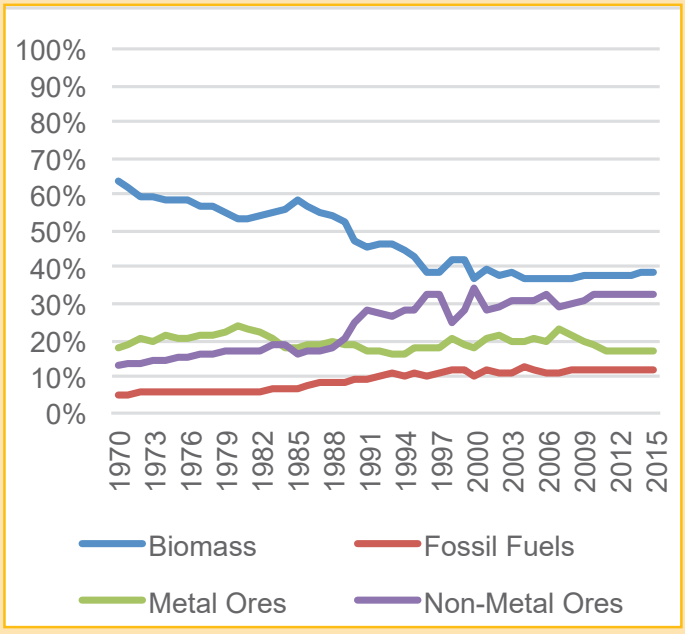


consumption, infrastructure, transportation, and the expanding middle-class (OECD

Emerging AMS alongside India and China have the fastest middle-class growth rates in

Resource efficiency





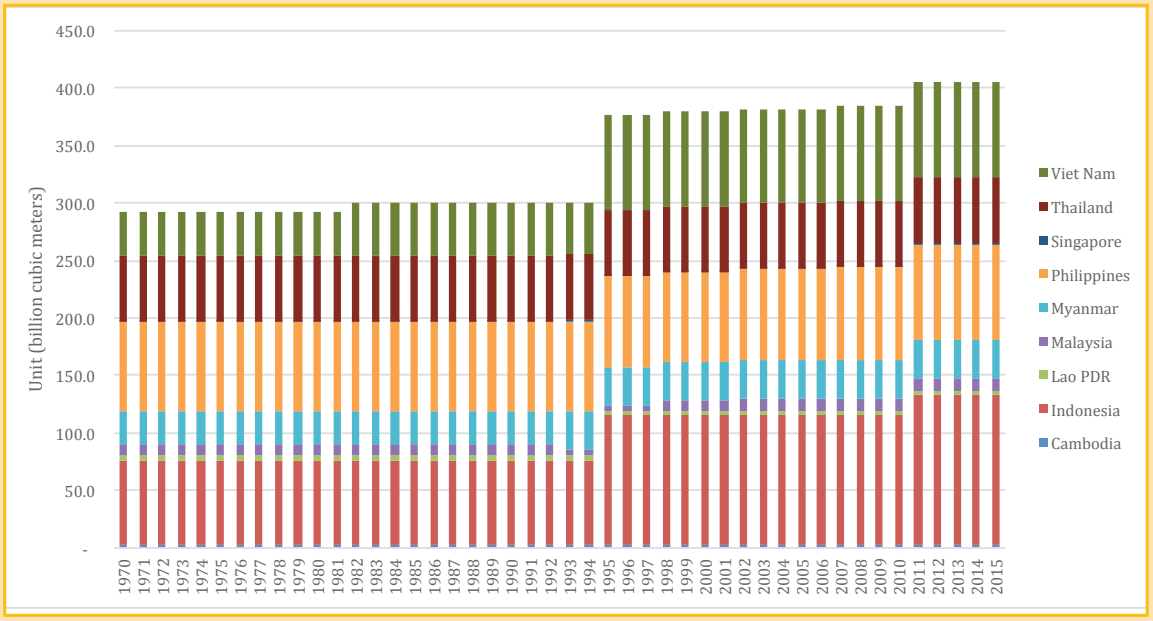
different categories of materials vary greatly, with non-metallic ores and non-metallic minerals

linear growth since the late-1980s (Shandl et. Al. 2016). The rate in Southeast Asia is slower than the Asia and Pacific region since the 20[1]

Asia and the Pacific, while it lags far behind the rest of the world where only 1 kilogram

Total water use in Southeast Asia has experienced two stages of increase: the first in

greatly contributed to the first step-up of the whole region's consumption, while some



All three kinds of water use – agriculture, manufacturing, and residential, increased two-

sources (DENR) at the Joint Awarding Ceremony of the Philippines-Chiller Energy Efficiency

The project's beneficiaries were awarded and recognized for their initiatives in implementing energy-efficient operations, particularly the chiller sector's move to replace their ozone depleting substances (ODS)-based inefficient chillers to new technologies.

The PCEEP, a World Bank-Global Environment Facility (WB-GEF)-initiated project, provides technical and financial assistance to replace old chillers with energy-efficient and Non-ODS-

that are not only more energy efficient, but also operating with non-ODS-based refrigerant and with lower leakage rate. Such a move will bring economic as well as ecological benefits

and site validation with the members of the PCEEP-Technical Evaluation Committee. At 30,649 tons of refrigeration, reduced 5,700 kilograms of ozone-depleting potentials, generated at least 124.7 gigawatt-hours in electricity savings, abated 10 megawatt-demand, and

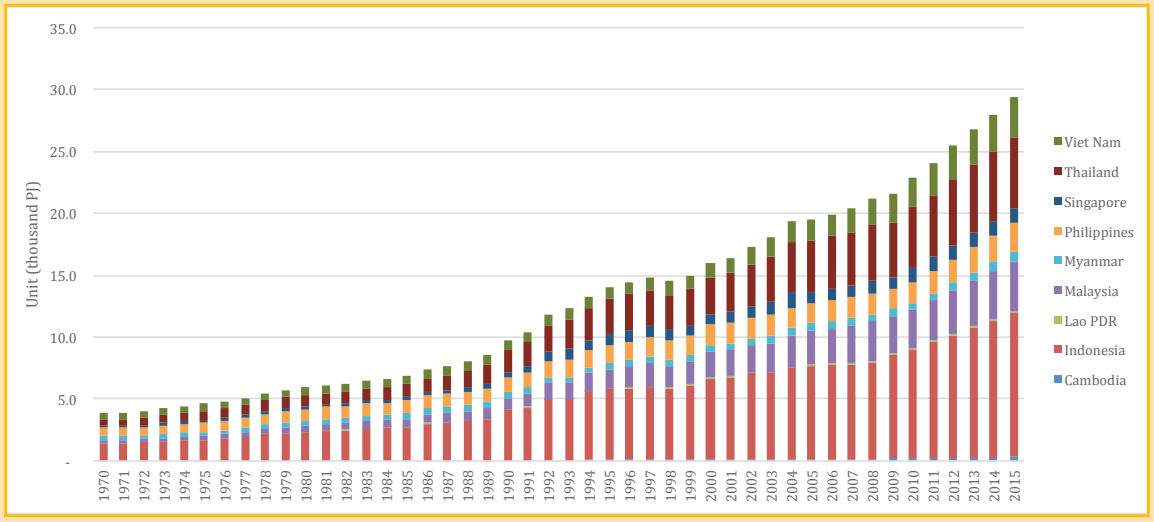
aims to support industry self-regulation towards improved environmental performance.

which means they should have had no cases filed with the Pollution Adjudication Board for

The energy demands in Southeast Asia increased seven-fold in 2015 when compared other urban infrastructure. Indonesia's energy demand has increased more than nine-

Although non-hydro renewables increased threefold to 7.9 thousand PJ in 2015, which is

actual consumption and share had increased more than five-fold in 2010. Indonesia is



the Asia and the Pacific region as a whole (UNEP 2013).

Process efficiency

of the Southeast Asia countries during 2001-2004 (Kao 2013). The labour productivity,

The study classified the ten countries into four categories – high-productivity, labour-intensive, capital-intensive, and low productivity, based on both labour productivity and relatively higher productivity; Myanmar and Cambodia are considered labour-intensive; Singapore and Brunei are capital-intensive; while Thailand, Lao PDR, and Viet Nam have low-productivity.

Using criteria for national productivity and GDP per capita, Kao (2013) classified living standards into another four groups: fast growing-moderate living standards group, represented by Malaysia only; fast growing-low living standards group, including stable growing-high living standards group; and the remaining five countries, Myanmar, Cambodia, Thailand, Laos, and Viet Nam belonging to the fourth group of slow growing-

shift from agriculture to more efficient sectors, rather than improvements within sectors (McKinsey Global Institute 2014). A study from World Bank confirmed that urbanization (Rosenthal and Strange 2003). It is estimated that a city of 200,000 people could be 3 - 8

Since the global financial crisis, most developing countries have experienced a slowing in more seriously affected than others (OECD 2015). It is said that "while demographics eventually begin to taper" (McKinsey Global Institute 2014).

growth rates, have been slowing or reached zero growth as they approach high-income country level status (OECD 2013a). This phenomenon is known as "middle-income trap", faced by economies that grew based on structural transformation, demographic more sustainable productivity-driven growth and technology-intensive development

securing more production efficiency from multinational corporations.

Waste management

Southeast Asia countries, especially plastic bags, e-waste and food waste. Different types of wastes are mixed together leading to unsustainable end-of-pipe management.

	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A
	N/A	N/A	N/A	N/A

Thailand and Malaysia made a significant contribution to this amount with 1.76 and 1.52

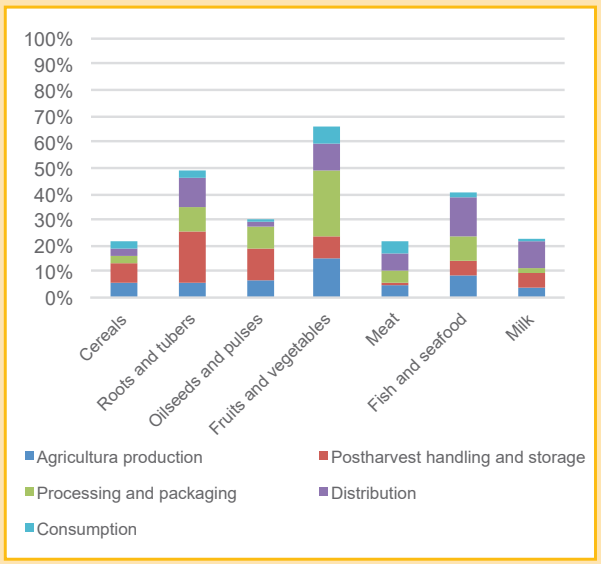
Indonesian Olefin, Aromatic and Plastic Association (Inaplas) found that, on average,

Table 51. Estimated Annual Production of Hazardous Waste in

ASEAN Member State	1993	2000	2010
Indonesia	5,000	12,000	23,000
Malaysia	377	400	1,750
Philppines	115	285	530
Singapore	28	72	135
Viet Nam	460	910	1,560
Thailand	882	2,215	4,120

is 120-170 kg/year, accounting for 26-36 percent of the total per capita human consumption – 460 kg/year. 6-11 kg/year (FAO 2011a).

(49%) and fish and seafood (40.2%).



E-waste management

with minimal improvements leads to an acceleration in the generation of e-waste (GBI

A recent study (United Nations University 2017) showed a 63 percent increase in e-waste. The average domestic e-waste generation in ASEAN in 2014 was 4.64 kg/inhabitant (inh), which is higher than the whole of Asia (3.7 kg/inh) and Africa (1.7 kh/inh) but is much lower compared to the other continents: Americas (12.2 kg/inh), Europe (15.6 kg/inh) and Oceania (15.2 kg/inh) (C.P. et al. 2015). Singapore produced the most e-waste

(16 percent); and, computers, VCD/DVD players, telephones and digital cameras: 57,058

Brunei Darussalam	N/A	N/A
Cambodia	1	16
Indonesia	3	745
Lao PDR	1.2	8
Malaysia	7.6	232
Myanmar	0.4	29
Philppines	1.3	127
Singapore	19.6	110
Thailand	6.4	419
Viet Nam	1.3	116

increased eight-fold between 1-10% while the value during 1999-2011. However, a large amount of used electronical products imported in

identified by GRID-Arendal as new e-waste destinations (Figure 51). Indonesia recycles

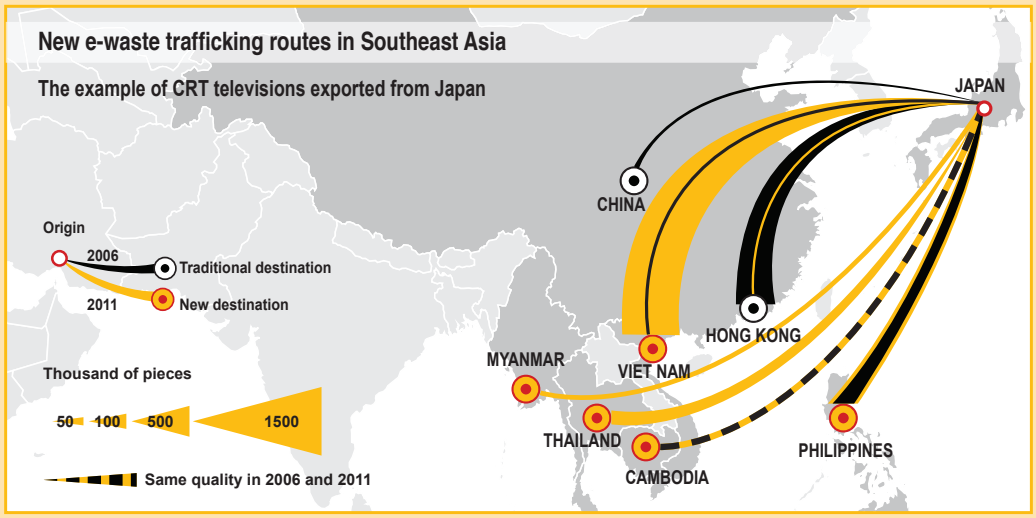


Figure 51. New e-waste trafficking routes in Southeast Asia

properties and infrastructure has become a significant concern in the Philippines,

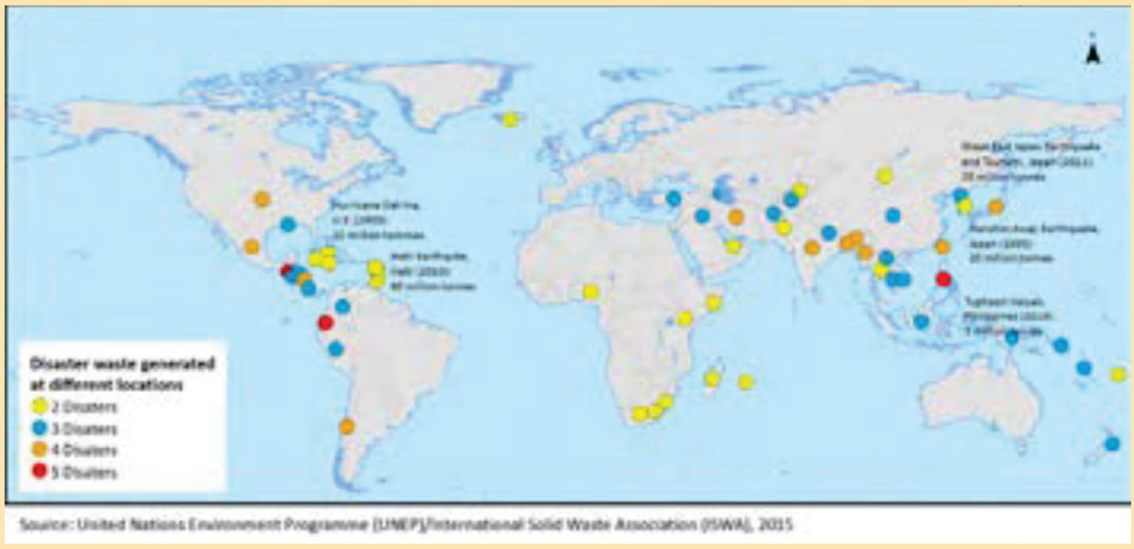


Figure 52. Different locations of disaster waste generation

[illegible]

[illegible] use of, along with insufficiently control over, pesticides in the agricultural sector (Swedish [illegible]

[illegible] (Swedish Chemicals Agency 2016). Pesticides are over-used and their residues have affected trade through the rejection of cross-border shipments (Dao 2016). Under the restricted control of chemical use in Europe and the US, the identification of unacceptably [illegible] to the U.S. for the first eight months of 2016 was only 22,084 tons, 33 percent less when [illegible]

[illegible]

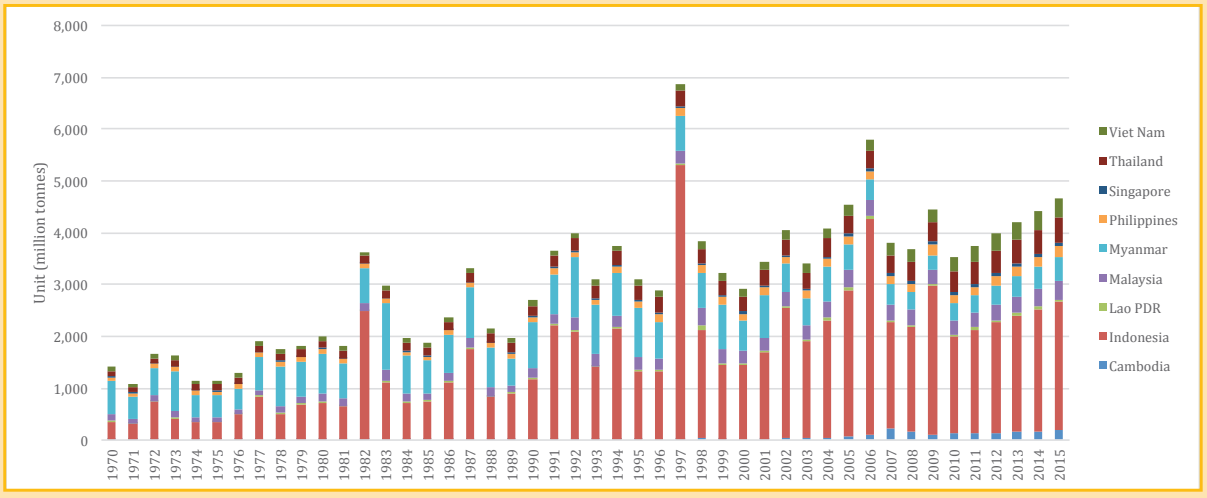
[illegible]	[illegible]					
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

developing countries to manage chemicals are not sufficient (WHO 2009).

Contributions of GHG emissions to global warming

More than half of the emissions resulted from land-use change; emissions decreased agriculture contributed 10-15 percent GHG emissions individually in 2015; while the from industry and energy increased thirteen-fold during this time.



Increasing environmental pollution

demands of rapid urbanization and industrialization is resulting in significant environmental which further affects the availability of clean water supplies whether from surface water

or ground water (UNEP 2004). Uncontrolled dumping leads to leachate run off, methane
Four of the top five countries that contribute the most plastic waste in the world's seas

Increasing health risks

Agreement to recover copper cables during e-waste recycling process, not only results

release, product safety, environmental hazards and as effects from natural disasters

Poor people from the rural areas are considered as the most affected group who might

Environmental crime

Recently, UNEP (2015) published a report discussing the criminal trade behind e-waste

E-waste contains toxic chemicals such as mercury, lead and brominated flame retardants, that categorize e-waste as hazardous and requires proper management (UNEP 2015). At materials of value such as indium and palladium, making e-waste an appealing trade. For this reason, e-waste is often shipped disguised as second-hand goods (UNEP 2015).

Some people benefit from illegal waste shipments to destination countries through payments for the safe disposal of waste and/or recycling certain valuable components (UNEP 2015). However, e-waste is frequently dumped or recycled in an unsafe manner. health. Driven by profit, illegal shipments may include exporters, middlemen and informal

non-existent (UNEP 2015).

Solving the E-waste Problem (StEP) Initiative on tracking and managing hazardous waste conventions and the different national legislations, the management of hazardous waste

Resource and process efficiency

In a recent UNEP report, resource efficiency has been defined as "the ways in which [illegible] resources needed, and emissions and waste generated, per unit of product or service" (Schandl et al. 2015). To address resource efficiency and process efficiency, ASEAN Member States have taken the following initiatives: Green finance to enable the region to invest in more resource- and process-efficient technologies and activities for production. On the consumption/demand side, efforts have focused on green/sustainable public procurement (GPP/SPP) and ecolabelling, green building rating system, and energy [illegible]

Green finance

The financial sector in ASEAN plays a crucial role in encouraging investment shifts from [illegible] resource-efficient technologies and business models (Volz 2016). Green investment in [illegible] Subsidies remain a significant factor of energy market distortion, even if Indonesia, Malaysia and Thailand have made notable reform efforts, through increasing electricity tariffs and reduced subsidies for liquefied petroleum gas (LPG) and oil use. Government actions will be continually needed to address the barriers to facilitate energy efficiency [illegible]

Table 54. Financial institutions in Southeast Asia signed up to global sustainable finance initiatives

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Source: Association for Sustainable & Responsible Investement in Asia (ASRA) 2014

[illegible] been incorporated in very few financial institutions in Asia (Table 56). With increased recognition of the benefits of green finance and the global trend in green investment, [illegible] finance standards for ASEAN at its 25th Forum in Jakarta (San and Nordin 2016).

[illegible] financial systems with sustainable development (Volz 2016). In 2014, Otoritas Jasa

Keuangan (OJK), the financial regulatory [illegible] for Sustainable Finances in Indonesia (2015- [illegible] and Social Risks and a 10-sector checklist [illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	-	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

Green/Sustainable public procurement (GPP/SPP) and ecolabelling

[illegible] Public Procurement (GPP) / Sustainable Public Procurement (SPP) has been considered as one of the most effective tools for [illegible] Public Procurement Initiative (SPPI) officially became UNEP's 10-year framework of [illegible] "Stimulating the demand and supply of sustainable products through green/sustainable public procurement and ecolabelling" (GPPEL/SPPEL) amongst ASEAN+3 countries in [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] certified [illegible]	[illegible] certified [illegible]
[illegible]	N/A	N/A	N/A	N/A	[illegible]	-	N/A	-
[illegible]	N/A	-	[illegible]	N/A	[illegible]	-	N/A	-
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	N/A	-	[illegible]	N/A	[illegible]	-	N/A	-
[illegible]	SIRIM E-L [illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	N/A	-	[illegible]	N/A	[illegible]	-	N/A	-
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	No specific laws		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible]	[illegible]	[illegible] [illegible]		[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

standardization (ISO) has classified environmental labels into three categories: Type I (ISO 14042) – "a voluntary, multiple-criteria based third party program"; Type II (ISO 14021) – "informative environmental self-declaration claims"; and Type III (ISO/TR 14025) – "voluntary programs that provide quantified environmental data" (AIT 2016). Table 57

international WTO Agreements - General Agreement on Tariffs and Trade (GATT) and

encouraging energy efficiency, water efficiency, material efficiency, indoor environmental

		-	-	-
		-	-	-
			-	
		-	-	-
			MYR 5,000 - 45,000	
		-	-	-
			SGD 15,390 - 35,790	
			THB 30,000 - 300,000	
			VND 84,500,000 -	

*Source: Cadoma et al., 2014, *Building & Construction Authority, Singapore 2016*

Southeast Asian countries do not pay enough attention to the first priority – waste avoidance and reduction. Furthermore, there is little separation or pre-treatment at source or during the collection processes (UNEP 2004). While landfill still remains the main way to dispose of solid waste, 3Rs (Reduce, Reuse, Recycle) and waste-to-energy have become popular in the region. Plastic bags, e-waste and food waste are among

National effort on solid waste management

Affairs is responsible for collecting and disposing of municipal waste from municipal area
waste management system, through talks/lectures in schools and communities, through public-private partnerships (PPP) with universities and primary schools; 2) promote eco/environmental clubs and set up waste separation activities in secondary school;

includes open pits and burning at its 76 landfills, before which recycling is carried out
transportation to the dumping-sites (Phalla 2016). The government allocated US$ 1.25 million to sub-national administration to support urban solid waste management in 2015 and another US$ 2 million in 2016. The country is also developing a waste-to-energy

implementation of 3R through waste bank, household and household-like solid waste

rehabilitated local and regional solid waste landfill (Ministry of Environment & Forestry
industry schemes through resource efficiency and cleaner production programmes. It

BC)" to
landfill and sanitary landfill (Sin et al. 2013). Waste disposal by incineration is expected to
(CIDB), which has produced a master plan and standard specifications for building work

		Air-conditioners (focus area),		
		-	-	-
				
		-	-	-
				 
		-	-	-
		Non-ducted ACs, refrigerators		
		All registrable goods including air-		
		monitors. For non-electric		  (for non- 
				

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landfill taxes, launching the pay-as-you-throw schemes, and deposit refund. Efforts

has adopted a 10-year SWM plan, Materials Recovery Facilities (MRF) per barangay or cluster of barangays and municipally-centralized MRF. In 2004, it converted open

(2012-2016) (Department of Environment and Natural Resources et al. 2015). In 1980, Metropolitan Manila started its first sewage treatment plant (STP) project with funding

Singapore has the most efficient waste management programme among all the AMS with

for commercial and industrial premises. In 1979, Singapore adopted the first Waste-to-

90% of non-recyclable Municipal Solid Waste (MSW) with the remaining 10% deposited at the offshore Semakau Landfill (World Bank 2011). A weigh-bill with type and source of

technology, clustering management, public-private partnership, and waste-to-

awareness raising, guidelines & manuals, and waste-specific containers. Community-

distributers and communities to take back end-of-life products including fluorescent

Viet Nam has enacted Decree No. 59/2007/ND-CP in 2007, on solid waste management, Decision No.1440/QD-TTg in 2008 on construction of solid waste treatment facilities in

Decision No. 2149/2009/QD-TTg in 2009, on national strategy for integrated management

The government also invested projects on electricity generation from landfill gas in Phuoc Hiep and Dong Thanh landfills, following the Clean Development Mechanism

in both cities went around by bike to collect waste and promote the “Viet Nam Recycles”

Four of the top five countries in ASEAN contribute 60% of the marine plastic waste – Indonesia, Philippines, Thailand and Viet Nam. AMS needs to have joint efforts between the national governments and multilateral institutions to prioritize ocean-plastic and waste-management agendas (Viet Nam Recycling Platform (VRP) n.d.). Many and retailers, Malaysia has started its “No Plastic Bag Day” every Saturday in Selangor since 2010. Seven years later, all retailers agreed not to provide free single-use plastic

E-waste

recycled “backyard” operations involving open-air burning of copper wire and acid baths

A recent study by Basel Convention Regional Centre for South-East Asia (BCRC-SEA) e-waste . Singapore has 100 licensed facilities, Malaysia 97 partial recovery and 32 full facility, and Thailand 1 regional e-waste facility (Basel Convention Regional Centre for South-East Asia 2016).

To improve its e-waste collection, Viet Nam has implemented the mandatory extended

Food waste

Thailand launched the “Save Food Campaign” in May 2015 and Malaysia in March in Cambodia. During 2011-2013, capacity building activities on reducing post-harvest

Regional effort

At regional level, ASEAN and UNEP International Environmental Technology Centre (UNEP-Electronic Waste (E-waste) Management and (iii) Mercury Waste Inventory. The studies on

of Technology (AIT), while the E-Waste study was conducted by Basel Convention Resource Centre-Southeast Asia (BCRC-SEA). The results and recommendations of the

Table 60. Ratification of international conventions on chemicals management

			Ratification	
		Ratification	Ratification	
			Ratification	
	Ratification	Ratification	Ratification	
			Ratification	
	Ratification		Ratification	
			Ratification	

Chemicals management

Efforts on international chemicals conventions have been made at both national and

National efforts on international conventions

the first three convention for better chemicals management. It is recommended that all countries continue the process of ratification of these conventions so that Target 12.4.1 the status of ratification of each convention in all ASEAN Member States.

conventions; however, the ratification rate is limited.

46. Rotterdam Convention was adopted on 10 September 1998 to promote shared responsibility and cooperative efforts

May 2004. It aims to minimize the risks from the agreed list of POPs through measures to reduce and/or eliminate their

Regional effort

“ASEAN Working Group on Chemicals and Waste (AWGCW)”, whose first meeting was held in 2016 to present updates on ASEAN-UNEP IETC Joint Activities on Waste Management, E-Waste Management and Mercury Inventory in Bali, Indonesia.

13th Meeting of the Conference of the Parties to the Basel Convention (BC COP-13), the 8th Meeting of the Conference of the Parties to the Rotterdam Convention (RC COP-
(SC COP-8) in Geneva, Switzerland during 24 April to 5 May 2017 and submitted to the

Organization (UNIDO) to support member countries in the ESEA region to fulfil their
Pollutants (POPs): “Regional Plan for the introduction of BAT / BEP strategies to industrial
region”(Merck 2012). It was launched on October 5, 2007 during the Inaugural Ministerial Meeting in Bangkok. With financial support from Global Environment Facility (GEF), BAT/

2007-2010 regional work plan, aiming at building the capacity of member countries and

pesticide regulatory management in Southeast Asia (RAP Publication 2012/13). The

Back to 2015, ASEAN and Japan reached an agreement on co-developing the ASEAN-

Cross-cutting responses

Sustainable production and consumption is a cross-cutting issue highly related to other

ASEAN Environmentally Sustainable Cities (ESC) initiative

To stimulate, benchmark, and recognize exemplary efforts on environmental sustainability

in 2011 and 2014. The ASEAN Environment Ministers presented the awards to ten cities/townships/districts in ASEAN that had made exemplary efforts towards environmental

ASEAN ESC Model Cities

capacity for implementing innovative and voluntary bottom-up initiatives, as well as to up of good practices and policies within and across countries. It also promotes city-to- support from the Japan-ASEAN Integration Fund (JAIF).

The ESC Model Cities Year 1 was conducted from 2011-2013, Year 2: 2014-2015, and Year 3: 2016-2017. The program has been implemented in 31 cities in 8 ASEAN Member

ASEAN Eco-Schools Award Programme

This is one of the flagship programmes under the ASEAN Cooperation on Environment preservation through management, commitment and infusion into curriculum, co- Sekolah Lestari/ Environmental Award Programme (Malaysia); and Ecofriend Award, and

Eco-schools Award, initially on a non-competitive basis in 2012, to encourage schools

ASEAN Eco-School Award was s conducted in Malaysia 2012 on 17-18 July 2012 in Kuala Lumpur, Malaysia back-to-back with the ASEAN Eco-Schools Award 2015 Presentation Ceremony was held on 29-30 July 2015 in Nay Pyi Taw, Myanmar, with support from Japan-ASEAN Integration Fund (JAIF) and Hanns Seidel Foundation (HSF). It granted

electric car-sharing will be encouraged.

Towards a zero waste nation

A joint effort from all stakeholders will be made to achieve this blueprint.

[illegible]

[illegible]

[illegible]	[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Hanoi-Amsterdam High	[illegible]

[illegible] Meeting of ASEAN Senior Official on Environment (ASOEN) held in 2016 in Nay [illegible] years back-to-back with the ASEAN Ministers Meeting on Environment.

ASEAN Youth Environment Forum

[illegible] ASEAN Environmental Education Action Plan (AEEAP) 2008-2012, and its successor plan, the AEEAP 2014-2018 (the AEEAP 2014-2018 is now being incorporated into the [illegible]

[illegible]

[illegible] AYEF was held on 22-25 April 2010 in Brunei Darussalam. The activity was co- [illegible] with the theme; "Creating a Climate for Change" was attended by a total of 140 youth [illegible]

AYEF that was held on 2-4 December 2013, with the theme: "'Youth and

AYEF with the theme "Imagine. Create. Change" was conducted on 8-10 April Forum was co-supported by ASEAN plus Three

Now in its fifth leg, the country's National Search for Sustainable and Eco-friendly Schools levels. It is a joint program of the Department of Environment and Natural Resources-Environmental Management Bureau (DENR-EMB), Department of Education (DepEd) and the Commission on Higher Education (CHED). It was first held in 2009 and has since been initiated biennially. The Search has two main objectives: first, to encourage schools

The strengthening of sustainable and eco-friendly schools is also enshrined as priorities in the ASEAN Environmental Education Action Plan for 2014-2018 and Roadmap for the under the National Environmental Education Action Plan (2014-2018).

The EMB-DENR also steers the Philippine Eco-friendly and Healthy Cities Program, as espoused under the ASEAN Environmentally-Sustainable Cities Program. The program is Water and Clean Air Programs. In February 2016, the EMB-DENR has completed (with Green Convergence) the National Search for Local Government Units (LGU) Eco-Champions, and recognized a number of environmentally-sustainable local government units.

AFSCP's main body is the member forum of high-level policy dialogue with support from its Scientific and Technical Advisory Group to identify gaps, provide knowledge base and and liaising with AMS (Akenji 2011). AFSCP has three phases: Phase I - Harvesting low-

hanging fruits (until 2015), Phase II – Resource efficiency; regional harmonization (until 2018) and Phase III – Integrating well-being indicators in measuring development (until

SDGs in ASEAN

process efficiency.

management. It is recommended that all countries proceed to the process of ratification

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[illegible]

[illegible]

- Support policies and programmes to address the rising air pollution levels in the [illegible]
- Since ASEAN cities are major sources of greenhouse gases, support policies and [illegible] reductions in cities across ASEAN, particularly supporting the development of low-[illegible]
- Support policies and programmes that focus on decreasing the growing emission [illegible] and methane levels, a focus of many recent national, regional and international efforts, as well as other potent GHGs, such as chlorofluorocarbons, hydrofluorocarbons, and perfluorocarbons, which are often less prioritized.
- More holistic measures are needed to address the issue of transboundary haze at its [illegible]
- Develop consistent and systematic ways of monitoring air quality and pollution [illegible]
- Establish improved public awareness programmes to better communicate knowledge [illegible]
- Organize frequent consultations and public fora among relevant ASEAN working groups [illegible]

- Land erosion and soil fertility loss from forest conversion emerge as urgent concerns research is needed to fill the knowledge gaps through an updated study of soil status
- Illegal conversion of forest areas for commercial plantations is an ongoing practice of
- Similar to peatlands and peat forests, ASEAN needs to develop a program to manage,
- Organize a regional conference to discuss trends in agriculture and the state of
- Organize an ASEAN-wide forum involving relevant stakeholders including commercial agricultural firms, smallholder farmers, forest dependent communities, environmental

- In order to address the underlying causes of biodiversity loss, mainstream biodiversity
- Develop a minimum standard on Environmental Impact Assessments (EIA), safeguards, impact of, large-scale infrastructure and other investments, including transboundary
- Develop and enforce laws that protect indigenous peoples' ownership and knowledge
- Encourage cooperation and knowledge exchange between ASEAN Member States in
- Undertake a comprehensive analysis of the region's agrobiodiversity, including crops
- Undertake a full assessment of the region's urban ecosystems and biodiversity; establish a regional platform between ASEAN cities of different scales for cooperation
- Integrate environmental education into schools in ASEAN, especially on the topics of

- Develop an effective monitoring and evaluation framework and conduct regular
  and ecosystem issues. Responses must sufficiently address the drivers and pressures,
  end, establish a multi-sectoral regional platform to align biodiversity conservation with

- Expedite improving sources and access of drinking water and sanitation, particularly

- Implement more effective water-related data sharing to support a regional monitoring

- Rapidly close knowledge gaps with respect to risks and impacts of floods and droughts

- Develop more robust regional water quality monitoring and management strategies as well as guidelines for the best-practice on water restoration, water treatment and

- Increase policy dialogue and synergy between regional and national plans on integrated water resources management to enhance basin-wide benefits, minimize adverse

- Build and enhance networks and partnerships of water-related academic institutions to support scientific information and evidence and provide innovative solutions/

- Enable a closer collaboration between the ASEAN's Environment and Fisheries

- Promote policies and programmes to address the rising poverty among the coastal populations in the low elevation coastal zones (LECZ) that continues to be of significant

- ASEAN should develop and implement improved laws and regulations to address the

- Undertake a comprehensive assessment of the region's coral reefs. Facilitate a

- Develop a regional platform to assist AMS to gather data on reef biomass to assess and ensure existing conservation efforts such as Marine Protected Areas are successful.
- Hold consultations among relevant sectoral working groups of ASEAN, not just within [illegible]
- Monitor mangrove degradation and implement remedial actions for rehabilitation of [illegible]
- ASEAN, through its programmes, projects, bodies and working groups, needs to [illegible]

[illegible]

- Promote and adopt more sustainable forms of consumption and production patterns [illegible]
- Support and coordinate the shift towards improvement in the quality of human and other capital to transition towards more sustainable productivity-driven growth and technology-intensive development
- Intensify the “reduce, reuse, recycle” (3R) concept more vigorously through a [illegible]
- Pay special policy attention to management of plastic bags, e-waste and food waste and provide advice and support for customized measures for action on these specific [illegible]
- Encourage all AMS to ratify the four international conventions on chemicals management [illegible]
- Provide relevant policies, regulations, infrastructure and facilities to improve resource [illegible]
- Support and promote green initiatives across ASEAN including green finance, green/sustainable public procurement (GPP/SPP) and ecolabelling, green building rating [illegible]
- Embed sustainable production and consumption across the sectors of economic [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

mainly in the ASCC Blueprint 2025, with strong inter-linkages with relevant elements of

The ASCC Blueprint 2025 envisions "an ASEAN Community that engages and benefits the peoples and is inclusive, sustainable, resilient, and dynamic". Guided by the Vision,

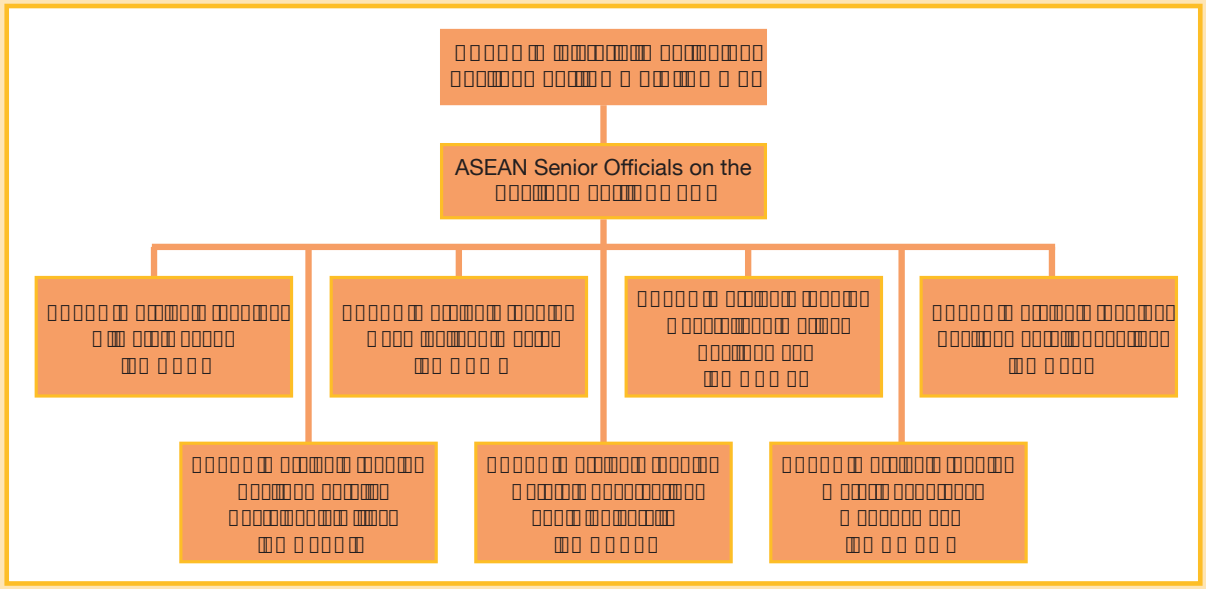
- Conservation and Sustainable Management of Biodiversity and Natural Resources
- Environmentally Sustainable Cities
- Sustainable Climate
- Sustainable Consumption and Production

the above priorities together with other identified priorities into more detailed plans of

The ASEAN Summit, the supreme policy-making body of ASEAN, now meets twice a year in addition to having special or ad-hoc meetings. The ASEAN Leaders provide the vision and broad thrust for co-operation in various sectors, including cooperation on

the three pillars of ASEAN cooperation, to enhance policy coherence, efficiency and work of the different sectors under its purview and on issues which cut across the other Community Councils. The ASEAN Socio-Cultural Community Council will oversee the

The ASEAN Senior Officials on the Environment (ASOEN) meet annually and are comprises heads of environmental ministries/departments/agencies who are responsible



COM meet back-to-back at least once a year.

2006-2020, which was developed with a goal of promoting sustainable management of to support and sustain local livelihoods, reduce risk of fire and associated haze and

In addition, considering the different circumstances and weather patterns in the southern and the northern ASEAN or Mekong sub-regions, two sub-regional institutional frameworks have been established to address the fire and haze situations in the

respective sub-regions. Environment Ministers from Brunei Darussalam, Indonesia, Malaysia, Singapore and Thailand meet regularly as the Sub-Regional Ministerial Steering
and Viet Nam meet regularly as the Sub-Regional Ministerial Steering Committee on Transboundary Haze Pollution in the Mekong Sub-region (MSC Mekong). Both MSCs are
senior officials.

The ASEAN Secretariat provides support for all the above-mentioned institutional bodies.

ASEAN Centre for Biodiversity (ACB)

use of biological diversity and the fair and equitable sharing of benefits arising from the use of such biodiversity in the ASEAN region. ACB performs its mandates through five

- Programme development and policy coordination
- Human and institutional capacity development
- Biodiversity information management
- Communication and public affairs
- Organisational management and resource mobilisation

Officials on the Environment (ASOEN) and the Secretary-General of ASEAN. The GB,

ASEAN's flagship programmes promoting a regional network of national protected areas

As environmental issues are often cross-sectoral in nature and inter-linked with other
disaster management. This is illustrated in Appendix 1: Cross-sectoral references on environment-related issues in the ASEAN Community Blueprint 2025 which maps out

references to environmentally-related issues which would also require close consultation

Education Sectoral Plan

Under the ASEAN Work Plan on Education 2016-2020, there is a Sub-Goal entitled "Complement the efforts of other sectors in meeting the objectives of Education for Sustainable Development (ESD)" and with a priority area of "Strengthening collaboration between the education and other sectors related to ESD". One of the two projects/ activities under this priority area is to strengthen cross-sectoral collaboration and synergies for ESD between environment (ASOEN) and education (SOM-ED) sectors, with Education Action Plan (AAEAP) 2014-2018. The expected output here is to support the conduct of ASEAN Eco-Schools Award Programme and the ASEAN Environmental Education Forum for eco-/sustainable/green schools under the auspices of ASOEN. The second project/activity under the above-stated priority area is to conduct multi- of significant policy implications for governments. The KPI here is the establishment of an exchange, cross-disciplinary learning and collaborative policy-relevant research with an

Health Sectoral Plan

Under the ASEAN Post-2015 Health Development Agenda Work Programme for 2016-2020, there is a specific need to address environmental and disaster health issues. One network by 2020. The identified risks and issues include water and sanitation, solid and

The SDGs and the ASEAN 2025 agenda are viewed as having mutually-reinforcing goals.

and better alignment between the ASEAN 2025 priorities and the key areas as specified

Although the timeline for these two initiatives are slightly different, they do coincide for the first ten years of their respective implementation intervals from 2016 until 2025, while the economic and socio-cultural pillars, there is plenty of room for developing synergies

Nations (2016-2020) and the ASEAN-UN Environment and Climate Change Action Plan 2016-2020, the former of which was adopted at the 8th ASEAN-United Nations (UN) partnership in the next five years.

environment-related matters.

It is also worth noting under the ASEAN Political-Security 2025 Blueprint, there are references to environment-related issues like transnational crimes, including illicit trafficking of wildlife and timber and illegal, unregulated and unreported (IUU) fishing, the movements of hazardous waste as well as transboundary challenges as non- smoke haze pollution from land/forest fires as well as protection and preservation of land-based and marine natural resources.

There is thus a growing recognition on the need for more cross-sectoral and cross-

Community. This is reflected in each of the three blueprints as well as in the Monitoring
for bodies under its purview, amore institutionalized and in-depth cross-sectoral/
certain identified nexus or clusters, where a clearly identified need for consultation and

b. Effective and timely monitoring and evaluation systems

systems to provide effective tracking of progress or otherwise, in the environmental
concerned decision-makers at the ASOEN and ministerial levels, with timely and up to date evidence-based information for good policy making and thus ensuring good progress in implementation of agreed activities. In this regard, efforts are being made to
based on the SMART (Specific, Measurable, Achievable, Realistic and Time-bound)
environmentally related concerns have been identified as areas of mutual or common

c. Better prioritization and implementation mechanisms

Overseeing a very multi-disciplinary and inter-sectoral subject matter like environment
for channeling resources (human, financial, material, etc.) and other necessary inputs to ensure that agreed joint activities are implemented in a timely and effective fashion.

d. Higher commitment and resource mobilization especially to have more

achievement or otherwise is crucial to the success of any development-oriented
the ASEAN Secretariat, which should function as a “nerve center” for processing the

e. Closer synchronization and increased synergy between SOER and ASPEN

While ASEAN has published five volumes of SOER since 1997, there has been no real concerted effort to link the periodic state of the environment reports produced,

enhanced synchronization and resulting synergies of the state-response mechanisms, so that ASEAN will be perceived as truly doing something beneficial to solving the

If achieved, then ASEAN can rightly claim to be a truly people-oriented and people-

B.3. Enhance ASEAN capacity to address non-traditional security issues effectively v. Enhance cooperation in addressing other emerging transnational crimes, including illicit trafficking of wildlife and timber as well as people smuggling, in accordance with relevant international conventions		• ASEAN Strategic Plan on Environment (ASPEN), 2016-2025 • Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry (2016-2025) or SOM-AMAF Plan • Plan on Illicit Trafficking of Wildlife and Timber
ii. Convene special meetings, as and when necessary, at Senior Officials' level to address challenges of transboundary or transnational nature such as haze pollution, pandemics, transnational organized crimes, irregular movement of persons, hazardous waste, oil spill incidents, trafficking in wildlife and timber	Same as above	• Same as above
B.6. Enhance maritime security and promote maritime cooperation in ASEAN region and beyond, through the strengthening of ASEAN-led mechanisms and the adoption of internationally accepted maritime conventions and principles viii. Explore or undertake cooperative activities among parties concerned on marine environmental protection		• relevant ASEAN-SOM work plan • ASPEN
ix. Explore or undertake cooperative activities among parties concerned on marine scientific research and other agreed activities	Same as above	• Same as above • APASTI
vi. Promote closer maritime cooperation in the protection and preservation of the marine environment, including the sustainable use of maritime resources and the protection of biodiversity	Same as above	• Same as above
vii. Expand ASEAN maritime cooperation to effectively combat transnational crimes such as maritime terrorism, smuggling of goods, people and weapons, drug trafficking, trafficking in persons, piracy, hijacking, armed robbery against ships, as well as to address transboundary challenges including oil spill incidents and illegal, unreported, and unregulated fishing, through concrete and practical activities		• ASPEN • SOM-AMAF Plan • Plan on Illicit Trafficking of Wildlife and Timber

[illegible]	[illegible]	[illegible]
viii. Strengthen ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region	[illegible] [illegible] SOMRI	• ASPEN
[illegible] **overflight, in accordance with relevant international laws** iv. Enhance dialogue and cooperation with relevant international organisations, such as the UN, the International Maritime Organization and the International Labour Organization to ensure the effective implementation of conventions and instruments related to maritime cooperation, including, but not limited to, safety of life at sea, the welfare of seafarers, and prevention of pollution from ships	[illegible] [illegible] [illegible]	• ASPEN • ASEAN Transport Strategic Plan
v. Enhance the implementation of the MoU on ASEAN Cooperation Mechanism for Joint Oil Spill Preparedness and Responses as a regional collaborative mechanism to build capacities and capabilities and promote mutual assistance	Same as above	• Same as above
[illegible]		
[illegible] [illegible] iii. Build higher consumer confidence and cross-border commercial transactions by strengthening product safety enforcement, stronger participation of consumer representatives and promotion of sustainableconsumption	ASEAN Committee on Consumer Protection (ACCP)	• Strategic ASEAN Action Plan for Consumer Protection (2016-2025); • ASPEN
[illegible] i. Foster policies supportive of renewable energy and set collective targets accordingly	ASEAN Senior Officials Meeting on Energy(SOME) [illegible]	• ASEAN Plan of Action for Energy Cooperation(APAEC) 2016-2025; • ASPEN
ii. Develop a framework to support the deployment and utilisation of efficient and low carbon technologies, and call for international support to ensure ASEAN access to mechanisms that foster more affordable low carbon technologies	Same as above	• Same as above
iii. Promote the use of biofuels for transportation. This includes ensuring free trade in biofuels within the region and investment in R&D on third-generation biofuels	Same as above Plus STOM	• Same as above plus ASEAN Transport Strategic Plan
vi. Develop new and appropriate technologies, best practices and management systems to ensure food safety and address health/disease and environmental issues, particularly in the fast growing aquaculture, livestock and horticulture subsectors	[illegible] [illegible] [illegible]	• ASPEN • SOM-AMAF Plan • SOMHD Plan

vii. Promote good agriculture practices to minimise the negative effects on natural resources such as soil, forest and water and reduce the greenhouse gas emission	[illegible]	• ASPEN • SOM-AMAF Plan
viii. Promote forest management involving the community living within, and surround[illegible] ing, the forest for the sustainability of the forest and prosperity of the people	Same as above	• Same as above
[illegible] v. Sustainable transport: To formulate a regional policy framework to support sustainable transport which includes low carbon modes of transport, energy efficiency and user-friendly transport initiatives, integration of trans[illegible] port, and land use planning	[illegible]	• ASPEN • ASEAN Transport Strategic Plan
[illegible] iii. Coal and Clean Coal Technology: Enhance the image of coal in ASEAN through promotion of clean coal technologies (CCT) as well as increase in the number of CCT projects by 202045F	[illegible]	• APAEC • ASPEN
iv. Energy Efficiency and Conservation: Reduce energy intensity in ASEAN by 20% as a medium-term target in 2020 and 30% as a long term target in 2025based on 2005 level	Same as above	• Same as above
v. Renewable Energy (RE): Increase the component of RE to a mutually agreed percentage number in the ASEAN Energy Mix (Total Primary Energy Supply) by 2020 Revised strategic measure based on the adopted APAEC 2016-2025 Phase 1: Renewable Energy (RE): Increase the component of RE to an aspirational target of 23% in the ASEAN Energy Mix (Total Primary Energy Supply) by 2025	Same as above	• Same as above
[illegible]	[illegible]	• ASPEN • SOM-AMAF Plan
iv. Increase the resilience to climate change, natural disasters and other shocks	[illegible]	• ASPEN • AADMER Work Programme
vi. Promote sustainable forest management	[illegible]	• ASPEN • SOM-AMAF Plan

[illegible]	[illegible]	[illegible]
[illegible] i. Achieve a more sustainable and inclusive pattern of ASEAN tourism (particularly sub-section c on “increase responsiveness to environmental protection and climate change”)	[illegible]	• ASEAN Tourism Strategic Plan2016-2025; • ASPEN
[illegible] i. Promote environmentally and socially sustainable mineral development	[illegible]	• ASEAN Minerals Cooperation Action Plan (AMCAP)III, Phase 1(2016-2020) • ASPEN
D. A RESILIENT, INCLUSIVE, PEOPLE-ORIENTED AND PEOPLE-CENTERED ASEAN D.3. Public-Private Partnership v. Encourage the ASEAN Infrastructure Fund (AIF) to study ways to act as a catalyst in order to attract private sector funding for financing commercially viable PPP projects that will contribute towards poverty reduction, inclusive growth, environmental sustain ability and regional integration	[illegible] SEOM (AIF)	• ASPEN • SEOM (AIF) Plan
[illegible]		
[illegible] [illegible] i. Institutionalise ASEAN policies on relevant stakeholders’ consultations and engage ment in the work of ASEAN Organs and Bodies including policy making initiatives, integration of impact assessment into policy development, programme development, implementation and monitoring, among others	All ASCC sectoral bodies including [illegible]	All Work Plans under ASCC sectoral bodies including ASPEN
ii. Promote partnership frameworks and guidelines in engaging the stakeholders for the effective implementation of ASEAN initiatives and promotion of public awareness of ASCC programmes and accomplishments	Same as above	Same as above
A.2. Empowered People and Strengthened Institutions i. Increase competencies and resilience of relevant stakeholders with advanced technological and managerial skills so as to improve institutional capacity to address current challenges and emerging trends, such as disasters, pandemics and climate change	Same as above	Same as above

A. SUSTAINABLE C.1. Conservation and Sustainable Management of Biodiversity i. Strengthen regional cooperation to protect, restore, and promote sustainable use of terrestrial ecosystems resources, combat desertification, halt biodiversity loss, and halt and reverse land degradation	ACB/ASOEN ASOF/ SOM-AMAF	Work Plans of the concerned sectoral bodies
ii. Strengthen regional cooperation on sustainable forest management in the context of forest fire prevention and control, including through the implementation of the ASEAN Agreement on Transboundary Haze Pollution, to effectively address transboundary haze pollution	ASOEN/COM-COP/ACB ACDM/AHA SOM-AMAF/ASOF	Work Plans of the concerned sectoral bodies including Roadmap on ASEAN Cooperation towards Transboundary Haze PollutionControl with Means of Implementation(Haze Roadmap)
iii. Promote cooperation for the protection, restoration and sustainable use of coastal and marine environment, respond and deal with the risk of pollution and threats to marine ecosystem and coastal environment, in particular in respect of ecologically sensitive areas	SOM-AMAF,	Work Plans of the concerned sectoral bodies
iv. Adopt good management practices and strengthen policies to address the impact of development projects on coastal and international waters and transboundary environmental issues, including pollution, illegal movement and disposal of hazardous substances and waste, and in doing so, utilise existing regional and international institutions and agreements	ASOEN/ACB SOM-AMAF/ASOF	Work Plans of the concerned sectoral bodies
v. Enhance policy and capacity development and best practices to conserve, develop and sustainably manage marine, wetlands, peatlands, biodiversity, and land and water	COM-COP/ASOEN/ACB SOM-AMAF/ASOF	Work Plans of the concerned sectoral bodies
vi. Promote capacity building in a continuous effort to have sustainable management of ecosystems and natural resources	ASOEN/COM-COP/ACB ACW	Work Plans of the concerned sectoral bodies
vii. Promote cooperation on environmental management towards sustainable use of ecosystems and natural resources through environmental education, community engagement and public outreach	ASOEN/COM-COP/ACB	Work Plans of the concerned sectoral bodies
viii. Strengthen global and regional partnerships and support the implementation of relevant international agreements and frameworks	ASOEN/COM-COP	Haze Roadmap and international conventions which AMS are parties to

ix. Promote the role of the ASEAN Centre for Biodiversity as the centre of excellence in conservation and sustainable use of biodiversity	ACB/ASOEN SOM-AMAF/ASOF	Work Plans of the concerned sectoral bodies
x. Support the full implementation of the Strategic Plan for Biodiversity 2011-2020 and the Aichi Targets	ASOEN/ACB SOM-AMAF/ASOF	ASPEN and other relevant sectoral plans
i. Enhance participatory and integrated approaches in urban planning and management for sustainable urbanisation towards a clean and green ASEAN	ASOEN, STOM,SOME,NTOs,SOMHD (Environmental Health)	Work Plans of the concerned sectoral bodies
ii. Strengthen the capacity of national and local institutions to implement strategies and programmes towards liveable cities	Same as above	Same as above
iii. Promote coordination among relevant sectors to provide access to clean land, green public space, clean air, clean and safe water, and sanitation	Same as above	Same as above
iv. Promote cities that are child-, youths-, the elderly/older persons, and persons with disabilities-friendly through enhanced coordination with relevant sectors to provide sustainable and accessible infrastructure systems	ASOEN, SOM-ED, STOM, SOMY, SOMHD, SOMSWD	Work Plans of the concerned sectoral bodies
v. Strengthen positive economic, social and environmental linkages among urban, peri-urban and rural areas	ASOEN, SOMY, SOMRDPE, SEOM	Work Plans of the concerned sectoral bodies
vi. Strengthen policies and strategies for the effective impact management of population growth and migration on cities	ASOEN, SOMSWD	Work Plans of the concerned sectoral bodies
i. Strengthen human and institutional capacity in implementing climate change adaptation and mitigation, especially on vulnerable and marginalised communities	ASOENN, SOMSWD, SOMRDPE	Work Plans of the concerned sectoral bodies
ii. Facilitate the development of comprehensive and coherent responses to climate change challenges, such as but not limited to multi-stakeholder and multi-sectoral	ASOEN, SOMHD, SOMRDPE, SOMY, SOME, SOM-AMAF/ASOF, AICHR, ACDM, STOM, NTOs	ASOEN, SOMHD, SOMRDPE, SOMY, SOME, SOM-AMAF/ASOF, AICHR, ACDM, STOM, NTOs
iii. Leverage on private sector and community to have access to new and innovative financing mechanisms to address climate change	ASOEN, SOM-AMAF/ASOF, ASEAN-CSR Network, ABAC, SEOM	Work Plans of the concerned sectoral bodies
iv. Strengthen the capacity of sectoral institutions and local governments in conducting Greenhouse Gas (GHG) inventory, and vulnerability assessments and adaptation needs;	Same as above	Same as above
v. Strengthen the effort of government, private sector and community in reducing GHG emission from main activities of development	Same as above	Same as above

vi. Mainstream climate change risk management and GHG emission reduction on sectoral planning	Same as above	Same as above
vii. Strengthen global partnerships and support the implementation of relevant international agreements and frameworks, e.g. the United Nations Framework Convention on Climate Change (UNFCCC)	ASOEN, SOM-AMAF/ASOF	Same as above
i. Strengthen public-private partnerships to promote the adoption of environmentally-sound technologies for maximising resource efficiency	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	Same as above
ii. Promote environmental education (including eco-school practice), awareness, and capacity to adopt sustainable consumption and green lifestyle at all levels	ASOEN, SOM-ED, SOMY, ASEAN Forum on SCP	Same as above
iii. Enhance capacity of relevant stakeholders to implement sound waste management and energy efficiency	ASOEN, SOME, ASEAN Forum on SCP	Same as above
iv. Promote the integration of Sustainable Consumption and Production strategy and best practices into national and regional policies or as part of CSR activities	ASOEN, ASEAN-CSR Network, ASEAN Forum on SCP	Same as above
D. RESILIENT iv. Promote policy coherence and interlinkages, and synergise initiatives on disaster risk reduction, climate change adaptation and mitigation, humanitarian actions and sustainable development		ASPEN AADMER Work Programme
D.3. A Climate Adaptive ASEAN with Enhanced Institutional and Human Capaci	Same as above	Same as above
ii. Promote sound scientific and evidence-based policies on climate change adapta	Same as above plus COST	Work Plans of the concerned sectoral bodies
iii. Promote and consider indigenous and traditional knowledge and practices in responding and adapting to the impacts of climate change	Same as above	Same as above

Older Persons, Persons with Disabilities, Ethnic Minority Groups, Migrant Work i. Encourage risk and vulnerability assessments and other scientific and evidence-based measures for policies and plans to ensure targeted response measures	SOMSWD ASPEN AADMER	Strategic Framework on Social Welfare and Development 2016-2020 ASPEN AADMER Work Programme
ii. Establish platforms to empower people living in at-risk areas to become resilient by reducing their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	Same as above	
Available, Accessible, Affordable and Sustainable ii. Enhance cross-sectoral and cross-pillar coordination to ensure availability and accessibility of affordable energy services at the household level and promote utilisation of renewable energy and green technologies	APAEC ASPEN	APAEC ASPEN
iii. Enhance cross-sectoral and cross-pillar coordination to ensure availability of clean water, sanitation facilities and electricity to households in times of crises	ASOEN - ASEAN Strategic Plan on Environment (ASPEN)	ASPEN ASEAN Post-2015 Health Development Agenda (APHDA)
v. Explore the possibility of establishing financial and insurance mechanisms and strategies for disaster risk reduction and climate change adaptation	ASPEN AADMER	ASPEN AADMER Work Programme
E. DYNAMIC **E.2. Towards a Creative, Innovative and Responsive ASEAN** x. Promote registration of intellectual property rights (IPR), and strengthen its cooperation and implementation in ASEAN in areas such as food safety, medicines, traditional cultural assets and biodiversity-based products	ASOEN/ACB ASPEN	ASPEN and the work plans/initiatives of other relevant sectoral bodies
E.3. Engender a Culture of Entrepreneurship in ASEAN i. Strengthen the supportive environment for socially and environmentally responsible entrepreneurship, such as mentoring, providing seed money, venture and crowd funding, and marketing support	ASPEN	Work Plans of the concerned sectoral bodies

[illegible]

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[illegible]

(Viet Nam) and Nguyễn Bích Loan (Viet Nam).

[illegible]

United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), UN Environment, Japan-ASEAN Integration Fund (JAIF), Institute for Global Environmental [illegible] and ASEAN, USAID ASEAN Connectivity through Trade and Investment, GIZ ASEAN- [illegible]

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