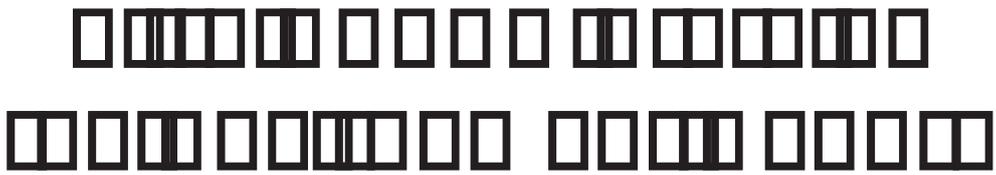


Fifth ASEAN STATE OF THE ENVIRONMENT REPORT



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. The ASEAN Secretariat is based in Jakarta, Indonesia.

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ASEAN State of the Environment Report



ASEAN SOER5 is part of ASEAN's continuous efforts to build a sustainable and resilient ASEAN community. It provides a comprehensive overview of the environmental status of the region and identifies challenges and opportunities for ASEAN to contribute to addressing global environmental issues.

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Population and rapid urbanisation continue to pose significant pressures on socio-economic development. Significant progress has been made to promote and ensure balanced social development and environmental protection for the benefit of the people in our region.

ASEAN SOER5 provides a comprehensive overview of the environmental status of the region and identifies challenges and opportunities for ASEAN to contribute to addressing global environmental issues. It provides a comprehensive overview of the environmental status of the region and identifies challenges and opportunities for ASEAN to contribute to addressing global environmental issues.

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ASEAN SOER5
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ASEAN member states have made significant progress in addressing environmental issues, particularly in the areas of air quality, water management, and waste management. However, challenges remain in the areas of climate change, biodiversity, and marine resources. The report highlights the need for continued cooperation and action to address these challenges and ensure a sustainable future for the region.

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Waste-to-Energy

ASEAN REGIONAL ENVIRONMENTAL STATE OF THE ENVIRONMENT REPORT

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

With Gross Domestic Product (GDP) of US\$2.4 trillion, today ASEAN is the sixth-largest economy in the world since 2010, after recovering from the global and regional financial crisis in 2008. With an integrated market and production base, with a free flow of goods, services, labour, investments and capital, ASEAN has become a major economic and production base in the region.

The ASEAN region is also a major economic and production base in the region. The region has a large population and a high level of economic activity. The region is also a major source of natural resources and is facing significant environmental challenges. The region is also a major source of natural resources and is facing significant environmental challenges.

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 and causes wide-ranging changes in weather patterns. Also given its location on the equator, the ASEAN region is prone to 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, meteorological and other natural disasters are increasing, 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 2011.

These changes have posed significant pressures to various natural resources and the environment. SOER5 follows the drivers-pressures-states and trends-

impacts-responses model (DPSIR). This model states that the pressure from human activities leads to environmental degradation, which in turn leads to environmental impacts, thus requiring a response that affects human activities and the state of the environment.

Energy-related CO2 emissions in the ASEAN region are projected to rise by 61% from 2014 to 2025. As significantly urbanising, ASEAN Member States (AMS) need to urgently seek low-carbon economies, infrastructure and transport. There is also a growing concern over transboundary haze pollution resulting from land and forest fires in the ASEAN region. Transboundary smoke haze in ASEAN is linked to peat fires related to expansion of large-scale agriculture, particularly palm oil plantations, and other forest types.

This is of significant concern for climate change mitigation due to the high carbon stocks in peatlands. The expansion of large-scale agriculture, particularly palm oil plantations, and other forest types, such as peatlands, is a major driver of transboundary haze pollution in the ASEAN region. This is of significant concern for climate change mitigation due to the high carbon stocks in peatlands.

ASEAN is home to the world's 34 biodiversity hotspots and three mega-diverse nations. Biota and ecosystems are under threat from 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 is highlighted in the ASEAN State of the Environment Report.

Population in the ASEAN region is projected to 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 water, sanitation and hygiene (WASH) services, and in reducing the number of people living in slums.

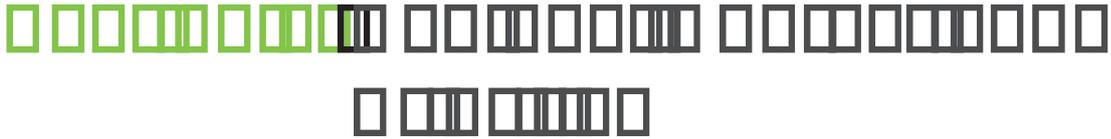
of the built environment into flood-prone areas and serious degradation of catchments. The frequency and intensity of extreme flood and drought events in the region. It also causes alteration of river flow regimes, loss of wetlands and floodplains, and salinity intrusion

currently under pressure as they are overfished and degraded. Key ecosystems such as 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. management, no-take reserves and community-based coastal resources management

an increasingly unsustainable trend across the ASEAN region. Although efficiency and 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 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

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

ASEAN member states have been working together to address environmental challenges in the region. This report provides an overview of the current state of the environment in ASEAN, highlighting key issues and progress made. The report covers various aspects of the environment, including air quality, water resources, land use, and biodiversity. It also discusses the role of governments, businesses, and citizens in addressing these challenges. The report is intended to provide a comprehensive overview of the environmental situation in ASEAN and to inform policy-making and public awareness.



ASEAN Socio-Economic and Environmental Trends

This section provides an overview of the trends in regional socio-economic and environmental issues, and highlights the potential for ASEAN to address these challenges.

ASEAN Socio-Economic and Environmental Trends

The ASEAN region has experienced rapid economic growth and social development over the past few decades. However, this growth has also led to significant environmental challenges, including air pollution, water scarcity, and deforestation.

The ASEAN region is facing a number of environmental challenges, including air pollution, water scarcity, and deforestation.

The state (condition) of the environment to change thus requiring a response that affects the entire region.

and policy framework for ASEAN to effectively implement its mandate, ensure better environmental protection and support regional efforts for coordinated actions at the national level to realize the ASEAN vision.

trends of social, economic and environmental conditions and looking in-depth at six key areas: air quality, water resources, land use, climate change, biodiversity, and disaster risk reduction.

ASEAN Socio-Economic and Environmental Trends

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ASEAN Socio-Economic and Environmental Trends

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

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

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

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.

ASEAN Community Building

ASEAN Community Building

The ASEAN Community is a new era of regional integration and cooperation. It is a community of shared values and interests, built on the foundation of the ASEAN way of life. The ASEAN Community is a community of shared destiny, where the success of one member is the success of all. The ASEAN Community is a community of shared responsibility, where each member has a role to play in building a better future for the region.

The ASEAN Community is built on three pillars, namely ASEAN Political-Security Community (APSC), ASEAN Economic Community (AEC), and ASEAN Socio-Cultural Community (ASCC) that are interconnected and interdependent. The APSC pillar focuses on maintaining peace and stability in the region, while the AEC pillar focuses on promoting economic growth and integration. The ASCC pillar focuses on promoting social justice and equity, and improving the quality of life for all ASEAN citizens.

The ASEAN Community is the result of a five-decade long effort of community building since the signing of the Bangkok Declaration in 1967. It is a testament to the resilience and determination of the ASEAN member states to work together for a better future. The ASEAN Community is a community of shared values and interests, built on the foundation of the ASEAN way of life.

The ASEAN Community Blueprint 2025 charts the future direction of the ASEAN Community into the next decade. It is a forward-looking document that sets out the vision, goals, and actions for the ASEAN Community. The Blueprint 2025 is a roadmap for the ASEAN Community, providing a clear and concise guide for the member states to follow. The Blueprint 2025 is a community of shared values and interests, built on the foundation of the ASEAN way of life.

The ASEAN Community Blueprint 2025 envisions 'an ASEAN Community that engages and benefits the people of the region'. It is a vision of a more integrated, prosperous, and resilient ASEAN region. The Blueprint 2025 is a community of shared values and interests, built on the foundation of the ASEAN way of life. The ASEAN Community Blueprint 2025 is a roadmap for the ASEAN Community, providing a clear and concise guide for the member states to follow.

ASEAN Community Building

The ASEAN region comprises two sub-regions i.e. mainland Southeast Asia (SEA) and Maritime Southeast Asia (MSEA). The SEA region, which includes Myanmar, 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-south mountain ranges and a central plain.

The MSEA region, which includes Indonesia, Philippines, Malaysia, Brunei Darussalam, East Timor and Papua New Guinea, is a volcanic archipelago. The MSEA region is characterized by its diverse topography, ranging from low-land coastal plains to high mountain ranges. The MSEA region is a community of shared values and interests, built on the foundation of the ASEAN way of life.

Located in the fringes of the Indian and the Pacific Oceans, the SEA region has a long coastline and two gulfs (i.e. the Gulf of Tonkin and the Gulf of Thailand) which offer diverse marine resources. The SEA region is a community of shared values and interests, built on the foundation of the ASEAN way of life.

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-known Strait of Malacca connecting the Indian Ocean to the Pacific Ocean.

- The region is also a major hub for international trade and investment. It is home to some of the world's largest and most dynamic economies, and is a key player in the global economy. The region's strategic location and rich natural resources make it an attractive destination for foreign investment and trade.



Figure 1.1: Member States of ASEAN

Climate and Environment

The regional climate is influenced by maritime wind systems, which originate from the Indian Ocean and the Pacific Ocean. The region is 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

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ASEAN Environmental Cooperation

ASEAN member states have been actively engaged in environmental cooperation through various mechanisms. The ASEAN Agreement on Transboundary Haze Pollution (AATHP) is a landmark agreement that addresses the transboundary haze problem caused by land and forest fires in Southeast Asia. Other initiatives include the ASEAN Agreement on the Conservation of Mammals (AACM), the ASEAN Agreement on the Conservation of Seals (AACS), and the ASEAN Agreement on the Conservation of Mammals (AACM). These agreements aim to strengthen regional cooperation and address environmental challenges that transcend national boundaries.

ASEAN Economic Integration

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: Singapore is the world's fourth-highest per capita income, while Laos is the world's 147th-highest. ASEAN has achieved an average annual growth rate of ca. 5% annually since 2010, after recovering from the global and regional financial crisis. The region's economic integration is supported by the ASEAN Free Trade Area (AFTA) and the ASEAN Economic Community (AEC) Blueprint, which aim to create a single market and production base.

ASEAN Environmental Cooperation

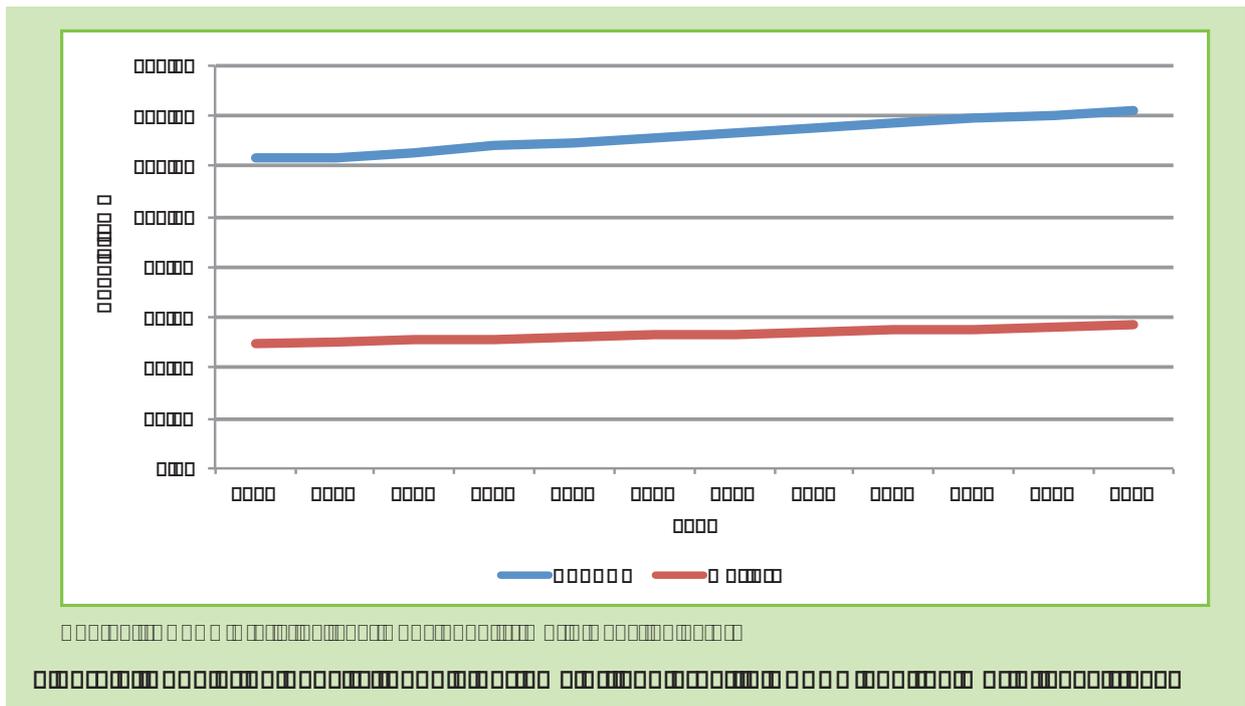
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4. <http://data.worldbank.org/indicator>

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 less than 1 million. ASEAN is home to 20 medium-sized and 21 small cities. This reflects a global trend where smaller urban areas accounts for 47% of the total population. The figure is expected to increase as the population of the ASEAN region grows.

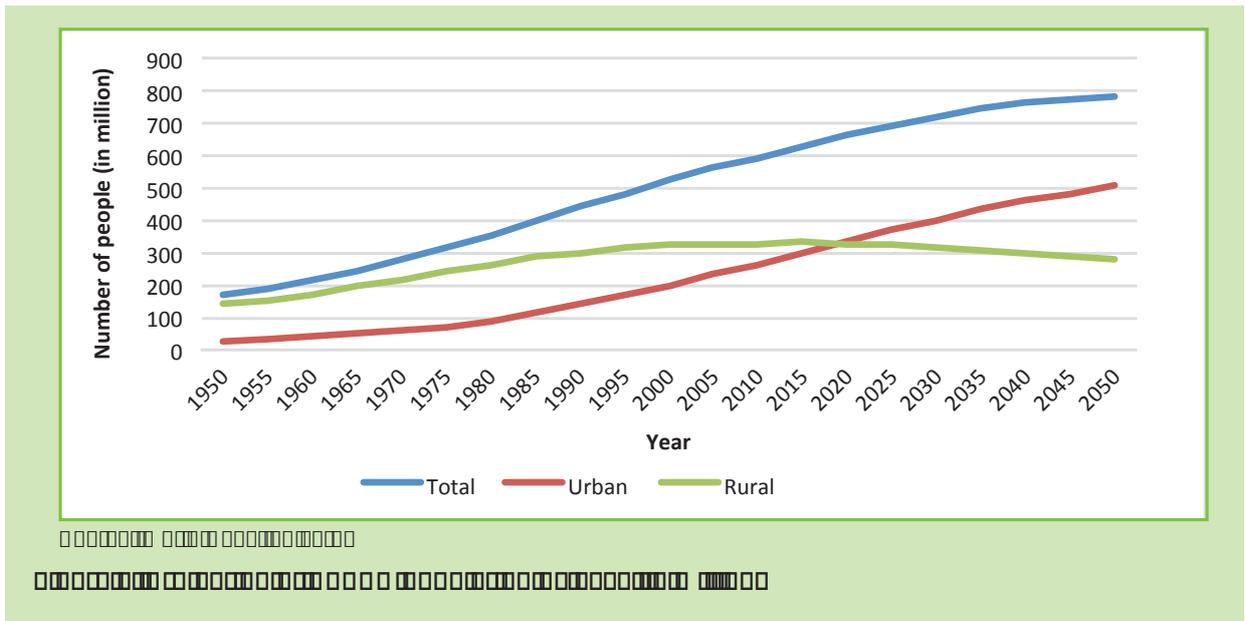
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Effects of urbanization

- Urbanization has led to a significant increase in the number of people living in cities, which has put pressure on infrastructure and resources. This has resulted in a number of challenges, including air pollution, traffic congestion, and a loss of green space. In addition, the rapid growth of cities has led to a loss of biodiversity and a decline in ecosystem productivity.
- Urbanization has also led to a number of social and economic challenges. For example, the concentration of people in cities has led to a number of social problems, including poverty, inequality, and crime. In addition, the rapid growth of cities has led to a number of economic challenges, including a loss of jobs and a decline in the quality of life.

Unsustainable urbanization also has disastrous effects on global ecosystems. The loss of natural habitats and the degradation of ecosystems threaten biodiversity and affect ecosystem productivity by causing loss of habitat, which in turn leads to a decline in the number of species and a loss of ecosystem services.

- Urbanization has also led to a number of environmental challenges. For example, the concentration of people in cities has led to a number of environmental problems, including air pollution, water pollution, and a loss of green space. In addition, the rapid growth of cities has led to a number of environmental challenges, including a loss of biodiversity and a decline in ecosystem productivity.
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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,

ASEAN member states are expected to experience rapid economic growth in the coming years. This growth is projected to lead to the expansion of the middle-class, which is an estimate of 300 million people. The rise of the middle-class and their materialism, consumption power and “wasteful behaviour” cause increasing environmental problems. It is projected that environmental problems will worsen because the middle-class is unlikely to change, as it signifies success and modernization (Sheng, 2011).

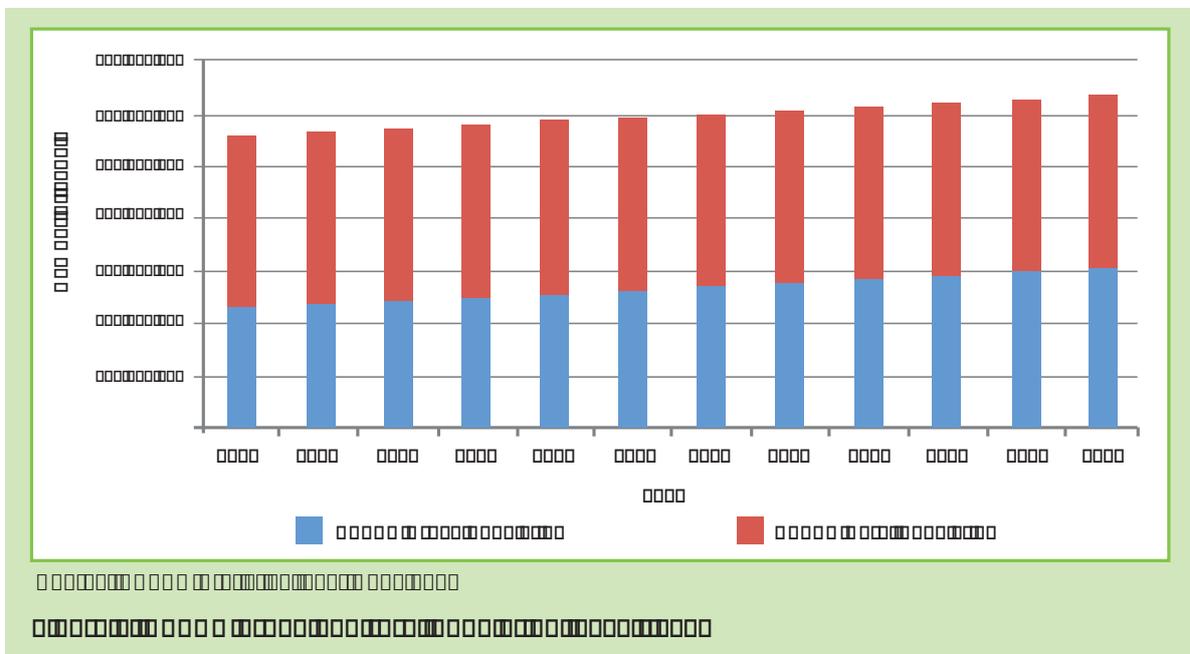
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Environmental problems caused by the middle class

The middle class in East Asia nations – China, Republic of Korea and Japan on finance, tourism, agriculture and other sectors. The middle class is a significant driver of economic growth and modernization. However, their consumption patterns, particularly in terms of energy use, waste generation, and resource consumption, contribute to environmental degradation. The middle class's demand for higher standards of living, including better housing, transportation, and consumer goods, leads to increased carbon emissions and environmental stress. This is particularly evident in East Asia nations – China, Republic of Korea and Japan on finance, tourism, agriculture and other sectors.

Environmental problems caused by the middle class



The middle class's demand for higher standards of living, including better housing, transportation, and consumer goods, leads to increased carbon emissions and environmental stress. This is particularly evident in East Asia nations – China, Republic of Korea and Japan on finance, tourism, agriculture and other sectors.

Internal Migration and Urbanization

Rates of internal migration predominantly from rural to urban areas, as well as intra-urban migration, are high in most ASEAN countries. In Brunei Darussalam, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Cambodia, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Indonesia, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Laos, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Malaysia, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Myanmar, migration is predominantly from rural to urban areas, as well as intra-urban migration. In the Philippines, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Singapore, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Thailand, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Timor-Leste, migration is predominantly from rural to urban areas, as well as intra-urban migration. In Vietnam, migration is predominantly from rural to urban areas, as well as intra-urban migration.

Internal Migration and Urbanization in ASEAN Countries

Country	Internal Migration (2010-2015)	Urbanization (2010-2015)	Internal Migration (2015-2020)	Urbanization (2015-2020)
Brunei Darussalam	High	High	High	High
Cambodia	-	High	High	High
Indonesia	-	High	High	High
Laos	-	High	High	High
Malaysia	High	High	High	High
Myanmar	High	High	High	High
Philippines	High	High	High	High
Singapore	High	High	High	High
Thailand	High	High	High	High
Timor-Leste	High	High	High	High
Vietnam	High	High	High	High
Average	High	High	High	High

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

Besides internal rural-urban migration, intra-ASEAN migrants, formal and informal, are also present. Intra-ASEAN migrants are those who have moved from one ASEAN country to another. Formal migrants are those who have obtained legal status in the host country. Informal migrants are those who have not obtained legal status in the host country. Intra-ASEAN migration is a significant component of the migration process in the region.

ASEAN Migration and Urbanization

ASEAN migration and urbanization are closely linked. Internal migration and urbanization are both driven by economic factors, such as the search for better employment opportunities and higher wages. ASEAN migration and urbanization are also driven by social factors, such as the desire for a better quality of life and access to education and healthcare.

ASEAN Migration and Urbanization

Country	Internal Migration (2010-2015)	Urbanization (2010-2015)	Internal Migration (2015-2020)	Urbanization (2015-2020)
Brunei Darussalam	High	High	High	High
Cambodia	-	High	High	High
Indonesia	-	High	High	High
Laos	-	High	High	High
Malaysia	High	High	High	High
Myanmar	High	High	High	High
Philippines	High	High	High	High
Singapore	High	High	High	High
Thailand	High	High	High	High
Timor-Leste	High	High	High	High
Vietnam	High	High	High	High
Average	High	High	High	High

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

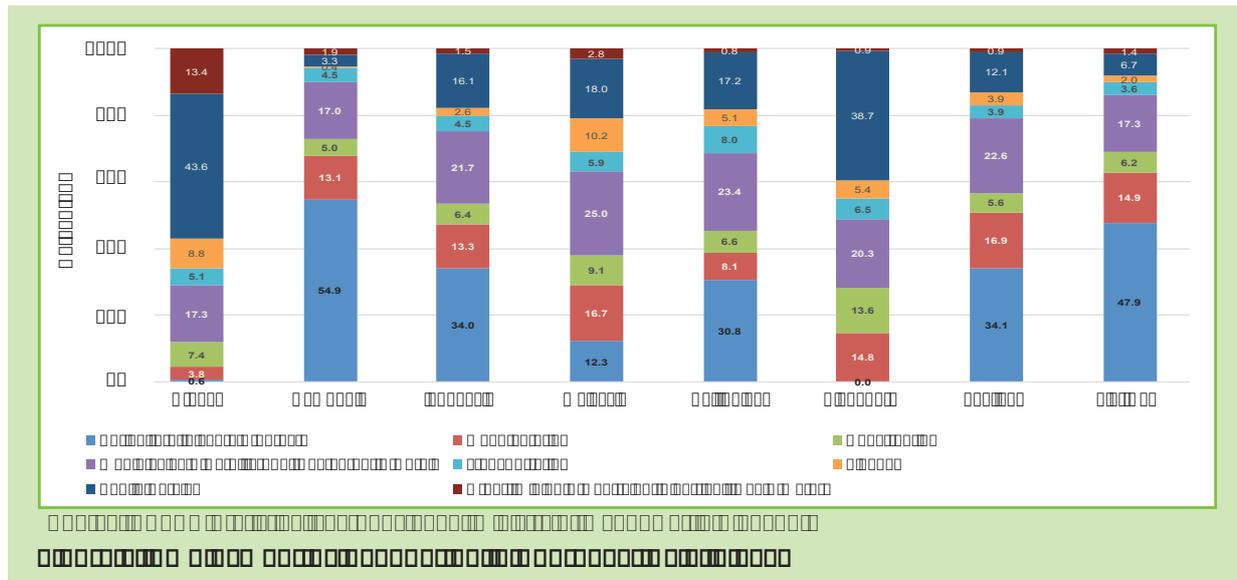
The efforts of AMS to improve wealth distribution have been far less successful. The trend is opposite in Indonesia and Malaysia where the Gini coefficient

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

ASEAN Member State	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Brunei Darussalam	0.25	-	0.25	0.25	0.25	-	0.25	0.25	-	-	-	-	-	-	-
Cambodia	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Indonesia	-	0.45	-	0.45	-	-	-	0.45	-	-	-	-	-	-	-
Malaysia	0.45	-	0.45	-	0.45	-	-	0.45	-	-	0.45	-	0.45	-	0.45
Philippines	0.45	0.45	-	-	0.45	-	-	0.45	-	-	0.45	-	-	-	-
Singapore	-	-	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-
Thailand	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Vietnam	0.45	0.45	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	-	0.45	-

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

to measure income inequality. Cambodia's Gini coefficient is for the period between 2007-2009. However, the trend is opposite in Indonesia and Malaysia where the Gini coefficient is for the period between 2007-2009. 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).



6. The Gini coefficient is a statistical measure of the degree of variation or inequality represented in a set of values, used to measure income inequality.
 7. Malaysia's Gini coefficient is for the period between 2007-2009

II. Gender Equality and Women's Empowerment

Gender inequality in the labor market is a significant barrier to women's economic empowerment. In ASEAN, women tend to work in low-skilled sectors such as clerical and service jobs, while men dominate high-skilled employment. This is due to gender inequalities in education and training opportunities. Women also have less opportunity to access well-paid work and social protection (ASEAN Development Cooperation Centre, 2018).

One of the key reasons why women tend to work in the more labor-intensive areas of the economy is their lower level of education and skills compared to men. Table 5 shows the gender gaps in education and women's participation in high-skilled employment. The gender gap in education is particularly large in Cambodia and Laos, where women have significantly lower literacy rates than men. This lower education level limits women's access to high-paying jobs and social protection. Women working in vulnerable fields of employment, such as garments, agriculture, self-employment and unpaid labor contributing to the family and household, is higher in ASEAN. This type of work is often low-paying and lacks social protection, making women more vulnerable to economic shocks.

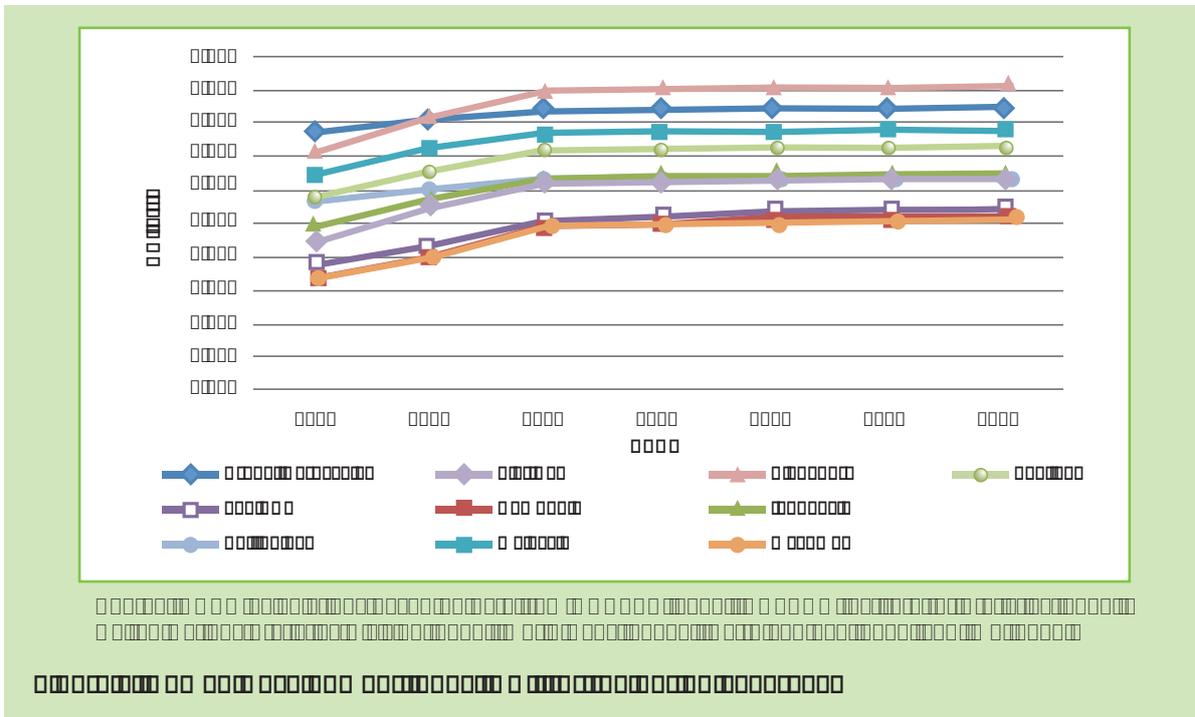
Gender inequalities in the labor market affects national productive capacity and economic growth. When women are not fully employed or are in low-paying jobs, the economy loses out on their potential. Promoting gender equality in the labor market can lead to higher productivity and economic growth. This is because women have similar capabilities to men but are often underemployed. Improving women's access to education, training and high-paying jobs can increase the labor force's skills and productivity, leading to higher national income and economic growth.

Table 5: Gender Gaps in Education and High-Skilled Employment in ASEAN

Country	Literacy Rate (%)		Upper Secondary Enrollment Ratio (%)		High-Skilled Employment (%)	Gender Gap in High-Skilled Employment (%)		Gender Gap in High-Skilled Employment (%)	
	Male	Female	Male	Female		Male	Female	Male	Female
	2018	2018	2018	2018		2018	2018	2018	2018
Brunei Darussalam	-	-	100	100	-	100	100	100	100
Cambodia	75	65	85	75	15	10	15	10	
Indonesia	95	90	95	90	10	5	10	5	
Laos	65	55	75	65	10	5	10	5	
Malaysia	98	95	98	95	15	10	15	10	
Myanmar	70	60	80	70	10	5	10	5	
Philippines	95	90	95	90	10	5	10	5	
Singapore	100	100	100	100	100	100	100	100	
Thailand	95	90	95	90	10	5	10	5	
Vietnam	95	90	95	90	10	5	10	5	

Source: ASEAN Development Cooperation Centre (2018), Gender Equality and Women's Empowerment in ASEAN. Data are based on the most recent available data from the ASEAN Development Cooperation Centre's Gender Equality and Women's Empowerment Index (GEWI).

□ The ASEAN region has experienced a significant increase in agricultural exports, particularly in the area of agricultural products, which has contributed to the overall economic growth of the region. This growth is driven by various factors, including the expansion of agricultural-based export and the changing socio-economic circumstances in ASEAN.



□

Regional economic integration has boosted the trade flow among AMS, with intra-ASEAN trade value having doubled between the period 2005-2014, and accounting for a significant portion of the total trade flow.

□ 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 have led to a significant increase in agricultural exports, particularly in the area of agricultural products, which has contributed to the overall economic growth of the region.

□ 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. This growth is driven by various factors, including the expansion of agricultural-based export and the changing socio-economic circumstances in ASEAN.

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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

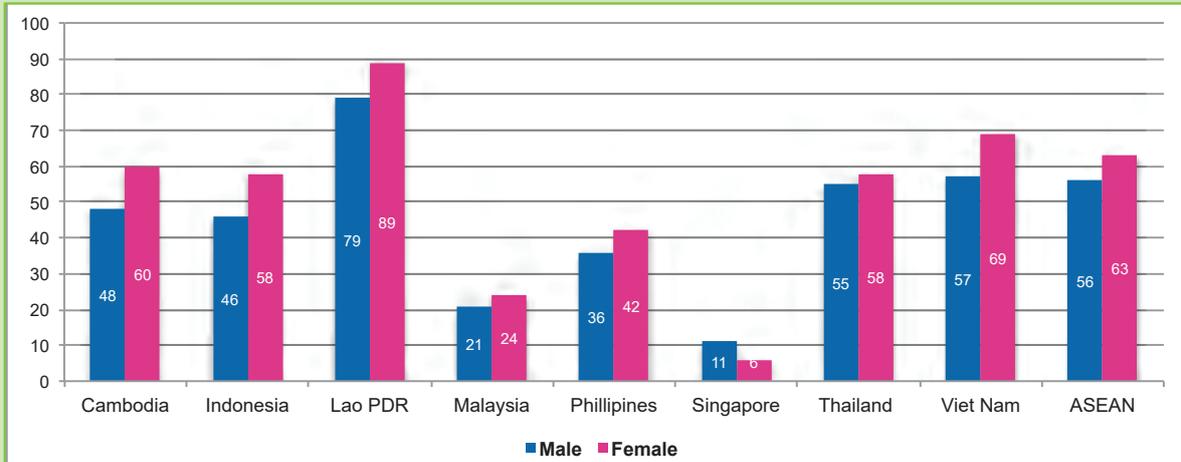


Figure 1: Investment in AMS by gender, 2015. Source: ASEAN Secretariat (2013). Note: Data is based on investment in AMS by gender for the year 2015. The Y-axis represents the percentage of investment in AMS by gender. The X-axis represents the countries and the ASEAN average. The legend indicates Male (blue) and Female (pink).

The expansion of commercial agriculture including large-scale land concessions is resulting in a number of social and ecological impacts such as land conflicts, deforestation, and loss of biodiversity. 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 most profitable agricultural activities are those that require the least amount of land and labor. Smallholder agriculturists and agro-industrial companies such as oil palm plantations are the most common types of agricultural activities in the region.

The three “economic corridors” supported by the Asian Development Bank (ADB), the ASEAN Economic Community (AEC), and the ASEAN Free Trade Area (AFTA), are the three main corridors for trade and investment in the region. The AEC is the main corridor for trade and investment in the region. The AFTA is the main corridor for trade and investment in the region. The AEC and AFTA are the two main corridors for trade and investment in the region.

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- Expansion of agro-fuel crops affects traditional landowners and indigenous communities with land scarcity, land conflicts and rising land prices (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 ...

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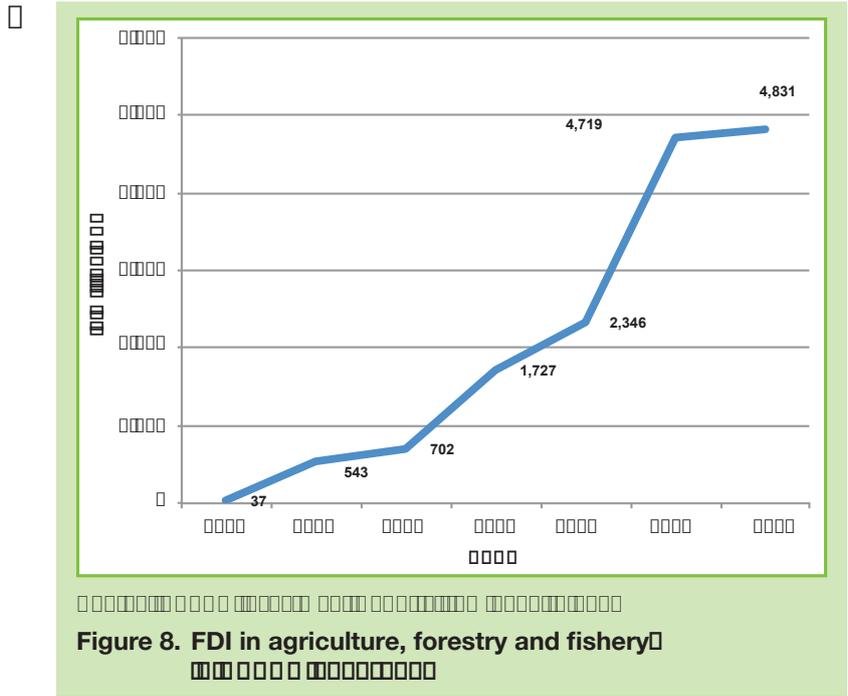
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- Expansion of agro-fuel crops affects traditional landowners and indigenous communities with land scarcity, land conflicts and rising land prices ... different coastal and marine resources abound, including coral reefs, mangroves, seagrass beds, pelagic fisheries, demersal fisheries, and seabed minerals. The ... hazards and physical processes, in particular, affecting the many major towns and ...

8. FDI in agriculture, forestry and fishery

FDI in agriculture, forestry and fishery has shown a significant upward trend over the period from 2000 to 2014. The values are 37, 543, 702, 1,727, 2,346, 4,719, and 4,831 million USD respectively. This indicates a strong and sustained interest in these sectors, particularly in the latter half of the period shown.



The graph illustrates a sharp increase in FDI starting in 2003, with a particularly notable jump in 2005. The values for 2005 and 2006 are very close, suggesting a plateau or a very slight decline in the final year shown. This growth is likely driven by increasing global demand for agricultural products and the need for modernization and investment in these sectors.

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

given that they are in the top five coal producing nations, with annual production of coal and oil is expected to rise in the coming 25 years.

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

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Source: ASEAN Secretariat, ASEAN State of the Environment Report, 2014.

ASEAN countries have made significant progress in reducing greenhouse gas emissions. The region's total emissions have decreased by 1.5% since 2005, with a 10% reduction in emissions from the transport sector. This is due to a combination of factors, including the implementation of energy efficiency measures, the promotion of renewable energy, and the adoption of low-carbon technologies. The region's emissions are also being offset by the growing forest area, which has increased by 1.5% since 2005. This is due to the implementation of forest management plans, the promotion of sustainable forestry, and the adoption of low-carbon technologies. The region's emissions are also being offset by the growing forest area, which has increased by 1.5% since 2005.

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Indicator	2005	2010	2015	2020
Total emissions	100	98.5	97	95.5
Transport emissions	100	90	80	70
Energy efficiency	100	105	110	115
Renewable energy	100	105	110	115
Low-carbon technologies	100	105	110	115
Forest area	100	101.5	103	104.5

Renewable energy and energy efficiency

ASEAN countries have made significant progress in increasing the share of renewable energy in their energy mix. The region's renewable energy share has increased from 15% in 2005 to 25% in 2020. This is due to a combination of factors, including the implementation of renewable energy policies, the promotion of renewable energy technologies, and the adoption of low-carbon technologies. The region's energy efficiency has also improved, with a 10% reduction in energy intensity since 2005. This is due to the implementation of energy efficiency measures, the promotion of energy efficiency technologies, and the adoption of low-carbon technologies.

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Energy production in the ASEAN region has also become more efficient. The amount of energy produced per unit of GDP has increased by 10% since 2005. This is due to a combination of factors, including the implementation of energy efficiency measures, the promotion of energy efficiency technologies, and the adoption of low-carbon technologies. The region's energy efficiency has also improved, with a 10% reduction in energy intensity since 2005. This is due to the implementation of energy efficiency measures, the promotion of energy efficiency technologies, and the adoption of low-carbon technologies.

Industrialization and materials consumption

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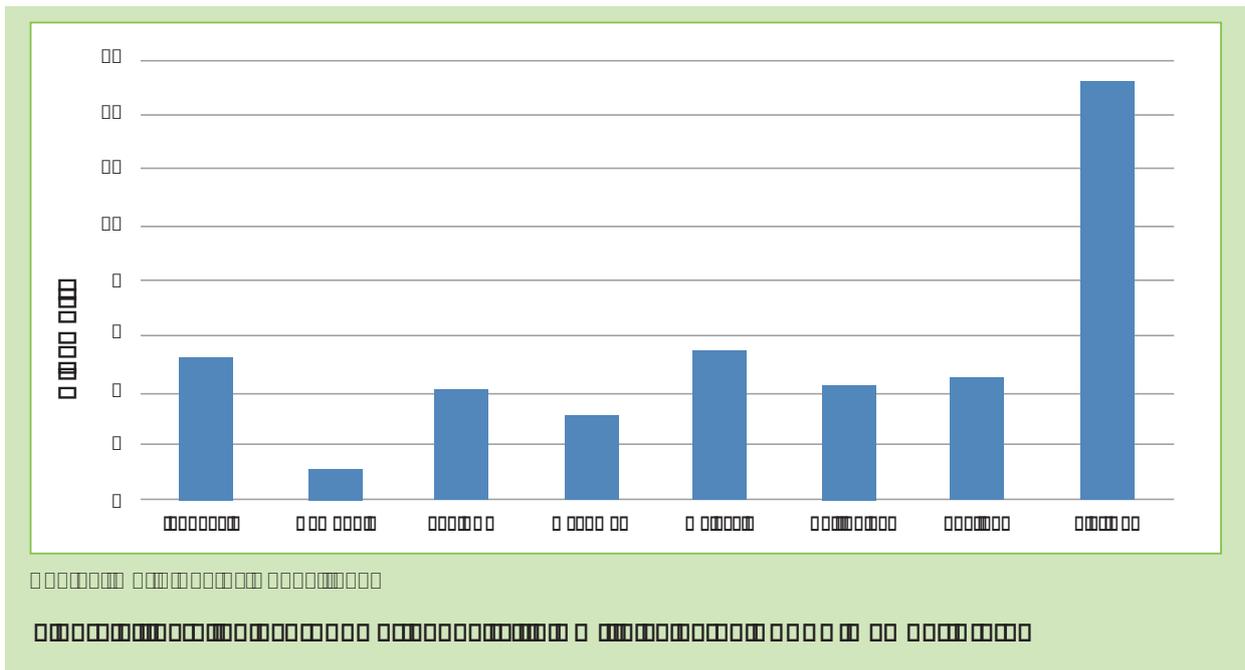
11. <http://www.globalforestwatch.org>

water, food, energy, transport and infrastructure for solid waste management. Efforts to improve the efficiency of resource use in these sectors are essential for sustainable development. The consumption of materials such as biomass, fossil fuel, metal ores and non-metallic minerals is increasing rapidly in the region, particularly in Northeast Asia, particularly China and Japan, the expanding middle-class in ASEAN and the growing economies in the region. This is leading to increased resource use and environmental degradation. It takes 3.5 kg of materials to produce one US\$ of GDP in ASEAN, which is significantly higher than in other regions. This indicates that the region is using resources inefficiently. It is important to improve resource efficiency to reduce environmental impacts and ensure sustainable development.

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Water Use Intensity

Figure 9 shows water-use intensity²⁰ in the AMS, indicating improvements in efficiency of use primarily in agriculture and industry. The chart shows that water-use intensity has decreased significantly in most sectors, with the most notable improvements in agriculture and industry. This is a positive trend, indicating that the region is becoming more efficient in its use of water resources. However, there is still a need for further improvements, particularly in the power generation sector, where water-use intensity remains high. Overall, the data suggests that the region is making progress in improving water efficiency, but there is still work to be done.



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²⁰ Water use intensity is defined as the volume of water consumed per unit of GDP.

Sea level rise (1-3 mm per year) (UNISDR, 2010). Coastal flooding poses the greatest threat to coastal communities and infrastructure in the ASEAN region. Coastal flooding is expected to increase significantly in the coming decades due to rising sea levels and increased storm frequency.

- **Terrestrial Ecosystems** are sensitive to variation in temperature and rainfall. Climate change effects on plants and animals are expected to be significant. Many plant species would be affected by greenhouse gas emissions (see chapter 2.2 Land). Climate change is also expected to affect the well-being of coastal inhabitants (see chapter 2.3 Coastal Resources and Ecosystems).

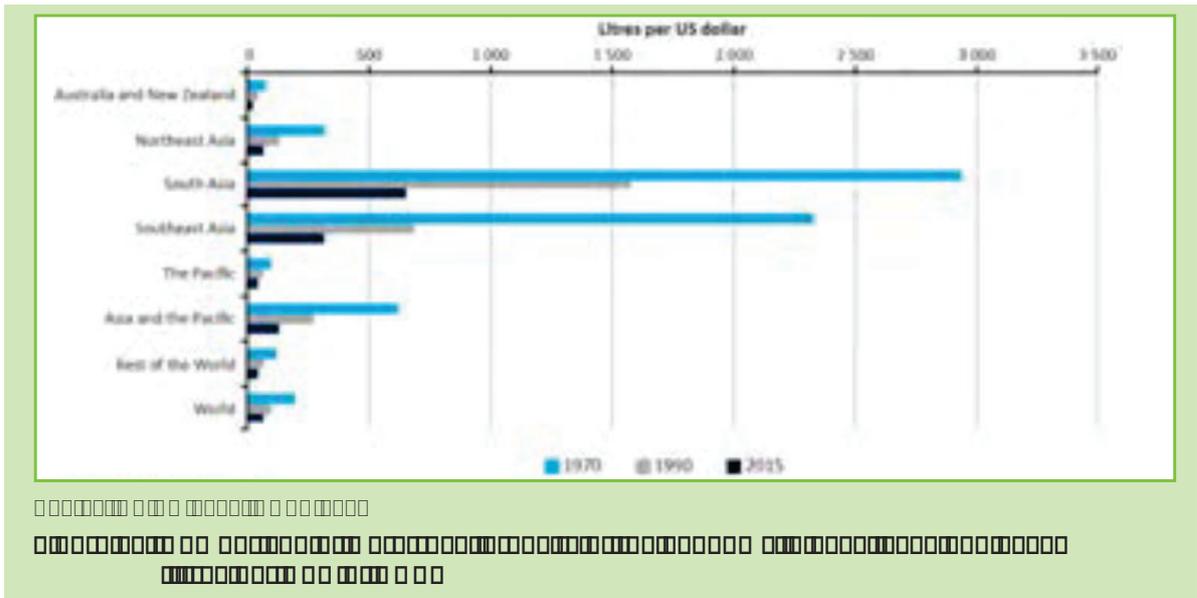
Freshwater resources are expected to be significantly affected by climate change, including changes in precipitation patterns, as well as leading to increasing frequency of extreme flood and drought events in the ASEAN region. Climate change also causes alteration of river flow regimes, along with the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

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 change. ENSO is a natural climate cycle that occurs in the Equatorial Pacific Ocean, influences global temperatures and precipitation, and can therefore significantly impact human societies and ecosystems. ENSO events have historically had large-scale social and economic impacts on millions of people across parts of Africa, North and South America, Australia, Asia, and the Pacific.

- **ENSO Impacts** 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, 2015).

During 2015-2016, there was a very strong El Niño with serious effects on water resources and ecosystems in the ASEAN region. The 2015-2016 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 people across the ASEAN region, including in parts of the ASEAN region, through 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% chance of a strong El Niño event in 2017.

- **Climate Hazards** are expected to increase significantly in the coming decades. The most significant hazards are floods (hydrological hazard type), tropical storms and heat waves (meteorological hazards), droughts and wildfires (climatological hazards), earthquakes, tsunamis, and landslides. The most significant hazards are floods, tropical storms and landslides (see Figure 10).



□

□

Region	Disaster Type	Frequency	Intensity	Frequency	Intensity	Frequency	Intensity
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■
□	□	■	■	■	■	■	■

□

The frequency and intensity of hydro-, meteoro- and climato-logical disasters has increased significantly over the past few decades. This is due to a combination of factors, including 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,

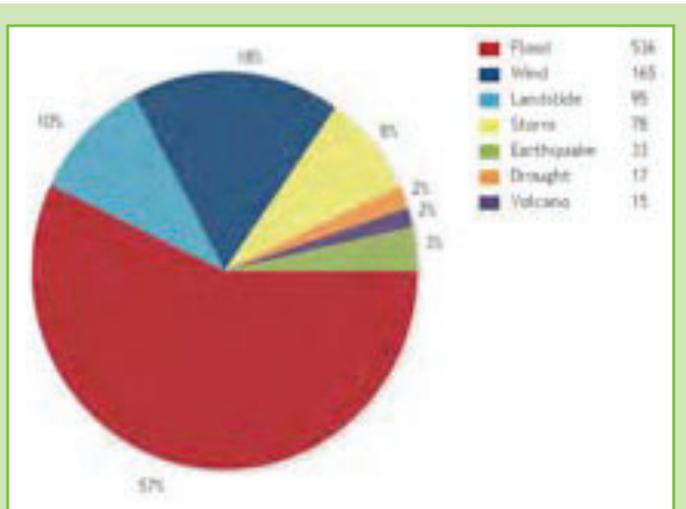


Figure 11. The number of hazard events by hazard type

Figure 11. The number of hazard events by hazard type

Thailand suffered over

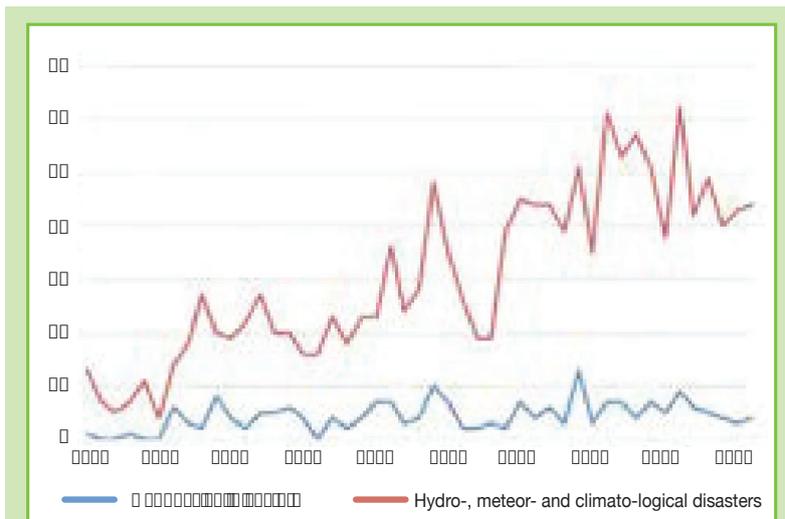
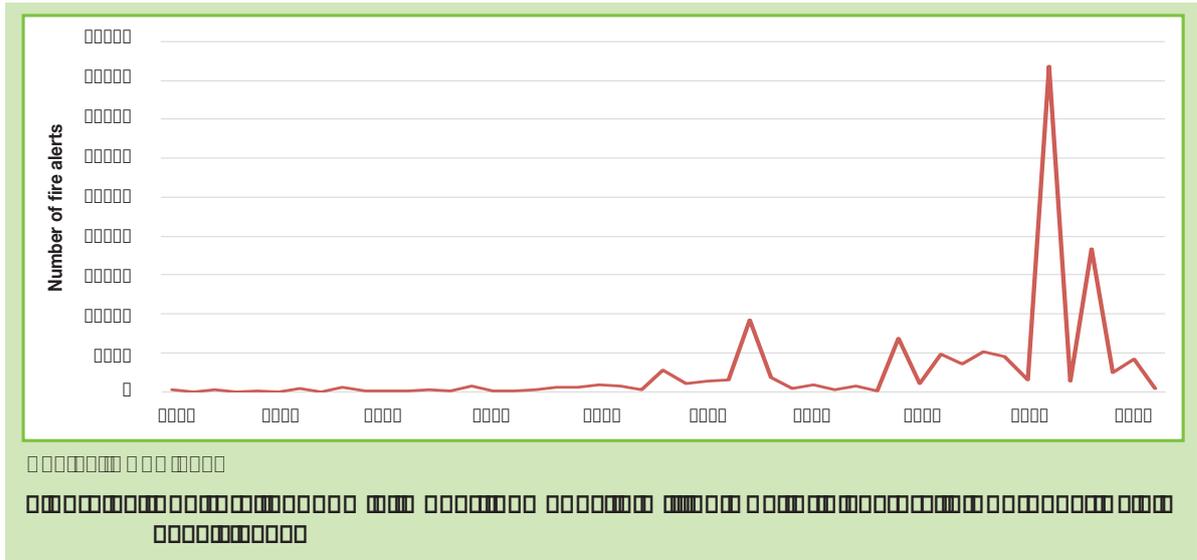


Figure 12. The number of hydro-, meteor- and climate-logical disasters in Thailand from 2000 to 2010

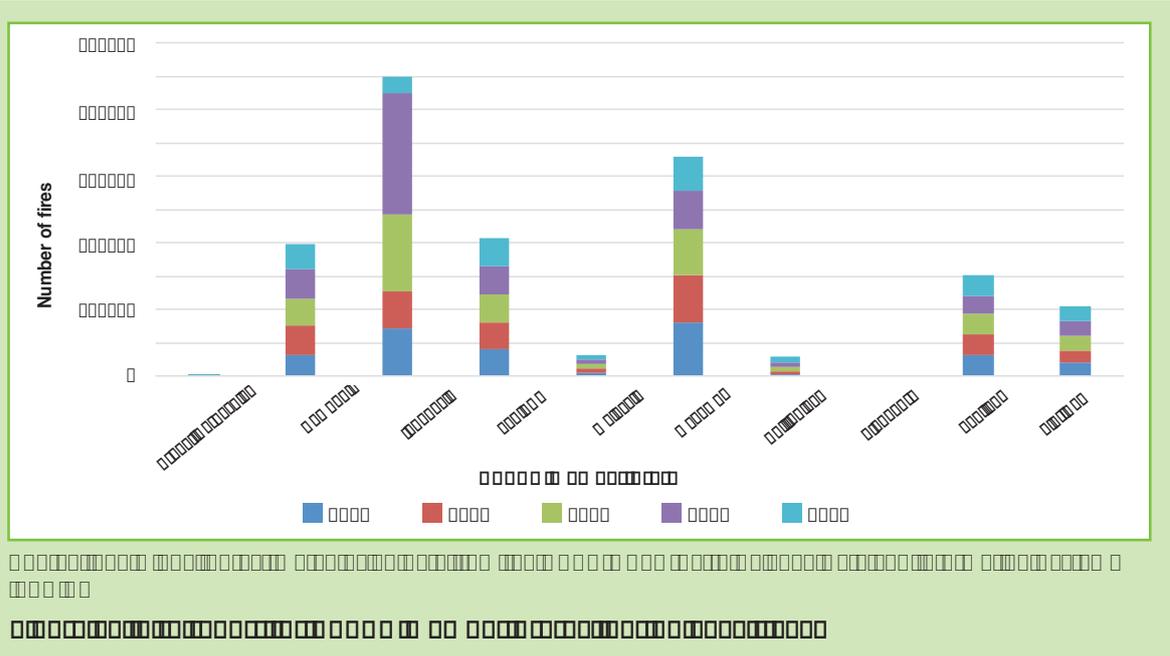
Thailand suffered over 100,000 deaths and 10 million people were displaced nationwide, flood in 2011 was the most significant disaster. The number of hydro-, meteor- and climate-logical disasters in Thailand has increased significantly since 2005, with a major peak in 2011. This increase is likely due to a combination of factors, including climate change and land use changes. The 2011 flood was particularly devastating, causing over 100,000 deaths and displacing 10 million people. This highlights the need for improved disaster preparedness and response mechanisms in Thailand and other countries in the region.

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) in 2003. The agreement aims to reduce transboundary haze pollution in Southeast Asia. It requires member states to take measures to prevent and control fires that cause transboundary haze pollution. The agreement also provides for a mechanism for resolving disputes between member states. In 2006, Indonesia ratified the agreement, which was a significant step towards addressing the haze problem in the region. However, the agreement has not been fully implemented, and haze pollution remains a major environmental issue in Southeast Asia.



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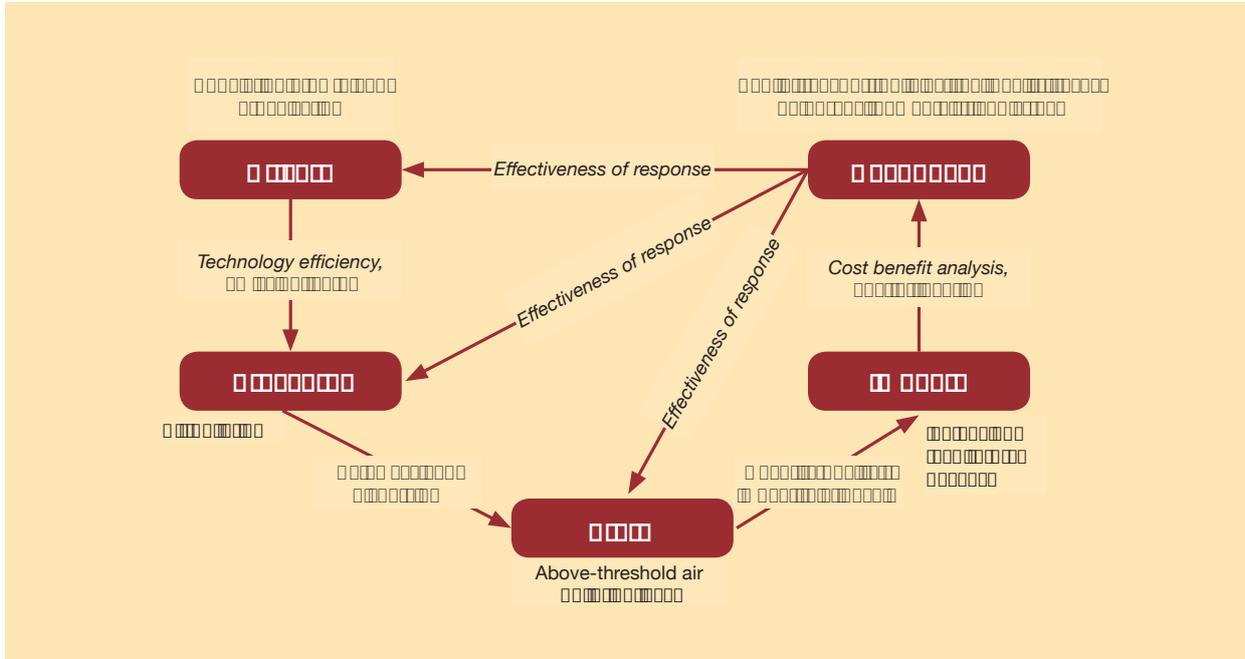
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offers a causal framework for describing the interactions between society and the environment. The diagram illustrates the complex interlinkages among various factors affecting natural resources and environment. The framework, which more accurately reflects the complexity of the environmental systems.

and consequences of environmental problems. Compared to PSR (Pressure-State-Impacts) framework, this framework 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 ecosystems is a function of the effectiveness of the Response.



POOR AIR QUALITY IS CAUSING LONG-TERM AND WIDE-SPREAD HEALTH PROBLEMS IN VIETNAM

Poor air quality is causing long-term and wide-spread health problems in Vietnam. The air quality index (AQI) in Hanoi, the capital, is consistently in the 'unhealthy' range, with many days in the 'very unhealthy' and 'hazardous' categories. This is due to a combination of factors, including traffic, industrial emissions, and natural sources like dust storms. The health impacts are significant, with increased rates of respiratory and cardiovascular diseases, and a higher burden of premature deaths. The government has implemented various measures to improve air quality, but more action is needed to address the root causes of pollution.

ASEAN Air Quality and Climate Change

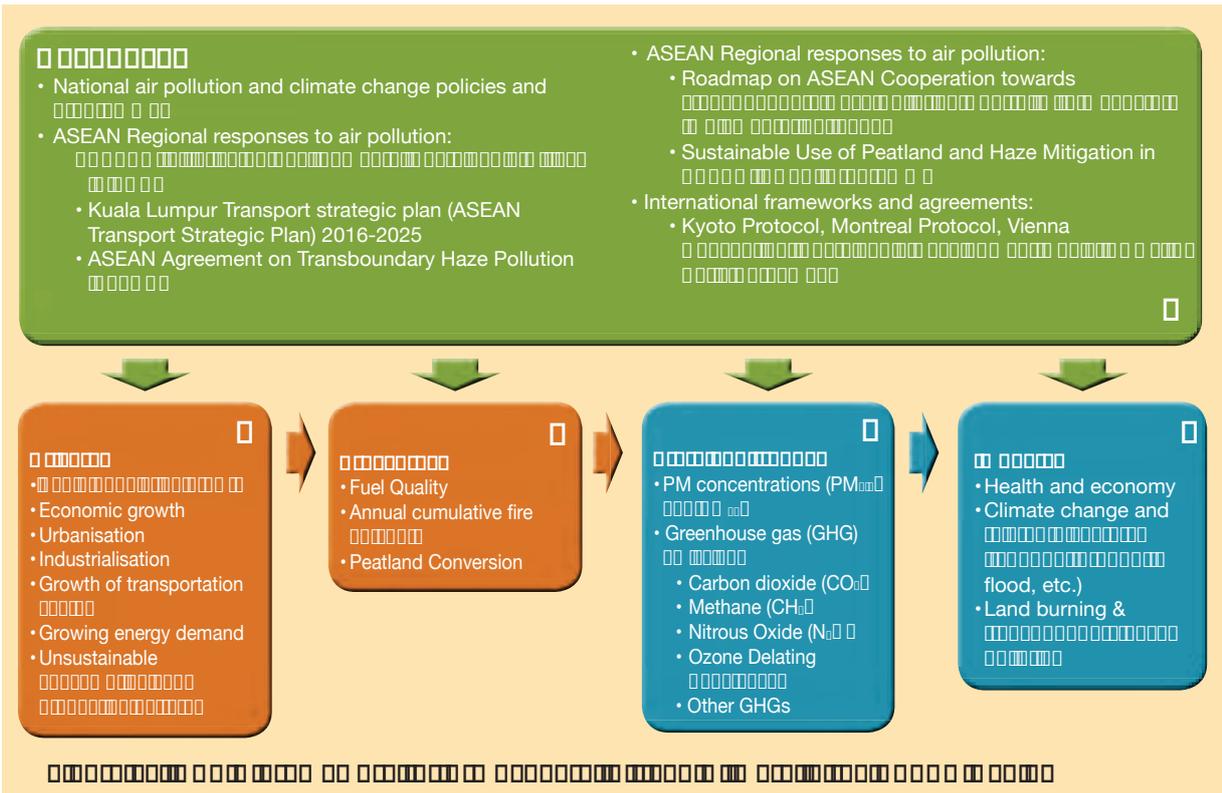
Air Quality

- Air pollution levels are increasing in the region with the energy sector being responsible for the largest carbon dioxide (CO2) emissions; it is predicted that energy-related CO2 emission will continue to rise significantly in the coming years.
- 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 a major environmental and health concern. Transboundary smoke haze in ASEAN is linked to peat fires related to expansion of large-scale agriculture and forestry. This is a significant source of greenhouse gas emissions and air pollution. The ASEAN region is also experiencing increasing levels of air pollution from urban areas, particularly in major cities.
- There is a need for improved air quality monitoring and standards which are consistent with WHO guidelines and regional air quality objectives.

Urban Air Quality

Efforts to satisfy socio-economic development demands in the ASEAN region are posing significant challenges to the environment and the health and well-being of our global citizens. Changing trends and patterns of activity and urbanization are contributing to increasing levels of air pollution, particularly in major cities. This is being further amplified by additional pressures from climate change and transboundary haze pollution.

Urban air pollution is a major environmental and health concern in the ASEAN region. 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 global scale, 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 to 100% in some cases.



Poor air quality is causing long-term and wide-ranging health and economic impacts. It is also contributing to climate change, which in turn is causing more frequent and severe hydro-meteorological hazard-based disasters.

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

Transboundary haze pollution resulting from land and forest fires in the ASEAN region is a major concern. AMS are also engaging in international efforts to tackle the haze pollution problem, including the full ratification of the ASEAN Agreement on Transboundary Haze Pollution.

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

Industrialization

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

Table 1: Industrialization and Carbon Emissions in ASEAN (2004-2014)

Country	2004	2014
Indonesia	1.2	2.1
Malaysia	0.8	1.5
Philippines	0.5	1.0
Singapore	0.1	0.2
Thailand	0.7	1.3
Vietnam	0.3	1.1
Myanmar	0.2	1.0
Lao PDR	0.1	0.4
Cambodia	0.1	0.4
Burma	0.1	0.4
Totals	3.7	7.9

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

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Road transportation generates about 89% of total transport-related emissions in the region.

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

Key trends

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

Fuel quality

Annual cumulative fire hotspots

could likely indicate serious fire

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

four-level alert system (Table 9) in

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.

NOAA-18 satellite (2010-2015) and NOAA-19 for 2016

Country	2010	2011	2012	2013	2014	2015	2016
Indonesia	-	-	-	-	-	-	-
Malaysia	100000	100000	100000	100000	100000	100000	100000
Thailand	100000	100000	100000	100000	100000	100000	100000
Philippines	100000	100000	100000	100000	100000	100000	100000
Vietnam	100000	100000	100000	100000	100000	100000	100000
Laos	100000	100000	100000	100000	100000	100000	100000
Myanmar	100000	100000	100000	100000	100000	100000	100000
Singapore	100000	100000	100000	100000	100000	100000	100000
Brunei	100000	100000	100000	100000	100000	100000	100000
Taiwan	100000	100000	100000	100000	100000	100000	100000
Japan	100000	100000	100000	100000	100000	100000	100000
South Korea	100000	100000	100000	100000	100000	100000	100000
China	100000	100000	100000	100000	100000	100000	100000
India	100000	100000	100000	100000	100000	100000	100000
Australia	100000	100000	100000	100000	100000	100000	100000
USA	100000	100000	100000	100000	100000	100000	100000
EU	100000	100000	100000	100000	100000	100000	100000
Other	100000	100000	100000	100000	100000	100000	100000

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

Land use conversion

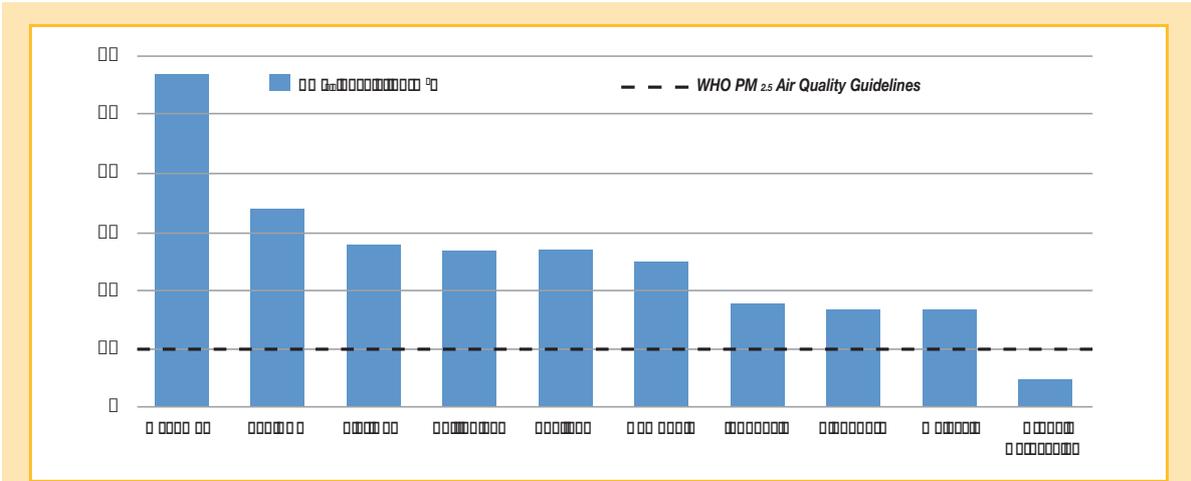
problem caused by land and forest fires, mostly to clear vegetation to establish

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,

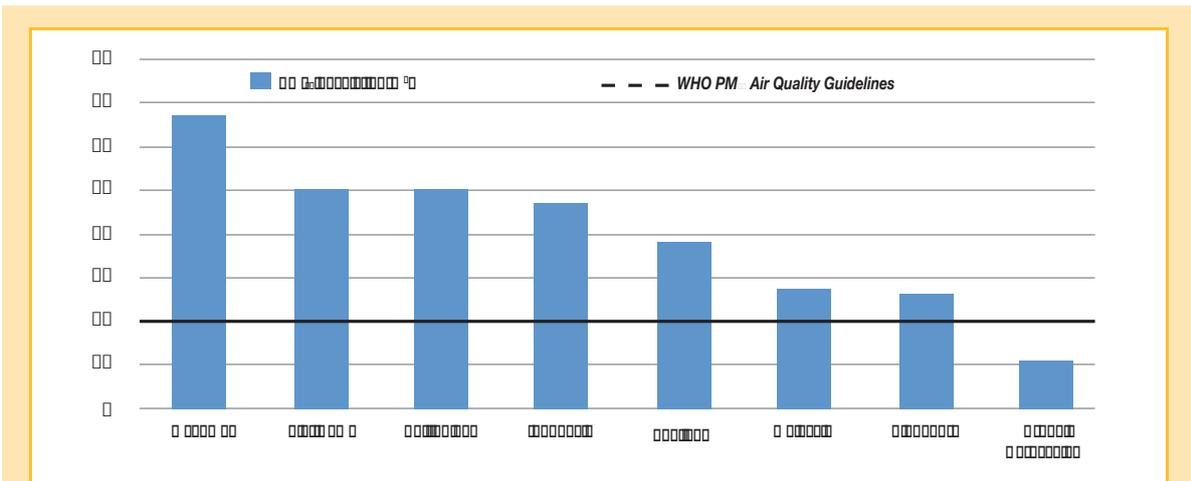
Particulate Matter (PM) concentrations (PM_{2.5} and PM₁₀)

Particulate Matter (PM) concentrations (PM_{2.5} and PM₁₀)



Source: ASEAN Centre for Environment and Natural Resources, 2014

Figure 18. Annual mean concentrations of fine particulate matter (PM_{2.5}) in ASEAN countries compared to WHO PM_{2.5} Air Quality Guidelines



Source: ASEAN Centre for Environment and Natural Resources, 2014

Source: ASEAN Centre for Environment and Natural Resources, 2014

Figure 19. Annual mean concentrations of fine particulate matter (PM₁₀) in ASEAN countries compared to WHO PM₁₀ Air Quality Guidelines

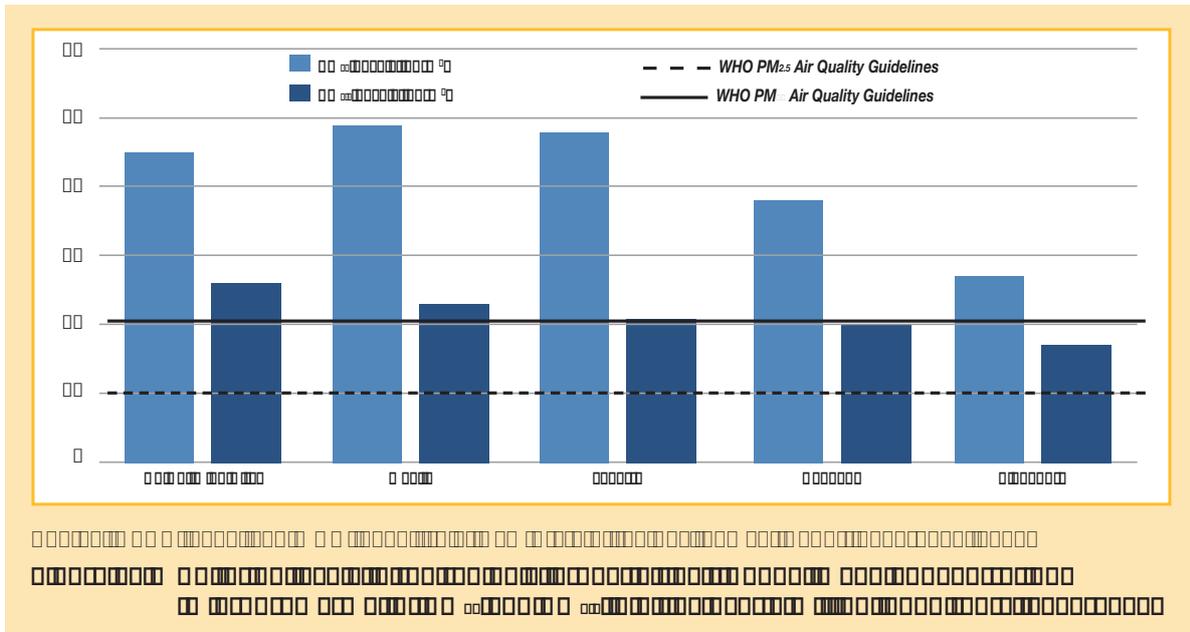
Particulate matter (PM) is a complex mixture of solid and liquid particles of various sizes and chemical compositions. It can be emitted directly from sources such as traffic, industry, and fires, or form as a result of a reaction between chemicals (e.g. SO₂ and NO_x in the atmosphere). PM is a major air pollutant and a significant health risk, particularly for vulnerable populations such as children, the elderly, and those with pre-existing respiratory and cardiovascular conditions.

PM is classified into different size fractions based on their aerodynamic diameter. The most harmful fraction is PM_{2.5}, which can penetrate deep into the lungs and even enter the bloodstream. Other fractions include PM₁₀, PM_{10-2.5}, and PM₄₋₁₀. Each fraction has different health impacts and is regulated by various air quality standards.

WHO recommends that annual average concentrations of PM_{2.5} should be reduced to no more than 10 µg/m³.

Myanmar (57 $\mu\text{g}/\text{m}^3$), Viet Nam (28 $\mu\text{g}/\text{m}^3$), and Thailand and the Philippines (both 27 $\mu\text{g}/\text{m}^3$) are all well above the WHO recommended level at 5 $\mu\text{g}/\text{m}^3$.

Thailand and the Philippines are also above the WHO recommended level at 20 $\mu\text{g}/\text{m}^3$.



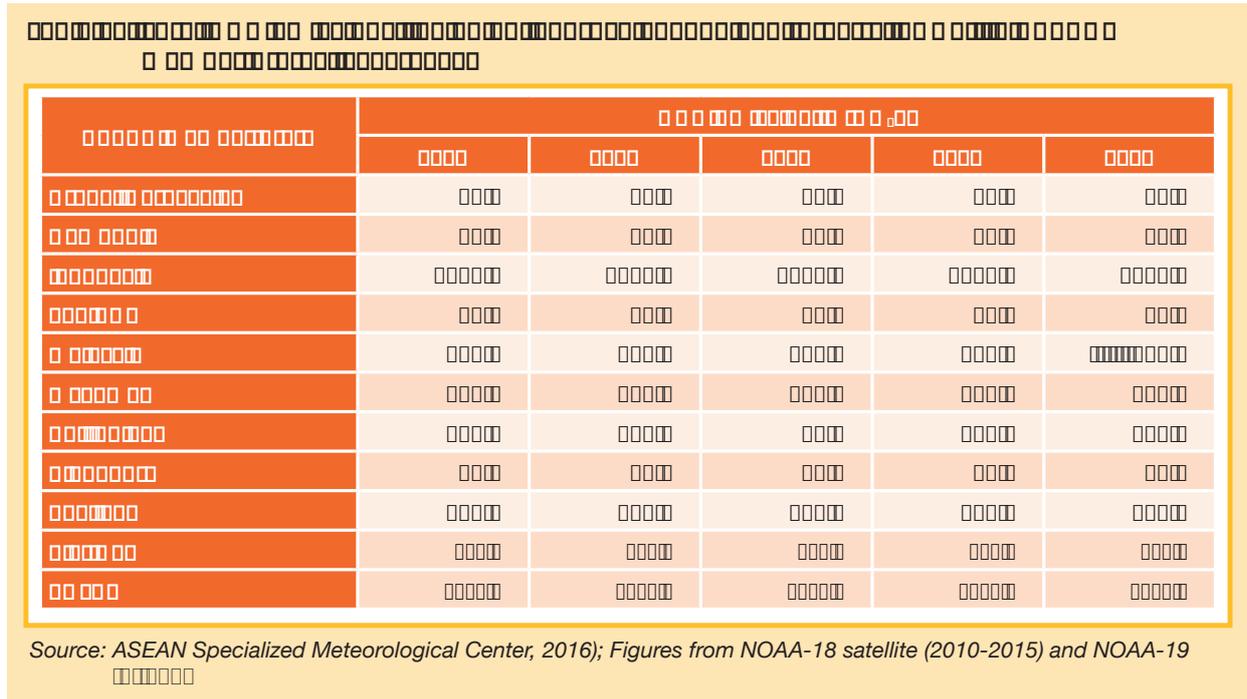
(Thailand) are over the recommended levels by two-fold or more, and PM₁₀ levels in Thailand and the Philippines are also over the recommended levels by two-fold or more.

Greenhouse gas (GHG) emissions

GHG emissions from land-use change and forestry (LUCF) in ASEAN amounted to 3,414 million tonnes of CO₂ equivalent (MTCO₂e) in 2018, or from land-used change and domestic waste. Major GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), and hydrofluorocarbons (HFCs).

including those from land-use change and forestry (LUCF) in ASEAN amounted to 3,414 million tonnes of CO₂ equivalent (MTCO₂e) in 2018, or from land-used change and domestic waste. Major GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), chlorofluorocarbons (CFCs), and hydrofluorocarbons (HFCs).

Figure 10: Greenhouse Gas Emissions from Energy-Using Activities in ASEAN, 2010-2015



On a sector level, the largest areas of emission growth have been due to energy-using activities. Emissions from energy-using activities increased by 44% from 2010 to 2015, while emissions from other sectors remained relatively stable.

Energy-using activities are the largest source of greenhouse gas emissions in ASEAN. Emissions from energy-using activities increased by 44% from 2010 to 2015, while emissions from other sectors remained relatively stable. This could be due to Myanmar recently opening up its energy sector to private investment, leading to a significant increase in energy production and consumption.

In 2013, the largest of any sectors, which may reflect the increasing industrial development in the region.

Other AMS saw a reduction in GHG emission due to fire events cause major emissions (ibid.). Other AMS saw a reduction in GHG emission due to fire events cause major emissions (ibid.).

Table 1: Summary of GHG Emissions (tCO₂e)

Category	Scope	2023					
		Scope 1	Scope 2	Scope 3	Scope 4	Scope 5	Scope 6
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	-	100	200	300	400	-
	Scope 2	-	100	200	300	400	-
Total Emissions	Scope 1	100	200	300	400	500	-10.85
	Scope 2	100	200	300	400	500	-139.91
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	-60.32
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	600
	Scope 2	100	200	300	400	500	600
Total Emissions	Scope 1	100	200	300	400	500	-7.02
	Scope 2	100	200	300	400	500	-17.67

Table 1: Summary of GHG Emissions (tCO₂e)

Table 1: Summary of GHG Emissions (tCO₂e)

CO₂ is the most significant GHG in Earth's atmosphere, produced mainly through the combustion of fossil fuels. It is a long-lived climate pollutant (LLCP) and a major driver of global warming. Specifically of carbon.

CH₄, also known as a short-lived climate pollutant (SLCP), and N₂O are also significant GHGs. They have a higher global warming potential (GWIP) than CO₂ but a shorter atmospheric lifetime. Methane is produced from natural gas processing and landfills, while nitrous oxide is produced from agricultural activities and industrial processes.

ASEAN Environmental Quality Index (EQI) 2018 Report

EQI Component	Indicator	EQI Score (0-100)				
		2017	2018	2019	2020	2021
Air Quality	PM2.5	65	68	70	72	75
	PM10	70	72	75	78	80
Water Quality	Surface Water	75	78	80	82	85
	Groundwater	80	82	85	88	90
Soil Quality	Soil Fertility	85	88	90	92	95
	Soil Contamination	90	92	95	98	100
Waste Management	Waste Recycling	70	75	80	85	90
	Waste Incineration	80	85	90	95	100
Biodiversity	Forest Cover	85	88	90	92	95
	Protected Areas	90	92	95	98	100
Climate Change	CO2 Emissions	60	65	70	75	80
	Renewable Energy	70	75	80	85	90
Pollution Control	Industrial Emissions	75	80	85	90	95
	Vehicle Emissions	80	85	90	95	100
Environmental Governance	Environmental Policy	85	88	90	92	95
	Environmental Monitoring	90	92	95	98	100
Public Awareness	Environmental Education	70	75	80	85	90
	Environmental Participation	80	85	90	95	100
Overall EQI	EQI Score	75	78	80	82	85
	EQI Index	80	82	85	88	90

ASEAN Environmental Quality Index (EQI) 2018 Report. The EQI is a composite index that measures the environmental quality of ASEAN member states. It is based on 12 indicators, each of which is weighted equally. The EQI score ranges from 0 to 100, with 100 representing the highest environmental quality. The EQI score for ASEAN member states in 2018 was 78, which is an improvement from 75 in 2017. This indicates that the environmental quality of ASEAN member states has improved over the past few years.

The EQI score is a composite index that measures the environmental quality of ASEAN member states. It is based on 12 indicators, each of which is weighted equally. The EQI score ranges from 0 to 100, with 100 representing the highest environmental quality. The EQI score for ASEAN member states in 2018 was 78, which is an improvement from 75 in 2017. This indicates that the environmental quality of ASEAN member states has improved over the past few years. The EQI score is a composite index that measures the environmental quality of ASEAN member states. It is based on 12 indicators, each of which is weighted equally. The EQI score ranges from 0 to 100, with 100 representing the highest environmental quality. The EQI score for ASEAN member states in 2018 was 78, which is an improvement from 75 in 2017. This indicates that the environmental quality of ASEAN member states has improved over the past few years.

Table 14. Greenhouse Gas Emissions in ASEAN Member States between 2000 and 2017

ASEAN Member State	2000		2010		2017	
	CO ₂	CH ₄	CO ₂	CH ₄	CO ₂	CH ₄
ASEAN	1,100	100	1,400	150	1,800	200
Burma	100	10	150	15	200	20
Indonesia	1,000	100	1,200	120	1,500	150
Laos	10	1	15	1	20	2
Malaysia	100	10	150	15	200	20
Philippines	100	10	150	15	200	20
Singapore	10	1	15	1	20	2
Thailand	100	10	150	15	200	20
Vietnam	100	10	150	15	200	20
Yemen	10	1	15	1	20	2

* Other greenhouse gas emission refer to hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride; TtCO₂ = Total CO₂ emissions

Source: UNFCCC, 2018

Table 15. Ozone-Depleting Substances Consumption in ASEAN Member States between 2000 and 2017

ASEAN Member State	Ozone-Depleting Substance Consumption (ODP Tons)				
	2000	2005	2010	2015	2017
ASEAN	100	100	100	100	100
Burma	10	10	10	10	10
Indonesia	100	100	100	100	100
Laos	1	1	1	1	1
Malaysia	100	100	100	100	100
Philippines	100	100	100	100	100
Singapore	10	10	10	10	10
Thailand	100	100	100	100	100
Vietnam	100	100	100	100	100
Yemen	100	100	100	100	100

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

Source: UNEP Ozone Secretariat, 2017

Hydrochlorofluorocarbons (HCFCs) are a class of ozone-depleting substances (ODS) that are widely used in various applications, including refrigeration, air conditioning, and industrial processes. HCFCs are recognized as a major ozone-depleting substance (ODS) and, due to their rising levels in the atmosphere, they are a significant concern for the environment. HCFCs are also responsible for global warming and climate change. The use of HCFCs is being phased out globally, and many countries have already banned their use. However, some countries, including several in the ASEAN region, still use HCFCs in their industrial and commercial sectors. This is a major challenge for the region, as it is difficult to phase out these substances without affecting the economy and the environment. The ASEAN region is working to address this challenge by promoting the use of alternative technologies and substances that do not deplete the ozone layer or contribute to global warming.

The ASEAN region is also working to address the challenge of ozone-depleting substances by promoting the use of alternative technologies and substances that do not deplete the ozone layer or contribute to global warming. This is a major challenge for the region, as it is difficult to phase out these substances without affecting the economy and the environment. The ASEAN region is working to address this challenge by promoting the use of alternative technologies and substances that do not deplete the ozone layer or contribute to global warming.

The degrading air quality in ASEAN is causing long-term and wide-ranging impacts on the health and economy of the region. The health impacts are particularly concerning, as they affect a large portion of the population. The economic impacts are also significant, as they affect the productivity of the workforce and the overall growth of the region.

Health and economy

Health and economy

The degrading air quality in ASEAN is causing long-term and wide-ranging impacts on the health and economy of the region. The health impacts are particularly concerning, as they affect a large portion of the population. The economic impacts are also significant, as they affect the productivity of the workforce and the overall growth of the region.

specifically, the mortality rate of people with respiratory diseases is increasing. This is due to the high levels of air pollution in the region, which is causing a significant increase in the number of people with respiratory diseases.

attributed specifically to air pollution in the region. This is due to the high levels of air pollution in the region, which is causing a significant increase in the number of people with respiratory diseases. The health impacts are particularly concerning, as they affect a large portion of the population. The economic impacts are also significant, as they affect the productivity of the workforce and the overall growth of the region.

in the transport sector, such as traffic patrollers, as well as car drivers, passengers and pedestrians. This is due to the high levels of air pollution in the region, which is causing a significant increase in the number of people with respiratory diseases. The health impacts are particularly concerning, as they affect a large portion of the population. The economic impacts are also significant, as they affect the productivity of the workforce and the overall growth of the region.

Table 1: Mortality rate of people with respiratory diseases in ASEAN, 2010-2019

Country	2010	2019
Brunei Darussalam	0	0
Indonesia	1,200	1,500
Malaysia	1,500	1,800
Philippines	1,800	2,100
Singapore	0	0
Thailand	2,100	2,400
Vietnam	2,400	2,700
Laos	2,700	3,000
Myanmar	3,000	3,300
Cambodia	3,300	3,600
Timor-Leste	3,600	3,900
Average	3,900	4,200

Source: WHO, 2020

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 of disease, is a measure of the overall health of a population. The higher the burden of disease, the poorer the health of the population.

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, which will increase the frequency and intensity of extreme weather events, including tropical cyclones, floods, and rain-triggered landslides. These hazards pose significant risks to human health and infrastructure, particularly in coastal and mountainous regions. The Philippines is particularly vulnerable due to its location in the Western Pacific typhoon belt and its diverse topography.

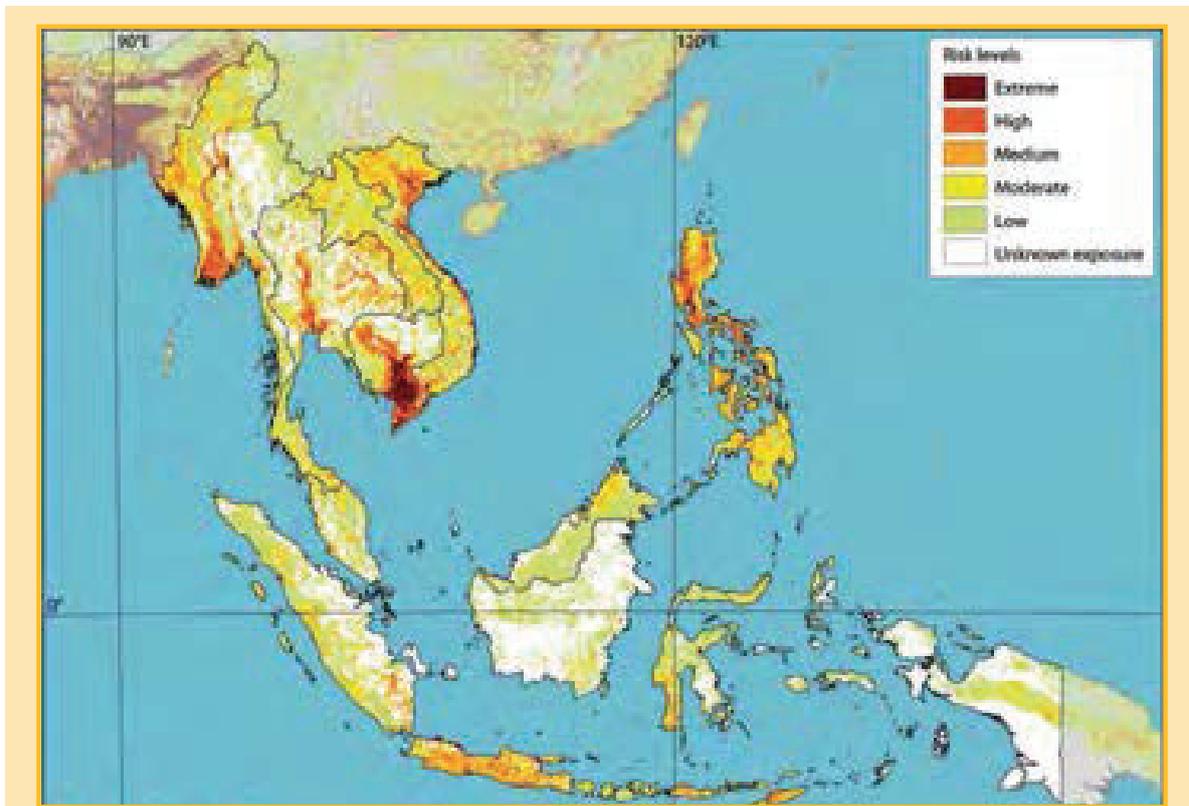


Figure 23. Mortality risk distribution of selected hydro-meteorological hazards (tropical cyclone, flood, rain-triggered landslide) in Southeast Asia

Climate change is expected to increase the frequency and intensity of extreme weather events, including tropical cyclones, floods, and rain-triggered landslides. These hazards pose significant risks to human health and infrastructure, particularly in coastal and mountainous regions. The Philippines is particularly vulnerable due to its location in the Western Pacific typhoon belt and its diverse topography. Specific multi-hazard hotspots (particularly hydro-meteorological hazards) are identified in the Philippines (UNEP 2014). These hotspots are areas where multiple hazards converge, increasing the potential for catastrophic events. For example, a tropical cyclone hitting a coastal area with high population density and poor infrastructure could result in significant loss of life and property. Similarly, a flood in a mountainous region could trigger landslides, further exacerbating the disaster. Understanding these hotspots is crucial for developing targeted disaster risk reduction strategies and emergency preparedness plans.

Understanding these hotspots is crucial for developing targeted disaster risk reduction strategies and emergency preparedness plans. This involves a multi-sectoral approach, including improved weather forecasting, early warning systems, resilient infrastructure, and community-based disaster risk management. Regular drills and public education campaigns can help communities better understand the risks and know what to do in the event of a disaster. Additionally, land-use planning and zoning regulations can help reduce exposure to hazards by restricting development in high-risk areas. By taking a proactive and integrated approach, Southeast Asian countries can better prepare for and respond to the challenges posed by climate change and extreme weather events.

particular during the harvest or post-harvest stages, has led to crop and land damage, particularly during the harvest or post-harvest stages, has led to crop and land damage,

particular during the harvest or post-harvest stages, has led to crop and land damage, particularly during the harvest or post-harvest stages, has led to crop and land damage,

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

Economic Impacts

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 smoke haze. The region 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 region. The 1997-1998 fire and haze episode in Indonesia had major economic impacts on the region. The 1997-1998 fire and haze episode in Indonesia had major economic impacts on the region.

Ecological Impacts

Forest fires and haze pollution has caused ecological impacts in the region, by damaging forest ecosystems. Additionally, forest fires contribute to climate change due to emissions of GHGs and other pollutants. Forest fires contribute to climate change due to emissions of GHGs and other pollutants.

Health Impacts

Smoke haze from forest fires can cause respiratory problems, such as asthma, and can have immediate and delayed effects on mortality, particularly of children. Smoke haze from forest fires can cause respiratory problems, such as asthma, and can have immediate and delayed effects on mortality, particularly of children.

occurred were the 2011 floods in Thailand, which caused over US\$ 45 billion worth of damage. The floods were caused by a combination of climatological and hydro-meteorological hazards owing to climate change in the region, and human activities such as deforestation and land use change.

Land burning and transboundary haze pollution

Forest fires and burning biomass, and the resulting smoke haze, has had serious direct and indirect impacts on the environment and human health. The haze is a transboundary issue that affects several countries in the region, particularly Indonesia, Malaysia, and Singapore.

Key findings

In the effort to tackle the drivers and impacts of air quality degradation, including the transboundary haze pollution, several countries in the region have implemented various measures to reduce emissions and improve air quality.

National responses to air pollution and climate change in selected AMS

The following table provides a summary of the national responses to air pollution and climate change in selected ASEAN Member States (AMS).

Indonesia has implemented various measures to reduce emissions and improve air quality, including the adoption of sustainable transport and innovative efforts to reduce vehicle emissions through the adoption of sustainable transport and innovative efforts to

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

vehicles through testing vehicle emissions and monitoring traffic and air quality (Ministry of Environment, Conservation and Forestry, 2014). The PROPER (Public Reporting of Environmental Evaluation, and Rating) initiative, a national-level public environmental reporting initiative, was successful in lowering air pollution and GHG emission levels from 65 percent in 2008 to 50 percent in 2013.

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

The Government aims to encourage Category C diesel vehicle owners to switch their older and higher-emission vehicles to Euro 4-compliant vehicles. An extension on the scheme was announced in March 2017 with plans to provide incentives for vehicle 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 which provides incentives for vehicle owners to replace their older and higher-emission vehicles with Euro 4-compliant vehicles. The scheme provides incentives for vehicle owners with Euro 2/3 emissions standards to turnover to Euro 6 (or equivalent) vehicles. There are currently 27,000 Pre-Euro/Euro 1/2/3 vehicles that have been replaced under the scheme.

The Government also introduced the Carbon Emissions-based Vehicle Scheme which provides incentives for vehicle owners to replace their older and higher-emission vehicles with Euro 4-compliant vehicles. The scheme provides incentives for vehicle owners with Euro 2/3 emissions standards to turnover to Euro 6 (or equivalent) vehicles. There are currently 27,000 Pre-Euro/Euro 1/2/3 vehicles that have been replaced under the scheme.

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

The Government also introduced the Carbon Emissions-based Vehicle Scheme which provides incentives for vehicle owners to replace their older and higher-emission vehicles with Euro 4-compliant vehicles. The scheme provides incentives for vehicle owners with Euro 2/3 emissions standards to turnover to Euro 6 (or equivalent) vehicles. There are currently 27,000 Pre-Euro/Euro 1/2/3 vehicles that have been replaced under the scheme.

which have better fuel efficiency and emit lower carbon emissions.

ASEAN countries have developed various policies and strategies to address 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).

The Government also introduced the Carbon Emissions-based Vehicle Scheme which provides incentives for vehicle owners to replace their older and higher-emission vehicles with Euro 4-compliant vehicles. The scheme provides incentives for vehicle owners with Euro 2/3 emissions standards to turnover to Euro 6 (or equivalent) vehicles. There are currently 27,000 Pre-Euro/Euro 1/2/3 vehicles that have been replaced under the scheme.

ASEAN regional responses to air pollution and climate change

Collective efforts by AMS to tackle air pollution and air quality degradation are also being undertaken through various initiatives. For example, under the ASEAN Project on energy efficiency and the use of cleaner fuels. For example, under the ASEAN Project on

technical support was provided to medium-sized cities in ASEAN in the development development (ASEAN-German Technical Cooperation 2015) (for more details on other

Transport Strategic Plan) 2016-2025, AMS have agreed to actively pursue sustainable supporting low carbon modes of transport, energy efficiency, user friendly transport More specifically, to reduce emissions from the transportation sector, ASEAN aims to

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

Haze Pollution Control with Means of

Force (under the ASEAN Senior Officials and mitigate fires and haze especially the has been ratified by all 10 AMS and significant progress in the implementation including concrete on-the-ground activities such as multi-national cooperation to fight

fires; and implementation of the ASEAN Peatland Management Strategy (2006-2020)

... 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 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,

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... 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

ASEAN Member States have committed to achieving internationally agreed environmental goals, including those set out in the Paris Agreement and the Sustainable Development Goals (SDGs). These goals are designed to address the most pressing environmental challenges of our time, such as climate change, air and water pollution, and the loss of biodiversity.

ASEAN Member States have also ratified the Kyoto Protocol under the UNFCCC that commits State Parties to reduce greenhouse gas emissions. In addition, ASEAN has adopted the Bali Action Plan (a protocol to the Vienna Convention), which directs efforts on protecting the ozone layer. These commitments demonstrate ASEAN's leadership in addressing global environmental issues.

For example, all AMS have significantly reduced the use of ozone depleting CFCs to less than 1% of their 1995 levels. This achievement is a testament to the effectiveness of the Bali Action Plan. ASEAN is also working to meet the deadlines to end the production and consumption of ozone-depleting substances (ibid.).

ASEAN is also committed to achieving the Sustainable Development Goals (SDGs), which are a set of 17 global goals designed to be a blueprint for achieving a better, more sustainable world for all. These goals include targets for clean air, clean water, and climate action. ASEAN is working to achieve these goals through various initiatives, including the promotion of emission-reduction techniques and renewable energy generation, as well as moves towards a low-carbon society (UNEP 2016). Some of the relevant goals include:

Table 1: Key Sustainable Development Goals (SDGs) related to environmental protection and climate action.

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, sustainable and modern energy for all (energy efficiency)	7.2 By 2030, increase substantially the share of renewable in the global energy mix 7.3 By 2030, double the global rate of improvement in energy efficiency 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 technology.
11. Make cities and human settlements inclusive, safe, 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 consumption and production pattern (fuel subsidies)	12.c Rationalise inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions 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 annually 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

Source: ASEAN Secretariat (2016)

mitigation, adaptation and finance, was an important moment for the world in recognizing the need to take action to address climate change (UNFCCC 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 of 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

Table 1. Summary of climate change mitigation actions in the AMS

Country	Key Mitigation Action	Key Mitigation Action	Baseline	Target
ASEAN	ASEAN Climate Change High Level Task Force (AHLTF) was established in 2011 to coordinate and monitor the implementation of the ASEAN Climate Change Action Plan (ACCAP). The AHLTF has been instrumental in the development of the ASEAN Climate Change Agreement (ACCA) and the ASEAN Climate Change Plan (ACCP). The ACCA and ACCP provide a framework for the AMS to develop and implement their climate change mitigation actions.		BAU	BAU
ASEAN		27% (+land use, land-use change and forestry)	BAU (2010-)	BAU
ASEAN			BAU (2010-)	BAU
ASEAN			2000-2015	2015-2030
ASEAN			BAU	BAU
ASEAN	Sectors are identified for mitigation but without specific emission targets			
ASEAN			BAU (2000-)	BAU
ASEAN			BAU	BAU
ASEAN			BAU (2005-)	BAU
ASEAN			BAU (2010-)	BAU

Source: ASEAN Secretariat (2017). ASEAN Climate Change Action Plan (ACAP) 2016-2025. Singapore: ASEAN Secretariat.

Box 10: Key Initiatives

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ENVIRONMENT

ENVIRONMENTAL ISSUES

- Between 1990 and 2012, most ASEAN Member States (AMS) experienced a decline in forest cover. This is a significant concern for climate change mitigation and biodiversity conservation.
- 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 and biodiversity conservation.
- Growing demand for forest and agriculture products like rubber and palm oil has led to poor forest management practices, deforestation, and land degradation.
- There is an increase in soil degradation caused by deforestation and agricultural expansion.

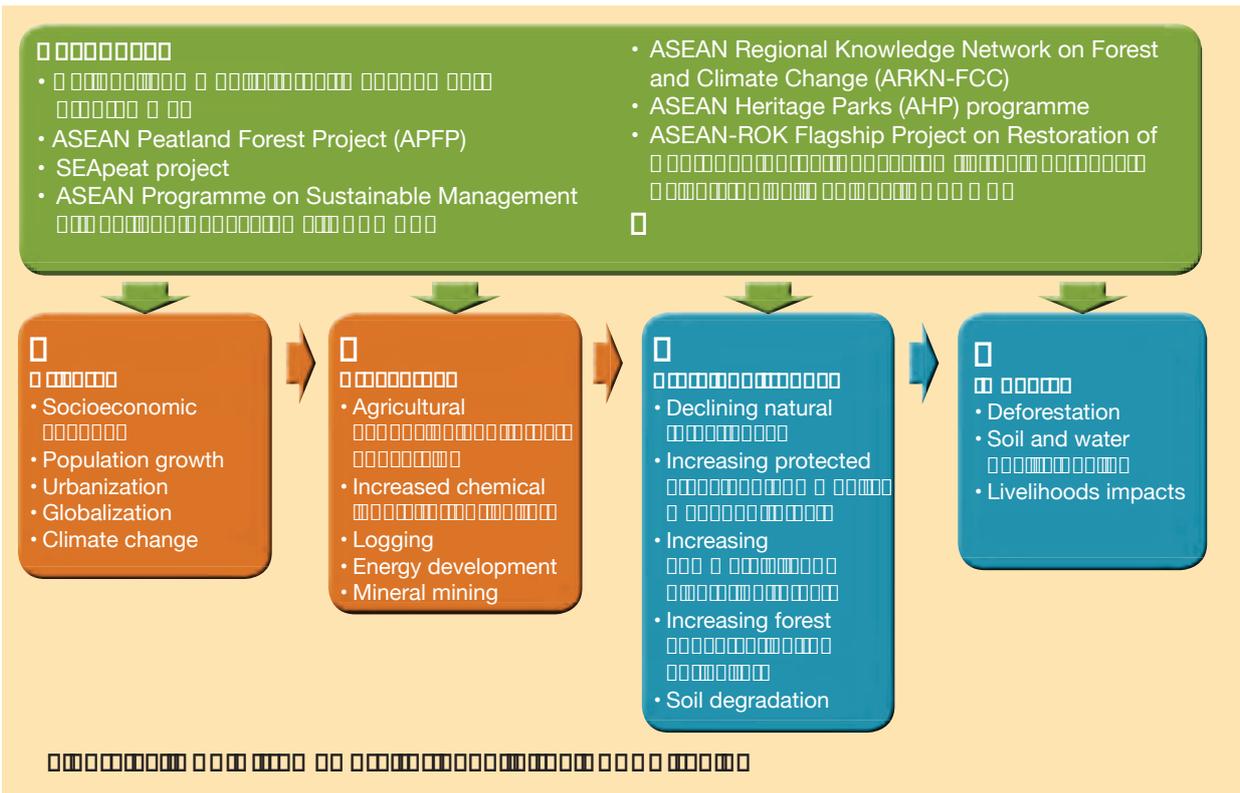
ENVIRONMENTAL IMPACTS

pressures in the ASEAN region which significantly affect the quality and availability of natural resources. These pressures include deforestation, land degradation, and the loss of biodiversity. Deforestation is a major concern as it leads to the loss of forest cover, which is essential for carbon sequestration and biodiversity conservation. Land degradation is also a significant issue as it leads to soil erosion, loss of soil fertility, and reduced agricultural productivity. The loss of biodiversity is a major concern as it leads to the extinction of species and the degradation of ecosystems.

Pressures upon land resources within the ASEAN region cause land-use changes primarily driven by the need for agricultural expansion and infrastructure development. While some efforts have reversed forest clearing trends in some areas, it is unable to reverse the overall trend of land-use changes. This is due to the growing demand for agricultural products and infrastructure, which has led to the conversion of forest land into agricultural and urban areas. This conversion has led to the loss of forest cover and the degradation of land resources.

The loss of forest cover and the degradation of land resources have led to a number of environmental impacts. These include the loss of biodiversity, the degradation of ecosystems, and the contribution to climate change. The loss of forest cover has led to the loss of many species and the degradation of ecosystems. The degradation of land resources has led to soil erosion, loss of soil fertility, and reduced agricultural productivity. The contribution to climate change is a major concern as deforestation and land degradation lead to the release of carbon dioxide into the atmosphere.

Addressing these environmental issues requires a number of measures. These include the implementation of sustainable forest management practices, the protection of peat and mangrove forests, and the promotion of sustainable agriculture. It is also important to address the underlying drivers of land-use changes, such as the growing demand for agricultural products and infrastructure. By taking these measures, it is possible to reduce the environmental impacts of land-use changes and to ensure the sustainable use of land resources in the ASEAN region.



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

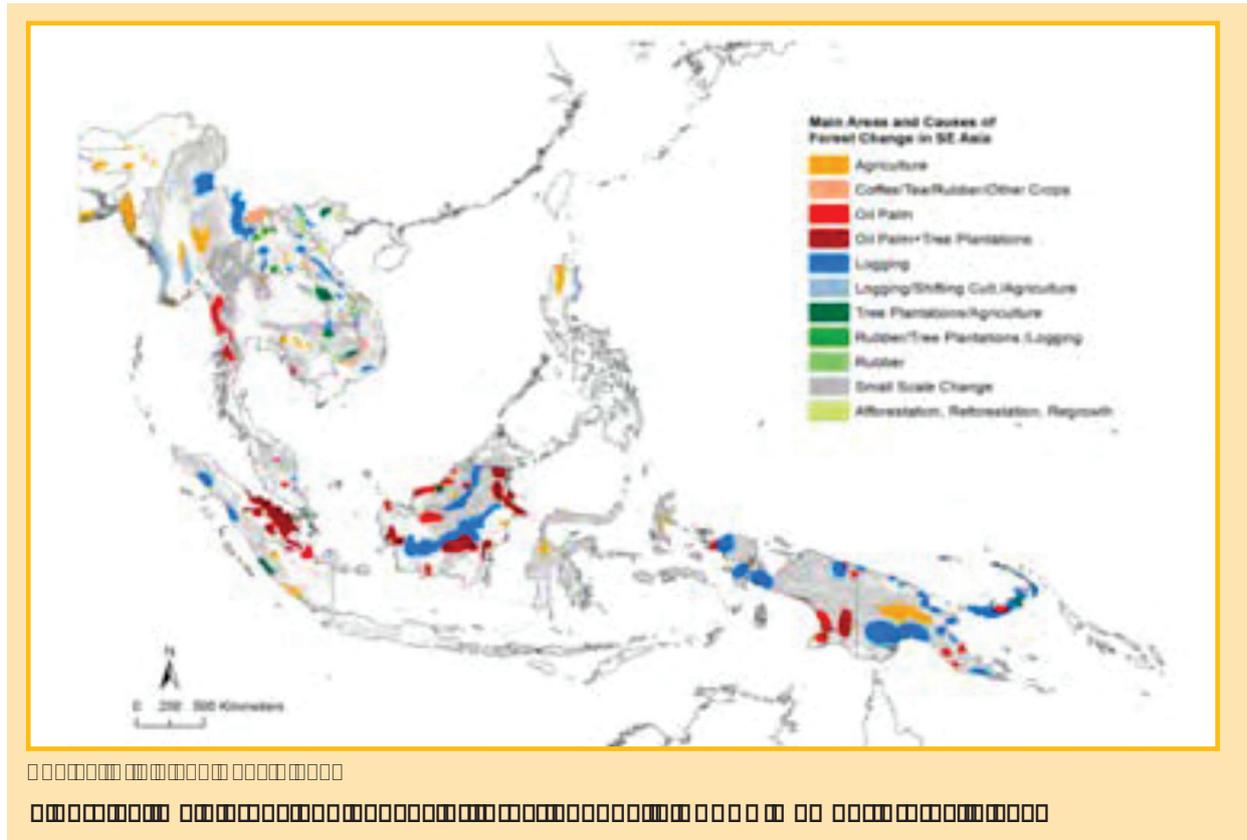
Drivers of Land-Use Changes

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

ASEAN Secretariat, 2015. ASEAN Socio-Economic Report 2015. Singapore: ASEAN Secretariat.

Figure 10: Main Areas and Causes of Forest Change in SE Asia



Forest change in Southeast Asia is primarily driven by agricultural expansion, logging, and land conversion. The map highlights major hotspots in Sumatra, Kalimantan, and the Philippines, where large-scale deforestation is occurring. The legend identifies various causes, including agriculture, logging, and small-scale changes, providing a detailed view of the drivers behind forest loss and regrowth in the region.

Changes in rainfall patterns and rainfall intensity, the onset of drought, floods and storms and shifts in the timing of the rainy season can affect forest 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 changes in rainfall patterns. Forest cover 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).

Forest cover

The growing demand caused by the increasing consumption of more food, fuel, fiber and other products has led to a significant loss of forest cover in Southeast Asia. This loss is primarily driven by agricultural expansion, logging, and land conversion. The map highlights major hotspots in Sumatra, Kalimantan, and the Philippines, where large-scale deforestation is occurring. The legend identifies various causes, including agriculture, logging, and small-scale changes, providing a detailed view of the drivers behind forest loss and regrowth in the region.

Agricultural expansion

The changing socio-economic circumstances in ASEAN are leading to a greater demand for agricultural products. This has led to an expansion of agricultural land, particularly in the form of plantations. The region has a long-standing history of forest to agricultural conversion. Since the 1960s, the region has seen a significant increase in agricultural land, with a focus on large-scale plantations. Now, across the ASEAN region agroforestry is undertaken at different scales mainly for

the production of agricultural products. This has led to an expansion of agricultural land, particularly in the form of plantations. The region has a long-standing history of forest to agricultural conversion. Since the 1960s, the region has seen a significant increase in agricultural land, with a focus on large-scale plantations. 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

Country	Fertilizers (metric tons)					
	2010	2011	2012	2013	2014	2015
Indonesia	1,200,000	1,300,000	1,400,000	1,500,000	1,600,000	1,700,000
Malaysia	100,000	110,000	120,000	130,000	140,000	150,000
Philippines	500,000	550,000	600,000	650,000	700,000	750,000
Thailand	800,000	850,000	900,000	950,000	1,000,000	1,050,000
Vietnam	1,500,000	1,600,000	1,700,000	1,800,000	1,900,000	2,000,000

Country	Pesticides (metric tons)					
	2010	2011	2012	2013	2014	2015
Indonesia	100,000	110,000	120,000	130,000	140,000	150,000
Malaysia	50,000	55,000	60,000	65,000	70,000	75,000
Philippines	200,000	220,000	240,000	260,000	280,000	300,000
Thailand	300,000	320,000	340,000	360,000	380,000	400,000
Vietnam	400,000	420,000	440,000	460,000	480,000	500,000

Source: FAO, 2016

practices. For example, plantations such as rubber and oil palm depend on large-scale agricultural practices. This has led to an expansion of agricultural land, particularly in the form of plantations. The region has a long-standing history of forest to agricultural conversion. Since the 1960s, the region has seen a significant increase in agricultural land, with a focus on large-scale plantations. Now, across the ASEAN region agroforestry is undertaken at different scales mainly for

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1. The data for 2015 is preliminary.

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

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Energy development

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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

... of the total forest area in the ASEAN region. The total forest area in the ASEAN region is estimated to be 1.2 billion hectares, of which Brunei Darussalam accounts for approximately 0.05 billion hectares.

... of the total forest area in the ASEAN region. The total forest area in the ASEAN region is estimated to be 1.2 billion hectares, of which Brunei Darussalam accounts for approximately 0.05 billion hectares.

... of the total forest area in the ASEAN region. The total forest area in the ASEAN region is estimated to be 1.2 billion hectares, of which Brunei Darussalam accounts for approximately 0.05 billion hectares.

Between 2008-2014, Brunei

... of the total forest area in the ASEAN region. The total forest area in the ASEAN region is estimated to be 1.2 billion hectares, of which Brunei Darussalam accounts for approximately 0.05 billion hectares.

Table 1: Forest area in Brunei Darussalam (in thousands of hectares)

Forest Type	2008	2014
Total forest area	5,000	5,000
Primary forest	3,000	3,000
Plantation forest	2,000	2,000
Other forest	0	0
Forest area under protection	1,000	1,000
Forest area not under protection	4,000	4,000
Forest area under conversion	0	0
Forest area under reforestation	0	0
Forest area under afforestation	0	0
Forest area under other uses	0	0
Forest area under other categories	0	0
Forest area under other sub-categories	0	0
Forest area under other sub-sub-categories	0	0
Forest area under other sub-sub-sub-categories	0	0
Forest area under other sub-sub-sub-sub-categories	0	0
Forest area under other sub-sub-sub-sub-sub-categories	0	0

... that are designated by national authorities as scientific nature reserves or wildlife reserves. Marine areas, unclassified areas, littoral (intertidal) areas, and sites protected under local laws are also included in the total forest area.

... Brunei Darussalam figure in 2008.

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

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).

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 PDR and Viet Nam. The figure shows that the area of Planted Forest has increased significantly in Cambodia and Lao PDR, while the area of Other Naturally Regenerated Forest and Primary Forest has decreased. This is due to the large-scale afforestation and reforestation programs implemented in the region.

Figure 27. Changes in forest types under FAO's classifications in Cambodia, Lao PDR and Viet Nam, 2000-2015

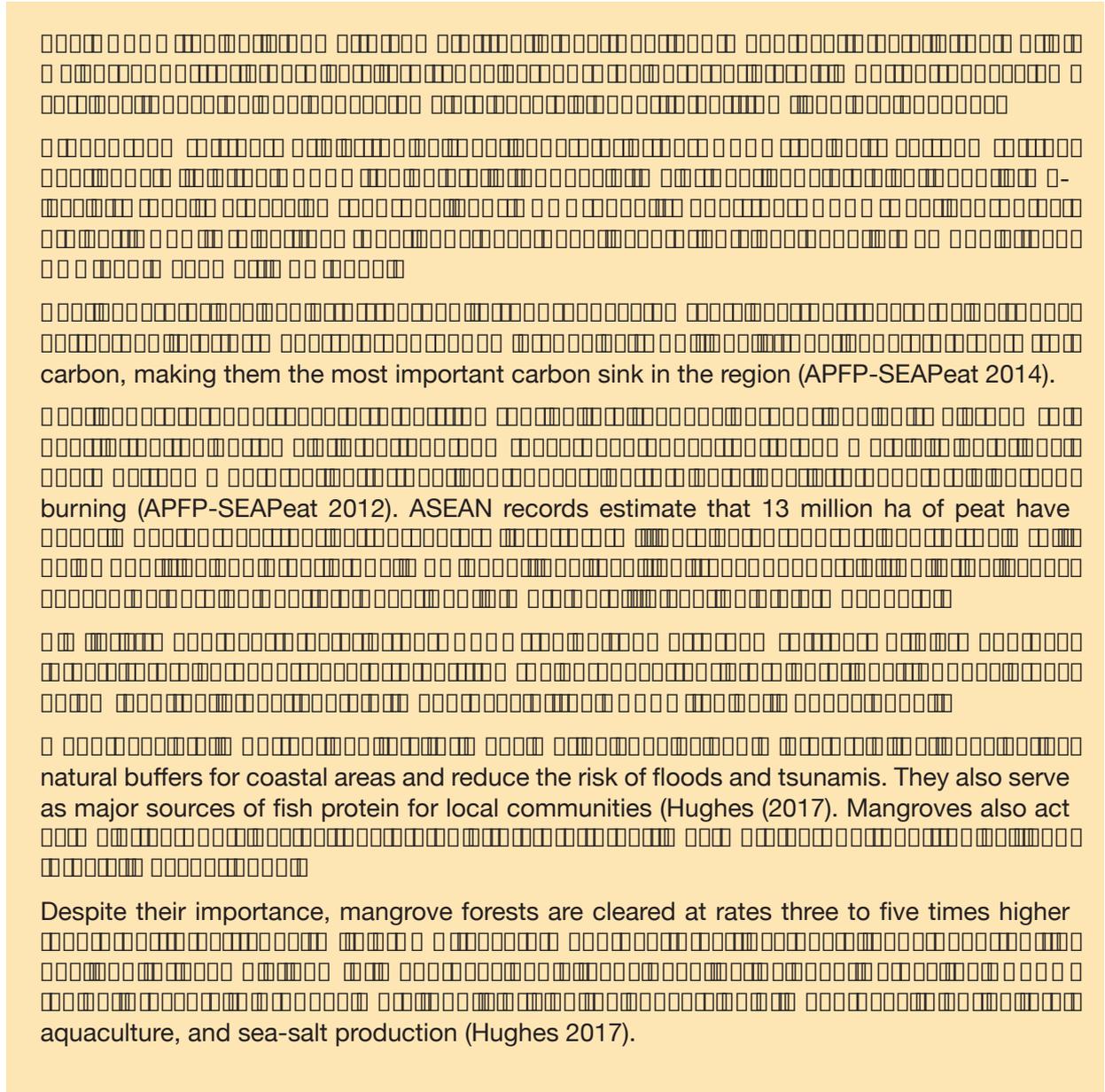


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23. FAO defines production forest as "forest area designated primarily for production of wood, fiber, bio-energy and/or non-wood forest products."(FAO 2012).

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

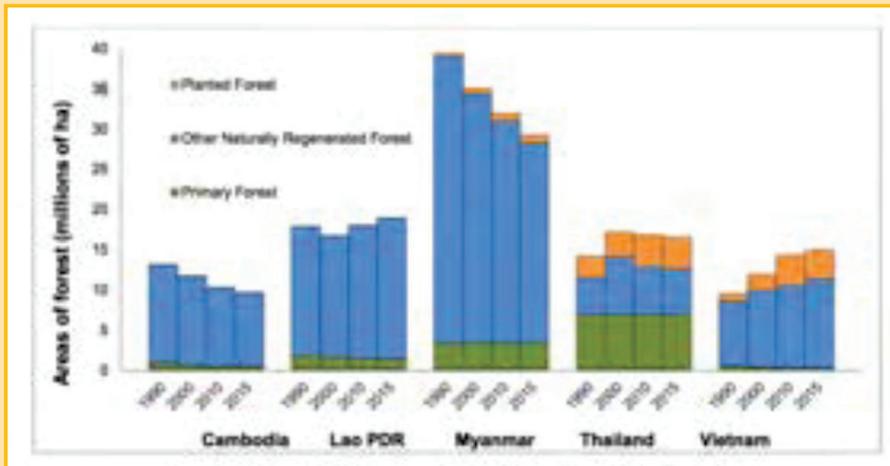


Figure 1: Areas of forest (millions of ha) in Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, 1990-2015

The chart shows that Myanmar has the largest forest area, followed by Thailand and Vietnam. Planted forests have increased significantly in Thailand and Vietnam, while Myanmar's forest area has generally declined over the period.

Agricultural land

The area of agricultural land in Cambodia, Lao PDR, Myanmar, Thailand and Vietnam has increased significantly over the period 1990-2015. This is primarily due to the expansion of planted forests, which are used for agricultural purposes. The increase in agricultural land is most pronounced in Thailand and Vietnam, where it has grown from around 10 million ha in 1990 to over 20 million ha in 2015.

Table 1: Agricultural land (millions of ha) in Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, 1990-2015

Country	Year	Agricultural Land (millions of ha)						Total
		Planted Forest	Other					
			Other Naturally Regenerated Forest	Primary Forest	Other	Other	Other	
Cambodia	1990	1	1	1	1	1	1	5
	2000	1	1	1	1	1	1	5
	2010	1	1	1	1	1	1	5
	2015	1	1	1	1	1	1	5
Lao PDR	1990	2	1	1	1	1	1	7
	2000	2	1	1	1	1	1	7
	2010	2	1	1	1	1	1	7
	2015	2	1	1	1	1	1	7
Myanmar	1990	3	1	1	1	1	1	7
	2000	3	1	1	1	1	1	7
	2010	3	1	1	1	1	1	7
	2015	3	1	1	1	1	1	7
Thailand	1990	7	1	1	1	1	1	12
	2000	7	1	1	1	1	1	12
	2010	7	1	1	1	1	1	12
	2015	7	1	1	1	1	1	12
Vietnam	1990	1	1	1	1	1	1	5
	2000	1	1	1	1	1	1	5
	2010	1	1	1	1	1	1	5
	2015	1	1	1	1	1	1	5

Table 1: Agricultural land (millions of ha) in Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, 1990-2015

The table shows that agricultural land has increased significantly in all five countries, with Thailand and Vietnam showing the largest increases. This is primarily due to the expansion of planted forests, which are used for agricultural purposes.

Source: FAO, Global Forest Resources Assessment 2015 (FRA 2015)

oil palm, sugarcane, tea, coffee, cashew nuts and cacao (Stibig and Stolle 2007). The conversion of forest to agricultural land is a major driver of deforestation in the region. Table 23 shows that between 2000-2012, an estimated 30-80% of the deforestation in the region was due to agriculture. The majority of this conversion was illegal, constituting an estimated 43-90% of the total deforestation.

Table 23: Deforestation in the ASEAN Region, 2000-2012

Country	Percentage of Deforestation due to Agriculture (2000-2012)	Percentage of Deforestation due to Illegal Conversion (2000-2012)	Percentage of Deforestation due to Legal Conversion (2000-2012)
Indonesia	40 - 80 %	43.4 - 86.7 %	55-75%; 82% (Estimate)
Malaysia	30 - 80 %	43.4 - 86.7 %	55-75%; 82% (Estimate)
Philippines	30 - 80 %	43.4 - 86.7 %	55-75%; 82% (Estimate)
Thailand	40-80%	43.4 - 86.7 %	55-75%; 82% (Estimate)

The conversion of forest to agricultural land is a major driver of deforestation in the region. The majority of this conversion was illegal, constituting an estimated 43-90% of the total deforestation. This conversion is driven by the demand for agricultural products such as oil palm, sugarcane, tea, coffee, cashew nuts and cacao.

Between 2011 and 2013, private firms were responsible for a significant portion of the deforestation. This is particularly true in Indonesia and Malaysia, where large-scale agricultural plantations are common. The conversion of forest to agricultural land is a major driver of deforestation in the region.

area is used for oil palm (Stibig and Achard 2014). Between 2011 and 2013, private firms were responsible for a significant portion of the deforestation. This is particularly true in Indonesia and Malaysia, where large-scale agricultural plantations are common. The conversion of forest to agricultural land is a major driver of deforestation in the region.

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Source: Stibig and Stolle (2007), Stibig and Achard (2014), and other sources.

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).

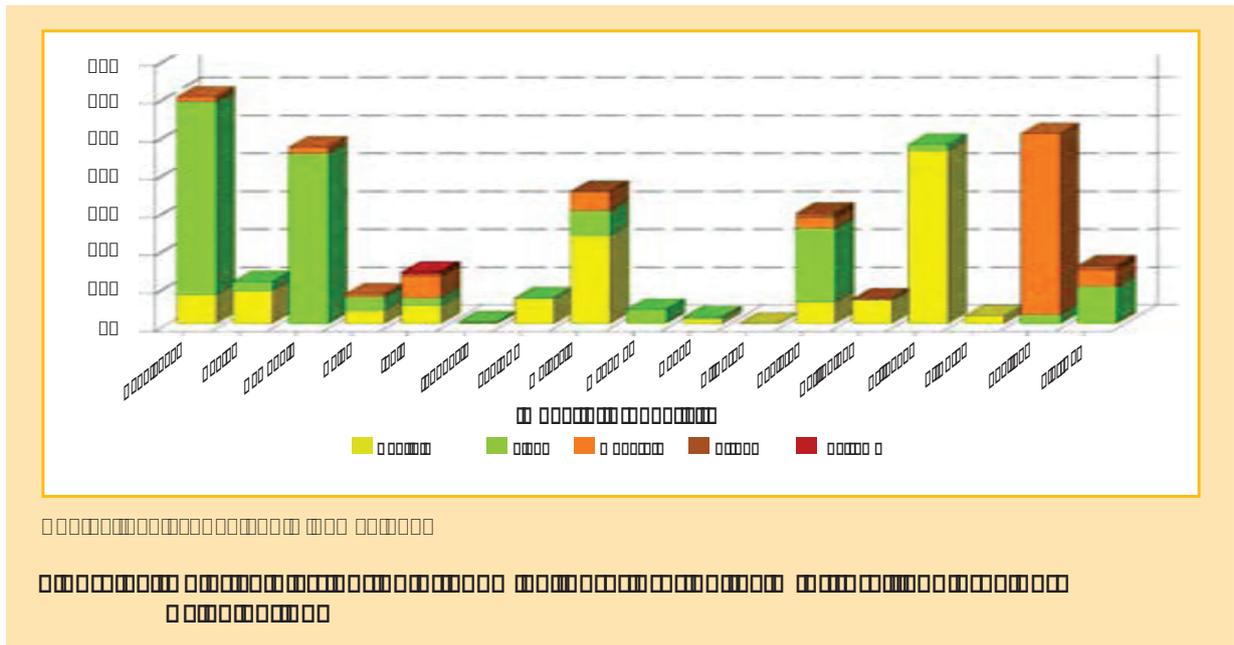
identified as a widespread concern in Asia (Syers 1997). In 1997, 53% of Thailand's total land area was affected by soil fertility loss, of which 50% was classified as having a strong impact on productivity (Limtong 2012). In Cambodia, 42% of soils suffered fertility loss and 4% had strong impact on 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



Soil and Water Quality

Soil and water quality are essential for the health of ecosystems and the well-being of communities. Soil compaction and erosion can lead to reduced soil fertility and increased sedimentation in water bodies, which can harm aquatic life and reduce water quality.

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Soil and water quality are essential for the health of ecosystems and the well-being of communities. Soil compaction and erosion can lead to reduced soil fertility and increased sedimentation in water bodies, which can harm aquatic life and reduce water quality. Impacts (IEA 2015). Coal mining for example causes massive landscape-scale changes and can lead to significant soil erosion and water pollution.

Soil and water quality are essential for the health of ecosystems and the well-being of communities. Soil compaction and erosion can lead to reduced soil fertility and increased sedimentation in water bodies, which can harm aquatic life and reduce water quality. One of the major consequences of hydropower development is the loss of forests due to the flooding of large areas of land.

... of the region, the impact of climate change is becoming increasingly apparent. The rise in sea levels and the frequency of extreme weather events are posing significant challenges to the coastal and inland communities. The loss of biodiversity and the degradation of ecosystems are also major concerns. The impact of climate change is not only a threat to the environment but also to the socio-economic stability of the region. The need for a coordinated and comprehensive response is therefore urgent.

... at a rate of approximately 1,000-2,000 ha per annum (Thomas 2015). Similarly, the impact of land use change is also significant. The conversion of natural habitats into agricultural and industrial areas is leading to the loss of biodiversity and the degradation of ecosystems. The impact of land use change is not only a threat to the environment but also to the socio-economic stability of the region. The need for a coordinated and comprehensive response is therefore urgent.

... forest habitat of different species and land degradation. The scale of impact of plantation on the environment is also significant. The conversion of natural habitats into agricultural and industrial areas is leading to the loss of biodiversity and the degradation of ecosystems. The impact of land use change is not only a threat to the environment but also to the socio-economic stability of the region. The need for a coordinated and comprehensive response is therefore urgent.

... to emissions from the ASEAN region. In 2015, fires from the burning of peat released significant amounts of greenhouse gases into the atmosphere. The impact of peat fires is not only a threat to the environment but also to the socio-economic stability of the region. The need for a coordinated and comprehensive response is therefore urgent.

More commercialized and large-scale forms of agriculture are changing the livelihoods of many people in the region. The impact of land use change is also significant. The conversion of natural habitats into agricultural and industrial areas is leading to the loss of biodiversity and the degradation of ecosystems. The impact of land use change is not only a threat to the environment but also to the socio-economic stability of the region. The need for a coordinated and comprehensive response is therefore urgent.

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Community forestry is the management of public forests involving local, forest-dependent people in decision-making processes. It is a form of forest management that involves local people in the management of forest use through enhanced decision-making (ASFN 2014).

National responses to land issues in selected AMS

National responses to land issues in selected AMS

Efforts to improve the livelihoods of forest dependent communities have focused on community forestry. Community forestry is the management of public forests involving local, forest-dependent people in decision-making processes. It is a form of forest management that involves local people in the management of forest use through enhanced decision-making (ASFN 2014).

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Table 1: National responses to land issues in selected AMS

Country	Response	Response
Indonesia	Community forestry	Community forestry
Malaysia	Community forestry	Community forestry
Philippines	Community forestry	Community forestry
Thailand	Community forestry	Community forestry
Vietnam	Community forestry	Community forestry
Laos	Community forestry	Community forestry
Myanmar	Community forestry	Community forestry
Timor-Leste	Community forestry	Community forestry
Cambodia	Community forestry	Community forestry
Burma	Community forestry	Community forestry

Community forestry is the management of public forests involving local, forest-dependent people in decision-making processes. It is a form of forest management that involves local people in the management of forest use through enhanced decision-making (ASFN 2014).

Source: ASEAN State of the Environment Report (2014)

Government of Indonesia, Ministry of Forestry and Environmental Conservation, 2014. The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia.

A number of afforestation schemes are also taking place throughout the ASEAN region. The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia. 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 peatlands. The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia. Facility through the International Fund for Agricultural Development (IFAD) from 2010-2014. The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia. was conducted between 2010-2014 and was funded by the European Union through the Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia.

The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia. Sustainable Management of Peatland Ecosystems (APSMPE). APSMPE is a scaled-up peatland management program in Indonesia. The Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia. (APMS 2006-2020), namely to promote sustainable management of peatlands through the Ministry of Forestry and Environmental Conservation (MFOREST) has been instrumental in the development of the National Forestry Policy (NFP) and the National Forestry Law (NFL) of 1997, which have provided the legal framework for the management of forests in Indonesia.

Key findings of the APSMPE program

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 significantly reduced emissions of greenhouse gases and

Peatlands were identified between 2010 and 2014. In Cambodia, while there were no known peatlands in 2010, peatlands were identified in 2011, 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

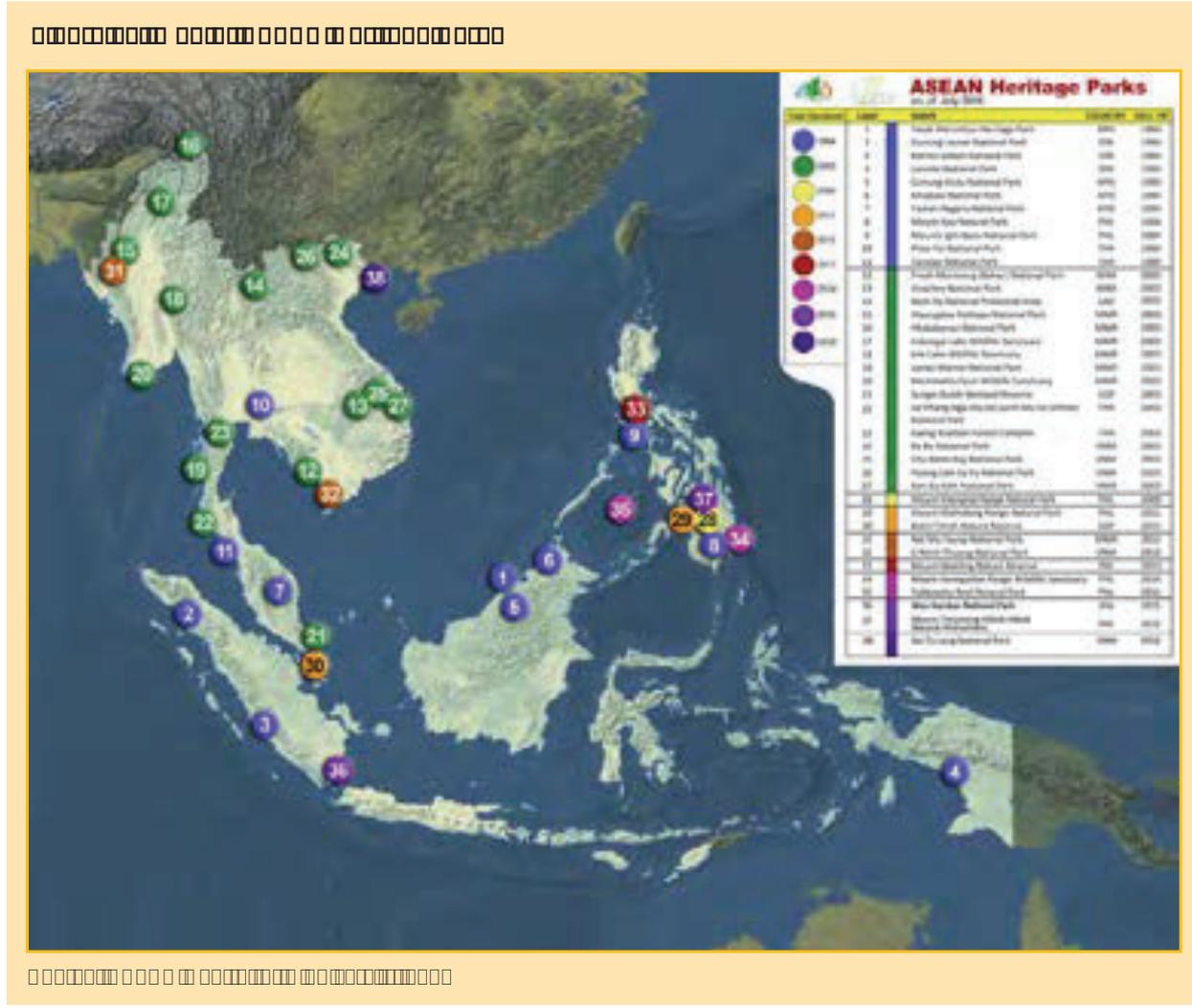
The ASEAN Regional Knowledge Network on Forests and Climate Change (ARKN-FCC) was established in 2008 to undertake joint initiatives on REDD+. The ARKN-FCC's role is to support member states in developing national strategies and action plans for REDD+, and to provide technical assistance and capacity building in this area.

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Further, as part of efforts to expand protected areas, ASEAN created the 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 experiences and best practices in the management of protected areas.

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

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



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ASEAN REGIONAL BIODIVERSITY STRATEGY

The ASEAN region is home to a rich and diverse array of species, including many endangered and threatened species. The region's biodiversity is a result of its location in a mega-diverse area, which is characterized by high levels of species richness and endemism. The region's biodiversity is also a result of its diverse landscapes, which include a wide range of habitats, from tropical rainforests to coral reefs. The region's biodiversity is a valuable resource that provides many ecosystem services, such as carbon sequestration, water regulation, and soil fertility. The region's biodiversity is also a source of inspiration for science, art, and culture. The region's biodiversity is a testament to the power of nature and the importance of protecting our natural world.

ASEAN Biodiversity Conservation

ASEAN Biodiversity

- 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 of these pressures.
- 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 by ASEAN member states and the international community. ASEAN member states are working together to conserve biodiversity and ecosystems, and to promote sustainable development.

ASEAN Biodiversity Conservation

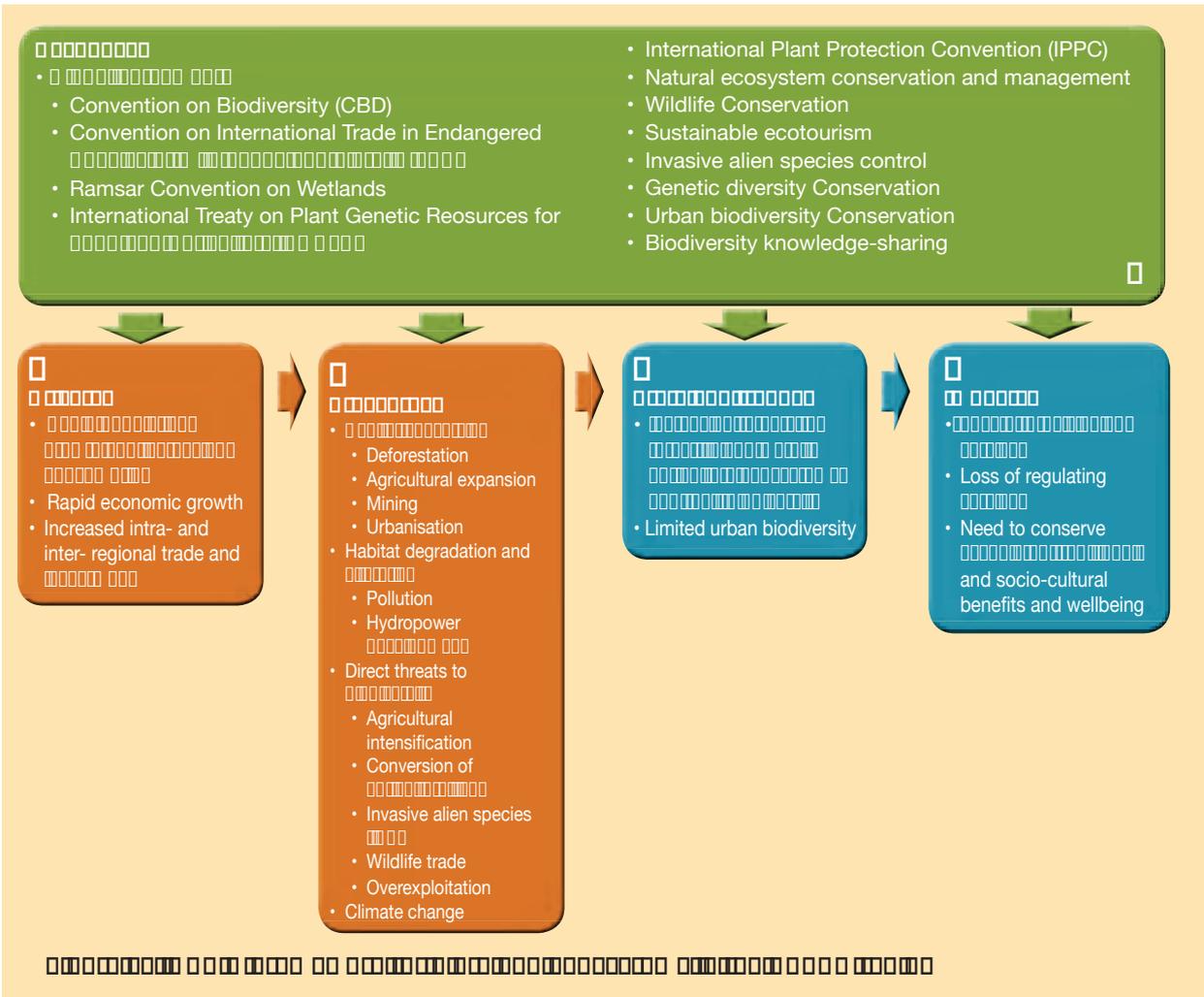
ASEAN member states are working together to conserve biodiversity and ecosystems, and to promote sustainable development. The ASEAN region is a major contributor to global biodiversity, containing four of the world's 34 biodiversity hotspots and three mega-diverse nations, which have exceptionally high levels of species endemism. 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 of these pressures. 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 by ASEAN member states and the international community. ASEAN member states are working together to conserve biodiversity and ecosystems, and to promote sustainable development.

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

ASEAN Biodiversity

Growth in population and consumption

ASEAN member states are working together to conserve biodiversity and ecosystems, and to promote sustainable development. The ASEAN region is a major contributor to global biodiversity, containing four of the world's 34 biodiversity hotspots and three mega-diverse nations, which have exceptionally high levels of species endemism. 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 of these pressures. 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 by ASEAN member states and the international community. ASEAN member states are working together to conserve biodiversity and ecosystems, and to promote sustainable development.



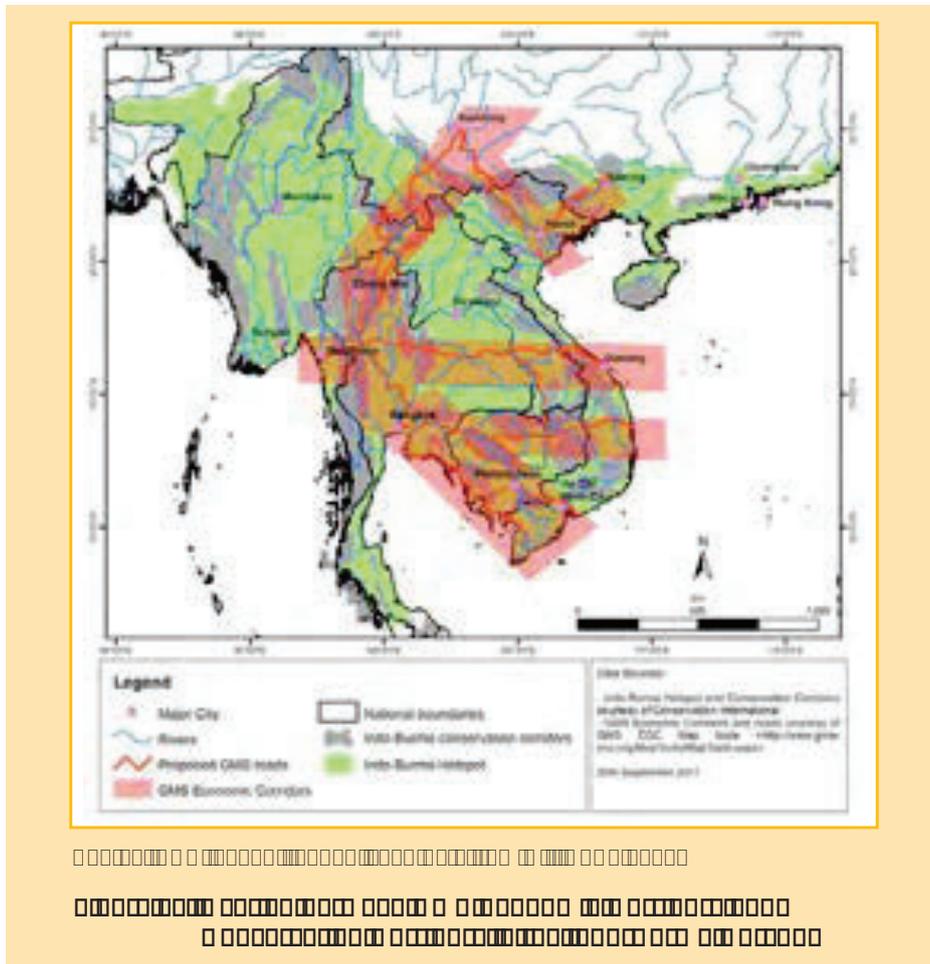
Rural-urban migration and urbanization are vastly expanding urban populations and increasing the demand for land and resources. Rapid economic growth and increased intra- and inter-regional trade and integration are driving these trends. Major urban centers such as Bangkok, Jakarta and Manila. Industrial development is also a significant driver of biodiversity loss.

Wildlife trade is a significant threat to biodiversity in the AMS. A large 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 biodiversity loss. Agro-industrial plantations of commercial crops such as palm oil, rubber and coffee have rapidly expanded in response to dramatic increases in global commodity prices. This has led to the loss of natural habitats and agro-industrial products (CEPF 2011).

Wildlife trade is a significant threat to biodiversity in the AMS. A large proportion of wildlife trafficked in the region (ASEAN Centre for Biodiversity 2010).

The map illustrates the geographical distribution of mining activities in Southeast Asia, highlighting areas of large-scale industrial mining and small-scale artisanal mining. The map shows various countries in the region, with different colors and patterns indicating mining zones. Key areas include the Philippines, Indonesia, and parts of Thailand and Vietnam. The map also shows major cities, rivers, and national boundaries.



of millions of tourists every year, a proportion of whom do nature-based tourism, such as ecotourism, bird watching, and trekking. The region is also a major source of natural resources, including timber, minerals, and agricultural products.

Increased intra- and inter-regional trade and investment

Increased cross-border trade investment within ASEAN and between ASEAN and other regions has led to significant economic growth and development. This has been driven by factors such as the expansion of trade agreements, the growth of the middle class, and the increasing integration of the region into the global economy. The region is now a major hub for trade and investment, with a growing number of multinational corporations and investors.

Hydropower dam development, driven by flood control and irrigation, has driven hydropower dam development in the Mekong region. The construction of large-scale dams has altered habitats and introduced direct threats to biota, such as the over-exploitation of certain species. Lao PDR earns significant economic incentive for hydropower development. A summary of the numbers of species threatened by different pressures is shown in Table 10.

Table 10: Species threatened by different pressures

The pressures 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 10.

Pressure	Number of species threatened	Number of species threatened
Conversion of natural habitats to agricultural land	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Conversion of natural habitats to urban and industrial areas	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Conversion of natural habitats to infrastructure	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Conversion of natural habitats to infrastructure	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Conversion of natural habitats to infrastructure	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Conversion of natural habitats to infrastructure	Annual and perennial non-timber crops; wood and other forest products; logging and wood harvesting; fishing	100
Natural system modification	Fire and fire suppression; dams and water management/use; other ecosystem modifications	100
Invasive non-native/alien species/disease; problematic native species/disease	Invasive non-native/alien species/disease; problematic native species/disease	100
Other	military effluents; agricultural and forestry effluents; garbage and solid waste; air-borne pollutants	100
Other	temperatures; storms and flooding	100

Habitat conversion

The pressures 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 10.

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 pressure on biodiversity through the selection of high-yielding crop and livestock varieties, and more intensive use of fertilizers and pesticides. This leads to the loss of genetic diversity and the degradation of soil and water resources.

Intensification also leads to the loss of habitats and the introduction of invasive alien species and micro-organisms. Invasive alien species can outcompete native species for food, space and other resources, leading to the decline or extinction of native species. Micro-organisms can also cause diseases in plants and animals, leading to significant losses.

Key threats to biodiversity in the ASEAN region

- Agricultural intensification and the use of fertilizers and pesticides are major threats to biodiversity in the ASEAN region.
- The conversion of natural habitats into agricultural land along the Mekong River into shrub lands unsuitable for cultivation, and affected fish populations.
- 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.
- The rice weevil, a pest that feeds on rice seedlings and has destroyed rice fields across the region.
- The introduction of invasive alien species and micro-organisms is also a major threat to biodiversity.

The loss of biodiversity in the ASEAN region is a major concern. The region is home to a wide range of species, many of which are found nowhere else. The loss of these species would have a significant impact on the region's ecosystems and the people who depend on them. The loss of genetic diversity is also a concern, as it reduces the ability of species to adapt to changing conditions.

Overfishing is also a growing concern, as the harvesting of freshwater fish in the region is increasing. This is especially true in AMS with important inland fisheries such as Cambodia, Indonesia, Myanmar and Thailand. Overfishing is leading to the depletion of fish stocks and the degradation of aquatic ecosystems.

Climate change

Climate change is a major threat to biodiversity in the ASEAN region. It is leading to the loss of habitats and the degradation of ecosystems. This is leading to the decline or extinction of many species.

Climate change is exacerbating the negative effects of other anthropogenic pressures on ecosystems. Changes in temperature and precipitation will affect many species by changing feeding, breeding, and migration patterns. This is particularly true for species that are already stressed by other factors such as habitat loss and pollution.

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Biodiversity

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 of biodiversity. The region is home to a wide variety of plant and animal species, many of which are found nowhere else in the world.

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.

ASEAN Biodiversity Outlook 2016

- *Parafimbrios lao*, a rainbow-headed snake, and the 111th snake species documented in Laos
- *Myotis* (Woolly-Headed Bat), a medium-sized bat with thick fur on its head
- *Musa* (Banana), 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
- *Amphibia* (Orange-Eyed Litter Frog), a small frog that lives in the hilly forests of Laos
- *Platymanis* (Purple Mouse-Eared Flower), a small purple flower from Mt. Kinabalu

ASEAN Biodiversity Outlook 2016

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

ASEAN Biodiversity Outlook 2016

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

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

Ecosystems

...

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

... .. 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. 2012). The region is also a key stop-over points for migratory birds of the East Asian-Australasian Flyway (Wetlands

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ASEAN Secretariat, 2012. ASEAN Environmental Outlook 2012. Singapore: ASEAN Secretariat.

Freshwater ecosystems are the most threatened ecosystems in the world. Losses in fish and aquatic biodiversity are occurring at an alarming rate. Freshwater ecosystems are the most threatened ecosystems in the world. Losses in fish and aquatic biodiversity are occurring at an alarming rate. Freshwater ecosystems are the most threatened ecosystems in the world. Losses in fish and aquatic biodiversity are occurring at an alarming rate.

Table 1: Freshwater Ecosystems in the ASEAN Region

Country	Number of Freshwater Ecosystems	Number of Fish Species	Number of Aquatic Biodiversity	Number of Threatened Species
Brunei Darussalam	0	0	0	0
Indonesia	0	0	0	0
Laos	0	0	0	0
Malaysia	0	0	0	0
Myanmar	0	0	0	0
Philippines	0	0	0	0
Singapore	0	0	0	0
Thailand	0	0	0	0
Vietnam	0	0	0	0
Timor-Leste	0	0	0	0

Table 2: Freshwater Ecosystems in the ASEAN Region (Continued)

Country	Number of Freshwater Ecosystems	Number of Fish Species	Number of Aquatic Biodiversity	Number of Threatened Species
Timor-Leste	0	0	0	0

Over the next decade, 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 and degraded by human activities.

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

Agroecosystems

Agroecosystems are the most threatened ecosystems in the world. Losses in fish and aquatic biodiversity are occurring at an alarming rate. Freshwater ecosystems are the most threatened ecosystems in the world. Losses in fish and aquatic biodiversity are occurring at an alarming rate.

10 Biodiversity and Ecosystem Services

The Tonlé Sap floodplain 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 to have declined by 80% since the 1970s. 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 Biodiversity Steering Committee 2014).

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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 Biodiversity Steering Committee 2014).

seasonally flooded swamp forest and grasslands rich in endemic and diverse species. 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 Biodiversity Steering Committee 2014).

economic activities. All private fishing lots were abolished in 2012 to encourage community-based fishery management, and several fish conservation areas have been established. 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 Biodiversity Steering Committee 2014).

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The ASEAN region has significant genetic diversity for rice (*Oryza spp.*) with 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* and *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-

State of the Environment Report

Singapore is a city-state with a land area of about 719 km² located within the Sundaland biodiversity hotspot. It is a highly urbanised city-state with a high density of built-up areas. Despite its small size, Singapore is home to a rich biodiversity of birds, 324 species of butterflies, 109 species of reptiles, 85 species of freshwater fish, 65 species of amphibians, and a variety of other species. The city's biodiversity is supported by a network of green spaces, including parks, gardens, and nature reserves.

One example of habitat conservation is the transformation of Bishan-Ang Mo Kio Park. This park was previously a residential area with a high density of buildings. Through better planning and co-ordination in the sustainable use, management and conservation of the park, a large area of natural habitat was preserved. This habitat is now home to a variety of species, including birds, butterflies, and reptiles. The park also provides a valuable ecosystem service by filtering water and reducing air pollution.

NParks has identified 68 species of flora and fauna for recovery efforts, and works alongside the community to conserve these species. One example is the butterfly *Taxilahaquinushaquinus*. NParks also engages the community through citizen science programmes such as the Garden Bird Watch and Butterfly Watch, and enhances the city's biodiversity through various initiatives.

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 the City; and the City's Contribution to Biodiversity Conservation.

and nature reserves, residential areas and city centres, and peri-urban agricultural land, although to differing degrees (Secretariat of the Convention on Biological Diversity). In Singapore, all butterfly species in the city were documented in forest reserves and urban parks (Koh et al., 2010).

State of the Environment Report

and nature reserves, residential areas and city centres, and peri-urban agricultural land, although to differing degrees (Secretariat of the Convention on Biological Diversity). In Singapore, all butterfly species in the city were documented in forest reserves and urban parks (Koh et al., 2010).

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

Provision of services

... 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).

... (2014).

... flood damage than new, high-yielding varieties (Talberth and Reyta 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, ...

ASEAN Biodiversity

... 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-

... 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 ...

... 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; ...

... 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 ...

... 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 Greater Mekong Sub-Region Biodiversity Corridors Initiative (BCI) and the Heart of ASEAN Wildlife Enforcement Network (ASEAN-WEN) is the region's main mechanism for

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

for

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

ASEAN member states have committed to the ASEAN Plan of Action for Biodiversity Conservation (APBC) and the ASEAN Regional Plan for Biodiversity Conservation (ARBC).

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

ASEAN member states have committed to the APBC and the ARBC.

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Achieving internationally agreed environmental goals

ASEAN member states have committed to the APBC and the ARBC. The APBC and ARBC are the main instruments for biodiversity conservation in the ASEAN region. They provide a framework for member states to work together to conserve biodiversity and promote sustainable use of natural resources. The APBC and ARBC also provide a platform for member states to share information and experiences, and to coordinate their efforts in biodiversity conservation.

- 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

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Water-related risks

Water-related risks are expected to increase by about one-third in 2025 and double during the period 2025-2050. This is due to increasing water scarcity, as water-related disasters and weak governance.

Water Demand and Availability

Water Demand

- Water demand is expected to increase by about one-third by 2025 and double during the period 2025-2050. This is due to population growth, urbanization, and economic development.
- Most ASEAN Member States (AMS) have made significant progress in improving access to water supply services. However, there is still a need to improve the quality and reliability of water supply services.
- Low wastewater treatment levels for a growing population, as well as the dumping of solid waste, contribute to water pollution and degradation of water quality.
- The main threat to water availability and water quality in most AMS is poor management, including over-extraction of groundwater, encroachment of the built environment into flood-prone areas and serious degradation of ecosystems.
- 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 coastal areas.

Water Availability

Water availability in the region has generally improved over the past two decades. Water demand is, however, expected to increase by about one-third in the next 25 years. This is due to population growth, urbanization, and economic development. The main threat to water availability and water quality in most AMS is poor management, including over-extraction of groundwater, encroachment of the built environment into flood-prone areas and serious degradation of ecosystems. 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 coastal areas.

Water availability is expected to increase significantly in several AMS, particularly Cambodia, Lao PDR, and Viet Nam. However, there is still a need to improve the quality and reliability of water supply services. Poor management, including over-extraction of groundwater, encroachment of the built environment into flood-prone areas and serious degradation of ecosystems, is the main threat to water availability and water quality in most AMS. 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 coastal areas. Weak governance exacerbates these freshwater-related issues, which are summarized in Table 3.8.

To secure water for different needs, freshwater resources in the region need to be managed sustainably. This requires a combination of measures, including improved water governance, investment in water infrastructure, and protection of ecosystems.

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

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

Table with 10 columns and 10 rows. The table contains various data points related to water resources and services. The columns represent different categories, and the rows represent specific data points or indicators.

Indicator 1	Indicator 2	Indicator 3	Indicator 4	flood	Indicator 5	Indicator 6	Indicator 7	Indicator 8	Indicator 9
Value 1				0	0	0	0	0	0
Value 2		0		0	0	0	0		0
Value 3				0	0	0	0	0	0
Value 4		0		0	0	0	0		
Value 5			0	0	0	0	0		
Value 6	0	0		0	0	0	0		
Value 7		0		0	0	0	0		
Value 8				0	0	0	0		

Legend: 0 = Not available, 1 = Available

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

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

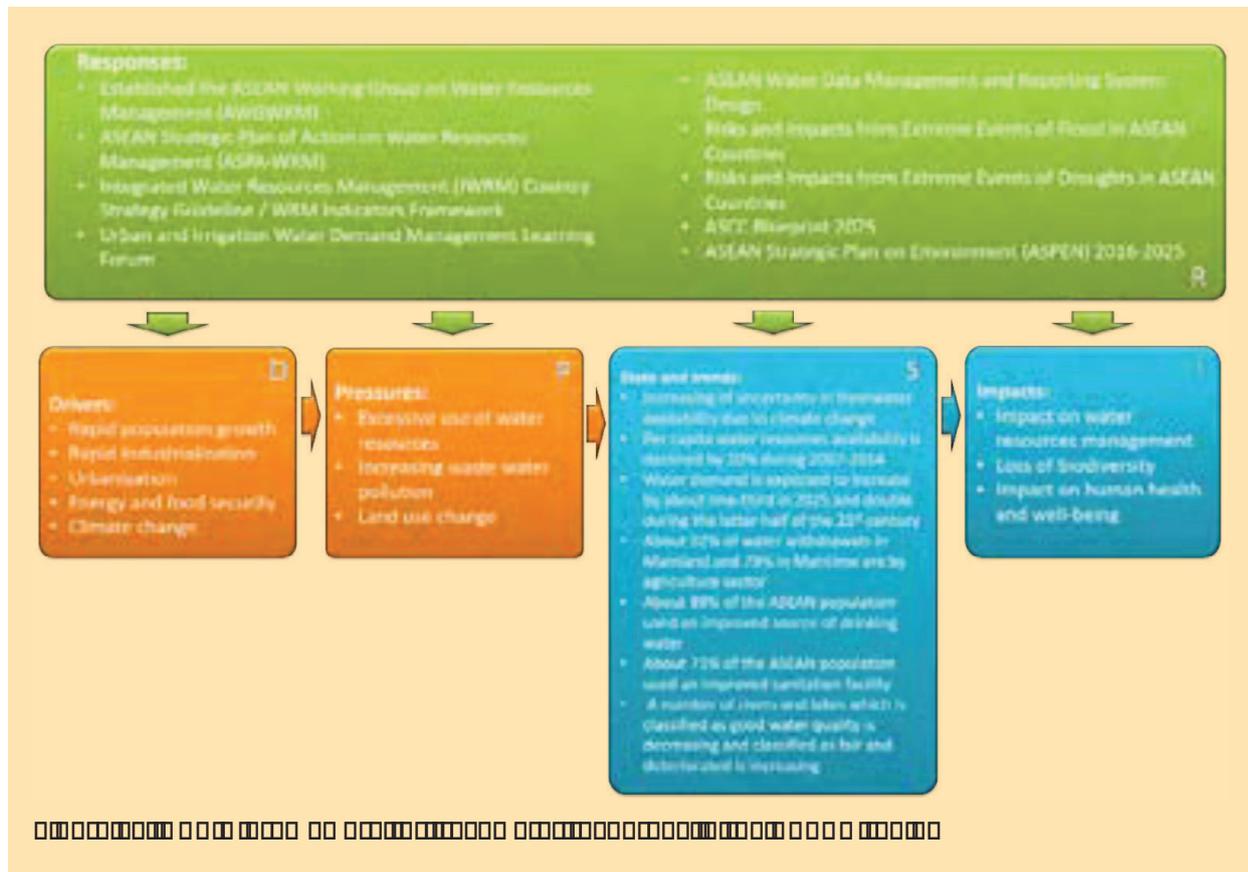
greater than 10 million) are located in Asia-Pacific region (UN-Habitat and UNESCAP

Water Quality

Water quality monitoring systems to increase efficiency in water resources

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

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

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 2014). A rise in sea level would exacerbate flood risk, salinity and change is expected to increase the frequency and severity of droughts and floods as well

Water Pollution

Water pollution is a major environmental problem in Thailand and Viet Nam. It is caused by a variety of factors, including urbanization and land-use change.

Water pollution is a major environmental problem in Thailand and Viet Nam. It is caused by a variety of factors, including urbanization and land-use change. Large hydropower projects to support energy production are already causing significant alteration of river flow patterns (Piman 2013).

Water pollution is a major environmental problem in Thailand and Viet Nam. It is caused by a variety of factors, including urbanization and land-use change.

- 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 100 in 2000 to 150 in 2010. The number of rivers in Thailand classified as deteriorated increased from 100 in 2000 to 150 in 2010. The number of rivers in Thailand classified as deteriorated increased from 100 in 2000 to 150 in 2010.

alterations of the catchment water and sediment balance and may influence 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

Water availability

Table 34: Average monthly precipitation (mm) and temperature (°C) for different regions.

Region	Temperature (°C)	Precipitation (mm)
North	28	1800
North West	28	1800
North East	28	1800
West	28	1800
Central	28	1800
South	28	1800
South West	28	1800
South East	28	1800
Delta	28	1800

Table 35: Average monthly precipitation (mm) and temperature (°C) for different regions.

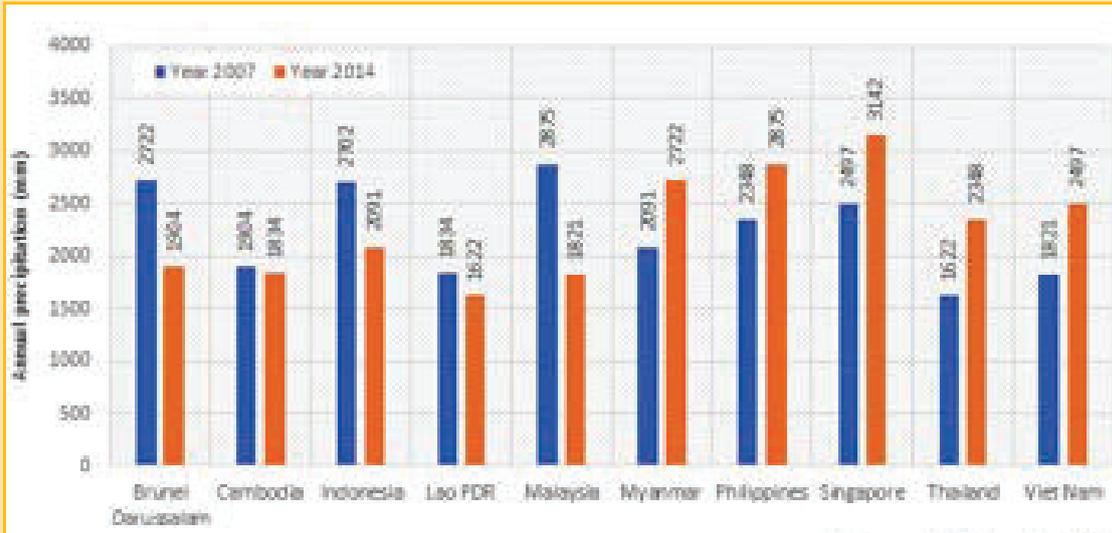
Region	Temperature (°C)	Precipitation (mm)
North	28	1800
North West	28	1800
North East	28	1800
West	28	1800
Central	28	1800
South	28	1800
South West	28	1800
South East	28	1800
Delta	28	1800

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).

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

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

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



Source: World Meteorological Organization (WMO)

Annual precipitation data for 2007 and 2014 are based on the latest available data from the World Meteorological Organization (WMO).

Table 1: Annual precipitation (mm) for 2007 and 2014 across Southeast Asian countries.

Country	2007 (mm)	2014 (mm)	% Change
Brunei Darussalam	2732	1904	-30.3%
Cambodia	1904	1834	-3.7%
Indonesia	2702	2091	-22.6%
Laos PDR	1834	1622	-11.6%
Malaysia	2875	1873	-35.2%
Myanmar	2091	2732	30.7%
Philippines	2348	2875	22.5%
Singapore	2497	3142	25.8%
Thailand	1622	2348	45.4%
Viet Nam	1873	2497	33.3%

Source: World Meteorological Organization (WMO)

Water demands and withdrawals

Water demands and withdrawals are critical indicators of water stress and sustainability. The data for 2014 for the three main water-consuming sectors (agriculture, domestic and industry) shows that agriculture remains the largest water consumer, followed by industry and domestic use. The total water demand and withdrawal for 2014 is estimated to be around 100 billion cubic meters (BCM) across the region.

Access to safe drinking water and improved sanitation

Access to safe drinking water and improved sanitation is a key challenge for many Southeast Asian countries. The data shows that while there has been significant progress in increasing access to safe drinking water, there is still a need for further investment and infrastructure development to ensure that all citizens have access to clean water and proper sanitation facilities.

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

Table 10. Access to safe drinking water and improved sanitation facilities (in percent)

	(in percent)								
	2006	2007	2008	2009	2010	2011	2012	2013	2014
Access to Safe Drinking Water									
Population with access to improved drinking water	80	80	80	80	80	80	80	80	80
Population with access to basic drinking water	-	80	80	80	80	80	80	80	80
Population with access to basic drinking water	80	80	80	80	80	80	80	80	80
Population with access to improved drinking water	-	-	-	-	80	80	80	-	-
Population with access to improved drinking water	80	80	80	80	80	80	80	-	-
Population with access to improved drinking water	80	80	80	-	80	80	80	-	-
Population with access to improved drinking water	80	80	80	80	80	80	80	80	80
Population with access to improved drinking water	80	80	-	80	80	80	80	80	80
Population with access to improved drinking water	80	-	80	-	80	80	80	-	-
Access to Improved Sanitation									
Population with access to improved sanitation	80	80	80	80	80	80	80	-	-
Population with access to improved sanitation	80	80	80	80	80	80	80	80	80
Population with access to improved sanitation	80	80	80	80	80	80	80	80	80
Population with access to improved sanitation	-	-	-	-	80	80	80	-	-
Population with access to improved sanitation	80	80	80	80	80	80	80	-	-
Population with access to improved sanitation	80	80	80	80	80	80	80	80	80
Population with access to improved sanitation	80	80	80	-	80	80	80	-	-
Population with access to improved sanitation	80	80	80	80	80	80	80	80	80
Population with access to improved sanitation	80	80	80	80	80	80	80	80	80
Population with access to improved sanitation	80	-	80	-	80	80	80	-	-

Source: AMSs' data submission for ASEAN Statistical Yearbook and or CPMS Report; Cambodia - Socio Economic Survey 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 Census; 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 and use of improved drinking water (%) by region and country.

The figure shows that the use of improved drinking water has increased significantly in most regions, particularly in Eastern Asia (90%) and Latin America & Caribbean (94%). The percentage point change in air quality has also increased in most regions, with the largest increase in Eastern Asia (26 percentage points). The use of improved drinking water is highest in developed regions (99%) and lowest in least developed countries (67%).

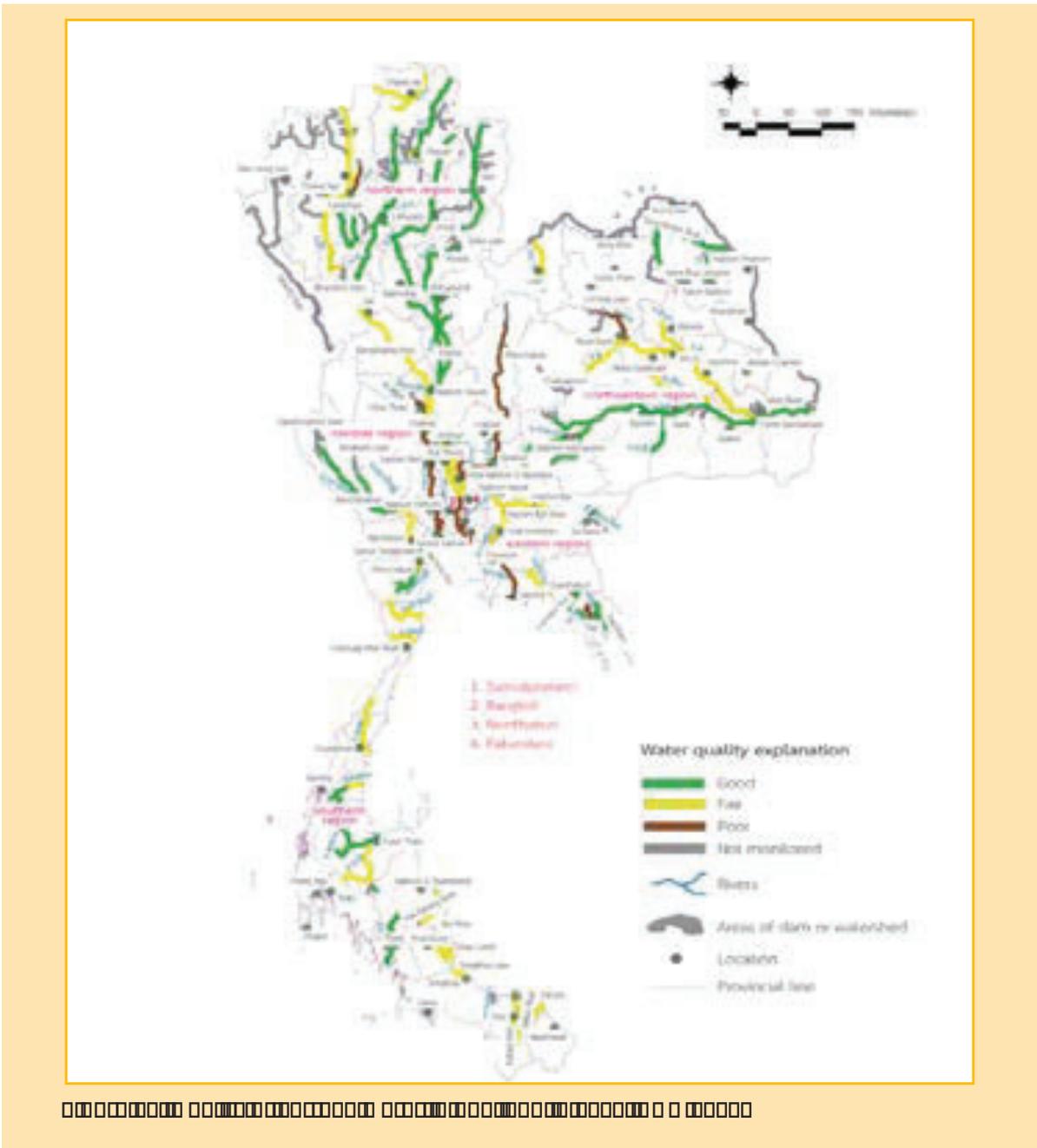


Percentage point change 1990-2012 and use of improved sanitation (%) by region and country.

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

Water resources management is a complex and multi-disciplinary task that requires a holistic approach. It involves the development and implementation of policies, plans, and programmes that aim to ensure the sustainable management of water resources. This includes the protection of water quality, the efficient use of water, and the equitable distribution of water among different sectors and users.

Water Quality

Water quality is a critical component of water resources management. It refers to the chemical, physical, and biological characteristics of water that determine its suitability for various uses. Poor water quality can have significant impacts on human health, the environment, and the economy. Therefore, it is essential to monitor and improve water quality through various measures, such as pollution control, water treatment, and the protection of water catchment areas.

Impact on water resources management

Climate change has a significant impact on water resources management. It affects the timing, quantity, and quality of water resources. For example, climate change can lead to more frequent and severe droughts and floods, which can damage water infrastructure and reduce water availability. Additionally, climate change can lead to sea-level rise, which can contaminate freshwater resources with saltwater. These impacts can have serious consequences for water security and the well-being of communities. Therefore, it is essential to take action to mitigate and adapt to the impacts of climate change on water resources.

Water resources management is a complex and multi-disciplinary task that requires a holistic approach. It involves the development and implementation of policies, plans, and programmes that aim to ensure the sustainable management of water resources. This includes the protection of water quality, the efficient use of water, and the equitable distribution of water among different sectors and users.

- 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
- Increasing irrigation areas and irrigation water supply
- Improving irrigation efficiency
- Reducing damages from flood and drought
- Improving agricultural production versus water utilization
- 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
- 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
- Controlling and treating wastewater from domestic, industrial and agriculture uses
- Improving water quality in the rivers to meet a defined ambient river water quality
- Improving water quality monitoring programme
- 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, Laos, Myanmar, Thailand, Cambodia and Vietnam. It has the second highest average annual flow in the world for a river basin of comparable size (Piman et al. 2013). Millions of people depend on the river for their livelihoods. The floodplains and wetlands of the basin are source of the river's great productivity. The inland fisheries produce 1.5 million 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 production is valued at US\$1.5 billion annually (Baran et al. 2015). 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 changes is increasing (Piman et al. 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 biodiversity.

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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 changes is increasing (Piman et al. 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 biodiversity.

Water Resources

Water Resource Management

Most of AMS have accepted and/or adopted integrated water resource management (IWRM) as a framework for water management. IWRM is a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant mutual benefits and avoid or minimize the negative impacts. IWRM is implemented at sub-regional and national levels for effective water management in AMS. The 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-national water resource management practices in AMS.

The 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-national water resource management practices in AMS.

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

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

During the last quarter of 2011, Thailand experienced its worst flooding since 1942. The

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

restoration and efficiency improvement of current and planned physical structures; (iv) response to specific geographical areas; (v) 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)

ASEAN Water Resources Management

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 ASEAN Water Resources Conference (AWRC) in 2015, provides a platform for sharing information on water resources management in the region. The website also features a news and events section, which provides updates on AMS and articles of water-related news and events in AMS. It is currently hosted by the Department of Water Resources, Ministry of Natural Resources and Environmental Conservation.

Water Resources Management in the Mekong Basin

The Mekong Basin is a transboundary river basin that spans across six countries: Cambodia, Laos, Myanmar, Thailand, Vietnam, and China. The basin covers an area of approximately 4.5 million km² and has a population of over 600 million people. The basin is a major source of water for agriculture, industry, and domestic use. However, the basin faces several challenges, including environmental degradation, over-exploitation of water resources, and increasing water scarcity. The basin also faces significant climate change impacts, such as increased flooding and droughts. The Mekong River Commission (MRC) was established in 1995 to promote sustainable water resources management in the basin. The MRC has updated the Basin Development Strategy (BDS) for 2016-2020 to respond to the basin's challenges. The BDS 2016-2020 has defined the following 7 basin-wide strategic priorities for basin water resources management:

- Reduce remaining knowledge gaps (i.e. capture fish ecology, biodiversity baseline, water quality, and sediment transport);
- 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.

The MRC has also initiated several projects to address the basin's challenges. One of the key projects is the Mekong River Water Resources Management (AWGWRM) project, which was launched in 2017. The project aims to improve water resources management in the basin through a series of activities, including water quality monitoring, flood and drought management, and capacity building. The project is currently in its early stages, but it is expected to have a significant impact on the basin's water resources management.

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... the workshop participants identified key issues in AMS. Key issues are insufficient irrigation infrastructure, weakness in legal and policy...

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.

... 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...

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>

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CHAPTER 10: FISHERIES AND OCEAN RESOURCES

The world's oceans are a rich source of food and other resources. They provide a productive fisheries industry. This chapter looks at the status of these resources and the threats from overfishing and other human activities. It also discusses the importance of sustainable management of these resources.

ASEAN Biodiversity Conservation

Key Findings

- The rich ocean resources of Southeast Asia are overfished and degraded. Key ecosystems are being lost, and marine biodiversity is declining. This is due to overfishing, habitat destruction, and pollution.
- 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 sectors to ensure sustainable use of marine resources.
- ASEAN should move swiftly to address the problem of marine litter or debris pollution as it poses a significant threat to marine ecosystems and human health.
- A coordinated and coherent regional approach is needed, especially those resources that are shared across national boundaries. Sustainable fisheries management and responsible fishing is critically needed.
- ASEAN should assist member states to achieve their Aichi targets especially on the creation of marine protected areas.

ASEAN Biodiversity Conservation

ASEAN member states are rich in biodiversity, with many species found nowhere else in the world. These species are often found in coastal and marine ecosystems, which are under increasing pressure from human activities. The ASEAN Centre for Biodiversity (ACB) is a regional hub for biodiversity conservation, providing technical assistance and capacity building to member states. ACB also works to raise awareness of biodiversity issues and promote sustainable use of natural resources.

Coastal and marine ecosystems are rich in biodiversity and well-known for their biodiversity. Different coastal and marine resources include mangroves, coral reefs, seagrass beds, pelagic fisheries, demersal fisheries, and seabed minerals. The ASEAN Centre for Biodiversity (ACB) is a regional hub for biodiversity conservation, providing technical assistance and capacity building to member states. ACB also works to raise awareness of biodiversity issues and promote sustainable use of natural resources.

ASEAN Economic Zone (AEZ) - economic zone of ASEAN

ASEAN Member State	Area (km ²)	Population (millions)
Brunei	57,651	0.4
Indonesia	1,904,569	250
Malaysia	328,550	30
Philippines	341,015	95
Singapore	710	5.5
Thailand	513,120	65
Vietnam	331,212	80
ASEAN Total	-	-

ASEAN member states are rich in biodiversity, with many species found nowhere else in the world. These species are often found in coastal and marine ecosystems, which are under increasing pressure from human activities.

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

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

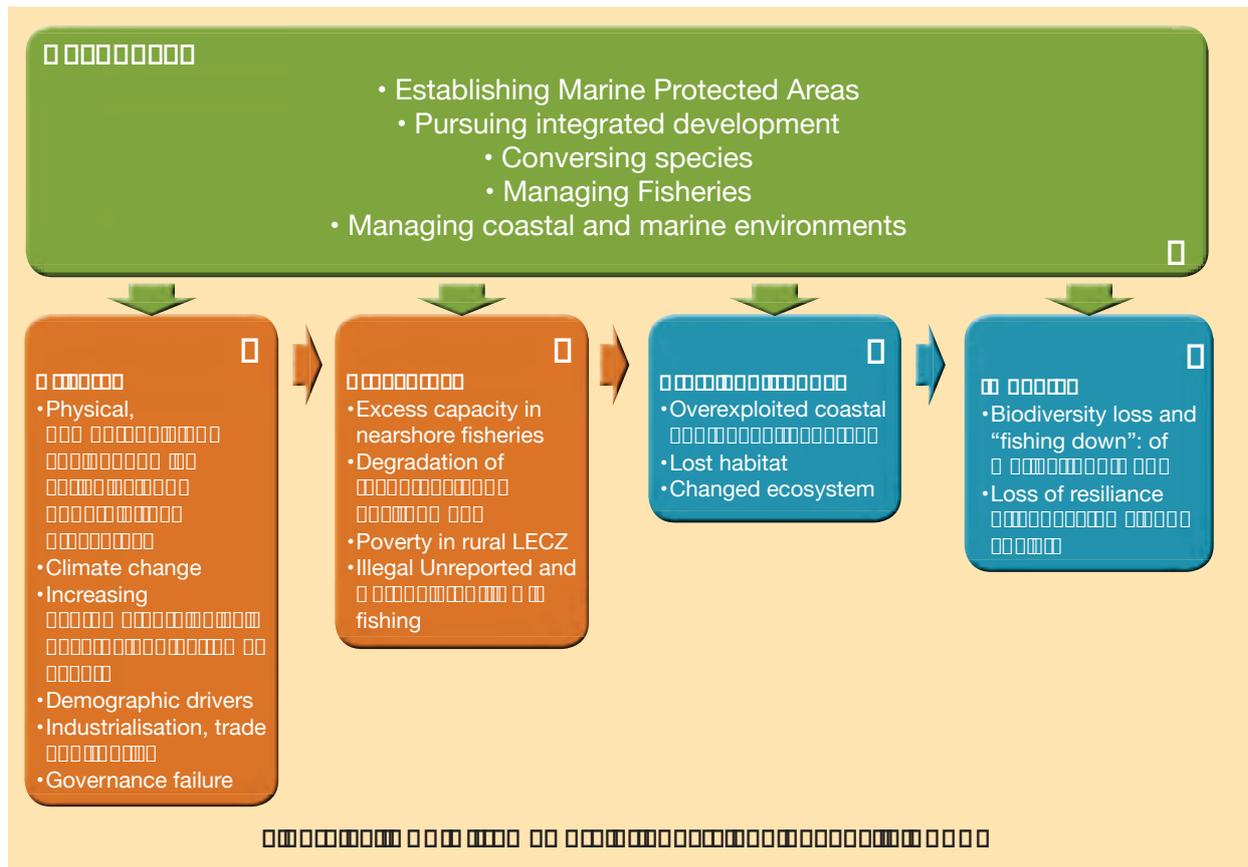
resource frontiers waiting to be exploited by a growing population as fishing becomes

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

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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

ASEAN Member State	Total Land Area (km ²)	Low Elevation Coastal Zone (km ²)	Percentage of Low Elevation Coastal Zone
Brunei Darussalam	57,657	1,000	1.7%
Indonesia	1,904,569	1,000,000	52.5%
Malaysia	329,814	1,000	0.3%
Myanmar	676,600	1,000	0.1%
Philippines	343,750	1,000	0.3%
Singapore	719	1,000	139.1%
Thailand	513,120	1,000	0.2%
Vietnam	331,212	1,000	0.3%
Laos	236,800	-	-
Cambodia	181,035	1,000	0.6%
Timor-Leste	14,719	1,000	6.8%
Average	300,000	1,000	0.3%

Drivers of Coastal Change

Drivers are the physical, demographic and socio-economic processes that lead to coastal change. Physical drivers include sea-level rise, storm surge, and coastal erosion. Demographic drivers include population growth and urbanization. Socio-economic drivers include land-use change, deforestation, and unsustainable resource management. These drivers interact to increase the vulnerability of coastal areas and their inhabitants.

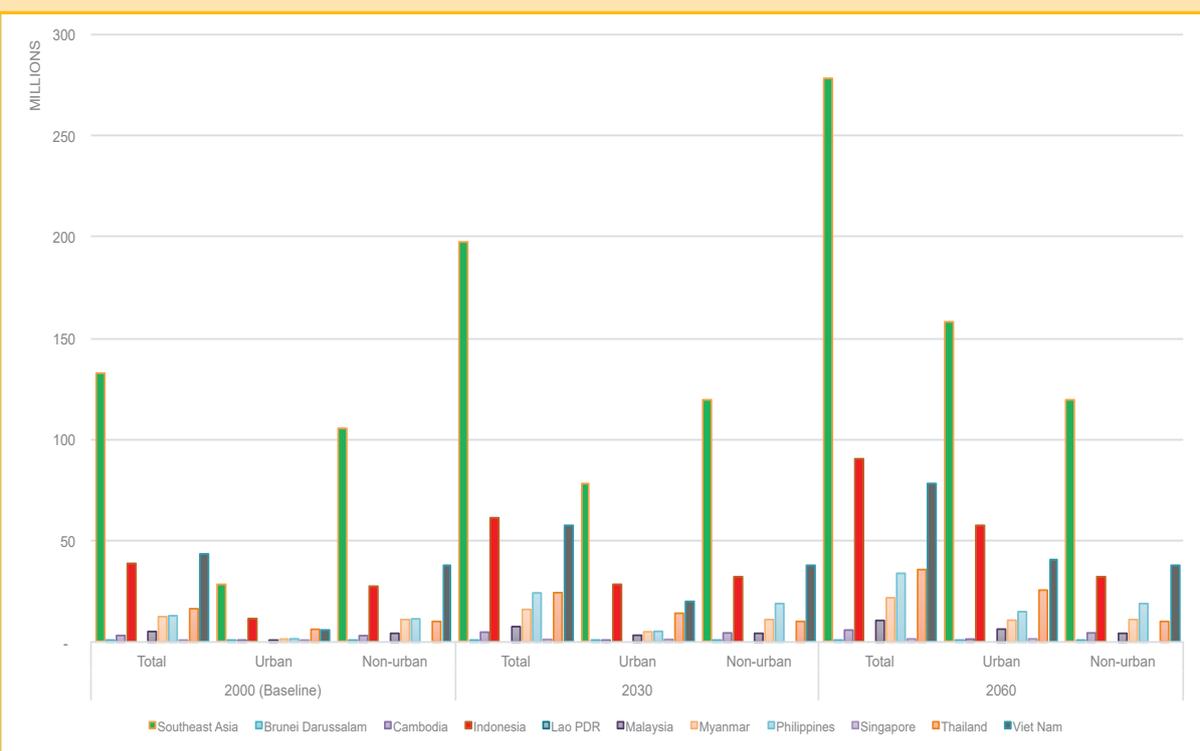
Increasing impacts of a changing climate on the coasts of ASEAN

Climate change is expected to have significant impacts on the coasts of ASEAN. Sea-level rise (SLR) is a major concern, as it will inundate low-lying coastal areas and displace millions of people. Other impacts include increased frequency and intensity of storms, coastal erosion, and saltwater intrusion. These impacts will affect the well-being of coastal inhabitants and the economies of ASEAN member states. The rate of change is expected to be faster than at any time during human civilization.

Figure 10: Projected SLR in Southeast Asia (Millions of People)

Country	Population (Millions)	SLR (m)	2030			2050			2060		
			Population	SLR (m)							
Indonesia	250	0.5	250	0.5	250	0.5	250	0.5	250	0.5	
Philippines	100	0.5	100	0.5	100	0.5	100	0.5	100	0.5	
Viet Nam	90	0.5	90	0.5	90	0.5	90	0.5	90	0.5	
Thailand	65	0.5	65	0.5	65	0.5	65	0.5	65	0.5	
Malaysia	30	0.5	30	0.5	30	0.5	30	0.5	30	0.5	
Myanmar	55	0.5	55	0.5	55	0.5	55	0.5	55	0.5	
Singapore	5.5	0.5	5.5	0.5	5.5	0.5	5.5	0.5	5.5	0.5	
Cambodia	16	0.5	16	0.5	16	0.5	16	0.5	16	0.5	
Lao PDR	6.5	0.5	6.5	0.5	6.5	0.5	6.5	0.5	6.5	0.5	
Brunei Darussalam	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.5	
Southeast Asia	600	0.5	600	0.5	600	0.5	600	0.5	600	0.5	

Source: IPCC AR5, 2007; IHO, 2007; IHO, 2009; IHO, 2012; IHO, 2014; IHO, 2016; IHO, 2018; IHO, 2020; IHO, 2022; IHO, 2024; IHO, 2026; IHO, 2028; IHO, 2030; IHO, 2032; IHO, 2034; IHO, 2036; IHO, 2038; IHO, 2040; IHO, 2042; IHO, 2044; IHO, 2046; IHO, 2048; IHO, 2050; IHO, 2052; IHO, 2054; IHO, 2056; IHO, 2058; IHO, 2060; IHO, 2062; IHO, 2064; IHO, 2066; IHO, 2068; IHO, 2070; IHO, 2072; IHO, 2074; IHO, 2076; IHO, 2078; IHO, 2080; IHO, 2082; IHO, 2084; IHO, 2086; IHO, 2088; IHO, 2090; IHO, 2092; IHO, 2094; IHO, 2096; IHO, 2098; IHO, 2100.



Source: IPCC AR5, 2007; IHO, 2007; IHO, 2009; IHO, 2012; IHO, 2014; IHO, 2016; IHO, 2018; IHO, 2020; IHO, 2022; IHO, 2024; IHO, 2026; IHO, 2028; IHO, 2030; IHO, 2032; IHO, 2034; IHO, 2036; IHO, 2038; IHO, 2040; IHO, 2042; IHO, 2044; IHO, 2046; IHO, 2048; IHO, 2050; IHO, 2052; IHO, 2054; IHO, 2056; IHO, 2058; IHO, 2060; IHO, 2062; IHO, 2064; IHO, 2066; IHO, 2068; IHO, 2070; IHO, 2072; IHO, 2074; IHO, 2076; IHO, 2078; IHO, 2080; IHO, 2082; IHO, 2084; IHO, 2086; IHO, 2088; IHO, 2090; IHO, 2092; IHO, 2094; IHO, 2096; IHO, 2098; IHO, 2100.

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

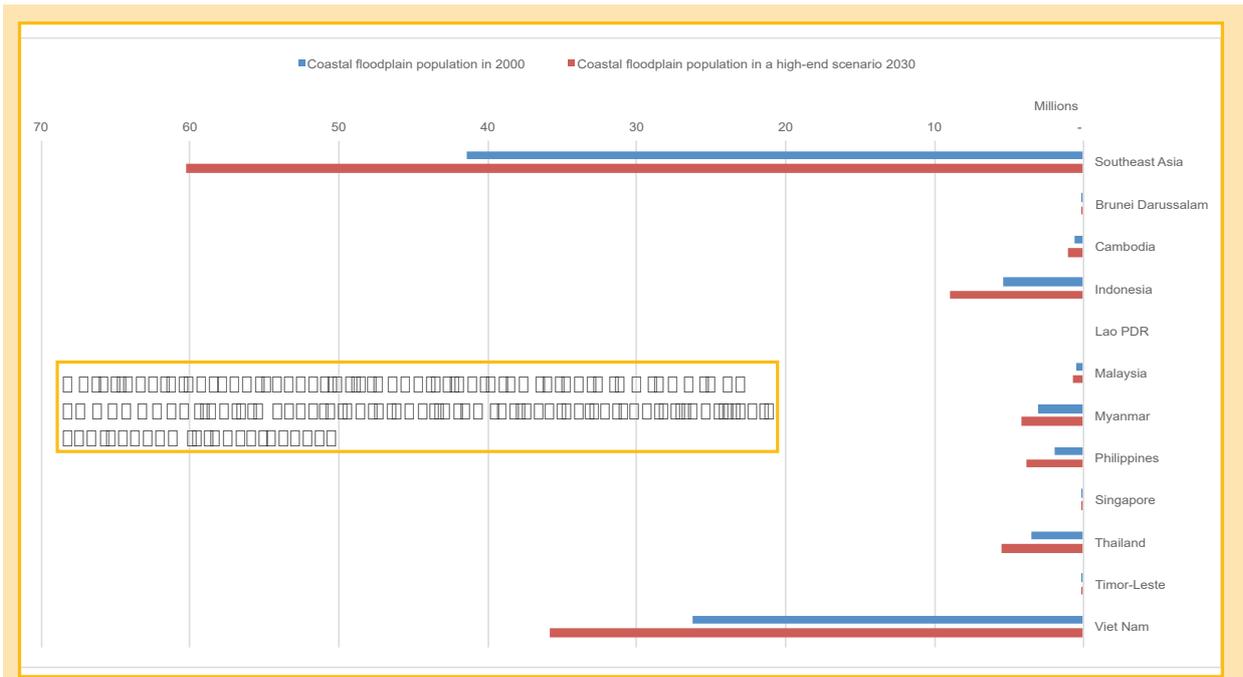


Figure 40. Population of coastal floodplain in ASEAN region in 2000 and 2030

Table 37. Population in low elevation coastal zone in key urban agglomerations in ASEAN based on the 2000 and 2030 population projections

Country	Urban agglomeration	Population in 2000 (Millions)	Population in 2030 (Millions)	Population in low elevation coastal zone (Millions)
Indonesia	Jakarta	~10	~15	~5
Indonesia	Surabaya	~5	~7	~2
Indonesia	Bandung	~5	~7	~2
Indonesia	Yogyakarta	~5	~7	~2
Indonesia	Medan	~5	~7	~2
Indonesia	Malang	~5	~7	~2
Indonesia	Semarang	~5	~7	~2
Viet Nam	Hanoi	~5	~7	~2
Viet Nam	Hue	~5	~7	~2
Viet Nam	Ho Chi Minh City	~5	~7	~2

Indonesia and Viet Nam highly exposed to the impacts of sea-level rise (Neumann et al. 2007). The rapid urbanization and population growth in coastal areas have led to the expansion of impervious concrete spaces which increase run-off and flooding (Secretariat of the ASEAN Intergovernmental Commission on Human Resources 2015; 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).

Urbanization is a process that has been occurring since the beginning of human civilization. It is the process of increasing the proportion of the population living in urban areas. Urbanization is a result of a number of factors, including economic growth, technological advancement, and the search for better living conditions. Urbanization has led to the development of cities and the concentration of population in urban areas. This has led to a number of challenges, including environmental degradation, social inequality, and the loss of traditional ways of life. However, urbanization has also led to many benefits, including economic growth, technological advancement, and the development of infrastructure. Urbanization is a complex process that is shaped by a number of factors, and it is likely to continue to be a major trend in the world for many years to come.

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exclusive social, political and economic governance. The share of LECZ areas defined by 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

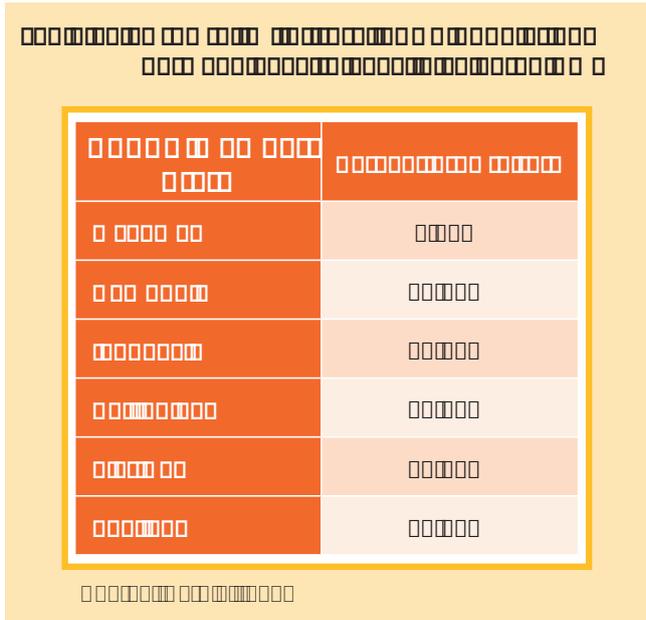
As a result, urbanization has become “the most irreversible and human-dominated form of land use” of all human activities (Seto et al. 2011, p.2). Urbanization is often a result of a number of factors, including economic growth, technological advancement, and the search for better living conditions. Urbanization has led to the development of cities and the concentration of population in urban areas. This has led to a number of challenges, including environmental degradation, social inequality, and the loss of traditional ways of life. However, urbanization has also led to many benefits, including economic growth, technological advancement, and the development of infrastructure. Urbanization is a complex process that is shaped by a number of factors, and it is likely to continue to be a major trend in the world for many years to come.

the rate of urban land expansion up by 0.829 percentage points compared to non-coastal areas. Urbanization is often a result of a number of factors, including economic growth, technological advancement, and the search for better living conditions. Urbanization has led to the development of cities and the concentration of population in urban areas. This has led to a number of challenges, including environmental degradation, social inequality, and the loss of traditional ways of life. However, urbanization has also led to many benefits, including economic growth, technological advancement, and the development of infrastructure. Urbanization is a complex process that is shaped by a number of factors, and it is likely to continue to be a major trend in the world for many years to come.

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. Urbanization is often a result of a number of factors, including economic growth, technological advancement, and the search for better living conditions. Urbanization has led to the development of cities and the concentration of population in urban areas. This has led to a number of challenges, including environmental degradation, social inequality, and the loss of traditional ways of life. However, urbanization has also led to many benefits, including economic growth, technological advancement, and the development of infrastructure. Urbanization is a complex process that is shaped by a number of factors, and it is likely to continue to be a major trend in the world for many years to come.

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 2050, between 80-89% of their population in rural areas 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

Ports therefore could... 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...

Figure 40: Top 10 ASEAN Ports by TEU Traffic (2010-2014)

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	Philippines
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

Source: ASEAN Secretariat (2015)

Although Figure 41 does not differentiate between coastal and non-coastal tourism, it shows that tourism is a significant sector in ASEAN. Tourism's environmental impacts on coastal areas are particularly concerning, as they can lead to degradation of marine ecosystems and loss of biodiversity (Thirumaran and Arumynathan 2016). Tourism's environmental impacts on coastal areas can be categorized into three main types: direct, indirect, and cumulative impacts. Direct impacts include the physical destruction of coastal habitats, such as coral reefs and mangroves, due to the construction of tourism infrastructure and the discharge of waste. Indirect impacts include the increased demand for resources, such as water and energy, and the resulting pollution and degradation of coastal ecosystems. Cumulative impacts are the result of the combined effects of multiple tourism activities over time, leading to the long-term degradation of coastal ecosystems and the loss of biodiversity (Thirumaran and Arumynathan 2016).

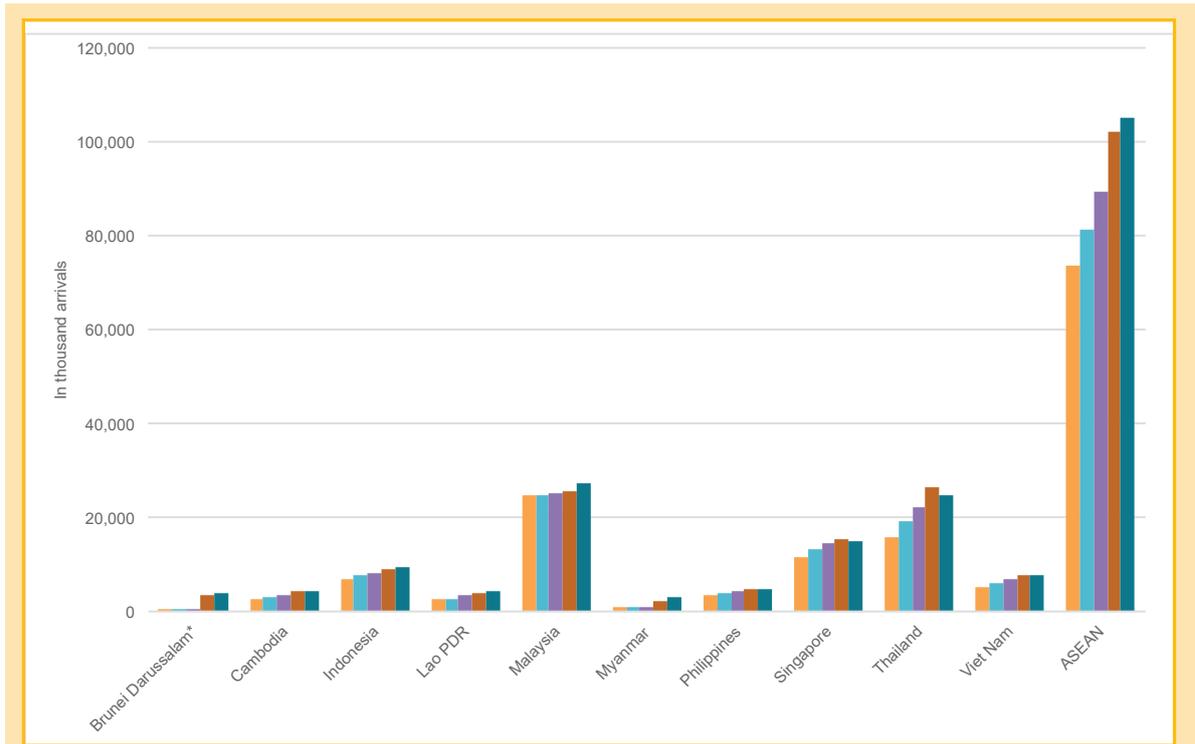
These impacts are often exacerbated by the political economy to produce situations where there are differences in income, job opportunities, and access to resources. This can lead to the marginalization of coastal communities and the loss of their traditional livelihoods. The political economy of tourism in ASEAN is characterized by a focus on short-term economic gains and a lack of long-term planning and management. This has led to the fragmentation of tasks across different actors in the bureaucracy, giving rise to problems of coordination and effectiveness (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 crisis response.

Fragmentation refers to the separation of tasks across the different actors in the bureaucracy, giving rise to problems of coordination and effectiveness (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 crisis response. Fragmentation is a common problem in ASEAN, where different sectoral ministries, departments, offices and authorities are responsible for different aspects of coastal management. This leads to a lack of coordination and effectiveness in policy-making and implementation. Rigidity refers to the inability of the bureaucracy to adapt to changing circumstances and needs. This is often due to a focus on short-term economic gains and a lack of long-term planning and management. Scale refers to the inability of the bureaucracy to manage large-scale issues, such as the degradation of coastal ecosystems and the loss of biodiversity. Elite capture refers to the concentration of power and resources in the hands of a small group of elites, leading to the marginalization of coastal communities and the loss of their traditional livelihoods. Crisis response refers to the reactive nature of policy-making and planning in response to political pressures instead of a more strategic, inclusive and well-thought out policy-making (Lebel et al. 2010).

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



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

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

indigenous communities in coastal and fisheries management.

ASEAN have had enduring fisheries management practices and institutions such as

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

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

REEF FISHERIES

Reef fisheries are usually small-scale, artisanal, subsistence and operating in usually remote locations far from regulated landing sites.

over five decades alongside being overfished³⁹ 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).

Reef fisheries are usually small-scale, artisanal, subsistence and operating in usually remote locations far from regulated landing sites. Reef fisheries⁴⁰ also include fishing in that there are 6 million reef fishers in 99 reef countries and territories worldwide. At least 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

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.

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 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 2007). Essentially, various forms of overfishing results from the overexploitation of the reef and the removal of keystone 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.

Figure 42 is a bar chart showing the estimated number of reef fishers among AMS in 2010. The y-axis represents the number of reef fishers, ranging from 0 to 10,000,000. The x-axis lists the countries and regions: Indonesia, Philippines, Viet Nam, Myanmar, Thailand, Malaysia, Cambodia, Brunei Darussalam, Total Southeast Asia, and Total World. The bars show that Indonesia has the highest number of reef fishers, followed by the Philippines, and then Viet Nam. The Total Southeast Asia and Total World bars are significantly higher than the individual countries, indicating a large number of reef fishers in the region and globally.

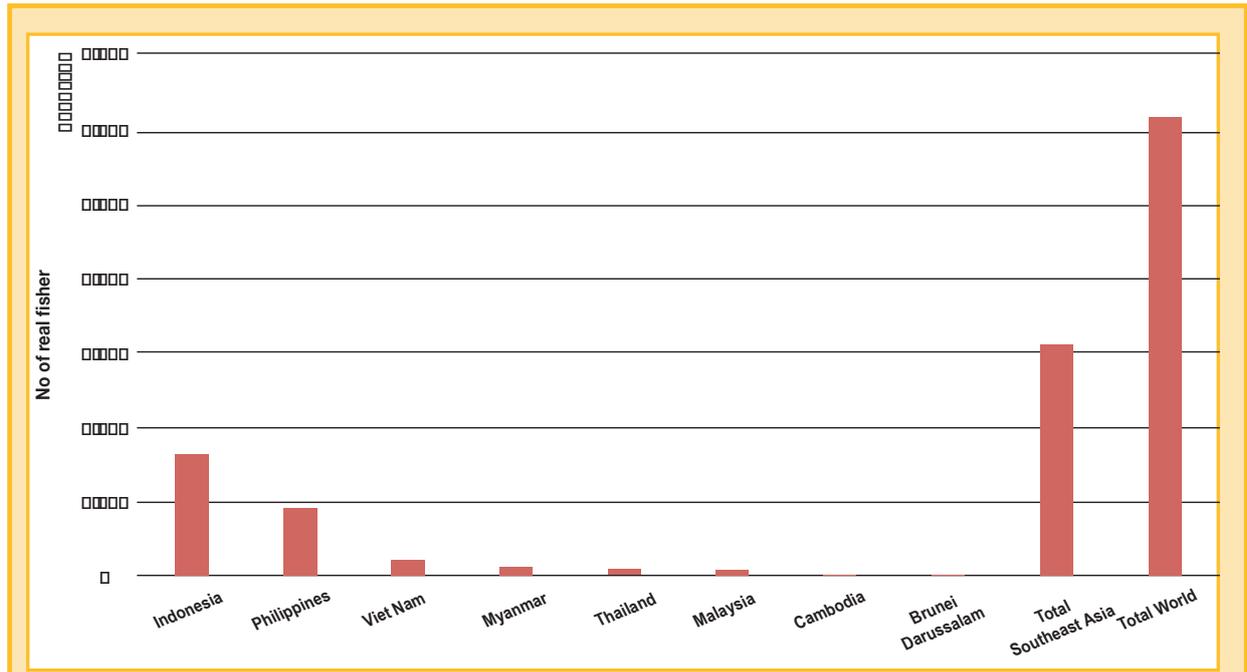


Figure 42. Estimated number of reef fishers among AMS in 2010

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 of coastal communities. This is particularly true in the LECZ of Thailand, where the majority of the population is dependent on coastal fisheries and other marine resources for their livelihoods. The high poverty levels in other AMS are likely due to a lack of such opportunities and resources. This highlights the importance of coastal zone management and sustainable development in reducing poverty and improving the well-being of coastal communities.

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

Country	High rural low elevation coastal zone poverty (2000)			Country	High rural low elevation coastal zone poverty (2000)		
	High infant mortality	High child malnutrition	High poverty		High infant mortality	High child malnutrition	High poverty
Indonesia	High	High	High	Thailand	High	High	High
Philippines	High	High	High	Myanmar	High	High	High
Viet Nam	High	High	High	Malaysia	High	High	High
Myanmar	High	High	High	Cambodia	High	High	High
Thailand	High	High	High	Brunei Darussalam	High	High	High
Malaysia	High	High	High				
Cambodia	High	High	High				
Brunei Darussalam	High	High	High				

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 malnutrition is defined as children with a weight-for-age z-score more than two standard deviations below the median of the NCHS/CDC/WHO International Reference Survey of 1977.

There has been an increase in illegal, unreported and unregulated (IUU) fishing⁴² in the region. This is due to a combination of factors, including the lack of adequate 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

Table 4.2: Marine fish catch in the region, 2014

Species	Volume (metric tons)	Value (US\$ million)	Percentage of total catch	Percentage of total value
Bluefin, Yellowfin and Bigeye	1,200	1,200	15%	15%
restrelliger mackarels, Queenfishes	800	800	10%	10%
unidentified	5,000	5,000	65%	75%

being decimated through rampant IUU fishing, leading to the degradation of the region's marine resources (Cinner et al. 2014; Dirhamsyah et al. 2012; Sadovy 2010; Warren-Rhodes et al. 2003; Johns 2013; Ventura et al. 2015). Other marine flora and fauna are now listed in CITES Red List as endangered or vulnerable. Harmful algal and jellyfish blooms are causing harmful algal and jellyfish blooms.

Illegal and unreported fishing losses worldwide are between US\$ 10 billion and 23.5 billion annually (Cinner et al. 2014; Dirhamsyah et al. 2012; Sadovy 2010; Warren-Rhodes et al. 2003; Johns 2013; Ventura et al. 2015).

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 economic zone.

decline in global marine fish catch from 1950 to 2000, and that the only remaining frontier fishing grounds are the high seas. The main threats to marine fisheries include by-catch and IUU fishing.

Table 1: Marine Fisheries in ASEAN

Country	Production (1000 mt)	Production (1000 mt)
Brunei Darussalam	0	0
Indonesia	1000	1000
Malaysia	1000	1000
Philippines	1000	1000
Singapore	-	-
Thailand	1000	1000
Vietnam	1000	1000
Myanmar	1000	1000
Cambodia	1000	1000
Laos	1000	1000
Timor-Leste	1000	1000

Source: FAO, 2010. Production of fish and fish products in ASEAN countries, 1950-2000. (mt = metric tonne)

ASEAN Coral Reefs

Coral reefs

Coral reefs are among the most diverse and productive ecosystems in the world. They provide habitat for a wide range of marine life, including many commercially important fish species. In the ASEAN region, coral reefs are found in Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Vietnam. The region has "the most extensive and diverse coral reefs in the world", but they are facing significant threats from overfishing, destructive fishing practices, sedimentation, and pollution from human settlements and agriculture (Pauly 2017). Biodiversity tapers off further away from this area (Veron et al. 2009). Table 1 shows the production of fish and fish products in ASEAN countries from 1950 to 2000.

Threats including overfishing, destructive fishing practices such as blast and poison fishing, sedimentation and pollution from human settlements and from agriculture, is a major concern. 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 threats to coral reefs. Overfishing has 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

Mangroves are important breeding and nursery grounds for various fisheries, store carbon and play a vital role in coastal protection. However, they are being lost at an alarming rate due to various drivers such as aquaculture, agriculture, and urban expansion. The rate of deforestation varies significantly across the region and by year, with some areas showing a sharp decline in mangrove cover over the past decade.

Country	2000	2005	2010	2015	2020
Brunei	1,000	1,000	1,000	1,000	1,000
Indonesia	1,000	1,000	1,000	1,000	1,000
Malaysia	1,000	1,000	1,000	1,000	1,000
Philippines	1,000	1,000	1,000	1,000	1,000
Thailand	1,000	1,000	1,000	1,000	1,000
Vietnam	1,000	1,000	1,000	1,000	1,000
Myanmar	1,000	1,000	1,000	1,000	1,000
Timor-Leste	1,000	1,000	1,000	1,000	1,000
TOTAL	1,000	1,000	1,000	1,000	1,000

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 the period, with a significant increase in 2015. The loss of mangroves is a major concern for the region, as they provide essential ecosystem services and are a carbon sink. Efforts are being made to protect and restore mangrove forests, but more action is needed to address the underlying drivers of deforestation.

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

Table 1: Land Use Change in Mangrove Ecosystems (1990-2010)

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

Seagrass meadows are highly productive ecosystems that provide a range of ecosystem services. They are important for carbon sequestration, nutrient cycling, and sediment stabilization. Seagrass meadows also provide habitat for a variety of marine life, including commercially important species of mollusk, crustacean, and fish while also protecting coastal areas from erosion. The loss of seagrass meadows can have significant impacts on the 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 by climate change, therefore, is a major long-term threat to the...

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

Indonesia, Philippines, Viet Nam, Thailand, Malaysia, Myanmar

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).

Figure 10: Direct Impacts of a 1m Sea Level Rise on Coastal GDP, Agricultural Area, Wetlands, and Fisheries Vulnerability in ASEAN Countries

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

Coastal and marine ecosystems are vital to the livelihoods of millions of people in ASEAN. These ecosystems provide a wide range of goods and services, including food, medicine, and recreation. However, these ecosystems are under increasing pressure from human activities, including coastal development, over-fishing, and climate change. The full utilization of the recreational values of the region's resources remains unfulfilled. The over-exploitation of marine resources has led to the over-fished state of coasts and oceans in ASEAN (Teh et al. 2016).

The significant direct impacts on the coastal wetlands of these countries and their fisheries, as shown in Figure 10, highlight the need for urgent action. Coastal wetlands are important for carbon sequestration, water filtration, and habitat for many species. The loss of these wetlands due to sea level rise and storm surges will have significant impacts on the coastal environment and the livelihoods of the people who depend on them. 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. The study found that flood losses could reach up to \$1.2 billion per year by 2050 in ASEAN countries.

Figure 10: Direct Impacts of a 1m Sea Level Rise on Coastal GDP, Agricultural Area, Wetlands, and Fisheries Vulnerability in ASEAN Countries

ASEAN were included. A 100-year flooding, without taking into consideration sea level rise, subsidence, and if no adaptation is made, Bangkok and Jakarta will suffer the most (i.e., coastal defenses), HCMC will suffer more with a mean annual loss of 0.83% of GDP. The Mekong delta, which is not only 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 significantly.

The rural coastal poor are facing a poverty-environment trap with high rates of infant mortality, low literacy rates, and poor health care. The trap is caused by the combination of poverty and environmental degradation. Coastal erosion and salt-water intrusion will lead to livelihood disruptions, loss of land, and reduced agricultural productivity. This will further exacerbate poverty and environmental degradation, creating a vicious cycle. The rural coastal poor are also vulnerable to natural disasters such as typhoons and storms, which can cause significant damage to their homes and livelihoods. This vulnerability is due to their limited resources and lack of access to disaster risk reduction measures. The rural coastal poor are also facing a poverty-environment trap with high rates of infant mortality, low literacy rates, and poor health care. The trap is caused by the combination of poverty and environmental degradation. Coastal erosion and salt-water intrusion will lead to livelihood disruptions, loss of land, and reduced agricultural productivity. This will further exacerbate poverty and environmental degradation, creating a vicious cycle. The rural coastal poor are also vulnerable to natural disasters such as typhoons and storms, which can cause significant damage to their homes and livelihoods. This vulnerability is due to their limited resources and lack of access to disaster risk reduction measures.

Policy Recommendations

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

Table 10. Mean annual loss of GDP due to sea level rise and subsidence in cities prone to subsidence in 2050, with and without adaptation (constant probability, constant population, constant protection)

Urban Agglomeration	No change to sea level					30 cm sea level rise and subsidence (no adaptation)		30 cm sea level rise and subsidence (adaptation at constant probability, constant population, constant protection)		
	100-yr expected loss (M\$)	100-yr loss with no protection (M\$)	Protection level in 2050 (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	48,066	14,460	50	508	0.07%	20,778	2387%	734	0.09%	20%
Jakarta	9,577	2,553	10	1,738	0.14%	16,354	1336%	1,700	0.22%	54%
Ho Chi Minh City	42,093	30,216	50	1,743	0.74%	7,335	321%	1,953	0.83%	11%
Hà Nội	14,283	4,726	50	320	0.37%	6,209	941%	303	0.44%	30%
Palembang	2,612	834	10	418	0.38%	4,764	1040%	606	0.48%	21%
Manila	2,339	872	10	254	0.05%	2,846	1019%	329	0.06%	29%
Bangkok	4,177	1,387	10	163	0.17%	1,818	1017%	202	0.21%	24%
Surabaya	727	163	10	80	0.04%	1,052	1025%	110	0.06%	39%
Kuala Lumpur	19,437	4,696	100	94	0.03%	253	366%	63	0.04%	13%
Makassar	156	30	10	11	0.01%	67	315%	12	0.02%	12%
Umeas	69	22	10	5	0.01%	56	921%	6	0.01%	7%
Singapore	3,412	2,020	2000	2	0.00%	27	1223%	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 resources. The Sulu-Sulawesi Ecoregion under the ASEAN Heritage Parks Programme. Others are set up under the UNESCO-Man and Biosphere, UNESCO World Heritage Convention, and other international agreements. Marine Protected Areas (MPAs) have been responsible for replenishing depleted fish stocks in the region. More MPAs are being established in the region to protect and manage marine resources. The establishment of MPAs is a key strategy to conserve marine biodiversity and ensure the sustainable use of marine resources. MPAs provide a safe haven for marine life, allowing fish stocks to recover and ecosystems to thrive. This, in turn, supports the livelihoods of coastal communities that depend on marine resources for their survival. The establishment of MPAs is a win-win situation for both the environment and the people who live in coastal areas.

Table 11. Key indicators of marine resources in ASEAN countries, 2010-2015

Indicator	2010	2015	Change (%)
Marine fish catch (1,000 metric tons)	1,200	1,300	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	-	-	-
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%
Marine fish catch per fisher (kg)	120	130	8.3%

Source: ASEAN Secretariat, 2016

At national levels, efforts, in both policy and project levels, are ongoing to manage the marine environment. The marine environment is a rich and diverse ecosystem that provides a wide range of goods and services to the coastal and marine communities. The marine environment is also a source of inspiration and recreation for many people. The marine environment is a vital part of the coastal and marine ecosystem and is essential for the well-being of the coastal and marine communities. The marine environment is a source of food, medicine, and other resources. The marine environment is also a source of recreation and tourism. The marine environment is a source of inspiration and recreation for many people. The marine environment is a vital part of the coastal and marine ecosystem and is essential for the well-being of the coastal and marine communities. The marine environment is a source of food, medicine, and other resources. The marine environment is also a source of recreation and tourism. The marine environment is a source of inspiration and recreation for many people.

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

Key Messages



The marine environment is a rich and diverse ecosystem that provides a wide range of goods and services to the coastal and marine communities. The marine environment is also a source of inspiration and recreation for many people. The marine environment is a vital part of the coastal and marine ecosystem and is essential for the well-being of the coastal and marine communities. The marine environment is a source of food, medicine, and other resources. The marine environment is also a source of recreation and tourism. The marine environment is a source of inspiration and recreation for many people.

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 protecting key marine features (Coral Triangle Initiative and Sulu-Sulawesi Marine Ocean-Southeast Asia Marine Turtle Memorandum of Understanding for marine turtles); managing fisheries and combatting IUU fishing, and managing the coastal and marine

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

- 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
- ASEAN Catch Documentation Scheme for Marine Capture Fisheries]
- Joint ASEAN-SEAFDEC Declaration on Regional Cooperation for Combating IUU
- ASEAN Level
 - o Regional Fishing Vessels Record for Vessels 24 Meters in Length and Over (RFVR-
- USAID Oceans and Fisheries Partnership

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

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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 2. 2015 年，全球集装箱贸易量预计将达到 1.2 亿吨，同比增长 9%。
 3. 2016 年，全球集装箱贸易量预计将达到 1.3 亿吨，同比增长 8%。
 4. 2017 年，全球集装箱贸易量预计将达到 1.4 亿吨，同比增长 7%。
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of the ASEAN. Although efficiency and productivity are
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ASEAN Environmental Performance Review

ASEAN Environmental Performance

- The patterns of production and consumption show an increasingly unsustainable trend across the ASEAN region. Although efficiency and productivity are increasing, improved resource management and environmental protection are needed to ensure sustainable development.
- Resource use continues to rise upwards in line with rapid urbanization and industrialization. Environmental protection and management measures are needed to address the increasing pressure on natural resources.
- 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 strategies.
- 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 environmental concerns. Pesticide use is a major source of water pollution and soil degradation. Integrated Pest Management (IPM) and other sustainable agricultural practices are needed to reduce pesticide use.
- 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 environmental protection and management.
- Sustainable production and consumption is a cross-cutting issue highly relevant to other environmental issues.

ASEAN Environmental Performance Review

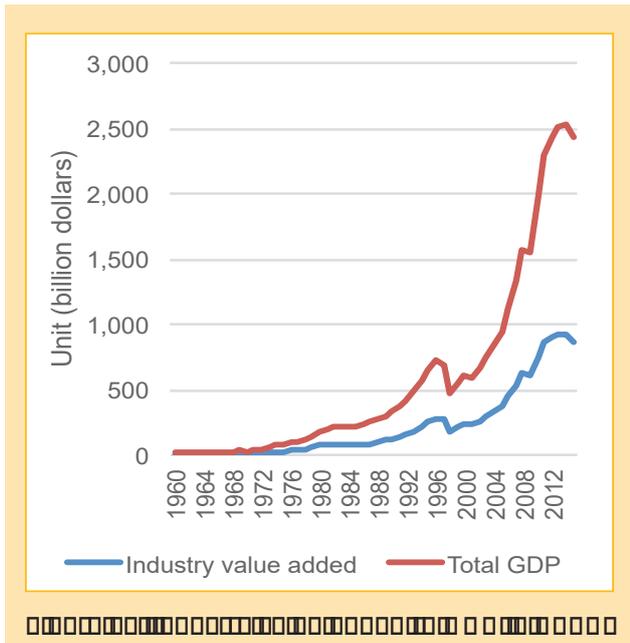
The ASEAN Environmental Performance Review (APER) is a comprehensive assessment of the environmental performance of the ASEAN region. It provides a detailed analysis of the environmental challenges and opportunities in the region, and offers recommendations for improving environmental management and protection.

- **Resource efficiency.** Natural resources are categorized into three areas – material, water and energy (UNEP 2013). The efficiency is analyzed from parameters of total resource use, resource productivity and resource efficiency.
- **Process efficiency.** The evaluation on process is based on parameters such as gross value added, energy intensity, water intensity and waste intensity.
- **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 and provides recommendations for improving chemical management.

Figure 1: GDP and Industry Value Added

The chart shows the growth of GDP and Industry Value Added from 1960 to 2012. Both metrics show a strong upward trend, with GDP reaching approximately 2,500 billion dollars and Industry Value Added reaching approximately 900 billion dollars by 2012.

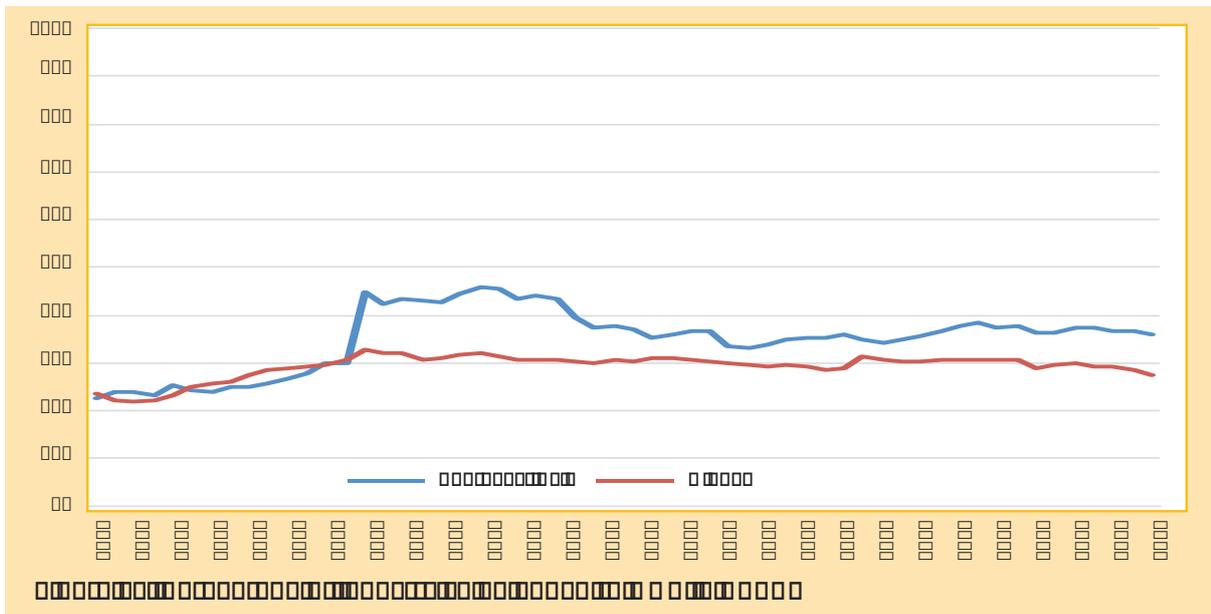
The data indicates that the economy has grown significantly over the period, with a notable acceleration in growth starting around 2000. The industry value added has also shown a steady increase, reflecting the expansion of the manufacturing and service sectors.

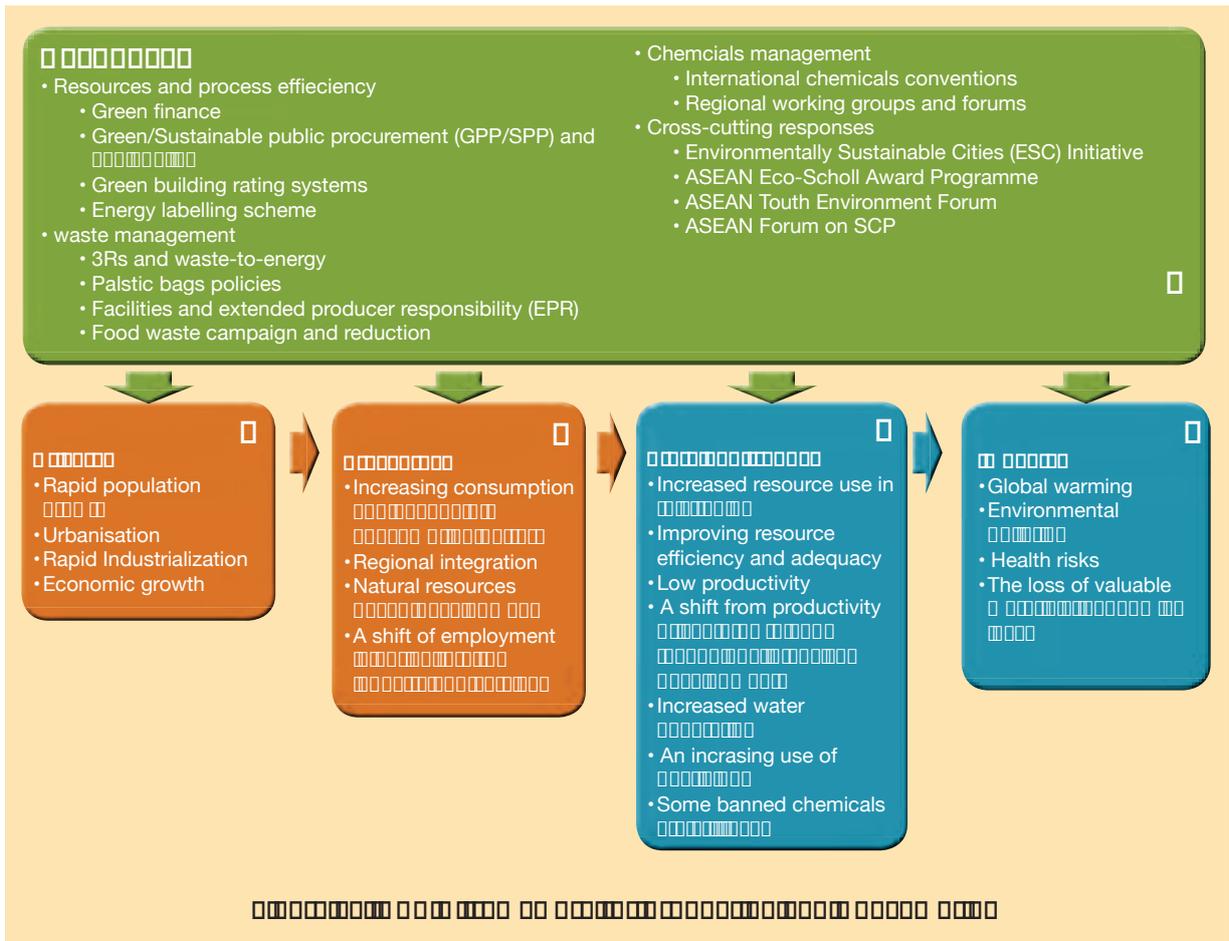


The chart illustrates the significant growth of the economy over the last five years. However, some of the growth has been driven by a higher rate of 7%. The middle-class has also benefited from this growth, with many households reaching a higher standard of living. The industry value added has also shown a steady increase, reflecting the expansion of the manufacturing and service sectors.

The data indicates that the economy has grown significantly over the period, with a notable acceleration in growth starting around 2000. The industry value added has also shown a steady increase, reflecting the expansion of the manufacturing and service sectors.

The chart shows the growth of GDP and Industry Value Added from 1960 to 2012. Both metrics show a strong upward trend, with GDP reaching approximately 2,500 billion dollars and Industry Value Added reaching approximately 900 billion dollars by 2012.





Key Findings

Emerging and developing economies are driving global economic growth and environmental change. Rapid population growth, urbanisation, and economic growth in these regions are leading to increased consumption, infrastructure, transportation, and the expanding middle-class (OECD countries).

Emerging AMS alongside India and China have the fastest middle-class growth rates in the world. This rapid growth is driving significant environmental impacts, including increased resource use and emissions. The expanding middle-class in these regions is a major driver of global environmental change.

The rapid growth of the middle class in emerging and developing economies is leading to a significant increase in resource consumption and emissions. This is particularly true for energy and land use, which are key drivers of climate change and environmental degradation.

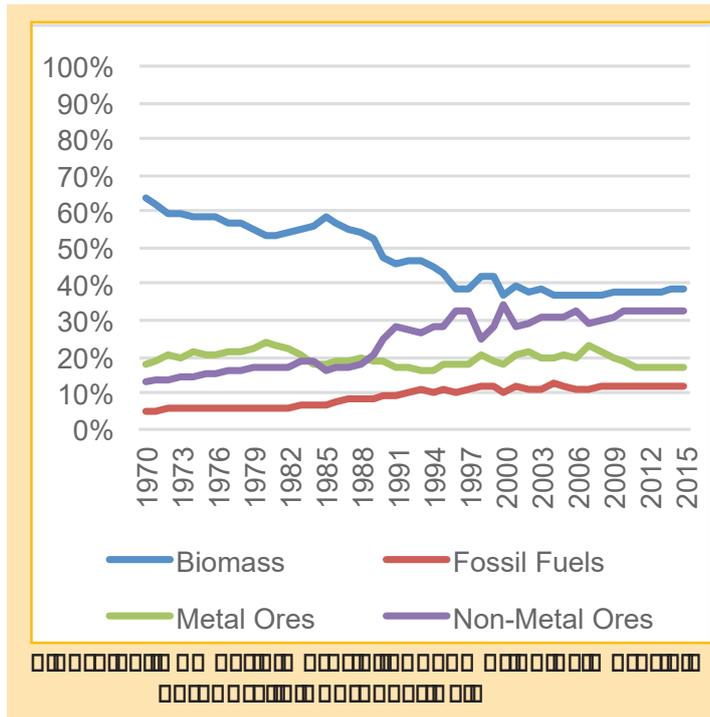
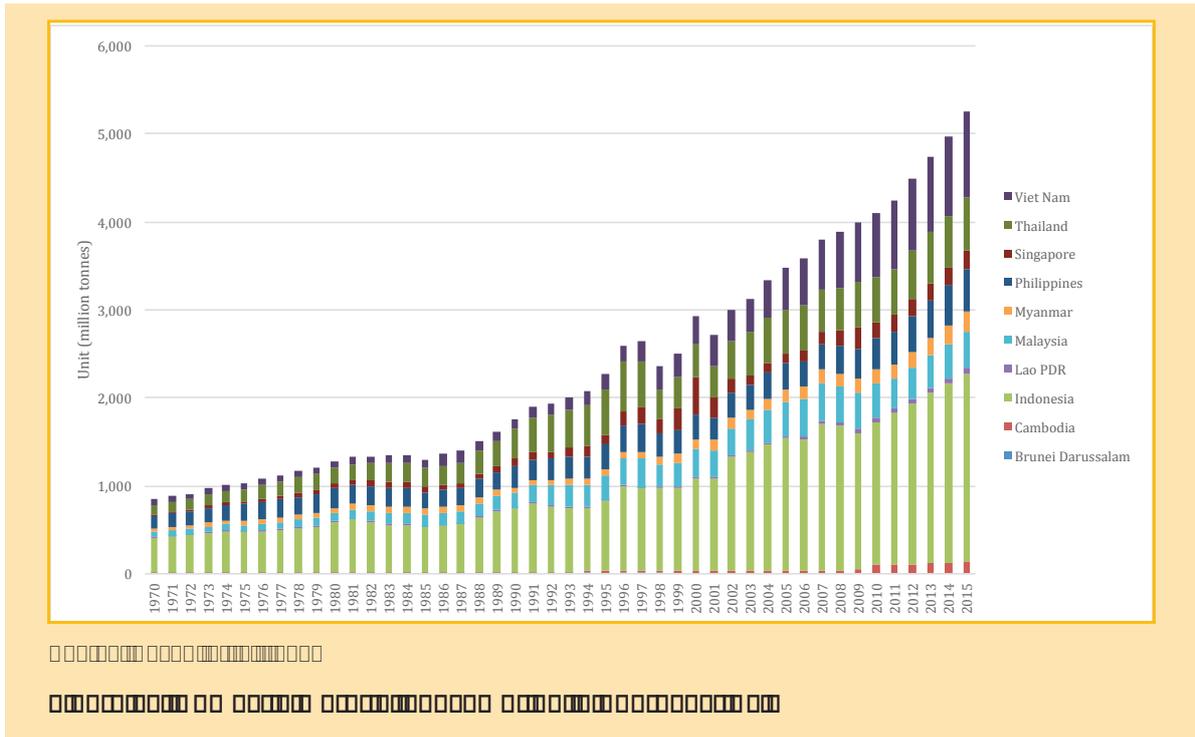
Addressing these challenges requires a combination of policy interventions, including improving resource efficiency, promoting green finance, and strengthening environmental governance. Regional working groups and forums are also playing a key role in addressing these challenges.

Resource efficiency

Resource efficiency

Resource efficiency

Resource efficiency is a key component of sustainable development. It involves using resources in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs. This includes reducing waste, improving energy efficiency, and using renewable resources. Resource efficiency is essential for achieving the Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).



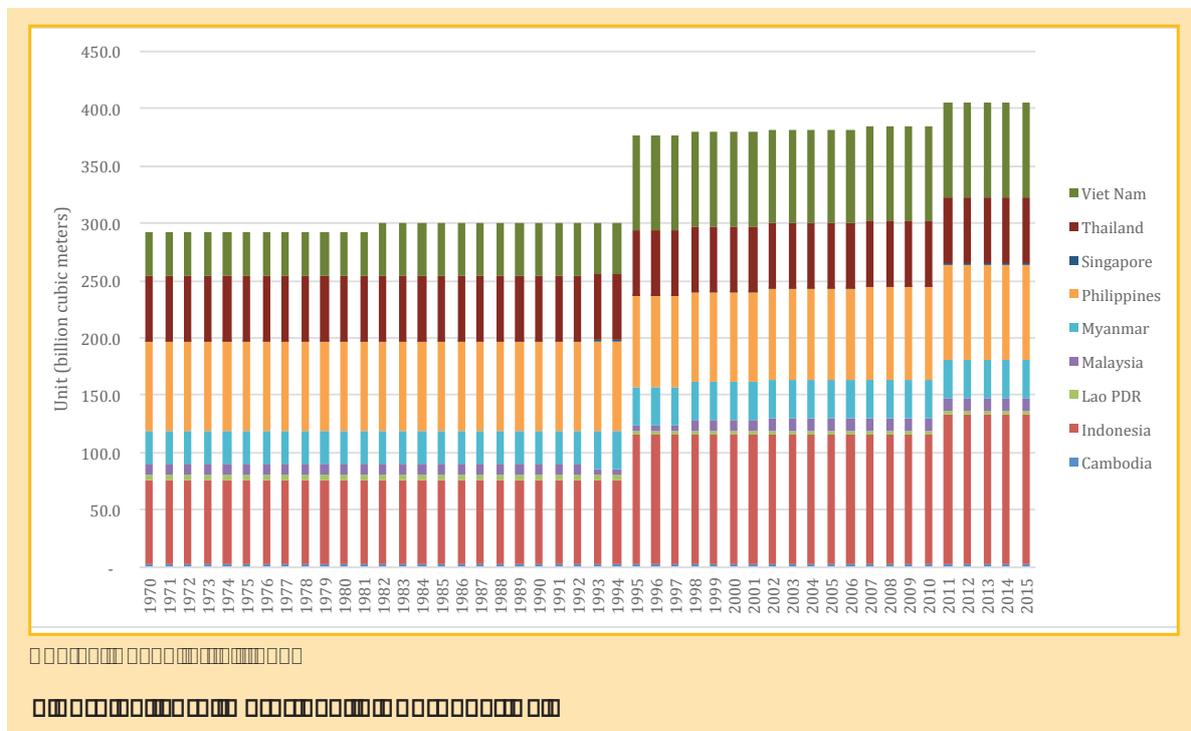
different categories of materials vary greatly, with non-metallic ores and non-metallic minerals. The use of biomass has decreased significantly over the period, while the use of fossil fuels has increased. The use of metal ores has decreased, while the use of non-metallic ores has increased. This shift in material usage reflects changes in industrial processes and resource availability.

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 20th century.

Water use in Southeast Asia has experienced two stages of increase: the first in the 1970s and 1980s, and the second in the 1990s and 2000s. The first stage was driven by agricultural expansion, while the second was driven by industrialization and urbanization. The rate of increase in Southeast Asia is slower than the Asia and Pacific region since the 20th century, while it lags far behind the rest of the world where only 1 kilogram of water is used per person per day.

Figure 10

Total water use in Southeast Asia has experienced two stages of increase: the first in the 1970s and 1980s, and the second in the 1990s and 2000s. The first stage was driven by agricultural expansion, while the second was driven by industrialization and urbanization. The rate of increase in Southeast Asia is slower than the Asia and Pacific region since the 20th century, while it lags far behind the rest of the world where only 1 kilogram of water is used per person per day.



All three kinds of water use – agriculture, manufacturing, and residential, increased two-fold in Southeast Asia since the 1970s. The increase in agricultural water use is driven by the expansion of irrigated areas, while the increase in manufacturing and residential water use is driven by industrialization and urbanization. The rate of increase in Southeast Asia is slower than the Asia and Pacific region since the 20th century, while it lags far behind the rest of the world where only 1 kilogram of water is used per person per day.

The increase in water use in Southeast Asia is driven by agricultural expansion, industrialization, and urbanization. The rate of increase in Southeast Asia is slower than the Asia and Pacific region since the 20th century, while it lags far behind the rest of the world where only 1 kilogram of water is used per person per day.

Philippines: PCEEP-Initiated Project Provides Technical and Financial Assistance to Replace Old Chillers with Energy-Efficient and Non-ODS-Based Chillers

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-

based chillers 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 least 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. The project also means they should have had no cases filed with the Pollution Adjudication Board for

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

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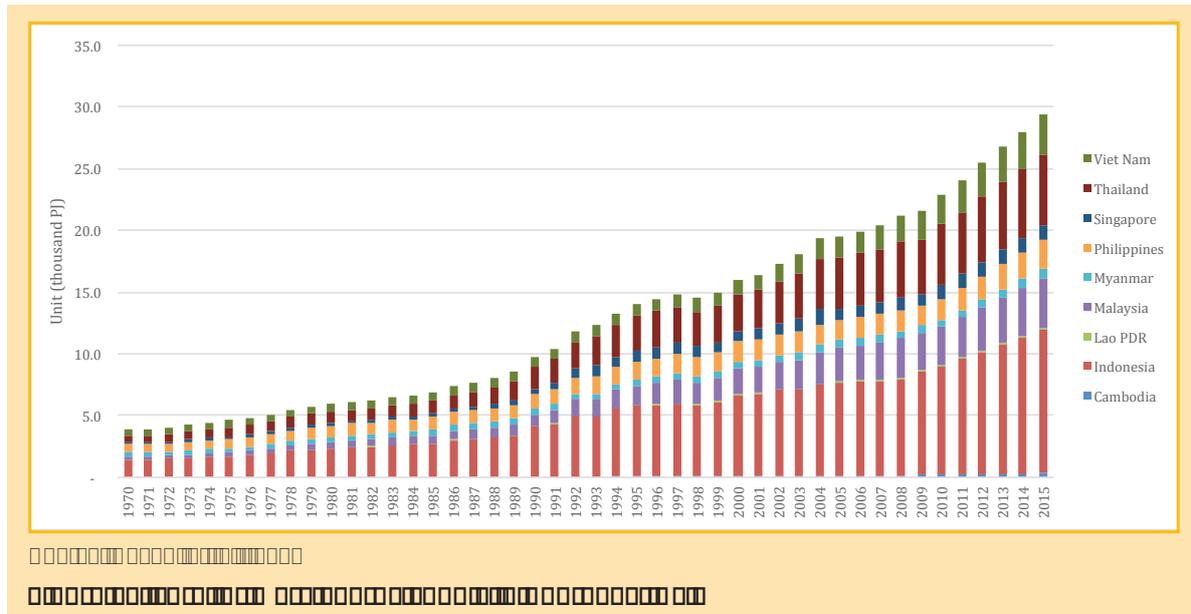
Indonesia

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-

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

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

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.

Table with 6 columns and 12 rows, containing placeholder text for data. The table is titled 'Table 1: Living Standards Classification'.

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 [country names]; 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-

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

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

[country names] 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 [country names] more sustainable productivity-driven growth and technology-intensive development [country names]

Manufacturing and construction activities are the main sources of air pollution in Southeast Asia. The region's air quality is generally poor, with high levels of particulate matter (PM2.5 and PM10) and other pollutants. This is due to a combination of factors, including rapid industrialization, urbanization, and the use of fossil fuels. The region's air quality is also affected by transboundary air pollution from neighboring countries. The region's air quality is generally poor, with high levels of particulate matter (PM2.5 and PM10) and other pollutants. This is due to a combination of factors, including rapid industrialization, urbanization, and the use of fossil fuels. The region's air quality is also affected by transboundary air pollution from neighboring countries.

Waste management

Waste management in 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.

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Table with 5 columns: Country, Total waste, Solid waste, Liquid waste, and Gaseous waste. Rows include Thailand, Malaysia, Indonesia, Philippines, Vietnam, Laos, Cambodia, Myanmar, Brunei, and Singapore.

Country	Solid waste		Liquid waste	
	Waste generated	Waste managed	Waste generated	Waste managed
Thailand	N/A	N/A	N/A	N/A
Malaysia	N/A	N/A	N/A	N/A
Indonesia	High	High	High	High
Philippines	High	High	High	High
Vietnam	High	High	High	High
Laos	High	High	High	High
Cambodia	High	High	High	High
Myanmar	N/A	N/A	N/A	N/A
Brunei	High	High	High	High
Singapore	High	High	High	High

Thailand and Malaysia made a significant contribution to this amount with 1.76 and 1.52 million tonnes respectively. The region's waste management is generally poor, with high levels of plastic waste and other pollutants. This is due to a combination of factors, including rapid industrialization, urbanization, and the use of fossil fuels. The region's waste management is also affected by transboundary waste management from neighboring countries.

Indonesian Olefin, Aromatic and Plastic Association (Inaplas) found that, on average, the region's waste management is generally poor, with high levels of plastic waste and other pollutants. This is due to a combination of factors, including rapid industrialization, urbanization, and the use of fossil fuels. The region's waste management is also affected by transboundary waste management from neighboring countries.

Table 51. Estimated Annual Production of Hazardous Waste in ASEAN Member States

The table shows the estimated annual production of hazardous waste in ASEAN member states for the years 1993, 2000, and 2010. The data is as follows:

Table 51. Estimated Annual Production of Hazardous Waste in ASEAN Member States

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

Source: ASEAN Secretariat (2011)

Food Waste

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

The largest source of food waste is consumption (49%) and fish and seafood (40.2%). Other sources include postharvest handling and storage, processing and packaging, and distribution.

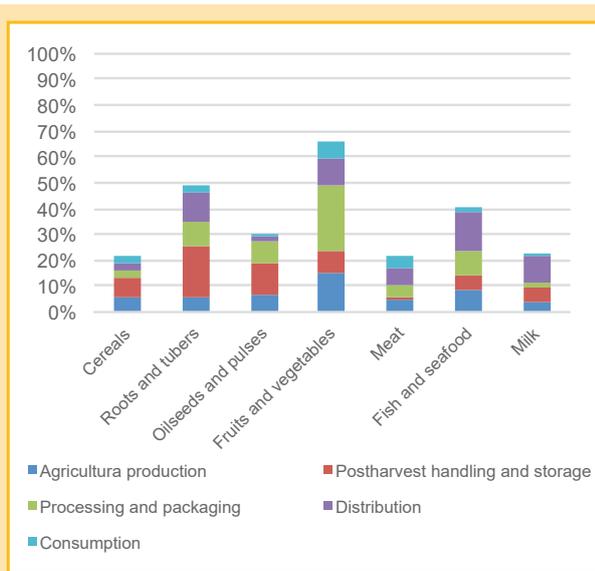


Figure 51. Percentage contribution of different stages to food waste

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

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

increased eight-fold between

Country	Value (USD million)	Quantity (thousand pieces)
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
Philippines	1.3	127
Singapore	19.6	110
Thailand	6.4	419
Viet Nam	1.3	116

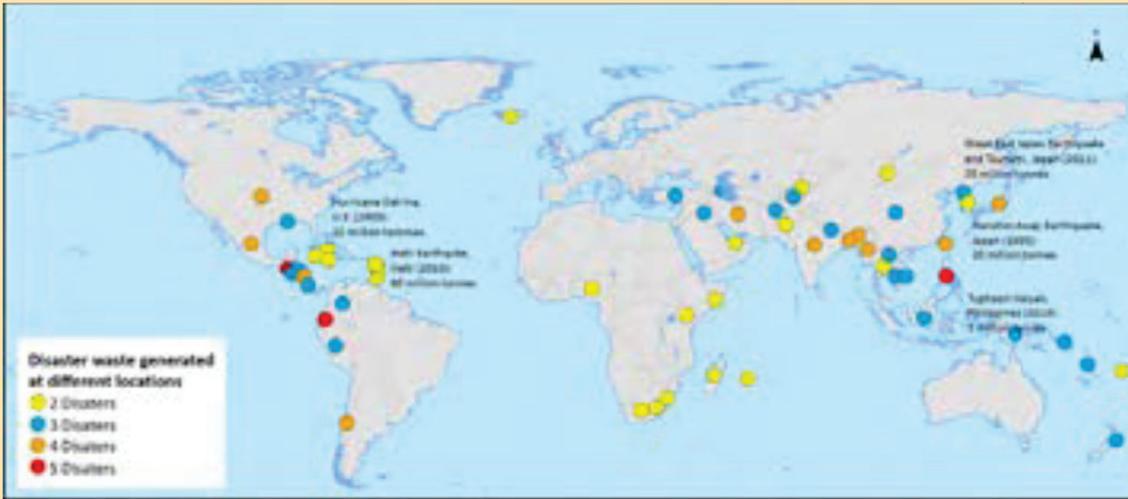
during 1999-2011. However, a large amount of used electrical products imported in

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,



Source: United Nations Environment Programme (UNEP)/International Solid Waste Association (ISWA), 2015

Figure 52. Different locations of disaster waste generation

Disaster waste generation is a global issue.

Disaster waste generation is a global issue. It is a result of various factors, including natural disasters, human activities, and industrial processes. The amount of waste generated is increasing rapidly, and it is becoming a major environmental problem. The waste is often dumped in landfills, which can cause pollution and health problems. It is important to find ways to reduce waste generation and to manage the waste that is generated.

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(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 high levels of pesticide residues in food and feed has become a major problem for the U.S. for the first eight months of 2016 was only 22,084 tons, 33 percent less when compared to the same period in 2015.

Table 52. Disaster waste generation at different locations

Disaster	Waste generated (million tonnes)					
	2005	2010	2011	2011	2011	2013
Hurricane Katrina	45					
Haiti earthquake		40				
West East Asia Earthquake and Tsunami, Japan			25			
Fukushima earthquake, Japan			25			
Typhoon Haiyan, Philippines						1.4

Source: United Nations Environment Programme (UNEP)/International Solid Waste Association (ISWA), 2015

ASEAN countries have made significant progress in managing chemicals, but the capacity of developing countries to manage chemicals are not sufficient (WHO 2009).

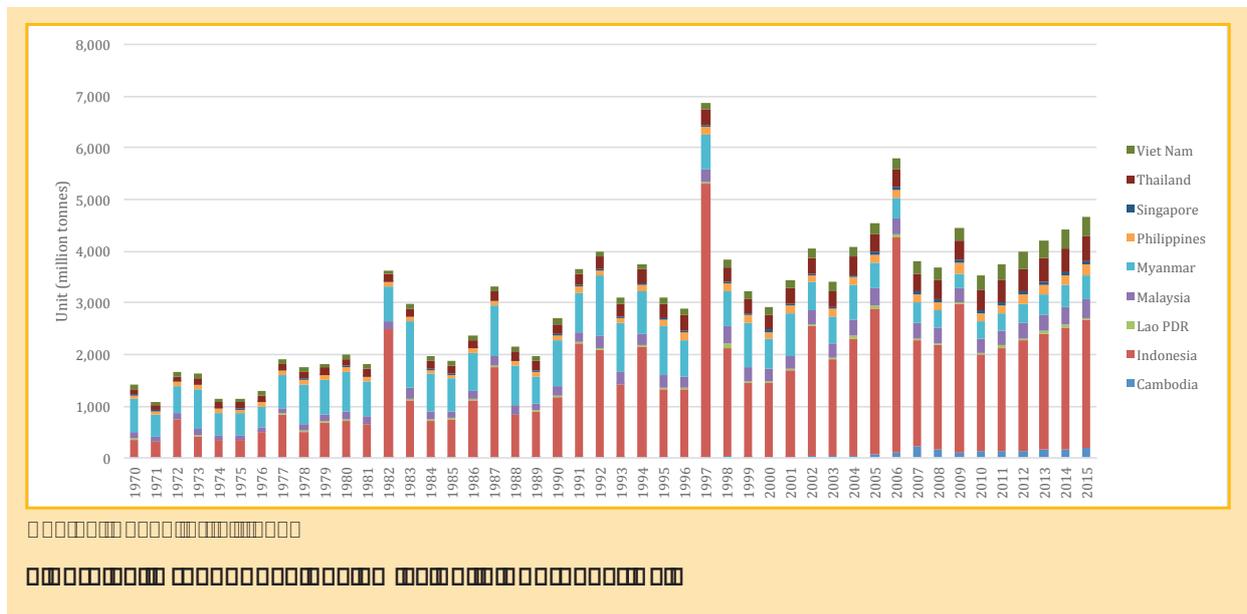
developing countries to manage chemicals are not sufficient (WHO 2009).

GHG Emissions

Contributions of GHG emissions to global warming

ASEAN countries have made significant progress in managing chemicals, but the capacity of developing countries to manage chemicals are not sufficient (WHO 2009).

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



Increasing environmental pollution

demands of rapid urbanization and industrialization is resulting in significant environmental pollution 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

Resource and process efficiency

In a recent UNEP report, resource efficiency has been defined as “the ways in which 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

Green finance

The financial sector in ASEAN plays a crucial role in encouraging investment shifts from resource-inefficient technologies and business models (Volz 2016). Green investment in resource-efficient technologies and business models (Volz 2016). Green investment in resource-efficient technologies and business models (Volz 2016). Green investment in resource-efficient technologies and business models (Volz 2016). 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

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

Country	Financial Institutions	Initiatives
Indonesia	Bank Mandiri, Bank Negara Indonesia, Bank Rakyat Indonesia, Bank Tabung Pensiun	Green Finance, Sustainable Finance
Malaysia	Bank Islam Malaysia, CIMB, HSBC, Maybank, Public Bank	Green Finance, Sustainable Finance
Philippines	Bank of the Philippine Islands, Citibank, PNB, Security Bank, Union Bank	Green Finance, Sustainable Finance
Thailand	Bank of Thailand, Kasikornbank, Krungsri, Siam Commercial Bank, Thai Union Bank	Green Finance, Sustainable Finance
Vietnam	Bank of Vietnam, Vietcombank, Techcombank, HDBank, Sacombank	Green Finance, Sustainable Finance
Laos	Bank of Laos	Green Finance, Sustainable Finance
Myanmar	Bank of Myanmar	Green Finance, Sustainable Finance

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

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, ASEAN has adopted green finance standards for ASEAN at its 25th Forum in Jakarta (San and Nordin 2016).

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

Keuangan (OJK), the financial regulatory authority, has issued a guide for Sustainable Finances in Indonesia (2015-2025) and a 10-sector checklist for Sustainable Finances in Indonesia (2015-2025) and a 10-sector checklist for Sustainable Finances in Indonesia (2015-2025).

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

Public Procurement (GPP) / Sustainable Public Procurement (SPP) has been considered as one of the most effective tools for

Public Procurement Initiative (SPPI) officially became UNEP's 10-year framework of "Stimulating the demand and supply of sustainable products through green/sustainable public procurement and ecolabelling" (GPPEL/SPPEL) amongst ASEAN+3 countries in

Public Procurement (GPP) / Sustainable Public Procurement (SPP) has been considered as one of the most effective tools for

Category	Indicator	Value
Green/Sustainable public procurement (GPP/SPP)	Indicator	Value
Ecolabelling	Indicator	Value
Other	Indicator	Value

Public Procurement (GPP) / Sustainable Public Procurement (SPP) has been considered as one of the most effective tools for

Country	Policy	Implementation	Legal Framework	Logo	Standard	Label	certified	certified
Indonesia	N/A	N/A	N/A	N/A	00	-	N/A	-
Malaysia	N/A	-	Malaysia Green Procurement Policy	N/A	000	-	N/A	-
Philippines	Philippines Green Procurement Policy	0000	Philippines Green Procurement Policy		000	00	00	00
Singapore	N/A	-	Singapore Green Procurement Policy	N/A	00	-	N/A	-
Thailand	SIRIM E-L	0000	Thailand Green Procurement Policy		000	00	00	00
Vietnam	N/A	-	Vietnam Green Procurement Policy	N/A	00	-	N/A	-
Other	Other	0000	Other Green Procurement Policy		000	00	00	00
Other	Other	0000	No specific laws		000	00	00	0000
Other	Other	0000	Other Green Procurement Policy		000	00	00	000
Other	Other	0000	Other Green Procurement Policy		00	00	00	00

Public Procurement (GPP) / Sustainable Public Procurement (SPP) has been considered as one of the most effective tools for

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

Category	Standard	Requirement	Value	Notes
Green Building	Green Mark	-	-	-
Green Building	Green Mark	-	-	-
Green Building	Green Mark	Green Mark	-	Green Mark
Green Building	Green Mark	-	-	-
Green Building	Green Mark	Green Mark	MYR 5,000 - 45,000	Green Mark
Green Building	Green Mark	-	-	-
Green Building	Green Mark	Green Mark	Green Mark	Green Mark
Green Building	Green Mark	Green Mark	SGD 15,390 - 35,790	Green Mark
Green Building	Green Mark	Green Mark	THB 30,000 - 300,000	Green Mark
Green Building	Green Mark	Green Mark	VND 84,500,000 - 300,000,000	Green Mark

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

Table 10.1: Energy efficiency measures in buildings

Energy efficiency measures		Energy savings	Energy savings	Energy savings
Energy efficiency measures in buildings	Energy efficiency measures	Energy efficiency measures in buildings	Energy efficiency measures in buildings	Energy efficiency measures in buildings
	Energy efficiency measures	-	-	Energy efficiency measures in buildings
Energy efficiency measures in buildings	Energy efficiency measures	Energy efficiency measures in buildings	Energy efficiency measures in buildings	Energy efficiency measures in buildings
	Energy efficiency measures	Energy efficiency measures in buildings	Energy efficiency measures in buildings	Energy efficiency measures in buildings
	Energy efficiency measures	Energy efficiency measures in buildings	Energy efficiency measures in buildings	Energy efficiency measures in buildings

Table 10.1: Energy efficiency measures in buildings

Energy efficiency measures in buildings

Energy efficiency measures in buildings are essential for reducing energy consumption and greenhouse gas emissions. The International Energy Agency (IEA) estimates that energy efficiency in buildings can save up to 30% of energy consumption in this region (IEA 2014).

Energy efficiency measures in buildings can also improve indoor air quality and reduce energy costs. For example, the Philippines, Viet Nam, and Myanmar have received support from the ASEAN-Japan Energy Efficiency Partnership (AJEEP) to improve energy efficiency in buildings. The Rice Office Tower in Malaysia is a prime example of a high-performance building that has achieved significant energy savings.

Energy efficiency measures in buildings

To find out where the trash goes, Jason Godfrey, Host of Channel News Asia tracked disposed household appliances, coffee cups, textile waste, mobile phones, and data in Singapore for the first time.

Energy efficiency measures in buildings can also improve indoor air quality and reduce energy costs. For example, the Philippines, Viet Nam, and Myanmar have received support from the ASEAN-Japan Energy Efficiency Partnership (AJEEP) to improve energy efficiency in buildings. The Rice Office Tower in Malaysia is a prime example of a high-performance building that has achieved significant energy savings.

Energy efficiency measures in buildings

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-

distributors 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

Convention	ASEAN	ASEAN	ASEAN	ASEAN
Basel Convention	Ratification		Ratification	Ratification
Rotterdam Convention	Ratification	Ratification	Ratification	Ratification
Stockholm Convention	Ratification	Ratification	Ratification	Ratification
Minamata Convention	Ratification	Ratification	Ratification	Ratification
Paris Convention	Ratification	Ratification	Ratification	Ratification
Geneva Convention	Ratification	Ratification	Ratification	Ratification
London Convention	Ratification	Ratification	Ratification	Ratification
Geneva Convention	Ratification	Ratification	Ratification	Ratification
Geneva Convention	Ratification	Ratification	Ratification	Ratification
Geneva Convention	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

conventions; however, the ratification rate is limited.

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

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

ASEAN ESC Model Cities award ceremony 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 award ceremony in 2011 and 2014

ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
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ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014

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).

ASEAN ESC Model Cities award ceremony in 2011 and 2014

ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
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ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014
ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014	ASEAN ESC Model Cities award ceremony in 2011 and 2014

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 States.

ASEAN Eco-Schools Award Programme

This is one of the flagship programmes under the ASEAN Cooperation on Environment. It focuses on environmental preservation through management, commitment and infusion into curriculum, co-operation, and innovation. The programme is implemented in various forms, including the Eco-schools Award, Sekolah Lestari/ Environmental Award Programme (Malaysia); and Ecofriend Award, and others.

The Eco-schools Award, initially on a non-competitive basis in 2012, to encourage schools to adopt sustainable practices. The award is given to schools that demonstrate excellence in environmental management and education.

The ASEAN Eco-School Award was first 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 awards to schools across the region.

ASEAN Eco-Schools Award Programme

ASEAN Eco-Schools Award Programme

The ASEAN Eco-Schools Award Programme is a flagship initiative under the ASEAN Cooperation on Environment. It aims to promote environmental awareness and sustainable practices among schools in the region. The programme is implemented through various activities, including award presentations, workshops, and training sessions.

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electric car-sharing will be encouraged.

Towards a zero waste nation

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

ASEAN Senior Official on Environment (ASOEN) Meeting

ASEAN Senior Official on Environment (ASOEN) Meeting	ASEAN Senior Official on Environment (ASOEN) Meeting		ASEAN Senior Official on Environment (ASOEN) Meeting	
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ASEAN Senior Official on Environment (ASOEN) Meeting	ASEAN Senior Official on Environment (ASOEN) Meeting	ASEAN Senior Official on Environment (ASOEN) Meeting	Hanoi-Amsterdam High	ASEAN Senior Official on Environment (ASOEN) Meeting

ASEAN Senior Official on Environment (ASOEN) Meeting held in 2016 in Nay Pyi Taw, Myanmar, marking the 10th anniversary of the ASEAN Senior Official on Environment (ASOEN) Meeting, which has been held year after year back-to-back with the ASEAN Ministers Meeting on Environment.

ASEAN Youth Environment Forum

The ASEAN Youth Environment Forum (AYEF) is a key activity under the 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 ASEAN Environmental Education Action Plan 2019-2025). The AYEF provides a platform for ASEAN youth to discuss environmental issues and share their views on environmental protection and sustainable development. The forum is held annually and is open to youth from all ASEAN member states. The AYEF is a key activity under the 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 ASEAN Environmental Education Action Plan 2019-2025). The AYEF provides a platform for ASEAN youth to discuss environmental issues and share their views on environmental protection and sustainable development. The forum is held annually and is open to youth from all ASEAN member states.

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The AYEF was held on 22-25 April 2010 in Brunei Darussalam. The activity was co-organized by the ASEAN Secretariat and the Ministry of Education, Youth and Sports of Brunei Darussalam. The forum was held with the theme; "Creating a Climate for Change" was attended by a total of 140 youth representatives from all ASEAN member states. The AYEF provides a platform for ASEAN youth to discuss environmental issues and share their views on environmental protection and sustainable development. The forum is held annually and is open to youth from all ASEAN member states.

AFSCCP AYEF that was held on 2-4 December 2013, with the theme: “Youth and Environmental Education”

AFSCCP AYEF with the theme “Imagine. Create. Change” was conducted on 8-10 April 2014. The AYEF Forum was co-supported by ASEAN plus Three

Environmental Education

The National Search for Sustainable and Eco-friendly Schools 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 to become sustainable and eco-friendly; second, to identify and recognize schools that are sustainable and eco-friendly.

Environmental Education Action Plan (EEAP) 2014-2018

Now in its fifth leg, the country’s National Search for Sustainable and Eco-friendly Schools 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 to become sustainable and eco-friendly; second, to identify and recognize schools that are sustainable and eco-friendly.

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 Environment 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 focused on the implementation of the National Environmental Education Action Plan (NEEAP) 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.

AFSCCP’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 liaising with AMS (Akenji 2011). AFSCCP 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 2020)

SDGs in ASEAN

ASEAN has been successful in achieving the Millennium Development Goals (MDGs) and is now working towards the Sustainable Development Goals (SDGs). The SDGs are a set of 17 goals that cover a wide range of issues, including poverty, inequality, climate change, and environmental degradation. ASEAN is committed to achieving the SDGs and is working to integrate them into its regional development process. This includes promoting sustainable growth, improving infrastructure, and enhancing social services. The process efficiency of the SDGs is a key focus for ASEAN, as it aims to ensure that the goals are achieved in a timely and effective manner.

It is recommended that all countries proceed to the process of ratification of the SDGs. This will ensure that the goals are legally binding and that all countries are committed to achieving them. ASEAN is currently working to facilitate the ratification process and is providing technical assistance to member states. The ratification of the SDGs is a crucial step towards achieving sustainable development in the region. It will enable ASEAN to monitor progress and to take action where needed. The process efficiency of the ratification process is also a key concern, as it is important to ensure that the process is completed as quickly as possible.

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ASEAN Air Quality Management Plan

The ASEAN Air Quality Management Plan (AQMP) is a regional framework for addressing air quality issues across the ASEAN region. It provides a common vision and sets out a series of actions to be taken by member states to improve air quality and protect public health and the environment. The AQMP is a key component of the ASEAN Environmental Cooperation Agreement (ECA) and is supported by the ASEAN Centre for Environment (ACE).

Key Objectives

- Support policies and programmes to address the rising air pollution levels in the ASEAN region, particularly in urban areas, and to reduce the health and environmental impacts of air pollution.
- Since ASEAN cities are major sources of greenhouse gases, support policies and programmes to reduce greenhouse gas emissions in cities across ASEAN, particularly supporting the development of low-carbon cities and sustainable urban transport systems.
- Support policies and programmes that focus on decreasing the growing emission of carbon dioxide, methane, and other greenhouse gases, 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 source, including strengthening regional cooperation and capacity building for haze management.
- Develop consistent and systematic ways of monitoring air quality and pollution, including establishing a regional air quality monitoring network and sharing data and information.
- Establish improved public awareness programmes to better communicate knowledge about air quality and pollution, and to encourage public participation in air quality improvement efforts.
- Organize frequent consultations and public fora among relevant ASEAN working groups, including the ASEAN Air Quality Working Group, to discuss and coordinate air quality management activities.

□

Recommendations

- 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

Recommendations on Biodiversity

- 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 monitoring and evaluation of progress on biodiversity conservation and ecosystem issues. Responses must sufficiently address the drivers and pressures, and the underlying causes of biodiversity loss. In the long term, end, establish a multi-sectoral regional platform to align biodiversity conservation with other regional and national development plans.

Water and Sanitation

- Expedite improving sources and access of drinking water and sanitation, particularly in rural and urban informal settlements. Accelerate the implementation of water supply and sanitation projects, including the expansion of existing networks and the construction of new ones. Promote water conservation and efficient use of water.
- Implement more effective water-related data sharing to support a regional monitoring and evaluation framework. Enhance the capacity of national and regional institutions to collect, analyze and use water-related data.
- Rapidly close knowledge gaps with respect to risks and impacts of floods and droughts. Strengthen the capacity of national and regional institutions to assess and manage the 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 distribution. Enhance the capacity of national and regional institutions to monitor and manage water quality.
- Increase policy dialogue and synergy between regional and national plans on integrated water resources management to enhance basin-wide benefits, minimize adverse impacts and promote sustainable development.
- Build and enhance networks and partnerships of water-related academic institutions to support scientific information and evidence and provide innovative solutions/innovative financing mechanisms for water supply and sanitation.

Coastal and Marine Resources

- Enable a closer collaboration between the ASEAN's Environment and Fisheries Ministers. Strengthen the capacity of national and regional institutions to monitor and manage coastal and marine resources.
- 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 importance.
- ASEAN should develop and implement improved laws and regulations to address the over-exploitation of marine resources. Strengthen the capacity of national and regional institutions to monitor and manage marine resources.
- Undertake a comprehensive assessment of the region's coral reefs. Facilitate a regional platform for the management and conservation of coral reefs. Enhance the capacity of national and regional institutions to monitor and manage coral reefs.

- 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 the region, to discuss the impact of climate change on marine ecosystems and the need for a regional approach to marine conservation.
- Monitor mangrove degradation and implement remedial actions for rehabilitation of degraded mangrove ecosystems.
- ASEAN, through its programmes, projects, bodies and working groups, needs to continue to support member states in their efforts to protect and restore marine ecosystems, including through the implementation of the ASEAN Plan of Action for the Environment (APAE).

ASEAN Plan of Action for the Environment (APAE)

- Promote and adopt more sustainable forms of consumption and production patterns that are consistent with the principles of sustainable development and the goal of sustainable consumption and production for all.
- 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 range of measures, including the development of standards and certification systems for products and services, and the promotion of green procurement.
- 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 waste management issues.
- Encourage all AMS to ratify the four international conventions on chemicals management (Basel, Rotterdam and Stockholm Conventions and the Minamata Convention on Mercury) and to implement them fully.
- Provide relevant policies, regulations, infrastructure and facilities to improve resource efficiency and reduce environmental impacts.
- Support and promote green initiatives across ASEAN including green finance, green/sustainable public procurement (GPP/SPP) and ecolabelling, green building rating systems and green infrastructure.
- Embed sustainable production and consumption across the sectors of economic activities, including agriculture, industry, construction, services and tourism.

ASEAN Plan of Action for the Environment (APAE) – Key Messages

ASEAN Plan of Action for the Environment (APAE) – Key Messages

ASEAN Plan of Action for the Environment (APAE)

The ASEAN Plan of Action for the Environment (APAE) is a key instrument for the region to address environmental challenges and promote sustainable development. It provides a framework for member states to coordinate their efforts and implement common environmental policies and programmes.

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

Integrating the above priorities into more detailed plans of

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

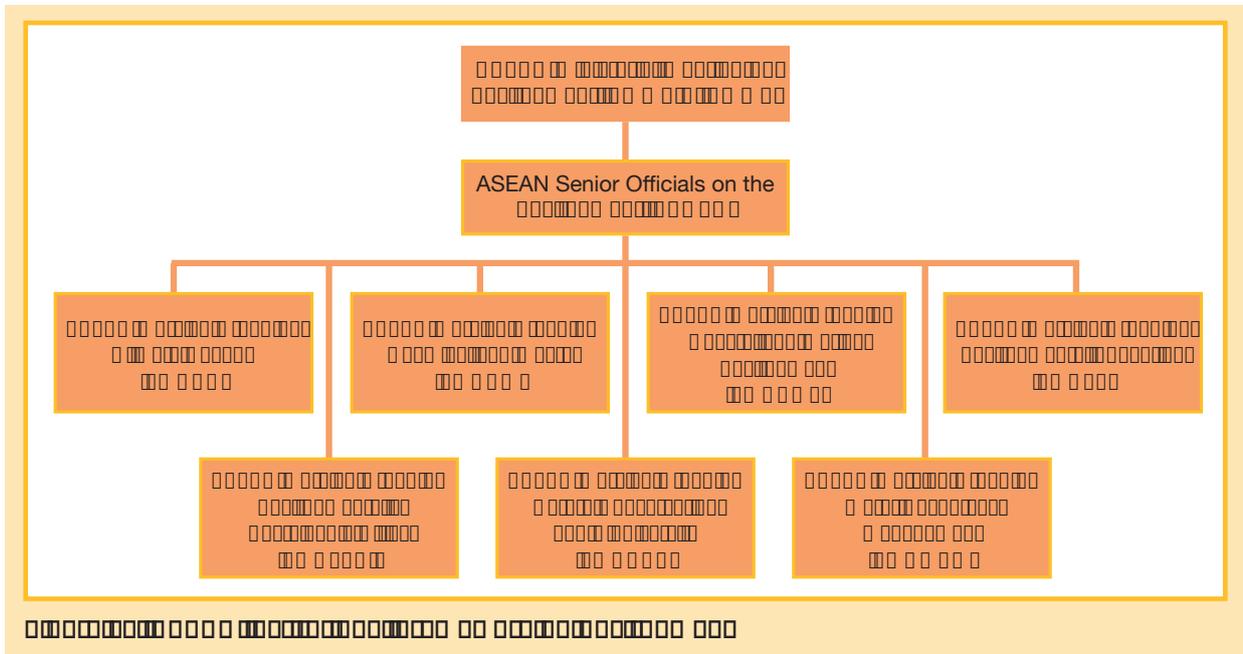
ASEAN Summit, the supreme policy-making body of ASEAN, now meets twice a

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

ASEAN Senior Officials on the Environment (ASOEN) meet annually and are responsible for coordinating and monitoring the implementation of the ASEAN Environmental Action Plan (ASEAN EAP) and other environmental agreements in the region.

The ASEAN Senior Officials on the Environment (ASOEN) meet annually and are responsible for coordinating and monitoring the implementation of the ASEAN Environmental Action Plan (ASEAN EAP) and other environmental agreements in the region. The ASOEN comprises heads of environmental ministries/departments/agencies who are responsible for coordinating and monitoring the implementation of the ASEAN EAP and other environmental agreements in the region. The ASOEN also provides a platform for the exchange of information and experiences among ASEAN member states on environmental issues.



The ASOEN meets annually and is responsible for coordinating and monitoring the implementation of the ASEAN Environmental Action Plan (ASEAN EAP) and other environmental agreements in the region. The ASOEN also provides a platform for the exchange of information and experiences among ASEAN member states on environmental issues. The ASOEN meets back-to-back at least once a year.

The ASEAN Senior Officials on the Environment (ASOEN) meet annually and are responsible for coordinating and monitoring the implementation of the ASEAN Environmental Action Plan (ASEAN EAP) and other environmental agreements in the region. The ASOEN also provides a platform for the exchange of information and experiences among ASEAN member states on environmental issues. The ASOEN was established in 2006-2020, which was developed with a goal of promoting sustainable management of natural resources to support and sustain local livelihoods, reduce risk of fire and associated haze and other environmental issues.

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 Committee on Transboundary Haze Pollution in the South-East Asian Sub-region (MSC SEA) 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 chaired by senior officials.

The ASEAN Secretariat provides support for all the above-mentioned institutional bodies. The ASEAN Secretariat also provides support for the ASEAN Centre for Biodiversity (ACB) and the ASEAN Centre for Environment (ACE). The ASEAN Secretariat also provides support for the ASEAN Centre for Environment (ACE) and the ASEAN Centre for Biodiversity (ACB).

The ASEAN Secretariat also provides support for the ASEAN Centre for Environment (ACE) and the ASEAN Centre for Biodiversity (ACB).

ASEAN Centre for Biodiversity (ACB)

The ACB is a regional centre for biodiversity conservation and sustainable 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 main programmes:

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

The ACB also provides support for the ASEAN Centre for Environment (ACE) and the ASEAN Centre for Biodiversity (ACB). The ACB also provides support for the ASEAN Centre for Environment (ACE) and the ASEAN Centre for Biodiversity (ACB).

ASEAN's flagship programmes promoting a regional network of national protected areas and the ASEAN Centre for Environment (ACE) and the ASEAN Centre for Biodiversity (ACB).

ASEAN Community Blueprint 2025

As environmental issues are often cross-sectoral in nature and inter-linked with other sectors, the ASEAN Community Blueprint 2025 (ACB 2025) provides a framework for addressing these issues. This is illustrated in Appendix 1: Cross-sectoral references on environment-related issues in the ASEAN Community Blueprint 2025 which maps out the cross-sectoral references to environmentally-related issues which would also require close consultation with other sectors.

Appendix 1: Cross-sectoral references to environmentally-related issues which would also require close consultation with other sectors.

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 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-disciplinary research on environmental issues 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 ASEAN Eco-Schools Award Programme and the ASEAN Environmental Education Forum.

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 of the identified risks and issues include water and sanitation, solid and hazardous waste management, and air quality. The ASEAN Health Development Agenda Work Programme aims to establish a network by 2020. The identified risks and issues include water and sanitation, solid and hazardous waste management, and air quality.

ASEAN 2025 Agenda

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

environment-related matters

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-

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 and Evaluation Framework. The Framework provides a clear and concise set of indicators for bodies under its purview, amore institutionalized and in-depth cross-sectoral/inter-agency monitoring system. The Framework also provides a clear and concise set of indicators for certain identified nexus or clusters, where a clearly identified need for consultation and coordination is required.

b. Effective and timely monitoring and evaluation systems

Monitoring and evaluation systems to provide effective tracking of progress or otherwise, in the environmental policy and action areas, are crucial to the success of any development-oriented process. The Framework provides a clear and concise set of indicators for 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 develop a monitoring and evaluation system based on the SMART (Specific, Measurable, Achievable, Realistic and Time-bound) criteria. The Framework also provides a clear and concise set of indicators for environmentally related concerns have been identified as areas of mutual or common interest. The Framework also provides a clear and concise set of indicators for monitoring and evaluation of the implementation of the Framework.

c. Better prioritization and implementation mechanisms

Overseeing a very multi-disciplinary and inter-sectoral subject matter like environment and natural resources is a complex task. The Framework provides a clear and concise set of indicators 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. The Framework also provides a clear and concise set of indicators for monitoring and evaluation of the implementation of the Framework.

d. Higher commitment and resource mobilization especially to have more effective implementation of the Framework

Higher commitment and resource mobilization especially to have more effective implementation of the Framework is crucial to the success of any development-oriented process. The Framework provides a clear and concise set of indicators for the ASEAN Secretariat, which should function as a “nerve center” for processing the information and data. The Framework also provides a clear and concise set of indicators for monitoring and evaluation of the implementation of the Framework.

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-

<p>B.3. Enhance ASEAN capacity to address non-traditional security issues effectively</p> <p>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</p>	<p>Same as above</p> <p>Same as above</p>	<ul style="list-style-type: none"> 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
<p>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</p>	<p>Same as above</p>	<ul style="list-style-type: none"> Same as above
<p>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</p> <p>viii. Explore or undertake cooperative activities among parties concerned on marine environmental protection</p> <p>ix. Explore or undertake cooperative activities among parties concerned on marine scientific research and other agreed activities</p>	<p>Same as above</p> <p>Same as above</p>	<ul style="list-style-type: none"> relevant ASEAN-SOM work plan ASPEN Same as above APASTI
<p>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</p>	<p>Same as above</p>	<ul style="list-style-type: none"> Same as above
<p>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</p>	<p>Same as above</p>	<ul style="list-style-type: none"> ASPEN SOM-AMAF Plan Plan on Illicit Trafficking of Wildlife and Timber

viii.	Strengthen ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p> <p>SOMRI</p>	<ul style="list-style-type: none"> • ASPEN 				<ul style="list-style-type: none"> • ASPEN • ASEAN Transport Strategic Plan
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	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p> <p>overflight, in accordance with relevant international laws</p>	<ul style="list-style-type: none"> • ASPEN • ASEAN Transport Strategic Plan 				
v.	Enhance the implementation of the MoJ 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	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • Same as above 				
iii.	Build higher consumer confidence and cross-border commercial transactions by strengthening product safety enforcement, stronger participation of consumer representatives and promotion of sustainable consumption	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • Same as above 	<p>ASEAN Committee on Consumer Protection (ACCP)</p>	<ul style="list-style-type: none"> • Strategic ASEAN Action Plan for Consumer Protection (2016-2025); • ASPEN 		
i.	Foster policies supportive of renewable energy and set collective targets accordingly	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • Same as above 	<p>ASEAN Senior Officials Meeting on Energy(SOME)</p>	<ul style="list-style-type: none"> • 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	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • 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	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • Same as above 	<p>ASEAN Senior Officials Meeting on Energy(SOME)</p>	<ul style="list-style-type: none"> • 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	<p>ASEAN cooperation in enhancing maritime domain awareness and its increased impact on security, safety, economy and environment of the region</p>	<ul style="list-style-type: none"> • Same as above 				<ul style="list-style-type: none"> • ASPEN • SOM-AMAF Plan • SOMHD Plan

<p>A. SUSTAINABLE</p> <p>C.1. Conservation and Sustainable Management of Biodiversity</p> <p>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</p>	<p>ACB/ASOEN ASOF/ SOM-AMAF</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>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</p>	<p>ASOEN/COM-COP/ACB ACDM/AHA SOM-AMAF/ASOF</p>	<p>Work Plans of the concerned sectoral bodies including Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution/Control with Means of Implementation(Haze Roadmap)</p>
<p>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</p>	<p>ASOEN/ACB SOM-AMAF; ASOF/ASOEN ASOF/ASOEN ASOF/ASOEN ASOF/ASOEN</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>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</p>	<p>ASOEN/ACB ASOF/ASOEN SOM-AMAF/ASOF</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>v. Enhance policy and capacity development and best practices to conserve, develop and sustainably manage marine, wetlands, peatlands, biodiversity, and land and water resources</p>	<p>COM-COP/ASOEN/ACB SOM-AMAF/ASOF ASOF/ASOEN</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>vi. Promote capacity building in a continuous effort to have sustainable management of ecosystems and natural resources</p>	<p>ASOEN/COM-COP/ACB ACW</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>vii. Promote cooperation on environmental management towards sustainable use of ecosystems and natural resources through environmental education, community engagement and public outreach</p>	<p>ASOEN/COM-COP/ACB ASOF/ASOEN ASOF/ASOEN</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>viii. Strengthen global and regional partnerships and support the implementation of relevant international agreements and frameworks</p>	<p>ASOEN/COM-COP</p>	<p>Haze Roadmap and international conventions which AMS are parties to</p>

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

<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>	<p>ASEAN Member States</p>
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	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, COST, SEOM, ABAC, ASEAN-CSR Network, ASEAN Forum on SCP	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	ASOEN, ASEAN-CSR Network, ASEAN Forum on SCP	ASOEN, ASEAN-CSR Network, ASEAN Forum on SCP											
D.3. A Climate Adaptive ASEAN with Enhanced Institutional and Human Capacity	Same as above	Same as above											
ii. Promote sound scientific and evidence-based policies on climate change adaptation	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											

	<p>SOMSWD Strategic Framework on Social Welfare and Development 2016-2020 ASPEN AADMER Work Programme</p>		<p>APAEC ASPEN</p>	<p>ASEAN Post-2015 Health Development Agenda (APHDA)</p>	<p>ASPEN AADMER Work Programme</p>	<p>ASPEN and the work plans/initiatives of other relevant sectoral bodies</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>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</p>	<p>Same as above</p>	<p>Same as above</p>	<p>Available, Accessible, Affordable and Sustainable</p>	<p>ASOEN - ASEAN Strategic Plan on Environment (ASPEN)</p>	<p>ASOEN/ACB</p>	<p>ASOEN/ACB</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>iii. Enhance cross-sectoral and cross-pillar coordination to ensure availability of clean water, sanitation facilities and electricity to households in times of crises</p>	<p>Same as above</p>	<p>Same as above</p>	<p>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</p>	<p>ASOEN - ASEAN Strategic Plan on Environment (ASPEN)</p>	<p>ASOEN/ACB</p>	<p>ASOEN/ACB</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>v. Explore the possibility of establishing financial and insurance mechanisms and strategies for disaster risk reduction and climate change adaptation</p>	<p>Same as above</p>	<p>Same as above</p>	<p>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</p>	<p>ASOEN - ASEAN Strategic Plan on Environment (ASPEN)</p>	<p>ASOEN/ACB</p>	<p>ASOEN/ACB</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>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</p>	<p>Same as above</p>	<p>Same as above</p>	<p>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</p>	<p>ASOEN - ASEAN Strategic Plan on Environment (ASPEN)</p>	<p>ASOEN/ACB</p>	<p>ASOEN/ACB</p>	<p>Work Plans of the concerned sectoral bodies</p>
<p>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</p>	<p>Same as above</p>	<p>Same as above</p>	<p>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</p>	<p>ASOEN - ASEAN Strategic Plan on Environment (ASPEN)</p>	<p>ASOEN/ACB</p>	<p>ASOEN/ACB</p>	<p>Work Plans of the concerned sectoral bodies</p>

