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**Economic and Social Commission for Asia and the Pacific**  
Committee on Environment and Development**Fifth session**

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Item 2 of the provisional agenda\*

**Environmental challenges in the context of the  
implementation of the 2030 Agenda for Sustainable  
Development****Key environment issues, trends and challenges in the  
Asia-Pacific region****Note by the secretariat***Summary*

In this document, pressing environmental challenges in Asia and the Pacific are presented that endanger social progress and economic prosperity in the region, including those related to unsustainable resource management and natural resource depletion, ecosystem degradation and biodiversity loss, pollution and waste, and climate change.

**I. Overview of environmental challenges to sustainable  
economic growth and social development**

1. The capacity of our environment to sustain economic growth and livelihoods across the region is under serious threat from wasteful resource use and depletion, widespread ecosystem degradation and pollution, and human-made climate change. The region's economic growth has come at heavy cost to people's health and livelihoods and to natural capital, has contributed to gender and income inequality, and will ultimately undermine economic development itself. The region's economies and societies are dependent on healthily functioning ecosystems. Pursuing integrated policies to conserve natural resources, ecosystems and biodiversity that build the foundation for economic productivity and livelihoods will be key to achieving the Sustainable Development Goals in Asia and the Pacific. Urgent action is needed to steer development onto an inclusive, environmentally responsible pathway for the future.

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\* ESCAP/CED/2018/L.1.

2. Progress towards the Sustainable Development Goals and targets associated with the environment has been insufficient across the board, despite achievements made on reducing poverty and improving access to basic services. In this document, selected environmental challenges in the region are presented that jeopardize social progress and economic prosperity in Asia and the Pacific, including rapid urbanization and increased demand for resources, loss of ecosystem services, an exponential increase in greenhouse gas emissions, waste generation and pollution and associated threats to human health. The Asia-Pacific region remains the most resource-intensive in the world, and urban areas in the region are generating increasing amounts of municipal solid waste. There has been no progress and even regression across the region since 2015 in protecting, restoring and promoting the sustainable use of terrestrial ecosystems and conserving biodiversity, and ocean health continues to decline. The region now accounts for over half of the world's greenhouse gas emissions, and the level of emissions is climbing.

3. This document contains an overview of the most pressing environmental challenges in the region, namely unsustainable resource management and natural resource depletion, ecosystem degradation and biodiversity loss, pollution and waste, and climate change.

4. Where available, this document uses the Economic and Social Commission for Asia and the Pacific (ESCAP) Statistical Online Database and United Nations databases. However, trend analysis at the regional level is possible for approximately a quarter of all the global Sustainable Development Goal indicators only (that is, for 64 indicators only), with two or more data points available for these indicators for only 50 per cent or more countries in the Asia-Pacific region. Data is largely missing for most Sustainable Development Goals and targets with a strong environmental dimension (such as Sustainable Development Goals 6, 11, 12, 13 and 14). Additional information on developments and current environmental challenges in the region rely on secondary data, limiting comparability. Increased efforts are required to improve data availability and statistical capacity at the regional level, to inform policymaking, and monitoring and reporting processes.

## **II. Unsustainable resource use**

5. This section contains a description of the unsustainable patterns of resource use and natural resource depletion in Asia and the Pacific in terms of domestic material consumption, resource intensity, and energy and water use, highlighting the fact that urbanization and the food and agriculture sector are major drivers of resource use (see table 1).

Table 1  
Regional trends in resource use

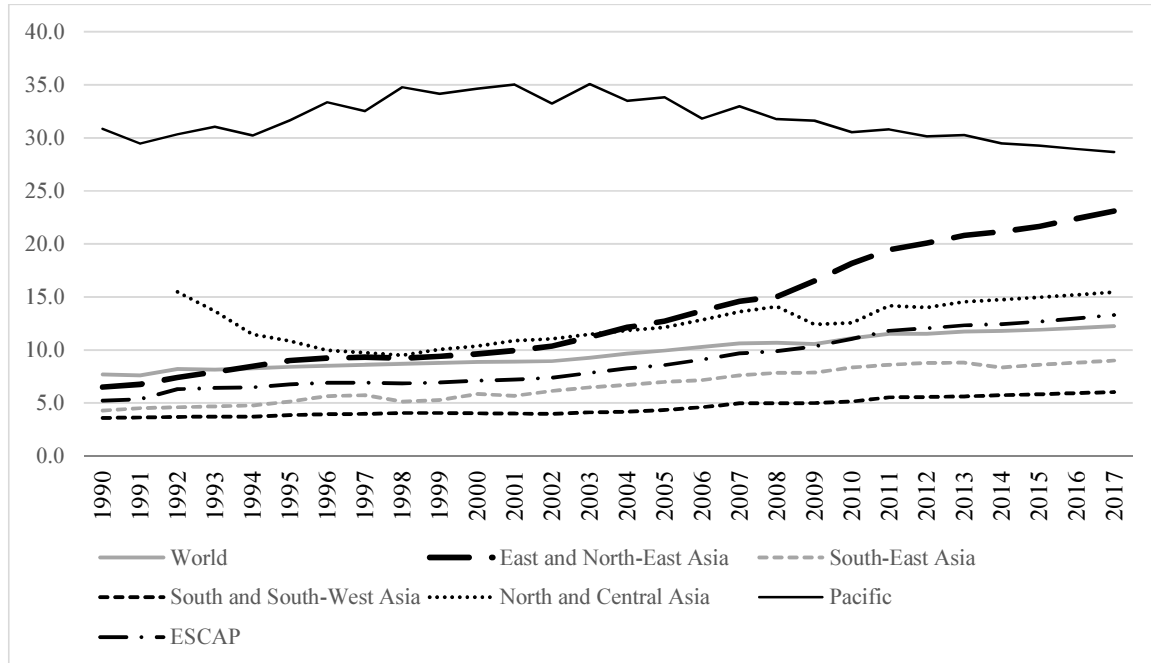
<i>Trend observed</i>	<i>Latest available data</i>
Increase in domestic material consumption	Between 1997 and 2017, there was an increase of 75 per cent in low-income countries, 69 per cent in lower-middle-income countries and 315 per cent in upper-middle-income countries.
Most resource-intensive region in the world	In 2017, the region accounted for 65 per cent of global domestic material consumption and 59 per cent of the global material footprint, with approximately 2 kg of domestic material consumption per dollar (almost double the global average). Between 1990 and 2017, there was virtually zero improvement on resource intensity in the region.
Decrease in primary energy intensity, while energy demand remains high	While from 1990 to 2014, the region's average energy intensity declined (from 9 to 6 megajoules per dollar), the region's energy demand doubled.
Increasing risk of water shortages and stress	In 2016, 29 of 48 countries qualified as water insecure owing to low availability and unsustainable withdrawal.

6. From 1990 to 2017, the rapidly growing low- and middle-income countries in the Asia-Pacific region recorded significant increases in resource use in both absolute and per capita terms. During this period, domestic material consumption per capita in low-income, lower-middle-income and upper-middle-income countries increased by 75 per cent, 69 per cent and 315 per cent respectively, while that of high-income countries decreased by 2 per cent. In the subregions, the Pacific has the highest per capita domestic material consumption, followed by East and North-East Asia. Rapid urbanization, expansion of manufacturing and the consumption patterns of the emerging middle class have led to an increase in demand for materials. As a result, the Asia-Pacific region surpassed the world average of per capita domestic material consumption in approximately 2010.

7. In terms of material resource use (comprising fossil fuels, biomass, metals and non-metallic minerals), the Asia-Pacific region is the most resource-intensive region in the world, both in terms of domestic material consumption and material footprint. While the world average is only 1.2 kg of domestic material consumption per dollar of economic output, this amount is roughly double in the Asia-Pacific region at approximately 2 kg. As shown in figures I and II, there is considerable variation in the level of resource-use intensity within subregions, but apart from the Pacific, all subregions have a higher resource intensity than the world average, calling for improvements in resource efficiency (see figure III). Although the region saw an average reduction in resource intensity in 2010 and in 2017, this progress was not uniform across Asia and the Pacific. In fact, between 2010 and 2017, economic growth recoupled with domestic material consumption in about 30 per cent of

countries,<sup>1</sup> implying higher material resource use in these countries per unit of economic output produced over that period.

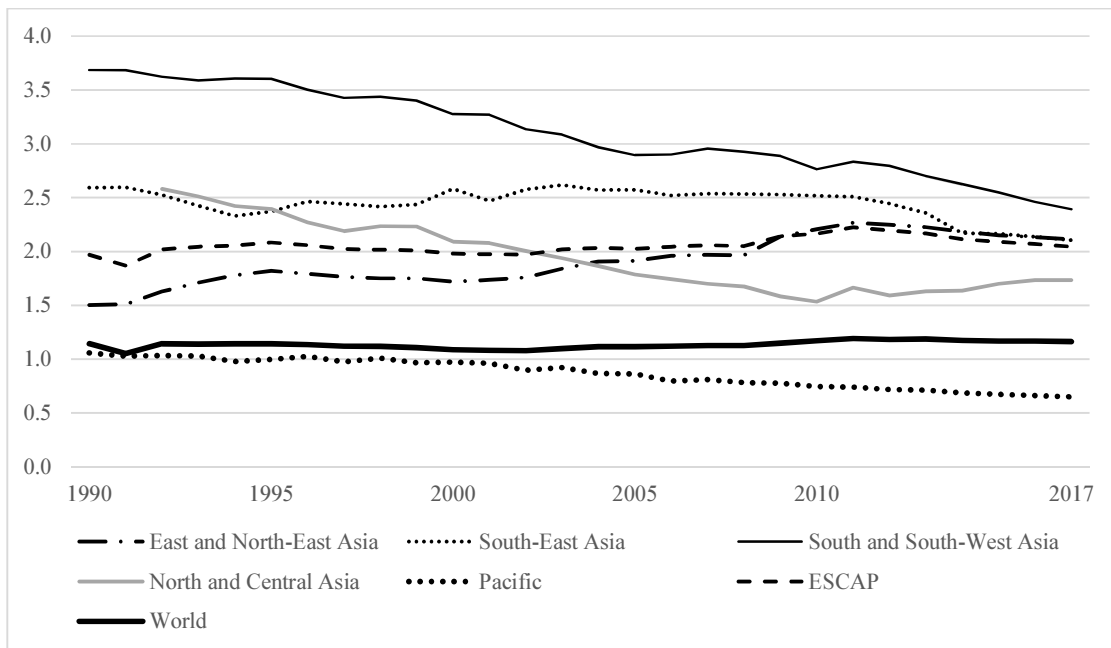
Figure I  
**Trends in domestic material consumption, 1990–2017**  
**(Tons per capita)**



Source: ESCAP calculations based on data from the ESCAP Statistical Online Database. Available at [http://data.unescap.org/escap\\_stat/](http://data.unescap.org/escap_stat/) (accessed on 18 August 2018).

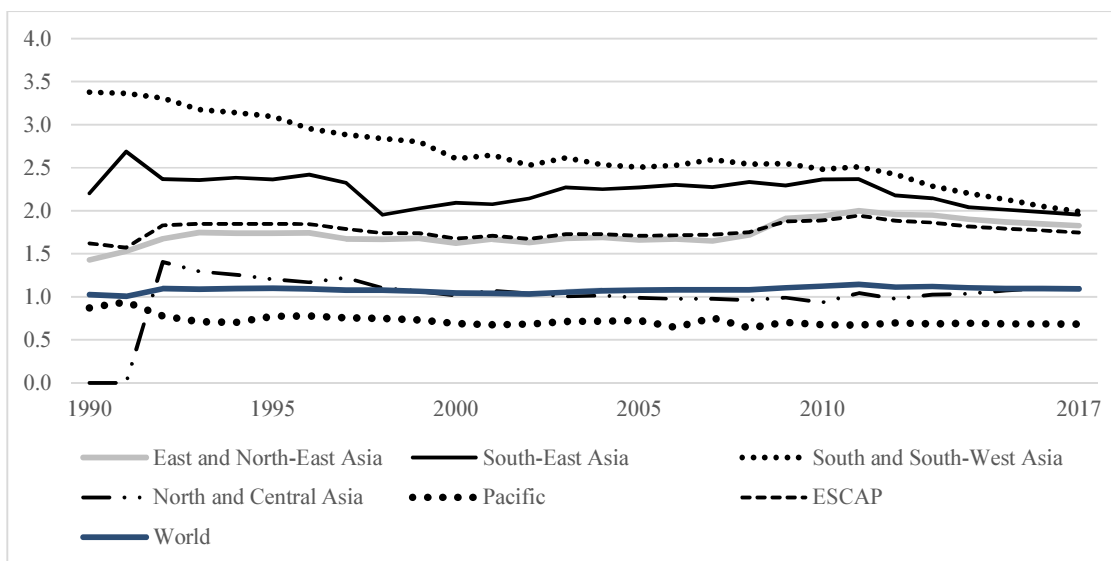
<sup>1</sup> ESCAP calculations based on data from the ESCAP Statistical Online Database. Available at [http://data.unescap.org/escap\\_stat/](http://data.unescap.org/escap_stat/) (accessed 18 August 2018).

**Figure II**  
**Trends in resource intensity: domestic material consumption, 1990–2017**  
 (Kilograms per United States dollar)



*Source:* ESCAP calculations based on data from the ESCAP Statistical Online Database (accessed 18 August 2018), using 2010 gross domestic product (GDP).

**Figure III**  
**Trends in resource intensity: material footprint, 1990–2017**  
 (Kilograms per United States dollar)



*Source:* ESCAP calculations based on data from the ESCAP Statistical Online Database (accessed 18 August 2018), using 2010 GDP.

8. The average resource intensity of low-income countries is almost 11 times the average of the high-income countries (in terms of domestic material consumption).<sup>2</sup> There is also a considerable difference in levels of resource usage between high-income countries and other countries in the region, but this gap is shrinking rapidly, especially in terms of domestic material consumption per capita.

9. In the energy sector, progress in energy efficiency has enabled the region to decouple energy use and GDP. Primary energy intensity – the ratio of primary energy to GDP – decreased at an annual compound rate of 1.8 per cent from 1990 to 2000. This rate of improvement has accelerated, reaching an annual decline of 3 per cent from 2012 to 2014. The region’s average energy intensity declined from 9 megajoules per dollar in 1990 to 6 megajoules per dollar in 2014, comparable with the global average of 5.49 megajoules per dollar. However, the region’s energy demand doubled from 1990 to 2014 alongside growth in fossil fuel use. These trends outpace any growth in renewable energy in absolute terms.<sup>3</sup>

10. In 2016, 29 out of 48 countries in the region qualified as water insecure owing to low availability of water and unsustainable groundwater withdrawal. Seven of the world’s 15 biggest extractors of groundwater are in Asia and the Pacific, and research suggests that groundwater use will increase by 30 per cent by 2050.<sup>4</sup> The increase in demand for irrigation has led to severe groundwater stress in some areas, especially in two of the major food baskets of Asia, the North China Plain and North-West India. Many large and medium-sized cities in the region face the risk of water shortages, owing to outdated water supply systems and inadequate infrastructure to harvest and store rainwater.<sup>5</sup> Water scarcity is compounded by the effects of climate change and worsened by disasters.

11. The availability of water is a challenging issue. Agriculture is the main driver of freshwater withdrawals in Asia, although rural to urban water ratios are shifting because of urbanization. Linked to climate change, freshwater availability is expected to decrease in countries at low latitudes, including heavily irrigated areas in China and India. The proportion of water withdrawn for agriculture was more than 90 per cent for 13 countries in the region,<sup>6</sup> in particular in Central Asia. Nearly all countries in the region are experiencing increasing pressure on water resources owing to their growing populations and economic development. Between 1990 and 2010, per capita water availability

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<sup>2</sup> *Analysing Resource Efficiency Transitions in Asia and the Pacific* (ST/ESCAP/2807).

<sup>3</sup> *Energy Transition Pathways for the 2030 Agenda in Asia and the Pacific: Regional Trends Report on Energy for Sustainable Development 2018* (United Nations publication, Sales No. E.18.II.F.14).

<sup>4</sup> Asian Development Bank (ADB), *Asia Water Development Outlook 2016: Strengthening Water Security in Asia and the Pacific* (Manila, 2016).

<sup>5</sup> ESCAP, “SDG 6 Goal Profile”, 28 March 2018. Available at [www.unescap.org/resources/sdg6-goal-profile](http://www.unescap.org/resources/sdg6-goal-profile).

<sup>6</sup> Food and Agriculture Organization of the United Nations (FAO), AQUASTAT database. Available at [www.fao.org/nr/water/aquastat/main/index.stm](http://www.fao.org/nr/water/aquastat/main/index.stm) (accessed on 23 January 2017).

dropped by 42 per cent in Solomon Islands, 36 per cent in Malaysia, Pakistan and Nepal, 29 per cent in India and Bangladesh and 23 per cent in Viet Nam.<sup>7</sup>

12. All resource-use trends and patterns have a particular connection to urbanization. As Asia-Pacific continues to urbanize, sustainable resource use and development depend increasingly on the successful management of urban growth, especially in secondary cities, where the most rapid urbanization is expected to occur. As cities expand, they convert areas on their rural peripheries and create an expanding urban and resource footprint. City development will require a push for resource-efficient infrastructure and buildings and a strategic intensification of urban spaces to improve urban productivity, creating prosperity while reducing pressure on the planet. Material consumption in cities is increasing worldwide; in the region, East Asia and China showed the largest increase alongside India, with less dramatic changes in Indonesia and Thailand.<sup>8</sup> Total urban final energy consumption in East Asia is comparable to that of Northern America.

13. The food and agriculture sector is also a driver for unsustainable resource use. Demand for both food and non-food produce, such as feed, energy and industrial raw materials, is rising significantly, and will continue in the future. Changing food consumption patterns across the region are increasing the demand for meat and compounding challenges relating to the availability of land and water. In East Asia in particular, consumption of red meat has increased substantially.<sup>9</sup>

14. Increased efficiency of production is required, new processing and marketing structures will need to be developed, and additional demands on the quality and sustainability of agricultural production need to be met. Sustainable agricultural mechanization using efficient machines improves the utilization efficiency of input such as fertilizers and other agrochemicals and reduces the negative impact on environment. Similarly, the use of microirrigation techniques improves the efficiency of water use and reduces deep percolation of water and pollution of groundwater. Improved tillage methods conserve soil health, reducing soil erosion and costs. Thus, appropriate and sustainable agricultural mechanization plays a major role in making agriculture sustainable.

15. Rapid growth in the region is threatening the foundations of development. In turn, measures aimed at reversing unsustainable production and consumption patterns, decoupling economic development from environmental degradation and investing in the protection and restoration of ecosystems are vital to achieve equitable prosperity and gender equality, healthy lives and sustainable livelihoods.

### III. Ecosystem degradation and biodiversity loss

16. The Asia-Pacific region is biologically diverse and hosts a high number of unique ecosystems, with 17 of the 36 global biodiversity hotspots and 7 of the world's 17 megadiverse countries found in the region. It is home to the highest marine biodiversity in the world, with the longest and most diverse coral reef systems, more than half of the world's remaining mangrove areas,

<sup>7</sup> FAO, *FAO Statistical Yearbook 2014: Asia and the Pacific Food and Agriculture* (Bangkok, 2014).

<sup>8</sup> ADB and Inter-American Development Bank, *Sustainable Urbanization in Asia and Latin America* (Manila and Washington, D.C., 2014).

<sup>9</sup> FAO, *The Future of Food and Agriculture: Trends and Challenges* (Rome, 2017).

and the highest seagrass diversity. However, the region’s rapid economic growth, increasing population and associated increases in consumption and pollution, high rates of urbanization, agricultural expansion and introduction of invasive alien species are resulting in extensive biodiversity loss and ecosystem degradation. This section contains a description of the major challenges that threaten vital ecosystem services, from land-use change and deforestation to marine ecosystem health, loss of biodiversity and inadequate increase in protected areas (see table 2).

Table 2  
**Regional ecosystem trends**

<i>Trend observed</i>	<i>Latest available data</i>
Continued increase in deforestation	Between 2000 and 2015, approximately 135,333 km <sup>2</sup> of natural forest area was lost, accounting for 10.6 per cent of the world’s total natural forest loss.
Marine ecosystems increasingly threatened	Over 40 per cent of coral reefs and 60 per cent of coastal mangroves in the region have already been lost, and approximately 80 per cent of the region’s coral reefs are currently at risk.
High risk of continued biodiversity loss	In 2014, the region recorded the world’s highest number of threatened species. A decline in the Red List Index from 2000 to 2016 shows an increasing threat of extinction.
Still inadequate increase in protected areas	While, on average, territorial waters under protection increased between 2000 and 2016, numbers are still falling short of targets to preserve marine biodiversity.

17. Among the different ecosystem types, forests, alpine ecosystems, inland fresh water and wetlands, and coastal and marine systems are the most threatened. Between 2000 and 2015, approximately 135,333 square kilometres of natural forest area (as a net figure calculated as forest area minus planted forest) was lost in the region, roughly three times the size of Denmark, and accounting for 10.6 per cent of the world’s total natural forest loss. The largest overall loss was registered in South-East Asia, which lost approximately 158,862 square kilometres of natural forest area within the same period.<sup>10</sup> This is largely due to an increase in timber extraction, large-scale bio-fuel plantations, the growing export market for palm oil and the expansion of intensive agriculture and shrimp farms.<sup>11</sup> However, over the same period, North-East Asia and South Asia have shown an increase in forest cover of 22.9 per cent and 5.8 per cent respectively, through policies and instruments

<sup>10</sup> ESCAP, ADB and United Nations Development Programme, *Asia-Pacific Sustainable Development Goals Outlook* (Bangkok and Manila, 2017).

<sup>11</sup> Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, “The regional assessment report on biodiversity and ecosystem services for Asia and the Pacific: summary for policymakers” (Bonn, 2018).



such as joint participatory management, payment for ecosystem services and the restoration of degraded forests.<sup>12</sup>

18. Despite the enormous benefits rendered by coastal vegetation, satellite imagery data reveals that the Asia-Pacific region witnessed the sharpest rate of reduction in mangrove forest cover in the world over the period from 2000 to 2012.<sup>13</sup> In South-East Asia, which saw the sharpest decline in mangrove forests, estimates suggest that under the current trends the benefits foregone by 2050 would be worth as much as \$2.2 billion on an annual basis.<sup>14</sup>

19. In 2011, the ESCAP *Statistical Yearbook* recorded that the region was already home to about one third of threatened species in the world. Biodiversity in Asia-Pacific continues to decline fast, and the region recorded the world's highest number of threatened species in 2014.<sup>15</sup> The International Union for the Conservation of Nature and Natural Resources Red List of Threatened Species, covering critically endangered, endangered and vulnerable plants and animals, shows that the flora and fauna of the region is becoming increasingly threatened with extinction. Between 2000 and 2016, all subregions showed a decline in the Red List Index, with the highest risks of biodiversity loss in the tropical zones of South and South-East Asia and the Pacific.<sup>16</sup>

20. The conversion of land surface to urban uses is one of the most irreversible human impacts on the biosphere. It hastens the loss of highly productive farmland, affects energy demand, alters the climate, modifies hydrologic and biogeochemical cycles, fragments habitats and reduces biodiversity. The environmental impacts of urban expansion reach far beyond urban areas themselves. Urbanization and city expansion lead to intensified agriculture on the remaining undeveloped land, putting pressure on limited land resources. The increased demand for fossil fuels and natural resources, extensive agriculture, intensified use of extractables, degradation of flora and fauna, deforestation and desertification are causing further environmental degradation and biodiversity loss.

21. Asia and the Pacific is a highly diverse marine region: the South-East Asian coral reefs are the most diverse and endemic-rich on the planet. However, the ocean and marine ecosystems in Asia and the Pacific are becoming increasingly degraded and overexploited. The First Global Integrated Marine Assessment identified a cycle of decline in ocean health, with changes and losses in the structure, function and benefits obtained from

<sup>12</sup> Sean Sloan and Jeffrey A. Sayer, "Forest Resources Assessment of 2015 shows positive global trends but forest loss and degradation persist in poor tropical countries", *Forest Ecology and Management*, vol. 352, 7 September 2015, pp. 134–145.

<sup>13</sup> Asa Strong and Susan Minnemeyer, "Satellite data reveals state of the world's mangrove forests", Global Forest Watch, 20 February 2015. Available at <https://blog.globalforestwatch.org/supplychain/agriculture/satellite-data-reveals-state-of-the-worlds-mangrove-forests>.

<sup>14</sup> Luke M. Brander and others, "Ecosystem service values for mangroves in Southeast Asia: a meta-analysis and value transfer application", *Ecosystem Services*, vol.1, No. 1 (July 2012), pp. 62–69.

<sup>15</sup> United Nations Environment Programme (UNEP), *The State of Biodiversity in Asia and the Pacific: A Mid-term Review of Progress towards the Aichi Biodiversity Targets* (Nairobi, 2016).

<sup>16</sup> *Statistical Yearbook for Asia and the Pacific 2016: SDG Baseline Report* (United Nations publication, Sales No. E.17.II.F.1).

marine systems.<sup>17</sup> Since the adoption in 2015 of the 2030 Agenda for Sustainable Development, including Sustainable Development Goal 14 on life below water, ocean health in Asia and the Pacific has deteriorated further, highlighting the need to strengthen measures to conserve and sustainably use ocean and marine resources in the region. Rampant pollution, destructive and illegal fishing practices, inadequate marine governance and continued urbanization along coastlines exacerbate climate-induced threats of ocean acidification and warming, endangering marine ecosystems and threatening the capacity of our oceans to balance our climate. Extensive coastal development and unsustainable exploitation of marine resources have resulted in the disappearance of over 40 per cent of coral reefs,<sup>18</sup> and about 60 per cent of the coastal mangroves in Asia and the Pacific have been cleared for development, leading to declines in fish stocks. Approximately 80 per cent of the region's coral reefs are at risk from coral bleaching and destructive human activities and nearly all corals may suffer severe degradation even under conservative climate change scenarios.<sup>19</sup>

22. While protected area coverage has increased substantially, it does not effectively target areas of important biodiversity, and management needs to be more effective. Between 2004 and 2017, the region registered a growth in protected area coverage of 0.3 per cent in terrestrial protected areas and 13.8 per cent in marine protected areas.<sup>20</sup> Many countries in North-East Asia, the Pacific and South-East Asia are on track to fulfil Aichi Biodiversity Target 11, on protected areas. The Pacific and wider Oceania has the highest overall protected area coverage in the region, while North-East Asia has a high percentage of land under protected areas (17 per cent), but less than 5 per cent of its marine area. The baseline report by ESCAP on the Sustainable Development Goals recorded that on average across the region, the proportion of the total territorial waters under protection increased from approximately 8 to 31 per cent at the country level between 2000 and 2016.<sup>21</sup> However, this change may fall short of Sustainable Development Goal target 14.5 and fail to preserve marine biodiversity, as it is limited mainly to small island States, while some of the region's largest countries (China, India and the Russian Federation) have experienced no change over the past 15 years. Despite the progress in protected area coverage in both marine and terrestrial ecosystems, the rate of species loss has not diminished.

23. Ecosystem health and biodiversity continue to decline in the Asia-Pacific region, despite limited progress in some areas. This is especially disconcerting as the natural environment is the foundation of all economic and social development in the region. Investing in conservation and restoration of ecosystems and biodiversity is an impactful strategy to protect human health and welfare and ultimately to sustain economic growth in line with the 2030 Agenda.

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<sup>17</sup> United Nations, Division for Ocean Affairs and the Law of the Sea, "First Global Integrated Marine Assessment (First World Ocean Assessment)", 21 January 2016. Available at [www.un.org/Depts/los/global\\_reporting/WOA\\_RegProcess.htm](http://www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm).

<sup>18</sup> UNEP, *The State of Biodiversity in Asia and the Pacific*.

<sup>19</sup> UNEP, *Global Environment Outlook: GEO-6 Regional Assessment for Asia and the Pacific* (Nairobi, 2016).

<sup>20</sup> Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, "The regional assessment report on biodiversity and ecosystem services".

<sup>21</sup> *Statistical Yearbook for Asia and the Pacific 2016*.

## IV. Pollution and waste

24. This section contains a description of the pressing environmental challenges linked to pollution and waste, including issues related to wastewater, plastics and air pollution, that threaten sustainable economic and social development in the region (see table 3).

Table 3  
**Regional trends in pollution and waste**

<i>Trend observed</i>	<i>Latest available data</i>
Wastewater remaining largely untreated	70 per cent of urban waste water is discharged into ecosystems, and 80 to 90 per cent of all wastewater remains untreated.
Increasing amounts of solid waste polluting ecosystems	Cities generate about 1.37 million tons of municipal solid waste a day, of which up to 90 per cent is leaked into the environment or disposed of improperly. With a business-as-usual path, this amount will double in 2025.
Air pollution increasing exponentially, threatening human health	The region witnessed the sharpest increase in premature deaths as a result of ambient air pollution (fine particulate matter – PM2.5) between 1990 and 2015, with an estimated 1.2 million to 2 million deaths related to air pollution per year in China.

### A. Wastewater

25. A total of 80 to 90 per cent of all wastewater produced in the Asia-Pacific region was released untreated in the past,<sup>22</sup> with alarming situations in coastal zones of South and South-East Asia. In 2011, only 21.3 per cent of total produced wastewater in South and South-West Asia was treated. In 2012, 82 per cent and 84 per cent of wastewater in Pakistan and Armenia respectively went back into ecosystems untreated. Singapore is one of the few countries with significant advances in wastewater treatment: in 2015, recycled water treated using the NEWater process met 30 per cent of drinking water demand, which is expected to increase to 50 per cent by 2060.

26. Countries experiencing rapid economic growth and urbanization coupled with a combination of water-related challenges related to access, depletion, pollution, sanitation and disasters are highly vulnerable to water scarcity, impeding efforts to advance development agendas. Water scarcity reduces the availability of water for irrigation, impacting food security. It also affects human health through the inability to deal with human waste, which, in turn, results in contaminated water supplies and increased prevalence of waterborne pathogens.<sup>23</sup>

<sup>22</sup> *Statistical Yearbook for Asia and the Pacific 2009* (United Nations publication, Sales No. E.10.II.F.1).

<sup>23</sup> See E/ESCAP/CED(3)/1.

## B. Solid waste and plastic pollution

27. With the increase in consumption of natural resources in the Asia-Pacific region, there has been a rise in the generation of waste (see below). The current linear “take-make-dispose” extractive industrial model is hugely wasteful, with the majority of material value lost to landfills or environmental pollution. Waste generated through these ineffective processes creates substantial costs associated with the loss of critical ecosystem services and additional waste management spending in municipal budgets. In developing countries, solid waste management and collection costs can reach 50 per cent of municipal annual budgets.

28. Urban areas in the region generated about 1.37 million tons of municipal solid waste a day in 2012. By 2025, this amount is expected to more than double to 3 million tons, increasing the cost of waste management from \$49 billion in 2012 to \$123 billion.<sup>24</sup> The majority of growing Asian towns and cities use open dump sites and only approximately 10 per cent of solid waste ends up in properly engineered and managed landfill sites. Chemical production in the region is projected to increase by 46 per cent over the period from 2012 to 2020,<sup>25</sup> and the region generates 1 million tons of hazardous waste daily.<sup>26</sup> Rapid industrialization, rising consumer demand and population growth in the region demand improved management of chemicals and hazardous waste and regulation of industrial and consumer chemicals and pesticides. Asia generated 18.2 million tons of e-waste in 2016, growing by 63 per cent in five years in East and South-East Asia (2010 to 2015), with the highest quantity of e-waste generated in China (7.2 million tons).<sup>27</sup> While some countries have passed legislation, the official collection rate across the region lies at approximately 15 per cent and as low as 6 per cent in Pacific island States.<sup>28</sup>

29. It is estimated that 95 per cent of plastic in the oceans is transported by 10 major rivers, eight of which are in Asia,<sup>29</sup> and that Asian countries with fast-growing markets and underdeveloped waste management systems – including China, India, Indonesia, the Philippines, Thailand and Viet Nam – may be responsible for as much as 60 per cent of plastic waste leakage. Of the approximately 8.3 billion tons of plastic produced over the past decades, only

<sup>24</sup> ESCAP calculations in 35 countries in Asia and the Pacific based on data from Daniel Hoornweg and Perinaz Bhada-Tata, “What a waste: a global review of solid waste management”, Urban Development Series, No. 15 (Washington, D.C., World Bank, 2012).

<sup>25</sup> International Monetary Fund, *Regional Economic Outlook: Asia and Pacific – Preparing for Choppy Seas*, World Economic and Financial Surveys (Washington, D.C., 2017).

<sup>26</sup> Swedish Chemicals Agency, *Regional Programme: Towards a Non-Toxic Environment in South-East Asia: Phase II – Progress Report 2016* (Stockholm, 2017).

<sup>27</sup> Shunichi Honda, Deepali Sinha Khatriwal and Ruediger Kuehr, *Regional E-waste Monitor: East and Southeast Asia*. (Tokyo, United Nations University and Ministry of the Environment of Japan, 2016).

<sup>28</sup> C.P. Baldé and others, *The Global E-waste Monitor 2017* (Bonn, United Nations University; Geneva, International Telecommunication Union; Vienna, International Solid Waste Association; 2017).

<sup>29</sup> Christian Schmidt, Tobias Krauth and Stephan Wagner, “Export of plastic debris by rivers into the sea”, *Environmental Science & Technology*, vol. 51, No. 21 (7 November 2017), pp. 12,246–12,253.

9 per cent is recycled – 79 per cent accumulates in landfills or the natural environment, and the remaining 12 per cent is incinerated – and approximately 13 million tons enter the ocean annually, although this number may be much higher. Over 80 per cent of marine plastic waste comes from land-based sources, making plastic the most common type of marine litter; 75 per cent of the leakage that comes from land-based sources originates from uncollected waste, while the remaining 25 per cent leaks from within the waste management system itself.<sup>30</sup>

30. While the health effects of plastic pollution in water, soil and the ocean remain under study, plastic debris has been detected worldwide in all major marine habitats and is ingested by fish, seabirds and marine mammals. Plastic fragments and attached toxins that are absorbed into flesh could enter the human diet, presenting a potential underexplored health risk.<sup>31</sup>

31. The incidence of food waste in industrialized Asia exceeds European levels and is high in cities across the region.<sup>32</sup> In low-income countries where rice is the dominant crop, such as in South and South-East Asia, agricultural production and post-harvest handling and storage yield high food losses, while approximately 40 per cent of food losses in industrialized countries occur at retail and consumer levels.<sup>33</sup> About half of global food loss and waste occurs in China, Japan and the Republic of Korea (28 per cent) and in South and South-East Asia (23 per cent), although on a per capita basis loss is lowest in South and South-East Asia.<sup>34</sup> It is estimated that 15 to 50 per cent of fruits and vegetables and 12 to 30 per cent of grains are lost between the producer and the consumer.<sup>35</sup>

### C. Air pollution

32. Approximately one third, or 2.2 million, of the world's 7 million premature deaths each year from household (indoor) and ambient (outdoor) air pollution are in the Western Pacific region of the World Health Organization (WHO). Deaths related to air pollution in that region in 2016 included heart disease (29 per cent), stroke (27 per cent), chronic obstructive pulmonary disease (22 per cent), lung cancer (14 per cent) and pneumonia (8 per cent), making air pollution the most lethal environmental health threat in many countries in Asia and the Pacific.<sup>36</sup>

<sup>30</sup> Ocean Conservancy and McKinsey Centre for Business and Environment, “Stemming the tide: land-based strategies for a plastic-free ocean” (McKinsey and Company, 2015); Roland Geyer, Jenna R. Jambeck and Kara Lavender Law, “Production, use, and fate of all plastics ever made”, *Science Advances*, vol. 3, No. 7 (5 July 2017); and Jenna R. Jambeck and others, “Plastic waste inputs from land into the ocean” *Science*, vol. 347, No. 6,223, pp. 768–771.

<sup>31</sup> “The known unknowns of plastic pollution”, *Economist*, 3 March 2018.

<sup>32</sup> FAO, *Regional Overview of Food Security and Nutrition 2017: Asia and the Pacific – Investing in Food Systems for Better Nutrition* (Bangkok, 2017).

<sup>33</sup> See E/ESCAP/MCED(7)/2.

<sup>34</sup> FAO, *FAO Statistical Yearbook 2014*.

<sup>35</sup> Save Food Asia-Pacific, “What is food loss and food waste?”. Available at [www.savefood.net/what-are-food-loss-and-food-waste](http://www.savefood.net/what-are-food-loss-and-food-waste) (accessed on 9 September 2018).

<sup>36</sup> WHO Regional Office for the Western Pacific, “One third of global air pollution deaths in Asia Pacific”, 2 May 2018. The Western Pacific region of WHO overlaps

33. Increased energy consumption and use of inefficient energy technologies in households and industrial processes in the region intensify air pollution, especially in urban areas, with high concentrations of particulate matter in cities. Latest estimates show that in 2015, Western Asia and Central and Southern Asia recorded the highest concentrations of particulate matter measuring 2.5 micrometres or less in diameter (PM<sub>2.5</sub>), estimated at 49 and 48 micrograms per cubic metre respectively.<sup>37</sup> Latest data on air quality show that 97 per cent of cities in low- and middle-income countries with more than 100,000 inhabitants do not meet WHO air quality guidelines.<sup>38</sup>

34. Air pollution is a problem for much of the developing world and is believed to kill more people worldwide than AIDS, malaria, breast cancer or tuberculosis.<sup>39</sup> Particulate matter measuring 2.5 micrometres or less in diameter (PM<sub>2.5</sub>) can penetrate the lungs, impacting respiratory health, and is a major concern for human health and a key indicator of air quality. Airborne particulate matter has previously been estimated to cause between 3 million and 7 million deaths every year, primarily by creating or worsening cardiorespiratory disease.<sup>40</sup> Particulate matter originates from emissions from electric power plants, industrial facilities, transport vehicles, biomass burning and fossil fuels used in homes and factories for heating. The region (especially East Asia, the Pacific and South Asia) witnessed the sharpest increase in premature deaths as a result of ambient air pollution (PM<sub>2.5</sub>) between 1990 and 2015 (see figure IV). A recent mapping study in China, for example, estimated that air pollution contributed to 1.2 million to 2 million deaths per year<sup>41</sup> owing to an accelerated rate of industrialization and high dependency on fossil fuels for energy production and urban transportation.

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with the ESCAP subregions of East and North-East Asia, South-East Asia and the Pacific.

<sup>37</sup> Health Effects Institute, “State of global air 2018: a special report on global exposure to air pollution and its disease burden” (Boston, 2018).

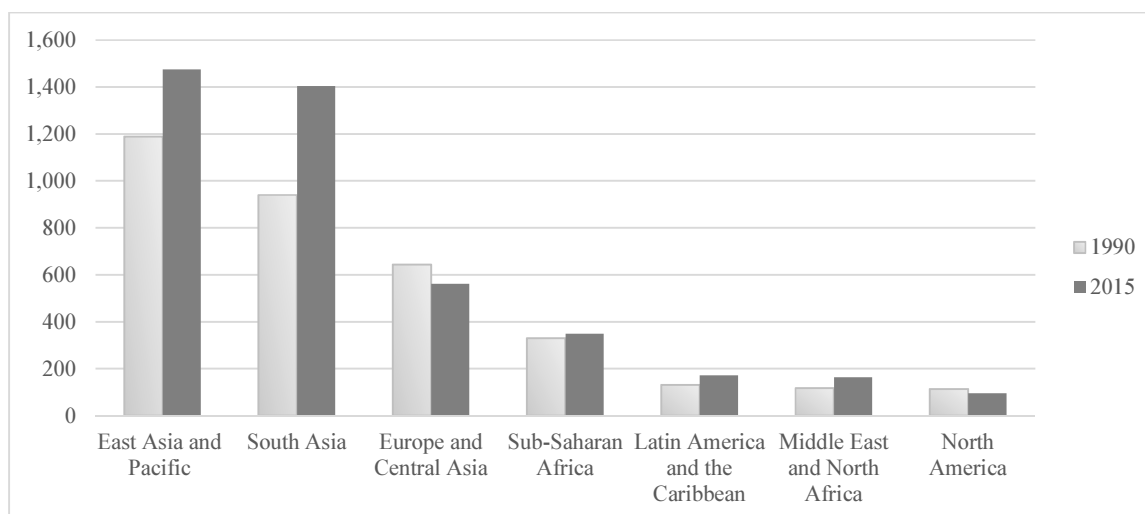
<sup>38</sup> WHO, WHO Global Ambient Air Quality database (update 2018). Available at [www.who.int/airpollution/data/cities/en](http://www.who.int/airpollution/data/cities/en) (accessed on 24 August 2018).

<sup>39</sup> WHO, “WHO methods and data sources for country-level causes of death 2000–2012”, Global Health Estimates Technical Paper WHO/HIS/HSI/GHE/2014.7 (Geneva, 2014).

<sup>40</sup> C. Arden Pope III and others, “Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution”, *JAMA*, vol. 287, No. 9 (March 2002), pp.1,132–1,141.

<sup>41</sup> Robert A. Rohde and Richard A. Muller, “Air pollution in China: mapping of concentrations and sources”, *PLoS ONE*, vol. 10, No. 8 (20 August 2015).

Figure IV  
**Premature deaths from ambient air pollution (PM<sub>2.5</sub>), 1990 and 2015**  
 (Thousands)



*Source:* Recreated from Glenn-Marie Lange, Quentin Wodon and Kevin Carey, eds., *The Changing Wealth of Nations 2018: Building a Sustainable Future* (Washington, D.C., World Bank, 2018).

35. In South-East Asia, forest and peatland fires emit large quantities of smoke and particulate matter causing transboundary air quality issues. One third of population exposure to smoke across equatorial Asia is caused by fires in oil palm and timber concessions such as in Sumatra and Kalimantan in Indonesia, exacerbating climate change and threatening public health. Exposure to smoke from forest fires also heavily affects the population outside of concession boundaries, accounting for 37 per cent of smoke exposure in Singapore alone.<sup>42</sup>

36. The main source of household air pollution is the use of kerosene and solid fuels such as wood in polluting stoves, open fires and lamps. In the region, progress in access to clean cooking fuel has been disappointingly slow, increasing to only 51 per cent in 2014 (from 40 per cent in 2000), leaving 2.2 billion people still cooking with biomass in traditional stoves.<sup>43</sup> South-East Asia and countries in the Western Pacific bear most of the global burden of household air pollution, with 1.5 million and 1.2 million deaths respectively in 2016.<sup>44</sup> Women and children remain the most exposed group to indoor air pollution and vulnerable to related health impacts.

37. Children are at an increasing risk of dying from air pollution, raising the need for more action to reduce various forms of air pollution if the vision of leaving no one behind is to be achieved. Globally, it is estimated that the number of deaths resulting from outdoor air pollution increased from 3.4 million in 1990 to 4.2 million in 2016. Estimates show that in 2015, the

<sup>42</sup> D.V. Spracklen, C.L. Reddington and D.L.A. Gaveau, "Industrial concessions, fires and air pollution in Equatorial Asia", *Environmental Research Letters*, vol. 10, No. 9 (1 September 2015).

<sup>43</sup> *Energy Transition Pathways for the 2030 Agenda in Asia and the Pacific*.

<sup>44</sup> WHO, "Burden of disease from household air pollution for 2016: V3 April 2018" (Geneva, 2018).

death rate due to air pollution was highest in landlocked developing countries followed by the least developed countries, and lowest in developed regions. ESCAP research has shown that the resulting damages from air pollution disproportionately impact the low-income and marginalized communities, and this can be a crucial factor that exacerbates income inequalities.<sup>45</sup>

## V. Climate change

38. Overall, the Asia-Pacific region contributes significantly to the production of greenhouse gas emissions, and is also highly vulnerable to its impacts. These trends highlight the urgent need to transition towards low-carbon development to further slow down climate change, as well the need to strengthen resilience to increasingly extreme weather events in the region (table 4).

Table 4  
**Regional trends related to climate change**

<i>Trend observed</i>	<i>Latest available data</i>
Continuing rise in greenhouse gas emissions	In 2017, carbon emissions from Asia-Pacific consumption with respect to activities related to the combustion of oil, gas and coal alone (excluding other sectors) rose to nearly 49 per cent of the world share of the respective emissions.
Still inadequate share of renewable energy in the mix	The share of renewable energy declined from 23 per cent in 1990 to 18.3 per cent in 2014, while the growth in renewables for electricity generation in China saw more than a fivefold increase, and coal remains the major energy source in many countries.
Continued increase in impacts from climate change	From 2011 to 2015, 45 per cent of global disasters occurred in the region, leading to a rise in disaster impacts from approximately 0.1 per cent in the 1970s to 0.4 per cent in recent decades.

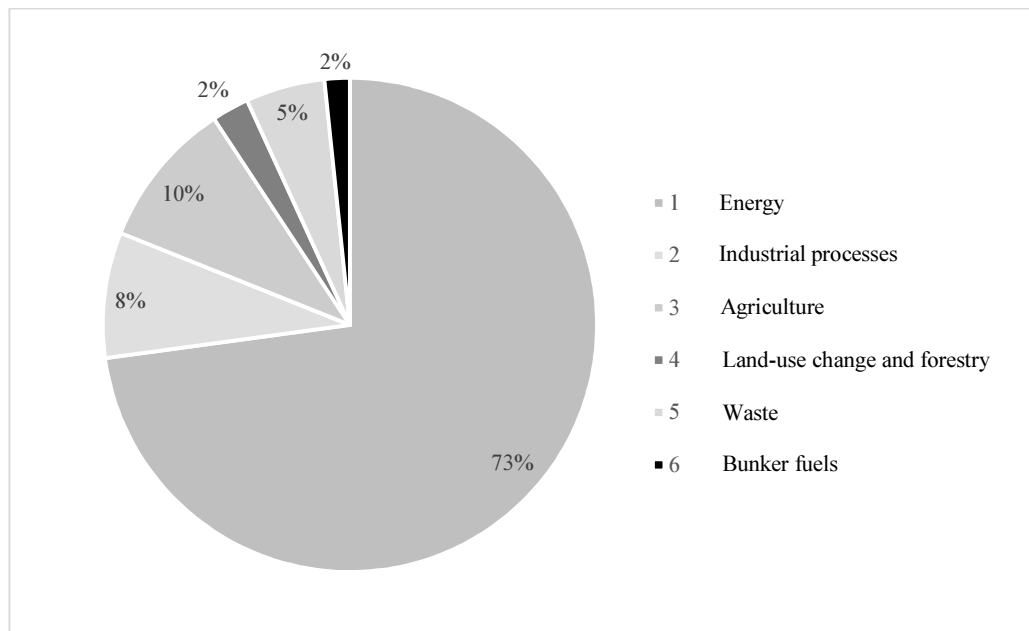
### A. Greenhouse gas emissions

39. The energy sector remains the largest emitter in Asia and the Pacific (see figure V). However, emissions from agriculture and land-use change, including from rice cultivation and deforestation, are highly significant. These emissions include methane and nitrous oxide emissions that may be unaccounted for, yet have a higher global warming potential than carbon dioxide and contribute significantly to the Asia-Pacific climate change impact. East and North-East Asia in particular saw an exponential growth in emissions (including land-use change and forestry) between 1990 and 2014 (see figure VI). Key sectors for reducing emissions include energy production and use, waste management, low-carbon transport and restoration of natural carbon sinks.

<sup>45</sup> *Inequality in Asia and the Pacific in the Era of the 2030 Agenda for Sustainable Development* (United Nations publication, Sales No. E.18.II.F.13).

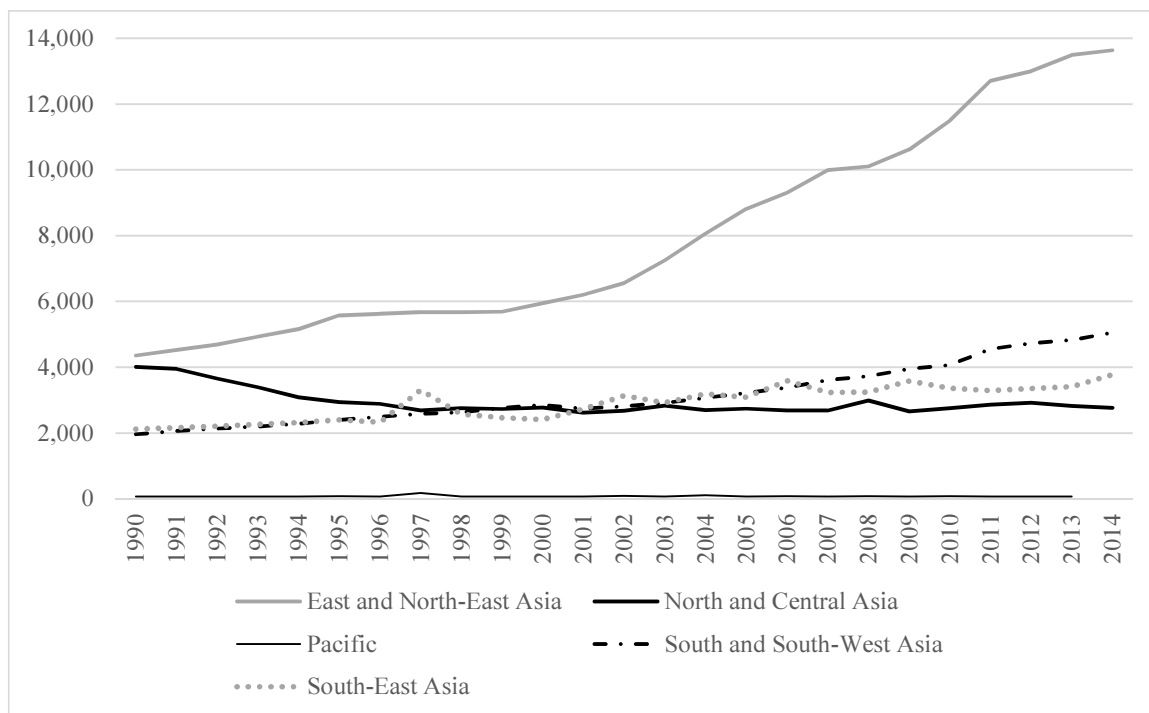


Figure V  
**Asia-Pacific emissions by sector, including land-use change and forestry, 2014**  
 (Percentage)



Source: Based on data from World Resources Institute, CAIT Climate Data Explorer. Available at <http://cait.wri.org> (accessed on 18 August 2018).

Figure VI  
**Total greenhouse gas emissions by subregion, including land-use change and forestry, 1990 to 2014**  
 (Tons of carbon dioxide equivalent)



Source: Based on data from World Resources Institute, CAIT Climate Data Explorer. Available at <http://cait.wri.org> (accessed on 18 August 2018).

40. Greenhouse gas emissions from agriculture are rising rapidly in Asia and the Pacific. South Asia is the largest emitter of greenhouse gases from agriculture in the region, largely from enteric fermentation from the digestive systems of ruminants and some other animals, as well as from the application of synthetic fertilizer to the soil for rice cultivation. East Asia is the second largest emitter, largely from the same sources. South-East Asia has lower greenhouse gas emissions than South Asia and East Asia, but the sources are largely from deforestation and cultivated organic soils. Emissions from agriculture in the Pacific have increased only slightly since the 1960s.

41. A robust shift to renewable energy is needed across the region. The share of renewable energy in the region's total final energy consumption, both from modern renewables and the traditional use of biomass, declined from 23 per cent in 1990 to 18.3 per cent in 2014. Growth in the use of modern renewables reached 37 per cent during this period. Growth in renewable energy in East and North-East Asia is driven by a rapid increase in renewables for electricity generation in China, which saw a more than fivefold increase from 2000 to 2014. The exponential growth in energy consumption, particularly in South and South-West Asia, is absorbing any increase in the share of renewables in the region's energy mix. Coal remains the major energy source in many countries and is mainly used for electricity production. Coal combustion has been the main cause of carbon dioxide emissions in the energy sector in Asia and the Pacific (see figure VII).

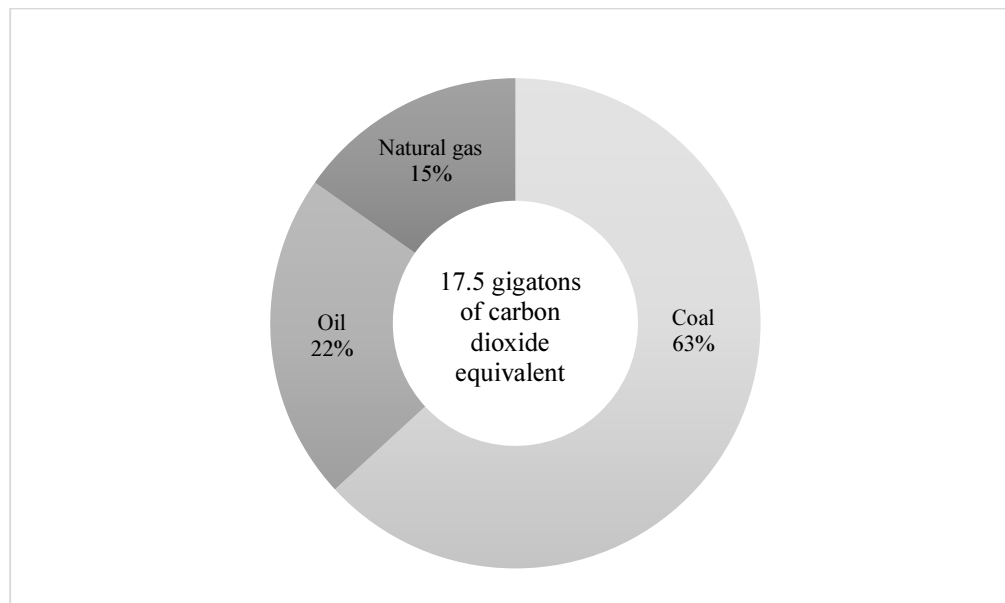
42. In 2017, carbon emissions from Asia-Pacific consumption with respect to activities related to the combustion of oil, gas and coal alone made up nearly 49 per cent of the world share of the respective emissions.<sup>46</sup> If no additional mitigation action is taken, emissions from fuel combustion in 2030 could reach up to 20 gigatons under the current policy scenario, which will make it difficult to achieve the Paris Agreement and targets set out in nationally determined contributions in the region. It is estimated that renewables will need to supply 35 per cent (1,789 million tons of oil equivalent in absolute terms) of the region's total final energy consumption by 2030 to help achieve targets to reduce energy sector emissions in the region.<sup>47</sup>

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<sup>46</sup> BP, *BP Statistical Review of World Energy 2018* (London, 2018).

<sup>47</sup> *Energy Transition Pathways for the 2030 Agenda in Asia and the Pacific*.

Figure VII  
**Greenhouse gas emissions from fuel combustion in Asia and the Pacific, 2014**  
 (Percentage)



*Source: Energy Transition Pathways for the 2030 Agenda in Asia and the Pacific.*

43. Achieving the climate targets set out in the Paris Agreement and the Sustainable Development Goals will be possible only if countries in Asia and the Pacific invest significantly in conserving and restoring the ecosystems vital to balancing its climate. Peatlands, terrestrial forests, coastal vegetation and planktonic ecosystems in the ocean are significant carbon sinks: their destruction releases large amounts of carbon, accelerating climate change. It is estimated that the ocean concentrates 50 times more carbon than the atmosphere and that mangroves, seagrass beds and salt marshes store at least 10 times more carbon than continental forests.<sup>48</sup> For example, in three decades, Indonesia has lost 40 per cent of its mangroves, making up only 6 per cent of its total forest loss, but equal to 10 to 31 per cent of estimated annual emissions from land-use sectors.<sup>49</sup>

## B. Climate change impacts

44. Climate change poses myriad threats to the regional economies, livelihoods and natural environment in Asia and the Pacific. The costs of climate change are likely driven by alterations to hydrological systems, lower crop yields, species extinction, natural disasters, public health crises, increased conflict and migration, and lowered economic productivity. Climate change impacts could be multiplied substantially if global warming triggers natural feedback processes such as a weakening of land and ocean carbon sinks.

<sup>48</sup> Ocean and Climate Platform, “The interactions between ocean and climate: 8 fact sheets”, fact sheets 7 to 14 (Paris, 2016). Available at <https://ocean-climate.org/?p=3896&lang=en>.

<sup>49</sup> Daniel Murdiyarto and others, “The potential of Indonesian mangrove forests for global climate change mitigation”, *Nature Climate Change*, vol.5, No. 12 (December 2015), pp. 1,089–1,092.

45. Asia and the Pacific is the most disaster-prone region in the world. The 687 climate-related disasters that occurred in the Asia-Pacific region in the period from 2011 to 2015 accounted for 45 per cent of global disasters.<sup>50</sup> A total of 60 per cent of the climate-related disasters occurred in East and North-East Asia and South-East Asia. Climate change is projected to increase the frequency and magnitude of hazards including tropical cyclones and high-intensity storms, droughts and floods.<sup>51</sup> Under a business-as-usual scenario, mean summer temperatures could increase to 6 degrees Celsius above pre-industrial levels by the end of the twenty-first century, with stronger summertime warming over higher latitudes in Asia, where the temperature increase may reach up to 8 degrees Celsius. This would cause heat extremes, with summer temperatures that are considered unusual under current climate conditions becoming the new norm from 2070 onward. Some areas, particularly in South-East Asia, could enter into entirely new climate regimes owing to the frequent occurrence of unprecedented heat extremes. Sea-level rise could be limited to 0.65 metres by the end of the century if the targets of the Paris Agreement are met, but would rise by 1.4 metres under a business-as-usual scenario. However, because sea-level rise is a slow-onset impact of climate change, even if global warming is limited to 2 degrees Celsius, sea levels will continue to rise by more than 5 metres over the following centuries.<sup>52</sup>

46. Climate change will have significant socioeconomic impacts in Asia and the Pacific, from threats to food security, energy and built infrastructure, to threats to health including from vector-borne diseases. Between 1970 and 2016, the region lost \$1.3 trillion owing to disasters, including floods, storms, droughts, earthquakes and tsunamis. This trend continues, as disaster impacts have been outpacing the region's economic growth and have risen from approximately 0.1 per cent in the 1970s to about 0.4 per cent in recent decades as a proportion of GDP.<sup>53</sup> The estimated damage fluctuates from year to year according to the nature and impact of disasters, but the trend is clear: disasters cause more damage in Asia and the Pacific than in the rest of the world, and this gap is widening. The region's rapid economic growth has increased the exposure of people and assets to natural hazards, thereby increasing disaster risks. The region requires investments of \$26,166 billion over the period 2016–2030, equating to an annual average of \$1,744 billion for mitigation measures and climate-proofing investments in infrastructure. To avoid the other devastating economic losses from climate change under a business-as-usual scenario, it is projected that South Asia alone needs to spend \$40 billion per year, or 0.48 per cent of GDP, by 2050 on adaptation measures.<sup>54</sup>

47. Climate change is emerging as a major threat to the agricultural sector, negatively affecting yields, as occurrences of natural hazards increase, average temperatures rise and precipitation patterns change. Agricultural productivity is reduced by declining soil productivity and groundwater depletion, as well as

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<sup>50</sup> *Statistical Yearbook for Asia and the Pacific 2016*.

<sup>51</sup> *Leave No One Behind: Disaster Resilience for Sustainable Development – Asia-Pacific Disaster Report 2017* (United Nations publication, Sales No. E.17.II.F.16).

<sup>52</sup> ADB, *A Region at Risk: The Human Dimensions of Climate Change in Asia and the Pacific* (Manila, 2017).

<sup>53</sup> *Leave No One Behind: Disaster Resilience for Sustainable Development – Asia-Pacific Disaster Report 2017*.

<sup>54</sup> ADB, *Meeting Asia's Infrastructure Needs* (Manila, 2017); and Mahfuz Ahmed and Suphachol Suphachalasai, *Assessing the Costs of Climate Change and Adaptation in South Asia* (Manila, ADB, 2014).

increased pest incidence and salinity. The effects of climate change on agricultural production and livelihoods are expected to intensify over time.<sup>55</sup>

48. Climate change will strongly exacerbate the levels of water stress in the region.<sup>56</sup> Higher temperatures reduce soil moisture which, combined with higher wind speeds, trigger large-scale sand and dust storms, especially in South-West Asia and North and East Asia. These are also caused by a significant reduction in the surface of freshwater bodies, such as Lake Urmia in the Islamic Republic of Iran, whose total surface has shrunk 80 per cent since 1980 and which in October 2017 went nearly dry. A similar fate is looming over Lake Balkhash in Kazakhstan, following the fate of the Aral Sea.

49. In conclusion, while countries in the Asia-Pacific region are highly impacted by climate change, they are also key to reducing the greenhouse gas emissions that cause global warming. To ensure sustainable development, the region urgently needs to increase ambition and action to combat climate change and build resilience against inevitable impacts, providing support to those most vulnerable.

## VI. Issues for consideration

50. In the Ministerial Declaration on Environment and Development for Asia and the Pacific, 2017, adopted by the Ministerial Conference on Environment and Development in Asia and the Pacific at its seventh session, the secretariat was requested, inter alia, to promote the review of progress at the regional level on the areas identified in the Declaration through the Committee on Environment and Development. The information presented in the present document constitutes the first such review. In the context of the above, and to support policy coherence and regional environmental cooperation in the Asia-Pacific region, the Committee may wish to provide guidance on specific action to strengthen the secretariat's analytical work and generation of knowledge on status and trends related to the priority areas identified in the Declaration.

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<sup>55</sup> FAO, *The State of Food and Agriculture 2016: Climate Change, Agriculture and Food Security* (Rome, 2016).

<sup>56</sup> UN-Water, "Special regional session: achieving water security for Asia and the Pacific through sustainable water management – session report, 15 January 2015", 2015 UN-Water Annual International Zaragoza Conference.