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Benefits of and opportunities for addressing emerging environmental challenges through regional cooperation

Benefits of environmental action, including through enhanced regional cooperation

Note by the secretariat

Summary

The present document contains highlights of the significant benefits and co-benefits of environmental action in four key areas, namely promoting resource efficiency, transitioning to a circular economy, conserving and restoring ecosystem services, and climate action. To harness these benefits and co-benefits, regional cooperation on environmental action is a prerequisite.

The Committee on Environment and Development may wish to consider recommending measures and providing direction to the secretariat for further analysis of the economic and social benefits of environmental action in the areas defined in the Ministerial Declaration on Environment and Development for Asia and the Pacific, 2017. The Committee may also wish to provide guidance to the secretariat on developing a regional initiative to facilitate increased understanding and use of environmental action through regional cooperation with a view to generating benefits for the people and planet and for the increased prosperity of the countries in the region.

I. Overview

1. As reviewed in the note by the secretariat on key environmental issues, trends and challenges in the Asia-Pacific region (ESCAP/CED/2018/1), in the rapidly growing countries of Asia and the Pacific, resource use and emissions are increasing, thereby intensifying risks and vulnerabilities, leading to intensified climate impacts and the depletion of vital ecosystems. Environmental assessments indicate a rapidly changing climate, coupled with unsustainable demand for natural resources and a continuing decline of critical ecosystem services. Considering the transboundary nature of climate, natural ecosystems, pollution and resource use, regional collaboration mechanisms become even more significant and urgent. The challenges identified in document ESCAP/CED/2018/1 can be tackled with environmental action that creates an array of co-benefits for the economy, society and the planet itself.

* ESCAP/CED/2018/L.1.

2. The 2030 Agenda for Sustainable Development provides a strong global consensus and momentum to improve resource efficiency, transition to a circular economy, effectively manage ecosystems and take concerted climate action. Recognizing that natural resources are intrinsically interlinked to the achievement of the Sustainable Development Goals, regional environmental actions will need to be integrated across the whole spectrum of global agendas and engage different actors and sectors.

3. Co-benefits span institutional and geographical boundaries. Relating the co-benefits of environment and development actions to other areas can spur widespread support for effective implementation. Ensuring that environmental co-benefits are realized requires enabling actions and coordination across sectors, actors and countries to increase the capture of positive synergies.

4. The present document contains an exploration of the co-benefits of action in the four areas corresponding to the challenges presented in document ESCAP/CED/2018/1, namely promoting resource efficiency, transitioning to a circular economy, conserving and restoring ecosystem services, and climate action.

II. Benefits of environmental action in priority areas

A. Promoting resource efficiency

5. A continued supply of natural resources is critical for meeting the basic needs of all people. The extraction of resources and the processes that transform them into useful economic inputs degrade ecosystems and natural areas and produce waste and pollution. These impacts work together to diminish the flow of ecosystem services on which people and economic activities depend. The efficient use of renewable and non-renewable natural resources and reinvesting in their replenishment are good economics and in line with regional commitments to achieving balanced and integrated sustainable economic development.

6. Improving resource efficiency delivers direct benefits in terms of substantial cost savings such as resources saved and reduction in the demand for natural resources. At the same time, it can deliver important co-benefits such as reducing greenhouse gas emissions, limiting price volatility of resources, controlling air and water pollution, and generating jobs.

7. In order to better understand the benefits of resource efficiency improvement in materials, energy and water, the Economic and Social Commission for Asia and the Pacific (ESCAP) has developed a simulation and scenario-building methodology[1] and an online tool to conduct scenario analyses at the regional, subregional and country level, targeting policymakers (see table 1 for one scenario for all three resource categories). This section includes

[1] The methodology accounts for the partial equilibrium and direct impacts corresponding to the scenarios of resource efficiency improvement. It quantifies the resources saved and monetizes the resources saved but it does not consider the general equilibrium indirect effects of these changes on various sectors in the economy. Neither does it account for potential rebound effects. For example, on modelling material efficiency scenarios, the methodology quantifies the direct benefits from the materials saved but it does not include the corresponding energy and water savings that would occur since the saved materials will not be produced. The tool helps policymakers to have a better understanding of the magnitude of benefits of resource efficiency improvement in terms of relatable aspects such as foreign direct investment (FDI) and potential jobs that can be generated.

information on some of the results from this methodology and on a tool for selecting scenarios for the region, while the subregional results are available in the annex.

Table 1
Benefits from a 20 per cent improvement in resource efficiency for the region

	Material	*Energy*	*Water*
Total resources saved	11.53 billion tons	16.46 billion megawatt hours	668 billion cubic metres
Cost of resources saved	$5.35 trillion	$1.74 trillion	
Number of times the annual consumption demand of a megacity[a]	83	23.7	298.08
Percentage of foreign direct investment inflows	988	322	-
Potential job equivalents[b]	304 million	99 million	-
Number of times the combined gross domestic product of least developed countries of the region	17.4	5.6	-
Averted greenhouse gases (tons of carbon dioxide equivalent)	-	3 billion	-
Tons of rice that can be produced with water saved	-	-	267.23 million
Number of people that can be fed for a year with the above quantity of rice	-	-	1.8 billion
As percentage of water required to produce the annual electricity demand of a megacity[a]	-	-	10 100

[a] Tokyo, as the largest megacity in the region in terms of population, is used as a comparison in this table.

[b] Measures the number of jobs that can be generated per year if resource savings are used to create jobs at current average annual wages in the region or subregion.

- : indicates cases where outputs cannot be estimated for corresponding resources using the simulation tool. For example, it is difficult to monetize the quantity of water saved. Hence, the cost savings from resource efficiency savings in water are not estimated.

Note: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency.

8. The Asia-Pacific region is the most resource inefficient in the world in terms of domestic material resource consumption, comprising fossil fuels, biomass, metals and non-metallic minerals. There is therefore significant room for improving resource efficiency. ESCAP calculations [2] show that just a 1 per cent improvement in resource efficiency of material resources (domestic material consumption) and energy combined can deliver the region monetary benefits of up to $275 billion in terms of resource costs at current prices. This translates to 51 per cent of the current FDI inflows to the region or almost 87 per cent of the combined gross domestic product (GDP) of the least developed countries in the region. These benefits accrue largely to the manufacturing, construction and energy-intensive sectors. At the firm level, if resource savings are used to provide jobs at the average wages, as many as 15.6 million could be generated.

Table 2
Impact of a 1 per cent improvement in energy efficiency and material resource efficiency

	Asia and the Pacific	*East and North-East Asia*	*South-East Asia*	*South and South-West Asia*	*North and Central Asia*	*Pacific*
Cost of resources saved (Billions of United States dollars)	275	100	49	93	23	6
Percentage of annual foreign direct investment	51	39	49	142	39	12
Job equivalents (Millions)	15.6	3.0	3.9	16.4	1.9	0.2

Note: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency.

Note: The sum of subregional gains can vary significantly from the regional aggregate due to significant disparity in the average value of key variables of the region from that of the subregions.

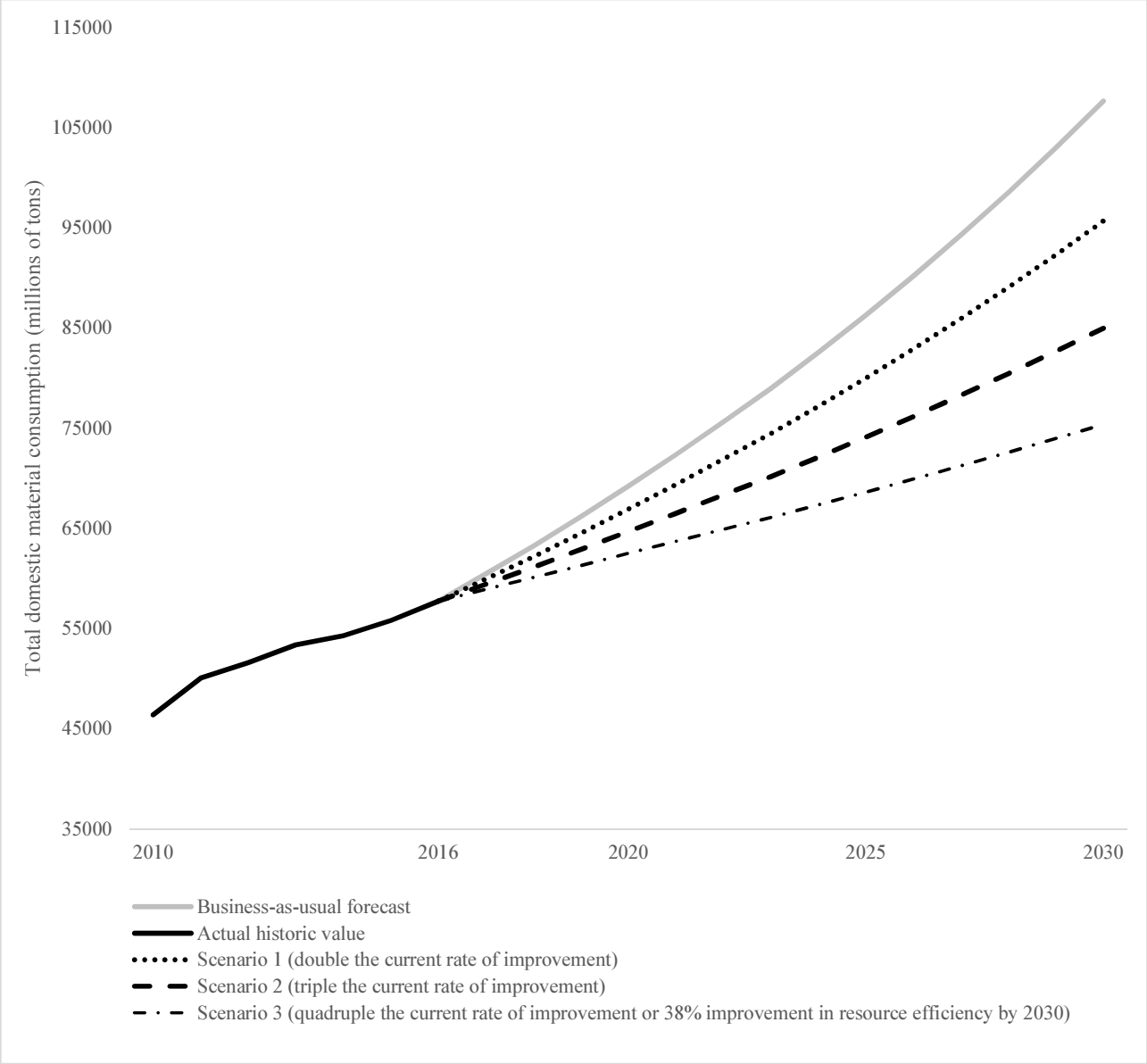
[2] In all the calculations in this section, the partial equilibrium direct benefits of resource efficiency improvement are calculated using current market prices in 2017. In translating the quantity of resources saved to the value of resources in the case of energy and domestic material consumption, the current composition structure of these resources at the national level and regional levels are taken into account and multiplied by the existing internationally traded prices of these resources provided by the International Monetary Fund. This can result in deviation from the actual cost of these resources, as the prices of some of these resources are significantly lower in some countries, where natural resources are not valued properly. In the case of energy, the composition of energy consumption and the levelized cost of energy from each source provided by the International Energy Agency is used. Fossil fuels is a category within domestic material consumption. To avoid double counting, the cost of energy produced by fossil fuels is deducted from the energy efficiency improvement scenario. The full methodology and data sources are made available together with the Resource Efficiency scenario-building online application developed by ESCAP, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency.

9. Though the importance of improving resource efficiency has been highlighted under Sustainable Development Goal 12 (Responsible consumption and production), Goal 8 (Decent work and economic growth), Goal 7 (Affordable and clean energy) and Goal 6 (Clean water and sanitation), no specific time-bound targets have been set for such improvements. The figure below contains a simulation of the resource use trajectory of the region for the period 2017–2030 for different resource efficiency improvement scenarios.[3] The business-as-usual scenario in the region is only a conservative estimate of the future resource increase, as the demand for material resources is linked to rising incomes and changing lifestyles. For the period 2010–2017, the region made improvements in resource efficiency in domestic material consumption at a rate of 0.8 per cent per annum. As the simulations show, accelerating the rate of improvement of resource efficiency of the region can deliver enormous savings in terms of material resources. For example, if the region quadruples the current rate of improvement in resource efficiency,[4] by 2030 it can limit the resource demand to that of 2022 under the business-as-usual scenario. Quadrupling the rate of resource efficiency improvement in the region should be considered a feasible option considering the low historic rate of resource efficiency improvements of only 0.8 per cent per annum during the period 2010–2017.

[3] Assuming the GDP growth for the region and subregion forecasted by the International Monetary Fund until 2023 and the minimum of the growth rate for the period 2017–2023 extrapolated for the period 2023–2030.

[4] Calculated as the compounded rate of deceleration of resource intensity of domestic material consumption for the period 2010–2017.

Simulations of resource use trajectories for the region under different resource efficiency improvement scenarios for domestic material consumption



10. Quadrupling the rate of current improvement for the region and subregion could deliver huge benefits, as shown in table 1 in the annex. The total materials saved for the region as a whole from 2017 to 2030 amount to 211 billion metric tons, with the largest savings in North-East Asia due to the resource savings accrued primarily in China. The weight of materials saved amount to approximately 700,000 times the weight of Petronas tower or approximately 1,518 times the annual domestic material consumption of Tokyo – the largest megacity in the region in terms of population. The approximate monetary value of this resource savings could be up to 98 trillion dollars over this period, which is more than 180 times the current FDI inflows to the region, or 320 times the combined GDP of the least developed countries of the region.

11. The availability of water is critically linked to the provision of food and energy in the region. Table 3 in the annex shows an estimate of resource efficiency improvement in terms of water resources. A 20 per cent improvement could result in 668 billion cubic metres of water saved for the region. This amount of water savings is approximately 300 times the annual water demand of a megacity like Tokyo. The water saved can be used to produce 267 million metric tons of rice, which is about 42 per cent of the rice production of the region or 38 per cent of the global rice production.[5] This quantity of rice is sufficient to meet the caloric requirements of 1.8 billion people per year. The largest savings of water in terms of quantities can be potentially made in South-East Asia – the most water intensive of the subregions. The water saved is approximately 10,000 per cent of the total water required to meet the electricity demand of a megacity like Tokyo.

12. Energy is a key input in promoting socioeconomic development. The energy intensity of the Asia-Pacific region is higher than the world average, with North and Central Asia being the most energy intensive among the subregions, followed by East and North-East Asia (see table 4 in annex). A 20 per cent improvement in energy efficiency could result in reduction of energy use by 16 billion megawatt hours and could result in monetary savings of approximately 1.7 trillion dollars in energy costs. This savings amount to approximately 322 per cent of the current FDI inflows to the region and can translate to 99 million jobs being created at the average wages of the region per annum. The benefits of matching the regional average resource intensity with that of the most resource efficient economy in the region will lead to considerably higher benefits as shown both for the region and its subregions, as indicated in table 4 in the annex.

13. The estimates in this section show a partial equilibrium effect of resource efficiency improvement in terms of resources saved and their associated costs, while the general equilibrium effects in terms of secondary effects may deliver even larger co-benefits. Using such a general equilibrium model at the global level, the International Resource Panel estimates that the combined economic and environmental consequences of ambitious resource efficiency and greenhouse gas abatement policies at the global level can help reduce natural resource use globally by 26 per cent by 2050, reduce greenhouse gas emissions by an additional 15 to 20 per cent by 2050, and deliver annual economic benefits of $2 trillion globally by 2050 relative to existing trends.[6] This further strengthens the case for promoting resource efficiency. Previous research by ESCAP has highlighted policy pathways at macro and sectoral levels to promote resource efficiency.[7]

B. Transitioning to a circular economy

14. Another key challenge identified in document ESCAP/CED/2018/1 is the increase in pollution and generation of waste. A transition to a circular economy is a key approach to address this challenge. The circular economy approach advocates for moving away from a linear production and consumption system – the take, make and dispose extractive industrial model, which generates a lot of waste, with most of the value in materials lost to landfills and resources being consistently underutilized. Conversely, a circular economy entails

[5] Ricepedia, "Rice productivity". Available at http://ricepedia.org/rice-as-a-crop/rice-productivity (accessed on 25 August 2018)

[6] International Resource Panel, *Assessing Global Resource Use: A Systems Approach to Resource Efficiency and Pollution Reduction* (Nairobi, United Nations Environment Programme, 2017).

[7] ESCAP, *Analysing Resource Efficiency Transitions in Asia and the Pacific* (ST/ESCAP/2807).

gradually decoupling economic activity from the consumption of finite resources and designing waste out of the system. Circular economy solutions can have economic, social and environmental co-benefits in terms of reduced demand for natural resources, reduction in emissions, generation of jobs and enhancement of innovation within the society as detailed in the following paragraphs.

Table 3
Summary of benefits and co-benefits of the transition to a circular economy

Benefits and co-benefits	*Quantity*
Material cost savings (global)	$1 trillion by 2025
Material cost savings in fast-moving consumer goods sectors (Asia-Pacific region)	$423 billion by 2025
New jobs from the transition to a circular economy in four material flows (global)	100 000 annually
Profits from waste collection to municipalities due to the transition to a circular economy (global)	$64 billion per year
Percentage of emissions gap between current policies and the 1.5 degrees centigrade target of the Paris Agreement that can be filled by a circular economy approach	50 per cent

Source: ESCAP calculations drawing on studies listed in the text.

15. Globally, a transition to a circular economy approach is estimated to provide more than $1 trillion in material cost savings by 2025.[8] In the case of the major fast-moving consumer goods sectors, the order of magnitude of the material resource savings that can be generated from a transition to a circular economy alone could result in up to $706 billion annually.[9] Considering that in key fast-moving consumer goods sectors[10] the Asia and the Pacific region accounts for more than 60 per cent of the global share, the bulk of these potential benefits can be harvested within the region.

16. Aside from the material resource savings, a move to a circular economy can generate both skilled and unskilled jobs. A global study estimates that the impact of the transition to a more circular economy in just three to four material flows alone can deliver at least 100,000 new jobs.[11] Another significant co-benefit of a move to a circular economy is an enhanced rate of innovation as the

[8] World Economic Forum, *Towards the Circular Economy: Accelerating the Scale-Up Across Global Supply Chains* (Geneva, 2014).

[9] Ellen MacArthur Foundation, *Towards the Circular Economy: Opportunities for the Consumer Goods Sector* (Cowes, United Kingdom, 2013).

[10] World Wide Fund For Nature, *Asian Fast Moving Consumer Goods: A Sustainability Guide for Financiers and Companies* (Gland, Switzerland, 2016).

[11] World Economic Forum, *Towards the Circular Economy*.

circular economy relies heavily on an underlying business case for innovation across the life-cycle of products.

17. In 2012, urban areas in 35 countries in the region produced approximately 1.37 million metric tons of waste per day, and this is expected to more than double by 2025 to 3 million metric tons. While the cost of management of this waste was approximately $49 billion in 2012, this is expected to increase to $123 billion by 2025.[12] However, this increase in waste can be reduced and also partly converted to a source of revenue through circular economy approaches. In municipalities, a move to a circular economy can generate profits from waste collection systems of approximately $64 billion globally per year.[13] This would imply significant potential gains to the region as the waste generated by developing countries in Asia and the Pacific is expected to rise more than 60 per cent in the coming decade, and currently as much as 70 per cent of the collected waste is untreated.[14]

18. More circular models to reduce and recycle materials have the potential to significantly reduce emissions from landfills and management of waste and wastewater. With more than 50 per cent of global greenhouse gas emissions currently related to material management, the circular economy may have the potential to close approximately half of the emissions gap between current policies and the 1.5 centigrade target of the Paris Agreement.[15] ESCAP research reveals that composting projects which tackle urban organic waste in selected developing countries in Asia can bring co-benefits as high as $184.21 per ton of carbon dioxide equivalent reduced.[16]

19. Waste separation and collection and the payment of collection fees need to happen with the engagement of communities, with adequate attention to community needs, behaviours, preferences and constraints, and a critical assessment of the stages of the waste-to-resource process. The secretariat's research has shown that effective partnerships linking critical stakeholders, such as local communities in developing countries, are needed to operate effective waste-to-resource facilities, with significant co-benefits associated with small-scale, decentralized and pro-poor solid waste management.[17] These include green job creation, improved health, improved waste collection, cost savings from reduced need for landfilling and improved crop yields using compost.

20. Another key way inclusive circular economy solutions can be particularly beneficial for Asian-Pacific cities is by unlocking the potential of the informal sector, while simultaneously ensuring their healthy livelihood. Informal industries already serve as miniature circular economies in many instances and account for 60 per cent of the workforce in the region.[18] The informal sector

[12] ESCAP calculations 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).

[13] World Economic Forum, *Towards the Circular Economy.*

[14] Uwe Weber, "Waste management: A pathway to circular economy", *SWITCH-Asia Magazine* (Winter 2016/2017), p. 4.

[15] Circle Economy and Ecofys, "Implementing circular economy globally makes Paris targets achievable" (Utrecht, the Netherlands, 2016).

[16] Lorenzo Santucci and others, "Valuing the sustainable development co-benefits of climate change mitigation actions: the case of the waste sector and recommendations for the design of nationally appropriate mitigation actions (NAMAs)" (Bangkok, ESCAP, 2015).

[17] ESCAP, Valuing Waste, Transforming Cities (Bangkok 2015).

[18] International Labour Organization, *Women and Men in the Informal Economy: A Statistical Picture*, 3rd ed. (Geneva, 2018).

provides employment and livelihoods for impoverished, marginalized, and vulnerable individuals or social groups and supports circularity in waste management despite using simple techniques and equipment. Recycling performed by the informal sector also provides savings to formal waste management systems by reducing the amount of waste to be collected, transported and disposed of, resulting in lower labour, transport and infrastructure costs.

21. Therefore, inclusive circular economy solutions have a triple bottom line, with economic, social and environmental benefits, and can be an important approach to promote sustainable natural resource management. There is a case to be made for enhanced regional cooperation to harness these benefits. Some initiatives to accelerate a transition to a circular economy supported by ESCAP are highlighted in the note by the secretariat on solutions to accelerate progress with respect to the environmental dimensions of the 2030 Agenda for Sustainable Development in Asia and the Pacific (ESCAP/CED/2018/3).

C. Conserving and restoring ecosystem services

22. The Asia-Pacific region depends on its biodiversity and variety of ecosystem services to sustain human well-being. The region's terrestrial, freshwater and marine ecosystems provide direct goods (in terms of food and water) and services that are of great ecological, cultural and economic importance. In document ESCAP/CED/2018/1, the alarming trends in degradation and loss of biodiversity and associated ecosystem services are revealed. This section contains information on the cost of inaction in terms of the conservation and rehabilitation of ecosystem services and associated co-benefits.

Table 4
Summary of benefits and co-benefits from the conservation and rehabilitation of ecosystem services

Scenario of ecosystems conservation and rehabilitation or destruction	*Benefits and co-benefits*
Loss of ecosystem services per year globally	$20 trillion worth loss per year
Loss of value of ecosystem services per year (Asia-Pacific region) under business-as-usual scenario	$4.7 trillion per year by 2050
Achieving ecosystem conservation-related targets of the Sustainable Development Goals	Gain of $3.3 trillion worth of ecosystem services per year for the region by 2050
Annual economic loss attributed to invasive alien species due to their impact on native ecosystems	$33.5 billion in South-East Asia per year
Foregone benefits from destruction of mangrove forests (South-East Asia)	$2.2 billion on an annual basis by 2050

Source: ESCAP calculations drawing on studies listed in the text.

23. Globally, it has been estimated that from 1997 to 2011 a $20.2 trillion worth loss of ecosystem services took place annually due to land use changes and associated loss of biodiversity and ecosystem services.[19] For 47 countries in the

[19] Robert Costanza and other, "Changes in the global value of ecosystem services", *Global Environmental Change*, vol. 26 (May 2014).

Asia-Pacific region, recent estimates posit that the benefits provided by terrestrial ecosystem services are worth approximately $14 trillion per year.[20] The study also finds that under the business-as-usual scenario, the loss in value of ecosystem services could be approximately $4.7 trillion per year by 2050. On the other hand, a scenario wherein the Sustainable Development Goals are met leads to an increase of $3.3 trillion worth of ecosystem services per year for the region by 2050.

24. Ecosystems such as forests, mangroves, marshlands and wetlands and oceans perform an invaluable service in terms of moderating the impacts of climate change, efficiently sequestering carbon and serving as buffers for various climate-induced natural disasters, including typhoons, storms, floods and droughts.

25. Regional studies confirm that the restoration of mangrove forests in the Asia-Pacific region has the highest potential to enhance ecosystem carbon storage and offset greenhouse gas emissions in the tropics.[21] Recent studies highlight the invaluable ecosystem services that mangrove forests provide with multiple benefits to local communities and biodiversity conservation. These range from coastal erosion protection to tsunami and typhoon buffers, and from nurseries for fish, birds and other species to a food and fuel source. Another invaluable service of mangrove forests is to provide three-to-fivefold greater carbon storage capacity than any other forests,[22] which makes them the most important carbon sink in the tropics.[23] The study conducted in the Can Gio Mangrove Forest Park, Mekong Delta, Viet Nam, after the typhoon in 2015 concluded that the mangrove forest and mudflat areas store the equivalent of 152.3 teragrams of carbon dioxide equivalent, which is greater than the total carbon dioxide emissions of Viet Nam for the year 2013 as per the reporting to the International Energy Agency for 2015.[24]

26. Despite these enormous benefits, satellite imagery data reveals that the Asia-Pacific region witnessed the sharpest rate of reduction in mangrove forest cover in the world from 2000 to 2012.[25] In South-East Asia, which saw the sharpest decline in mangrove forests, estimates suggest that given the current trend, the foregone benefits by 2050 would be as much as $2.2 billion on an annual basis.[26]

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[20] Ida Kubiszewski and others, “The future of ecosystem services in Asia and the Pacific”, *Asia & the Pacific Policy Studies*, vol. 3, No. 3 (September 2016).

[21] Luu Viet Dung and others, “Carbon storage in a restored mangrove forest in Can Gio Mangrove Forest Park, Mekong Delta, Vietnam”. *Forest Ecology and Management*, Vol. 380 vol. 380 (November 2016).

[22] Daniel Murdiyarso and others, “The potential of Indonesian mangrove forests for global climate change mitigation”, *Nature Climate Change*, vol. 5 (December 2015).

[23] Luu Viet Dung and others, “Carbon storage in a restored mangrove forest in Can Gio Mangrove Forest Park, Mekong Delta, Vietnam”.

[24] Viet Nam reported a total of 130.1 teragrams of carbon dioxide equivalent emissions for the year 2015.

[25] Asa Strong and Susan Minnemeyer, “Satellite data reveals state of the World’s mangrove forests”, Global Forest Watch, 20 February 2015.

[26] 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).

27. Many aspects of ecosystem services are currently understudied. For example, the annual economic loss attributed to invasive alien species due to their impact on native ecosystems is not well studied but is likely to be substantial. It is estimated at $33.5 billion in South-East Asia.[27]

28. These valuations make the case for immediate action to conserve and restore ecosystems to support sustainable development, including regional and subregional cooperation efforts. Governments of the Asia-Pacific region are at a crossroads in deciding how to design ecosystem management strategies that are compatible with biodiversity conservation to ensure sustainable, long-term management of their natural wealth. Such strategies will also provide the space for other species and wildlife to continue to perform their natural functions as part of a healthy ecosystem, as highlighted in Sustainable Development Goals 14 and 15. Among many other actions, proper accounting of the contribution of natural capital to socioeconomic development, which is currently poorly reflected in GDP estimates, would support the recognition of the direct and indirect costs of the use of ecosystem services. Some further approaches towards this, such as promoting nature-based solutions, are discussed in document ESCAP/CED/2018/3.

D. Climate action

29. Climate change is forecasted to generate impacts with enormous social, economic and environmental costs to the region.[28] As a result, climate change mitigation and adaptation policies can deliver several co-benefits. Some of the major co-benefits, especially due to changes in land use and energy policies, range from improved human health, protection against natural hazards, enhanced energy security, sustained crop yields and reduced transport congestion. Through these co-benefits, climate policies can contribute significantly to several of the Sustainable Development Goals simultaneously, as many of these co-benefits can be realized in the short-run and can be often captured locally.[29]

[27] Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), *Summary for Policymakers of the IPBES Regional Assessment Report on Biodiversity and Ecosystem Services for Asia and the Pacific* (Bonn, Germany, 2018).

[28] Asian Development Bank, *A Region at Risk: The Human Dimensions of Climate Change in Asia and the Pacific* (Manila, 2017).

[29] Economic Commission for Europe, "The co-benefits of climate change mitigation", *Sustainable Development Brief*, No. 2 (January 2016).

Table 5
Summary of benefits and co-benefits from climate action

Benefits and co-benefits	*Quantity*
The overall economic benefits of climate action (that would limit global warming to well below 2 degrees centigrade) for developing countries in the region	10 per cent of gross domestic product (GDP) per capita for the developing countries in the region by 2100
Positive impact on crop yields of climate action strategies involving reductions in surface ozone	30 to 135 million metric tons of cereals globally 24.5 million metric tons of crop yield projected in India, China and Pakistan alone
Leveraging investments in low-carbon measures in cities	Cost: 0.4–0.9 per cent of city GDP Benefits: 1.7–9.5 per cent of city GDP
Premature deaths averted in five countries in the region (namely, Bangladesh, China, India, Indonesia and Pakistan) by 2030 due to climate action	1.8 million per year

Source: ESCAP calculations drawing on studies listed in the text.

30. The overall economic benefits of climate action that would limit global warming to well below 2 degrees centigrade is estimated to be as much as 10 per cent of GDP per capita for the developing countries in the region by 2100. South Asia (12 per cent), followed by South-East Asia (9.6 per cent) and the Pacific (7.5 per cent) are estimated to see huge benefits from climate actions.[30]

31. Aside from the direct benefit of reducing risks to human health, climate action delivers health-related co-benefits through reduced air pollution, increased physical activity and access to healthier diets. In terms of health co-benefits, strategies to reduce black carbon and tropospheric ozone, which can reduce projected global mean warming by approximately 0.5 degrees centigrade by 2050, can help to avoid 0.7 to 4.7 million annual premature deaths from outdoor air pollution globally.[31] Of that number, approximately 1.8 million averted premature deaths are estimated to come from just five countries in the region (namely Bangladesh, China, India, Indonesia and Pakistan) in 2030 and beyond. The study also found that climate action strategies involving reductions in surface ozone alone could boost annual crop yield by 30 to 135 million metric tons, with 24.5 million metric tons of crop yield projected in India, China and Pakistan alone.

32. As of October 2017, 51 countries in the Asia-Pacific region had signed the Paris Agreement (43 have now signed and ratified). While these countries have a broad range of targets and normative benchmarks against which progress on national determined contributions can be measured, together they have set ambitious goals. The national determined contributions, which are at the heart of

[30] Minsoo Lee, Mai Lin Villaruel and Raymond Gaspar, "Effects of temperature shocks on economic growth and welfare in Asia", ADB Economics Working Paper Series, No. 501 (Manila, Asian Development Bank, 2016).

[31] Drew Shindell and others, "Simultaneously mitigating near term climate change and improving human health and food security", *Science*, vol. 335 (January 2012).

the Paris Agreement and determine its fate, embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. Parties are required to pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

33. In the energy sector, which has huge climate action potential, the Asia-Pacific region collectively aims, through the aggregation of the national determined contributions, to reduce its emissions by 39 per cent by 2030. It is estimated that renewables will need to supply 35 per cent (in other words 1.7 billion tons of oil equivalent in absolute terms) of the region's total final energy consumption by 2030 to help to achieve the required energy sector emissions reduction.[32] Compared to a scenario based on existing and announced energy policies, a sustainable development scenario is projected to globally lower cumulative carbon dioxide emissions by 195 gigatons over the period until 2040, reduce premature deaths in developing countries by 1.5 million by minimizing household air pollution and by 1.6 million by reducing outdoor air pollution by 2040, and provide approximately 700 million additional people access to electricity and 2 billion more people access to clean cooking by 2030.[33] Even without any changes in the composition of energy sources, ESCAP estimates that energy savings corresponding to a 20 per cent improvement in energy efficiency can result in significant reduction in greenhouse gases, up to 3 billion metric tons of carbon dioxide equivalent, which is roughly 12 per cent of regional emissions.[34,35]

34. Studies have also shown that the cost of climate action is substantially lower than the potential benefits it can deliver. The costs of attaining a 2-degrees-centigrade scenario for the region are estimated at approximately 0.1 per cent of GDP annually or 4 per cent by 2050, relative to business as usual, while the GDP in the region could decrease by as much as 3.3 per cent by 2050 and 10 per cent by 2100, relative to the base case without climate action.[36]

35. A recent study estimates that doubling renewable energy globally could save up to $4.2 trillion per year, which is 15 times the investment required in renewable energy.[37] ESCAP estimated that a carbon tax of $25.7 per ton of carbon dioxide equivalent, together with savings from phasing out fossil fuel subsidies, would be sufficient to meet the entire investment needed for renewable energy to meet its target share.[38]

36. Another recent study provides a comparative analysis of the economic case for investing in low carbon measures in five cities: Leeds, United

[32] *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).

[33] International Energy Agency, *World Energy Outlook 2017* (Paris, 2017).

[34] ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency.

[35] The latest available regional aggregate value for greenhouse gases is for 2012. ESCAP, ESCAP Statistical database. Available at http://data.unescap.org/escap_stat/ (accessed August 2018).

[36] ESCAP, *The Economics of Climate Change in the Asia-Pacific Region* (ST/ESCAP/2761).

[37] International Renewable Energy Agency, *Renewable Capacity Statistics 2017*. (Abu Dhabi, 2017).

[38] *Energy Transition Pathways for the 2030 Agenda in Asia and the Pacific.*

Kingdom of Great Britain and Northern Ireland; Kolkata, India; Lima; Johor Bahru, Malaysia; and Palembang, Indonesia. It made a strong economic case for cities in developed and developing countries to invest, at scale, in cost-effective low-carbon measures. The results suggest that these investments could generate significant reductions in the range of 15–24 per cent (relative to business-as-usual trends) in urban carbon emissions over the next 10 years. Securing these savings would require an average investment of $3.2 billion per city, which, if spread over 10 years, equates to 0.4–0.9 per cent of the annual city GDP. However, the savings generated in the form of reduced energy bills would be equivalent to between 1.7 per cent and 9.5 per cent of the annual city GDP. The study also builds the case for replicating similar investments in cities globally, which could generate cumulative reductions equivalent to 10–18 per cent of global energy-related greenhouse gas emissions in 2025.[39]

37. As shown by the above examples, the cost of climate action is substantially lower than the benefits and the co-benefits that can be gained through climate action. This provides compelling reasons for countries in the region to set up regional and subregional efforts to strengthen climate action.

III. Issues for consideration by the Committee at its fifth session

38. The findings set out in the present document are intended to support policymakers in the Asia-Pacific region in their efforts to realize the benefits and opportunities of environmental action in support of the implementation of the Ministerial Declaration on Environment and Development for Asia and the Pacific, 2017, adopted by the seventh Ministerial Conference on Environment and Development in Asia and the Pacific, and ultimately to implement the 2030 Agenda and to achieve the Sustainable Development Goals. Given this context, the Committee on Environment and Development may wish to provide guidance to the secretariat on the scope of analysis on measuring economic and social benefits of environmental action in the priority areas identified in the Declaration of the Seventh Ministerial Conference on Environment and Development.

[39] Andy Gouldson and others, "Exploring the economic case for climate action in cities", *Global Environmental Change*, vol. 35 (November 2015).

Annex

Table 1
Accumulated benefits of quadrupling resource efficiency improvement of domestic material consumption in the region until 2030

	Asia and the Pacific	*East and North-East Asia*	*South-East Asia*	*South and South-West Asia*	*North and Central Asia*	*Pacific*
Total materials saved (billions of tons)	211	92	43	77	23	5
Cost of materials saved (trillions of United States dollars)	98	25	37	63	15	3
As percentage of the annual domestic material consumption of a megacity[a]	151 800	66 300	30 800	55 500	17 000	4 200
Percentage of foreign direct investment inflows	18 165	9 507	36 770	96 330	26 061	6 252
Potential job equivalents (millions)	419	58	229	857	98	10
Number of times the combined gross domestic product of least developed countries of the region	320	81	121	206	49	10

[a] Tokyo, as the largest megacity in the region in terms of population, is used as a comparison in this table.

Notes: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency. The sum of subregional gains can vary significantly from the regional aggregate due to significant disparity in the average value of key variables of the region from that of the subregions.

Table 2
Benefits of a 20 per cent improvement in resource efficiency of domestic material consumption

	Asia and the Pacific	*East and North-East Asia*	*South-East Asia*	*South and South-West Asia*	*North and Central Asia*	*Pacific*
Total materials saved (billions of tons)	11	7	1	2	.7	.2
Cost of materials saved (trillions of United States dollars)	5.3	1.9	.9	1.8	.4	.1
Number of times annual domestic material consumption of a megacity[a]	83	52	7.9	16	5	1.6
Percentage of foreign direct investment inflows	988	745	951	2 760	765	238
Potential job equivalents (millions)	304	59	77	319	37	5
Number of times the combined gross domestic product of least developed countries of the region	17.4	6.3	3.1	5.9	1.4	0.4

[a] Tokyo, as the largest megacity in the region in terms of population, is used as a comparison in this table.

Notes: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency. The sum of subregional gains can vary significantly from the regional aggregate due to significant disparity in the average value of key variables of the region from that of the subregions.

Table 3
Potential benefits of improvements to water efficiency in the region

	Scenario: 20 per cent improvement in water use efficiency					
	Asia and the Pacific	*East and North-East Asia*	*South-East Asia*	*South and South-West Asia*	*North and Central Asia*	*Pacific*
Total water saved (billions of m^3)	668	150	356	214	44	5
Number of times the annual water demand of a megacity[a]	298.08	67.17	159.01	95.64	20.01	2.28
Tons of rice that can be produced with water saved (millions of tons)	267.23	60.22	142.55	85.74	17.94	2.05
Number of people that can be fed for a year with the above quantity of rice (billions)	1.8	0.4	0.9	0.5	0.1	.01
As percentage of water required to produce the annual electricity demand of a megacity[a]	10 100	2 276	5 388	3 240	678	77

[a] Tokyo, as the largest megacity in the region in terms of population, is used as a comparison in this table.

Notes: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency. The sum of subregional gains can vary significantly from the regional aggregate due to significant disparity in the average value of key variables of the region from that of the subregions.

Table 4
Potential benefits of improvements in energy efficiency in the region

	Asia and the Pacific	*East and North-East Asia*	*South-East Asia*	*South and South-West Asia*	*North and Central Asia*	*Pacific*
	Scenario: 20 per cent improvement in energy efficiency					
Energy saved total (billions of megawatt hours)	16	9	1.5	3.4	2	0.3
Cost of energy savings (trillions of United States dollars)	1.7	.8	.2	.3	.2	.04
Percentage of the total energy subsidy	49	34	138	86	61	136
Number of times the annual energy consumption of a megacity[a]	23.70	13.05	2.20	4.91	2.97	0.50
Percentage of the annual foreign direct investments inflow	322	325	200	588	421	85
Potential job equivalents (millions)	99	25	16	68	20	1.8
Averted greenhouse gas emissions (billions of tons)	3	2.2	0.2	0.5	0.3	.06
	Scenario: Improvement of resource efficiency to that of the regional best performer					
Energy saved total (billions of megawatt hours)	60	34	4.8	11.5	8.4	1.2
Cost of energy savings (trillions of United States dollars)	6.3	3.2	0.6	1.3	1	.1
Percentage of the total energy subsidy	180	128	436	293	251	476
Number of times the annual energy consumption of a megacity	87	49	6.9	16.6	12.1	1.7
Percentage of the annual foreign direct investment inflow of a country/subregion	1 181	1 226	629	1 993	1 724	296
Potential job equivalents (millions)	278	97.5	50.9	230.7	84.6	6.2
Averted greenhouse gas emissions (billions of tons)	11.1	8.5	0.7	1.8	1.5	0.2

[a] Tokyo, as the largest megacity in the region in terms of population, is used as a comparison in this table.

Notes: ESCAP calculations using the Resource Efficiency scenario-building online application, available at https://sdghelpdesk.unescap.org/knowledge-hub/thematic-area/resource-efficiency. The sum of subregional gains can vary significantly from the regional aggregate due to significant disparity in the average value of key variables of the region from that of the subregions.