



Economic and Social Council

Distr.: General
7 December 2016

Original: English

Economic and Social Commission for Asia and the Pacific Committee on Energy

First session

Bangkok, 17-19 January 2017

Items 2 and 4 of the provisional agenda*

High-level panel discussion on the theme

“Opportunities and challenges of energy system transformation in Asia and the Pacific: how far and how fast can the region go?”

Energy scene and trends in Asia and the Pacific

Energy scene and trends in Asia and the Pacific

Note by the secretariat**

Summary

Countries in Asia and the Pacific are facing a series of energy-related challenges, including the need to increase energy supplies to meet the growing demands of a region undergoing rapid urbanization, industrialization and economic growth. At the same time, the developing countries in the region are striving to improve energy access for some half a billion people that do not have access to electricity and 2.1 billion people that rely on solid fuel for cooking and heating. Across the region, countries have common goals to decarbonize and diversify the energy mix to meet global commitments on climate change, reduce environmental impacts, especially air pollution, and enhance energy security.

The 2030 Agenda for Sustainable Development, in particular Sustainable Development Goal 7, and the Paris Agreement will shape the energy future of Asia and the Pacific. Regional cooperation is a key tool to respond to the global challenges and to address national development priorities with the Economic and Social Commission for Asia and the Pacific (ESCAP) playing an important role in that regard.

The present document provides an analysis of the energy scene and trends in the region with a view to supporting the transition towards an energy sector which is low carbon, more economically sustainable and environmentally friendly and which contributes to a better society. It provides information to support discussions on the topic and supplements the notes by the secretariat on promoting regional energy connectivity in Asia and the Pacific (E/ESCAP/CE(1)/2) and on progress in the implementation of Sustainable Development Goal 7 and other Goals in relation to energy (E/ESCAP/CE(1)/3).

The identification of issues in the present document, together with guidance from member States, would further facilitate the implementation of the outcomes of the Asian and Pacific Energy Forum for the attainment of the 2030 Agenda, in particular Sustainable Development Goal 7, and energy connectivity.

* E/ESCAP/CE(1)/L.1/Rev.1.

** The present document was submitted late owing to the need for extensive research and internal consultation.

I. Introduction

1. The Asia-Pacific region consists of both energy rich and energy deficient countries, and the region continues to face challenges in the long-term positioning of its energy sector to support sustainable development.

2. Driven by continuous remarkable economic performance, energy demand in Asia and the Pacific has been growing fast. The region became a net energy importer in 1994. The increased demand for energy, especially the growing consumption of fossil fuels, has social and environmental consequences and costs: air pollution has reached dangerous levels in many cities and greenhouse gas emissions are continuing to grow. Lack of access to modern energy deprives the poor of development opportunities and exacerbates gender inequity. Given these pressures, there is an urgent need for a holistic transition to an energy system based on sustainability.

3. Dynamic changes have taken place in the energy sector over the past two decades. A combined effect of economic growth and restructuring, and increased middle class population, urbanization and technology innovation, have led to a change in energy end-use patterns and consumption. There have been improvements in renewable energy and energy efficiency and in delivering energy services to remote communities. New technologies such as energy storage, electric transportation and advanced energy efficiency are poised to make significant impacts on the sustainability of how energy is used. However, more efforts, scale-ups and innovations with regards to sustainable energy approaches are needed to meet the targets of Sustainable Development Goal 7 and the Paris Agreement. The different levels of resource endowments and capacities among countries and subregions provide a strong basis for regional cooperation to drive an energy transition in the Asia-Pacific region.

4. The first Asian and Pacific Energy Forum, which was held in 2013, recognized the role of regional cooperation in enhancing energy security and the sustainable use of energy in Asia and the Pacific. The 2030 Agenda for Sustainable Development provides a more integrated approach to development, including energy development, as specified in Sustainable Development Goal 7, which aims to ensure access to affordable, reliable, sustainable and modern energy for all and provides clear targets on energy access, renewable energy and energy efficiency.

II. Overview of the energy scene in Asia and the Pacific

A. The net energy import of the region is increasing

5. The Asia-Pacific region was a net energy exporter in 1990, with net energy exports of 179 million tons of oil equivalent (Mtoe). The region became a net energy importer in 1994, and the net total energy import increased dramatically from 27.0 Mtoe in 1994 to 410 Mtoe in 2014.

6. Within the region there are both major energy importers and exporters. Major energy exporters include the Russian Federation, which had a net energy export of 571 Mtoe in 2014, followed by Australia (234 Mtoe), Indonesia (231 Mtoe), Kazakhstan (89.0 Mtoe) and the Islamic Republic of Iran (75.3 Mtoe). The main energy importers are China, which had a net energy import of 508 Mtoe in 2014, followed by Japan (422 Mtoe), India (290 Mtoe) and the Republic of Korea (232 Mtoe). In countries such as

Japan, the Republic of Korea and Singapore, imported energy makes up more than 80 per cent of their total primary energy supply (TPES).

B. Energy supply and consumption in the region have been growing faster than the world average

7. Driven by continuous economic growth, TPES in the Asia-Pacific region has been increasing at double the global rate. It increased by 102 per cent in 2014, compared to 1990 levels.¹ The regional share of global TPES grew from 38.2 to 49.5 per cent between 1990 and 2014, which was mainly driven by growth in the developing countries.

8. Per capita TPES for the region grew 52.8 per cent from 1.03 tons of oil equivalent (toe) in 1990 to 1.58 toe in 2014, faster than the world average of 13.9 per cent, from 1.66 to 1.88 toe, over the same period. North and Central Asia is the only subregion where TPES per capita actually dropped, from 5.00 to 3.91 toe between 1990 and 2014. The East and North-East Asia subregion presents the strongest growth of TPES per capita, with a growth rate of 123.5 per cent, from 1.07 toe in 1990 to 2.40 toe in 2014, surpassing the world average in 2007.

9. Total final energy consumption of the region grew significantly, from 39.4 per cent of the global total in 1990 to 47.9 per cent in 2014. However, between 1990 and 2014, the world average for total final energy consumption grew 50.1 per cent, while in comparison South-East Asia increased 153 per cent and North and Central Asia decreased 27.8 per cent.

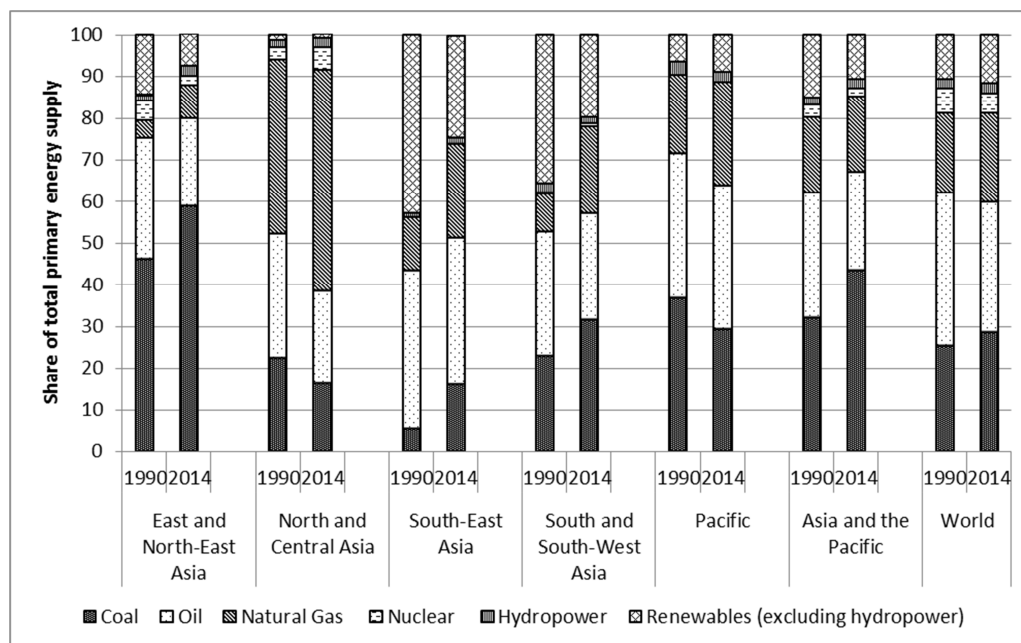
10. Per capita final energy consumption in the region stood at 81.0 per cent of the world average in 2014, an increase from 63.8 per cent in 1990. Within the region, per capita final energy consumption varied significantly, from a low of 0.162 toe in Bangladesh to 3.15 toe for Singapore in 2014.

C. Reliance on fossil fuels has increased

11. Fossil fuels (coal, oil and natural gas) dominate TPES in Asia and the Pacific, accounting for 81.5 per cent of TPES in 1990 and 85.2 per cent in 2014 (figure I).¹ Aside from the slight decrease in North and Central Asia and the Pacific, the share of fossil fuels in the TPES increased in the other subregions. Still, 91.6 per cent of TPES in North and Central Asia and 88.6 per cent in the Pacific came from fossil fuels in 2014.

¹ Organization for Economic Cooperation and Development (OECD), International Energy Agency, World Energy Statistics and Balances database. Available from www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances_enestats-data-en (accessed 15 October 2016). The data for the Pacific subregion cover only Australia and New Zealand.

Figure I
Energy mix of total primary energy supply in Asia and the Pacific and the world (1990 and 2014)
 (Percentage)



Source: ESCAP calculations, based on data from OECD, International Energy Agency World, Energy Statistics and Balances database. Available from www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances_enestats-data-en (accessed 15 October 2016). The data for the Pacific subregion covers only Australia and New Zealand.

12. Coal as a primary source for energy supply almost tripled, from 1,067 Mtoe in 1990 to 2,939.5 Mtoe in 2014; the share of coal in TPES for the Asian-Pacific region grew from 31.9 to 43.4 per cent, while the global average increased from 25.3 to 28.6 per cent. The increased use of coal was mainly driven by demand from East and North-East Asia, South-East Asia, and South and South-West Asia, where the share of coal in TPES increased, respectively, from 46.0 per cent in 1990 to 58.9 per cent in 2014, 5.4 to 15.9 per cent, and 22.9 to 31.6 per cent. In North and Central Asia and the Pacific, the share of coal in TPES decreased slightly, but it still contributed 16.3 and 29.4 per cent of TPES, respectively.

13. Oil supply in Asia and the Pacific grew from 1,019 Mtoe in 1990 to 1,604.7 Mtoe in 2014. However, the share of oil in TPES for the region decreased from 30.4 to 23.7 per cent, in line with the global decline from 36.9 to 31.3 per cent. The share of oil in TPES decreased in all subregions, but was still significant, ranging from 35.4 per cent in South-East Asia, to 21.1 per cent in East and North-East Asia in 2014.

14. The supply of natural gas in the region grew from 601 Mtoe in 1990 to 1,227.6 Mtoe in 2014. The share of natural gas in TPES almost stabilized in Asia and the Pacific, while it increased 2.2 per cent globally. All subregions experienced growth of the share of natural gas, with the most remarkable growth in South and South-West Asia (from 9.0 to 20.7 per cent), followed by North and Central Asia (from 41.8 to 53.1 per cent), South-East Asia (from 12.9 to 22.4 per cent), the Pacific (18.8 to 24.7 per cent), and East and North-East Asia (from 4.1 to 8.1 per cent).

15. Nuclear energy grew from 99 Mtoe in 1990, peaked at 186 Mtoe in 2010, then declined to 135.3 Mtoe in 2014. The share of nuclear energy in TPES in the region declined from 3.0 to 2.0 per cent between 1990 and 2014, while the global share declined from 6.0 to 4.8 per cent. Hydropower as a primary energy supply increased from 55 Mtoe in 1990 to 151.9 Mtoe in 2014. The share of hydropower in TPES increased slightly, from 1.7 to 2.2 per cent. Between 1990 and 2014, the primary energy supply from renewables excluding hydropower increased from 505 to 718.2 Mtoe, but the share of renewables excluding hydropower in TPES in the Asia-Pacific region decreased from 15.1 to 10.6 per cent.

D. Greenhouse gas emissions and air pollution are increasing

16. Energy accounts for approximately 68 per cent of global emissions.² Within the energy sector, carbon dioxide resulting from fuel combustion dominates total greenhouse gas emissions.³ From 1990 to 2014, the growth rate of carbon dioxide emissions from fuel combustion in Asia and the Pacific was more than double the global growth rate. Global carbon dioxide emissions from fuel combustion have been steadily increasing, growing from 20.623 billion tons in 1990 to 32.381 billion tons in 2014,⁴ of which the Asia-Pacific region contributed 38.2 per cent in 1990 and 54.2 per cent in 2014, while the regional share in global total gross domestic product (GDP) grew from 27.3 to 31.8 per cent. To meet the commitments in the Paris Agreement, emissions need to fall between 40 and 70 per cent by 2050, compared to 2010 levels, with fossil fuel use almost entirely phased out by 2100,⁵ which will significantly impact energy choices in Asia and the Pacific.

17. Another significant environmental consequence from fuel combustion is air pollution, including indoor air pollution from household use of traditional energy and outdoor air pollution from transport, power plants and industries. In 2012, 8 million deaths worldwide were the result of indoor and outdoor air pollution. The low- and middle-income countries in Asia and the Pacific had the largest share of those deaths, at 5.9 million.⁶ Asian-Pacific cities represented 85 of the top 100 polluted cities for annual average levels

² OECD, International Energy Agency CO₂ Emissions from Fuel Combustion database. Available from www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics_co2-data-en (accessed 15 October 2016).

³ Ibid. The energy sector includes emissions from fuel combustion (the large majority) and fugitive emissions, which are intentional or unintentional releases of gases resulting from production, processes, transmission, storage and use of fuels (for example, methane emissions from coal mining).

⁴ OECD, International Energy Agency CO₂ Emissions (see footnote 2). The estimates were calculated using the International Energy Agency energy balances and the default methods and emission factors from the Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (Hayama, Japan, Institute for Global Environmental Strategies, 2006). The results may not be the same as the figures that a country submits to the secretariat of the United Nations Framework Convention on Climate Change.

⁵ Intergovernmental Panel on Climate Change, *Climate Change 2014 Synthesis Report: Summary for Policy makers*. Available from www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf (accessed 15 October 2016).

⁶ World Health Organization (WHO), “7 Million Premature Deaths Annually Linked to Air Pollution” 25 March 2014. Available from www.who.int/mediacentre/news/releases/2014/air-pollution/en/.

of particulate matter 10 micrometres or less in diameter and particulate matter 2.5 micrometres or less in diameter.⁷

18. Achieving stabilization and the eventual decline of global greenhouse gas emissions and addressing air pollution requires a transition to renewable energy, low carbon fuels and improved energy efficiency.

E. Social inequity and energy poverty are interlinked challenges

19. Energy poverty remains a prevalent issue in Asia and the Pacific. As of 2012, 10.7 per cent of the regional population or 455 million people⁸ did not have access to electricity, of which 369 million lived in South and South-West Asia, 61 million in South-East Asia, 18 million in East and North-East Asia, and 7 million in the Pacific.⁹ There are 2.1 billion people in the Asian-Pacific countries who rely on traditional biomass fuels such as firewood, charcoal, animal dung and agricultural residues for cooking, and who are mainly concentrated in Bangladesh, China, India, Indonesia and Pakistan.⁹ The table below shows energy poverty in selected Asian-Pacific countries.

⁷ WHO, Ambient (Outdoor) Air Pollution database. Available from www.who.int/phe/health_topics/outdoorair/databases/cities/en/ (accessed 15 October 2016).

⁸ According to the World Bank's Global Tracking Framework 2015. The International Energy Agency cites 621.5 million. The difference lies in the fact that the World Bank's Global Tracking Framework 2015 looked at household surveys while the Agency used utility data which does not include households with access to off-grid electricity systems.

⁹ ESCAP calculations from data in International Bank for Reconstruction and Development, The World Bank and International Energy Agency, *Progress toward Sustainable Energy 2015: Global Tracking Framework Report* (Washington, D.C., 2015).

Table
Energy poverty in selected Asian-Pacific countries

	<i>Population without electricity access</i>		<i>Population relying on traditional use of biomass for cooking and heating</i>	
	<i>1990</i>	<i>2012</i>	<i>2012</i>	
	<i>Millions</i>		<i>Millions</i>	<i>Percentage</i>
China	67	0	612	45
Democratic People's Republic of Korea	16	17	23	92
Mongolia	0.4	0.3	2	63
East and North-East Asia	86	18	636	41
Cambodia	7	10	13	89
Indonesia	60	10	101	41
Lao People's Democratic Republic	2	2	6	98
Myanmar	24	25	49	93
Philippines	21	12	52	54
Thailand	11	0	16	24
Viet Nam	8	0.9	44	49
South-East Asia	136	61	283	46
Bangladesh	83	63	138	89
India	427	269	809	64
Nepal	6	7	22	80
Pakistan	44	11	105	59
Sri Lanka	4	2	15	74
South and South-West Asia	575	369	1 116	63
North and Central Asia	3	0	11	6
Pacific	5	7	6	17
Asia-Pacific	805	455	2 055	48
World	1 284	1 089	2 910	41
	<i>Percentage</i>		<i>Percentage</i>	
Asia-Pacific as percentage of the world	62.7	41.8	70.6	-

Source: ESCAP calculations based on United Nations, Department of Economic and Social Affairs, World Population Prospects, the 2015 Revision database, available from <https://esa.un.org/unpd/wpp/> (accessed 15 October 2016) and data in the International Bank for Reconstruction and Development, World Bank and International Energy Agency, *Progress toward Sustainable Energy 2015: Global Tracking Framework Report* (Washington, D.C, 2015). Available from <http://trackingenergy4all.worldbank.org/~media/GIAWB/GTF/Documents/GTF-2105-Full-Report.pdf>.

20. Lack of modern energy access keeps people from more productive activities, is linked to the deterioration of the local environment and causes health problems but more importantly, it exacerbates social inequity by depriving the rural poor of development opportunities and imposes extra burdens on women and children due to fuel collection activities and exposure to indoor pollution. In countries where there are a higher proportion of households relying primarily on non-solid fuels for cooking,¹⁰ there is a higher gender inequality index.¹¹ Ensuring access to affordable, reliable, sustainable and modern energy for all would contribute to the reduction of the risks of exposure to air pollution, the alleviation of energy poverty, the improvement of public health and towards the elimination of social and gender inequity.

F. The economic cost of energy externalities is high

21. An increased focus is being placed on the externalities of energy use, particularly as the global community committed to the global climate agreement in Paris, and as local air pollution has reached critical levels in a number of Asian cities. The global economic cost of climate change is estimated at hundreds of billions of dollars each year.¹² It is estimated that without climate action, 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.¹³ The costs of addressing air pollution are rising within the region, which has some of the highest global concentrations of particulate matter and associated death rates.¹⁴

22. Significant resources have been devoted by countries to the subsidization of fossil fuels, which incentivizes consumers to continue their use and hinders moves towards greater energy efficiency and cleaner alternatives. Fossil fuel subsidies pose a huge financial burden on Governments. Pre-tax subsidies for fossil fuel and electricity in Asia and the Pacific reached an estimated total of \$152 billion in 2015.¹⁵ If externalities related to climate change, local air pollution, congestion, accidents, road damage and foregone consumption tax revenue are included, total post-tax

¹⁰ Solid fuels include traditional biomass (including wood, charcoal, agricultural and forest residues and dung), processed biomass (such as pellets and briquettes) and other solid fuels (such as coal and lignite). In March 2016, a technical recommendation was made to use “access to clean fuels and technologies” rather than “access to non-solid fuels” in the WHO guidelines, to ensure that health and other nexus benefits are better counted and thus realized.

¹¹ The gender inequality index is a composite measure reflecting inequality in achievement between women and men in three dimensions: reproductive health, empowerment and the labour market.

¹² International Fund for Agricultural Development, “Climate Change Impacts in the Asia/Pacific Region. Available from www.ifad.org/documents/10180/88baa1cf-4661-4077-9292-84dff5253f0 (accessed 15 October 2016).

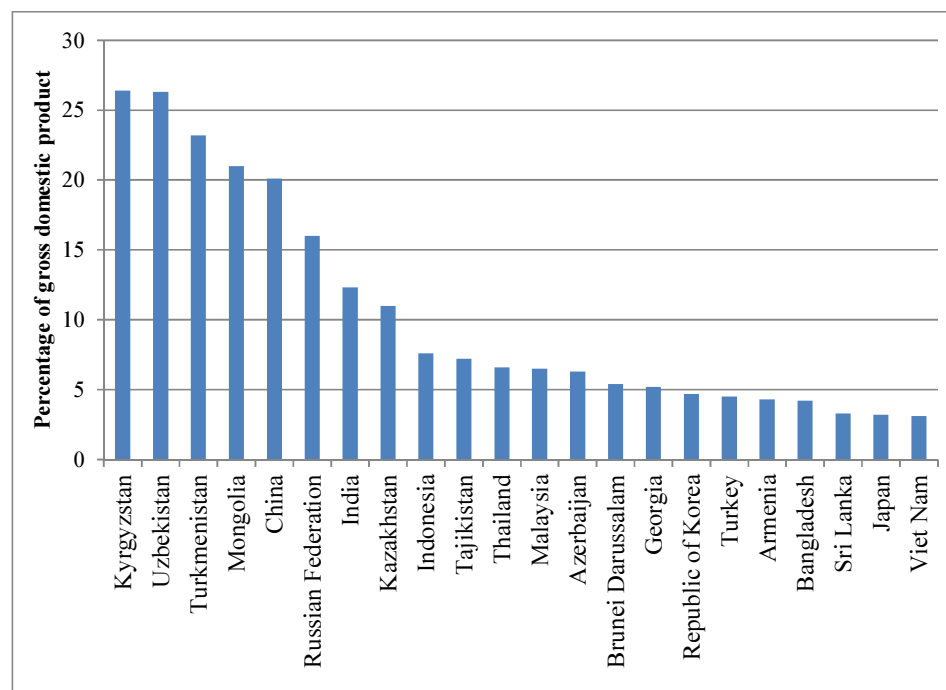
¹³ Minsoo Lee, Mai Lin Villaruel and Raymond Gaspar, “Effects of temperature shocks on economic growth and welfare in Asia”, Asian Development Bank (ADB) Economics Working Paper Series, No. 501 (Manila, 2016). Available from www.adb.org/sites/default/files/publication/217061/ewp-501.pdf.

¹⁴ WHO, “Burden of Disease from Ambient Air Pollution for 2012”. Available from www.who.int/phe/health_topics/outdoorair/databases/AAP_BoD_results_March2014.pdf (accessed 15 October 2016).

¹⁵ International Monetary Fund (IMF), “IMF Survey: Counting the Cost of Energy Subsidies” 17 July 2015. Available from www.imf.org/external/pubs/ft/survey/so/2015/NEW070215A.htm.

subsidies on coal, petroleum, natural gas and electricity were as high as \$3.5 trillion globally in 2015.¹⁵ Figure II reflects the share of total post-tax energy subsidies as a percentage of GDP for selected Asian-Pacific countries. Reforms of these subsidies could make available significant resources for investment in sustainable energy.

Figure II
Total post-tax energy subsidies as a percentage of gross domestic product for selected Asian-Pacific countries, 2015



Source: IMF, “IMF Survey: Counting the Cost of Energy Subsidies”, 17 July 2015. Available from www.imf.org/external/pubs/ft/survey/so/2015/NEW070215A.htm.

G. Future energy demand and greenhouse gas emissions are predicted to increase

23. In the long run, the region’s primary energy demand is projected to increase 2.1 per cent per year between 2010 and 2035, faster than the projected world average growth rate of 1.5 per cent per year. The primary energy demand of Asia and the Pacific will grow more than 60 per cent from 4,985 Mtoe in 2010 to 8,358 Mtoe by 2035.¹⁶ Primary energy demand in developing countries is projected to increase faster than in developed countries: 2.3 per cent per year through 2035, sustained by the assumed economic growth rate of 5.6 per cent per year. In contrast, the developed countries’ primary energy demand will decline at an annual rate of 0.01 per cent through 2035. Carbon dioxide emissions in Asia and the Pacific are predicted to increase from 13,404 million tons of carbon dioxide in 2010 to 22,112 million tons of carbon dioxide in 2035 at a growth rate of 2.0 per cent per year, higher than the global average growth rate of 1.3 per cent per year through 2035.¹⁶

¹⁶ ADB, *Energy Outlook for Asia and the Pacific* (Manila, 2015).

H. A comprehensive transition to sustainable energy is necessary

24. Current patterns of energy supply and consumption in Asia and the Pacific have resulted in significant environmental, social and economic consequences. Unevenly distributed energy resources and heavy reliance on fossil fuels and resulting air pollution and greenhouse gas emissions are all realities for the region. Challenges include meeting the increasing demand in a sustainable manner, addressing the issue of energy access, and transitioning to a cleaner energy mix that is secure, affordable, environmentally friendly and economically sustainable.

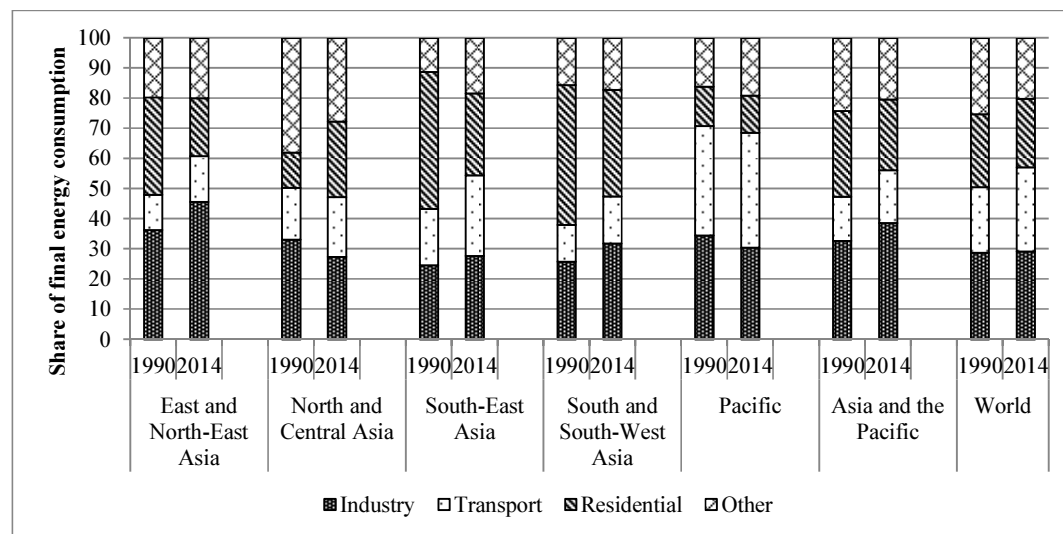
III. Dynamics of the energy sector

A. Industry and transportation needs are increasingly driving growth in final energy consumption

25. There has been an obvious shift for Asia and the Pacific in the sectoral breakdown¹⁷ of final energy consumption since 1990 (figure III). The share of industrial energy consumption increased from 32.7 per cent in 1990 to 38.1 per cent in 2014, reflecting progress in industrialization. Transport energy consumption grew from 14.6 to 17.9 per cent, indicating the increasing demand for transporting people and goods. Despite increasing energy consumption in households, the share of energy consumption of the residential sector decreased from 28.5 to 23.6 per cent.

Figure III

Final energy consumption by sector in Asia and the Pacific and the world (1990 and 2014)
(Percentage)



Source: OECD, International Energy Agency World Energy Statistics (see figure I).

¹⁷ According to the definition by the International Energy Agency, industry refers to the following subsectors excluding energy used for transport by industry: iron and steel, chemical and petrochemical, non-ferrous metals basic industries, non-metallic minerals, transport equipment, machinery, mining and quarrying, food and tobacco, paper, pulp and printing, wood and wood products, construction, textile and leather, and any manufacturing industry not included above; consumption in transport covers all transport activity regardless of the economic sector to which it is contributing; and residential includes consumption by households and excludes fuels used for transport.

26. East and North-East Asia experienced the highest increase in industrial energy use in total final energy consumption, from 36.3 per cent in 1990 to 49.8 per cent in 2011, which then dropped to 45.7 per cent in 2014, corresponding to the growth and subsequent slowdown of China's export-oriented economy. South and South-West Asia, as well as South-East Asia, also experienced an increase in the share of industrial energy use, from 25.8 to 30.3 per cent, and from 24.6 to 27.7 per cent, respectively. Meanwhile, North and Central Asia and the Pacific experienced a decline in the share of industrial energy use in total final energy consumption, from 33.1 to 27.4 per cent and from 34.5 to 30.4 per cent, respectively.

27. The share of transport in total final energy consumption grew at the subregional, regional and global levels. Within the region, it ranged from 15.1 per cent in East and North-East Asia to 38.2 per cent in the Pacific in 2014. With economic growth, urbanization and industrialization, energy consumption for the transportation sector is likely to grow. It is necessary to improve fuel economy, promote public transportation and diversify the technologies of transport modes and fuel mix.

28. More significant change was seen in the share of residential energy use in final energy consumption. Only North and Central Asia experienced an increase, from 11.7 per cent in 1990 to 25.1 per cent in 2014. South-East Asia had the biggest drop, from 45.4 to 27.2 per cent.

B. Primary energy intensity has been reduced

29. Energy intensity is used for measuring energy efficiency and is calculated by energy use per unit of GDP output. Higher energy intensity implies lower energy efficiency.

30. For most countries and subregions, energy intensity levels have been declining. Compared with the global average of 282 toe per \$1 million GDP (2005 dollars) in 1990 and 235 toe in 2014, the region consumed 438 toe in 1990 and 371 toe per \$1 million GDP in 2014. The North and Central Asia subregion had the highest primary energy intensity, consuming 1,123 toe in 1990 and 728 in 2014, which indicates the potential for promoting more efficient use of energy.

31. There is huge variation in primary energy intensity in the form of kilograms of oil equivalent (koe) per \$1,000 GDP (2005 dollars), ranging from 57 for Hong Kong, China, to 1,471 for Uzbekistan, due to variations in economic structure, technological development, energy supply, energy mix and consumption patterns. With improvements in energy efficiency and economic restructuring to move away from energy intensive growth, energy intensity in Asia and the Pacific is expected to be decoupled from GDP growth through 2035.¹⁶ In 2035, the region's energy demand per unit of GDP is projected to be reduced by 41 per cent, compared to a projected average decline of 35 per cent globally.¹⁸

¹⁸ BP PLC, *BP Energy Outlook*, 2016 Edition (London, 2016).

C. The carbon intensity of the region's economies is growing

32. The carbon intensity of the energy sector is measured in terms of kilograms of carbon dioxide per dollar of GDP (2005 dollars). The carbon intensity of Asia and the Pacific was 0.889 kg per dollar in 1990 and 0.956 in 2014,¹⁹ compared to the global average of 0.636 in 1990 and 0.561 in 2014. North and Central Asia had the highest carbon intensity but also saw the biggest improvement between 1990 and 2014; it decreased from 2.83 to 1.57 kg per dollar of GDP (2005 dollars).

33. There was a large variation among countries, which ranged from 0.193 kg of carbon dioxide per dollar of GDP (2005 dollars) for Hong Kong, China, to 3.30 for Uzbekistan, due to variations in economic structure, energy efficiency, technological development, energy mix, carbon contents of various energy sources and consumption patterns.

D. Low oil prices offer an opportunity for subsidy reform

34. International crude oil prices dropped from \$112 per barrel (Brent spot price) in June 2014 to approximately \$46.6 per barrel by September 2016.²⁰ Lower prices will have significant implications for many countries. Low international oil prices offer policymakers a unique opportunity to implement reforms to energy taxes and fuel subsidies, which may raise revenues and reorient public spending towards infrastructure and other productive uses. For example, India has taken advantage of decreased oil prices to reduce subsidies for all oil-based transport fuels, which resulted in its total subsidy bill falling by half, from \$38 billion in 2014 to approximately \$19 billion in 2015.²¹ For oil-exporting countries, economic growth might be negatively impacted depending on the role of the energy in the national economy.

35. Low oil prices have a visible impact on the transport sector. They drive up the use of existing vehicles and affect investment in new vehicles. In India, the average fuel economy of new cars worsened in 2015, despite a government policy to shift from subsidizing to taxing transport fuels over the past two years. This is largely explained by a rise in the purchase of larger cars attributable to rising incomes and a growing middle class population. For the same reason, as household vehicle purchases are likely to grow in developing countries in the region, measures are needed to accelerate fuel economy and energy conservation in the transport sector, which will require robust efficiency standards, financial incentives such as excise taxes and reduced fossil fuel subsidies, and public awareness campaigns to compensate for the effects of oil price decline and consumer preferences for larger and more powerful vehicles.²²

¹⁹ OECD, International Energy Agency CO₂ Emissions (see footnote 2); and United Nations, Statistics Division, National Accounts Main Aggregates database. Available from <http://unstats.un.org/UNSD/snaama/selCountry.asp> (both accessed 15 October 2016).

²⁰ United States of America, Energy Information Administration, Petroleum and Other Liquids, Spot Prices database. Available from www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm (accessed 15 October 2016).

²¹ International Energy Agency, *World Energy Outlook 2016* (Paris, 2016).

²² International Energy Agency, *World Energy Investment 2016* (France, 2016).

36. Government savings from the removal of fossil fuel subsidies could be redirected to more sustainable infrastructure that supports energy access, improvements in energy efficiency and accelerated development of renewable energy. Policymakers need to ensure that subsidy reforms are credible and enduring and that the redistribution of savings is beneficial for the national economy.²³

E. Renewable energy is developing rapidly despite low oil prices

37. Investment and installation of renewable energy reached its highest peak ever in 2015, with global investment committed to renewables, excluding large hydroelectric projects, rising 5 per cent to \$285.9 billion, of which \$160.6 billion was in Asia and the Pacific, including \$102.9 billion in China and \$10.2 billion in India. The year 2015 marked the first time renewable energy accounted for more than 50 per cent of newly installed capacity, and investment in renewable energy was more than double that of coal and gas generation.²⁴ Low oil prices may not influence renewable energy in the near term as oil accounts for only 3 per cent of power generation in Asia and the Pacific. While many uncertainties are associated with future oil prices, the costs of renewable energy generation continue to fall. For example, weighted average unit investment cost for onshore wind fell 20 per cent between 2010 and 2015, and that of utility scale solar photovoltaics dropped more than 60 per cent globally.²⁵ Moreover, long-term commitments to achieving established goals for renewable energy capacity are less likely to be influenced by short-term fluctuations in fossil fuel prices. In power generation, renewables, including hydropower, are gaining a small but rapidly increasing foothold, increasing from 665,556 GWh in 1990 to 2,036,160 GWh in 2014. With hydropower excluded, renewable electricity output grew 20-fold for the region and almost 8-fold globally.

F. The investment required for the energy sector is huge

38. Global energy investment in 2015 amounted to \$1.8 trillion, down 8 per cent from 2014 mainly due to a sharp fall in upstream oil and gas investment. It is predicted that by 2035, annual global energy investment will rise to \$2 trillion.²²

39. To meet the business-as-usual energy demand, Asia and the Pacific would require a cumulative investment of approximately \$11.7 trillion in the energy sector (2010-2035).²⁶ It is predicted that by 2030, 5 terawatts (TW) of net new power capacity will be added worldwide with a \$7.7 trillion investment, of which 2.7 TW or \$3.6 trillion in investment is likely to be in Asia and the Pacific. In the region, fossil fuel power generation might continue to grow despite concerns over pollution and climate change, but the

²³ OECD and International Energy Agency, *Medium-Term Coal Market Report 2015: Market Analysis and Forecasts to 2020* (Paris, 2015).

²⁴ Frankfurt School of Finance and Management-United Nations Environment Programme Collaborating Centre for Climate and Sustainable Energy Finance and Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2015* (Frankfurt, 2015).

²⁵ International Renewable Energy Agency, IRENA Renewable Costing Alliance dataset. Available from <http://costing.irena.org/irena-renewable-costing-alliance.aspx> (accessed 15 October 2016).

²⁶ ADB, *Energy Outlook for Asia and the Pacific* (Manila, 2015). The publication does not cover the Islamic Republic of Iran or the Russian Federation, because they are not member countries of ADB.

biggest growth is expected to be in renewables, mostly wind and solar, which may amount to 1.7 TW added capacity and require a \$2.5 trillion investment.²⁷

G. The region is experiencing rapid change in its energy sector

40. The Asia-Pacific region is undergoing marked changes to its economy, energy consumption and fuel mix. Figure IV summarizes changes to selected indicators for Asia and the Pacific as well as for the world for the period 1990-2014. A few highlights include:

(a) The regional economy grew 107 per cent during that period, accompanied by a 102 per cent growth of TPES. Both indicators grew faster than the world average;

(b) Fossil fuels have been the primary energy source in Asia and the Pacific and will dominate the energy mix for some time. The growth rate of fossil fuels for the period 1990-2014 in TPES terms was 114.7 per cent, more than double the world rate;

(c) Renewable energy has grown strongly. Hydropower increased 174.7 per cent in TPES terms. While the share of renewable energy excluding hydropower grew 42.2 per cent, it has been outstripped by overall energy growth as TPES grew 102.5 per cent;

(d) However, as renewable energy is principally applied to power generation, growth in renewable energy electricity in the region has been dramatic. It increased 2,000 per cent between 1990 and 2014, compared to the world increase of 770 per cent;

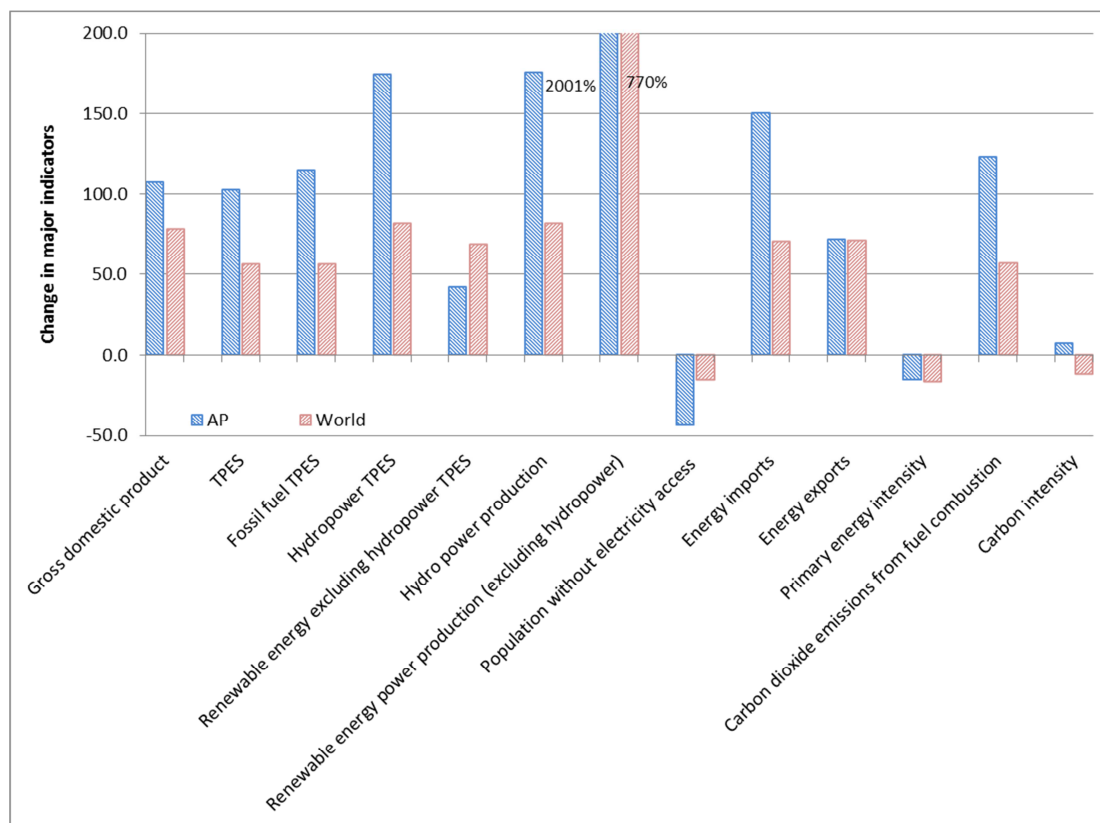
(e) With expanding economic growth and increasing urbanization and industrialization, energy consumption patterns have changed and will continue to evolve. Between 1990 and 2014, primary energy intensity decreased 15.3 per cent for the region and 16.7 per cent for the world;

(f) The regional growth of carbon dioxide emissions from fuel combustion stands at more than double the world level, and carbon intensity of energy has increased 7.5 per cent for the region, compared to the 11.8 per cent decrease in the global carbon energy intensity level;

(g) The region has become increasingly dependent on imported energy; 150 per cent more energy was imported in 2014 than in 1990.

²⁷ Bloomberg New Energy Finance, "2030 Market Outlook: Asia Pacific", 2015. Available from www.metering.com/wp-content/uploads/2015/03/bnefwhitepaper.pdf.

Figure IV
Energy indicator changes in Asia and the Pacific, compared with the world average (1990-2014)



Source: ESCAP calculations, based on data from United Nations Statistics Division, National Accounts Main Aggregates database; and OECD, International Energy Agency, World Energy Statistics and Balances database and CO₂ Emissions from Fuel Combustion database. Available from <http://unstats.un.org/UNSD/snaama/selCountry.asp>, www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances_enestats-data-en and www.oecd-ilibrary.org/energy/data/iea-co2-emissions-from-fuel-combustion-statistics_co2-data-en (accessed 15 October 2016).

Note: TPES, total primary energy supply.

41. Data suggest that widespread changes are happening in the energy sector of Asia and the Pacific. The dynamics of energy supply and demand vary among subregions and countries as a result of differences in resource endowment, levels of development and economic structure, as well as available technical and financial resources. Regional cooperation is essential to achieve the goals of the 2030 Agenda and the Paris Agreement and enable sustainable energy development in Asia and the Pacific.

IV. Enhanced regional cooperation to enable sustainable energy development

42. Different levels of energy development and the availability of technology and human and financial resources are all significant factors that highlight the role of regional collaboration on energy access, trade, connectivity and technology development and transfer, as well as fiscal strategies for repositioning energy for sustainable development in the Asia-Pacific region. Member States are repositioning their energy sectors to

support the delivery of the 2030 Agenda. Enhancing regional cooperation is key to facilitating the transition as part of broader sustainable development strategies encompassing economic growth, social equity and environmental protection. Enhancing regional cooperation will help to address difficulties and challenges in a collaborative manner and promote a common vision for sustainable energy in Asia and the Pacific. Political commitment to align global agreements and national policies with development priorities, streamlined institutional frameworks for coordination, enabling environments for financing, technology innovation and partnerships are necessary.

43. As the regional arm of the United Nations in Asia and the Pacific, ESCAP is uniquely positioned to promote intergovernmental coordination for regional cooperation on enhanced energy security and sustainable use of energy. ESCAP is responsible for implementing global agreements and for working with member States and development partners in the region on long-term vision, planning and strategies. The following two sections provide an overview of the different areas in which ESCAP plays an important role.

A. Sustainable Development Goal 7

44. Sustainable Development Goal 7 is to ensure access to affordable, reliable, sustainable and modern energy for all. ESCAP, together with ADB and the United Nations Development Programme, leads the Asia-Pacific hub of the global network to facilitate and coordinate the implementation of the Sustainable Energy for All initiative. ESCAP currently collaborates on global tracking of the progress towards Goal 7 in Asia and the Pacific, including universal access to affordable, reliable and modern energy services, increasing substantially the share of renewable energy in the global energy mix, and doubling the global rate of improvement in energy efficiency by 2030.

45. Energy is fundamental to development and is crucial for the achievement of the other Sustainable Development Goals due to its role in public health, education, water sanitation, infrastructure construction, industrialization, poverty alleviation and climate change. The Commission's work to enhance regional cooperation on energy in Asia and the Pacific may facilitate the progress of member States towards addressing their specific development priorities by providing and promoting knowledge-sharing, capacity-building, and financial and technical assistance in the region.

B. Energy connectivity

46. The potential of energy connectivity, which can optimize and compliment the use of all energy resources, connect energy supply to demand centres, and facilitate energy security as well as the sustainable use of energy and economic integration, has been well recognized in the region. A number of emerging as well as existing regional and subregional initiatives and organizations are in development, planning and implementation, such as the Association of Southeast Nations (ASEAN) Power Grid of the ASEAN Economic Community, the Energy Ring of the South and South Asian Association for Regional Cooperation and the 1000 Electricity Transmission and Trade Project for Central Asia and South Asia (CASA-1000). They will create great opportunities for regional and subregional cooperation on energy and economic integration.

47. At its seventieth session, the Commission endorsed the Bangkok Declaration on Regional Economic Cooperation and Integration in Asia and the Pacific, which promoted a comprehensive view of regional economic cooperation and integration. Energy connectivity, with a specific focus on

transboundary interconnection and power trade, can play an important role in overall regional economic cooperation and integration. Governments, policymakers and experts must work together in partnership with the private sector towards the sustainable energy goal by connecting Asian energy networks and building institutions of integration. The secretariat is in a unique position to lead such a transformative partnership to ensure that regional energy connectivity creates incentive structures and institutions to deliver cost-effective energy for the entire region.

V. Conclusions and key points for discussion by the Committee

48. The demand for energy in the region will continue to increase rapidly in order to support economic growth. At the same time, a transition in the energy sector is needed to meet the aspirations of member States as contained in the 2030 Agenda and the Paris Agreement. The energy sector in Asia and the Pacific is transitioning slowly, but the measures, pace and sequencing of reforms being implemented vary depending on national circumstances and development priorities. The dynamics and quality of energy transition depends to a large extent on national-level actions, but there are strong global and regional trends that impact domestic policy. While strong political commitment at the national level is a prerequisite, enhanced regional cooperation is equally critical to pursue energy diversification, improve energy efficiency and ensure universal energy access in Asia and the Pacific.

49. The first Asian and Pacific Energy Forum provided ESCAP with a mandate to track progress of member States on the major outcomes of the Forum. Further, ESCAP has restructured its conference structure to be in line with the 2030 Agenda. The establishment of a Committee on Energy as part of its subsidiary structure will strengthen regional cooperation and facilitate increased knowledge-sharing.

50. The Committee may wish to provide comments and guidance on issues affecting current energy trends to further strengthen the work programme on energy. The following questions enumerate points for discussion during the Committee session.

(a) What are the challenges countries face in diversifying their energy mix and aligning national energy policies and strategies with the Sustainable Development Goals and the Paris Agreement, specifically in the following areas:

- (i) Improving energy access in line with target 7.1 (By 2030, ensure universal access to affordable, reliable and modern energy services)?
- (ii) Securing a higher proportion of energy from renewable energy in line with target 7.2 (By 2030, increase substantially the share of renewable energy in the global energy mix)?
- (iii) Promoting energy efficiency to reach target 7.3 (By 2030, double the global rate of improvement in energy efficiency)?

(b) What are the innovative approaches needed in mobilizing financial resources to promote the transformations in the energy sector needed to implement Goal 7 and to align national energy policies and strategies with national actions to mitigate climate change?

- (c) What role could regional cooperation play in facilitating the transition of the energy sector towards supporting sustainable development?
 - (d) What should be the future priorities of the Committee on Energy and of its programme of work?
 - (e) How can the secretariat support member States in their energy transition?
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