



# EGEDA under APEC-EWG

May 2018

## Overview of APEC energy supply and demand

### APEC and the world

Over the period 1990-2015, total population in APEC grew gradually at a compounded annual growth rate (CAGR) of 0.9%, from 1.2 billion in 1990 to reach 2.83 billion in 2015. Population of the rest of the world on the other hand, grew by 1.6% CAGR during the same period, from 3.02 billion in 1990 to 4.52 billion in 2015.

The sluggish growth in APEC population was still evident in 2015 with the 0.7% increase from the 2014 level of 2.81 billion while the rest of the world grew by 1.5% during the same year. Given the slow growth in APEC population, its share to the world's population decreased from 43% in 1990 to 38% in 2015. (Figure 1)

While population in APEC slowed down between 1990 and 2015—maintaining the 0.7% annual growth for over ten years since 2004—its GDP (constant 2010 USD) on the other hand, surged faster than the rest of the world at 3.1% CAGR. This period marked the fast growth seen in China (10% CAGR) and the group of economies that make up South-East Asia (4.9% CAGR). (Figure 2)

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*"APEC GDP (at constant 2010 USD) grew faster than the rest of the world"*

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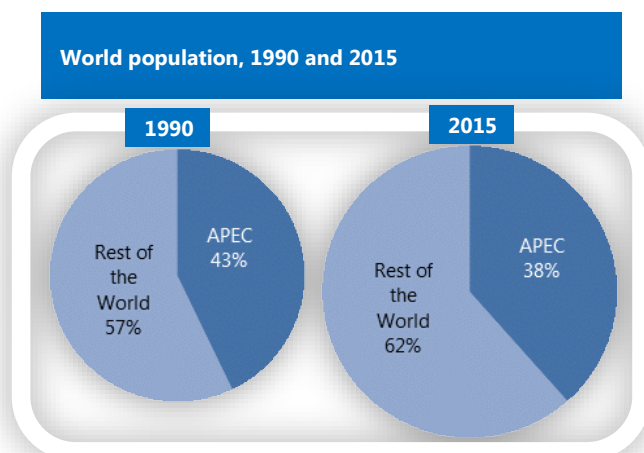


Figure 1

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In terms of primary energy supply, APEC accounted for more than 50% of the world's total primary energy supply (TPES) between 1990 and 2015 (Figure 3). The five percentage point increase in its share to the world TPES in 2015 compared to 1990 levels can be attributed to region's rising income for the last 20 years.

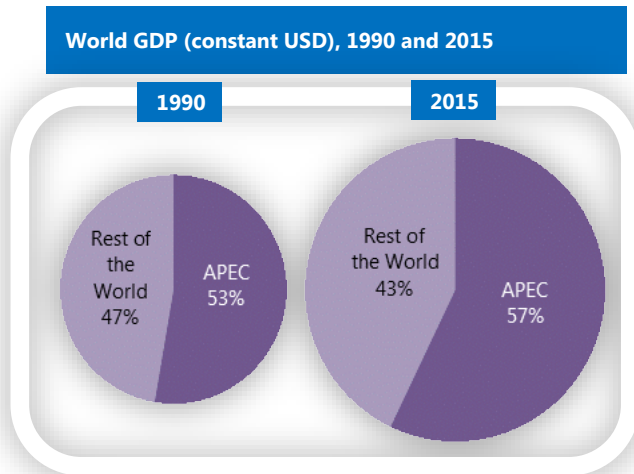


Figure 2

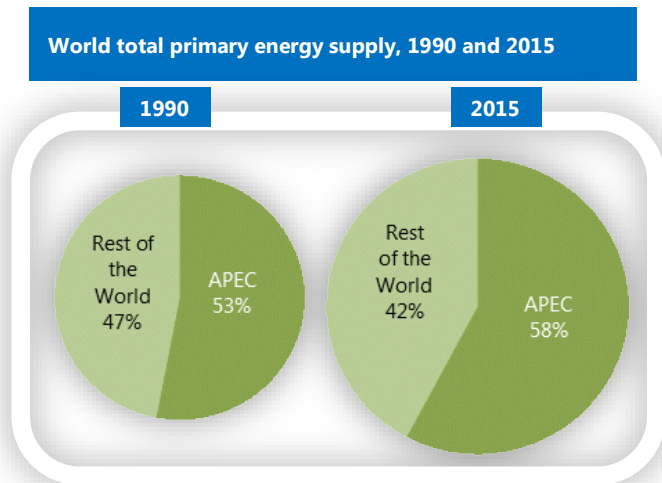


Figure 3

## Energy supply trends in APEC

### Total primary energy supply

In 2015, total primary energy supply in APEC was 7 885 Mtoe representing a measy 0.3% drop from the 2014 levels (7 912 Mtoe). This rate was much slower compared to its compounded annual growth rate (CAGR) of 2.1% between 1990 and 2015 and the previous year's (2014) 1.1% increase (Figure 4).

Coal which took over oil as the major fuel in APEC in 2005, continued to dominate APEC TPES in 2015 with 37% share (Figure 4). Its absolute volume however, decreased from 2 969 Mtoe in 2014 to 2 896 Mtoe (-2.5%) in 2015. Over the period 1990 to 2015, it had a CAGR of 3.1%.

Oil was the second largest fuel in APEC in 2015, maintaining its share of 29% of TPES since 2010. It grew modestly from 2014 to 2015 at 0.8%, a bit lower compared to 1.1% CAGR during the period 1990 to 2015.

Data improvement between 2014 and 2015 shown gas supply increasing by 2.0% in 2014 instead of 0.5% as previously reported. In 2015, gas supply posted a modest 0.6% rise from the 2014 levels to reach 1 684 Mtoe. The CAGR of gas supply over the period 1990-2015 was 2.1%.

In APEC TPES, nuclear supply continued to be very minimal with a share of 5% in 2015. Albeit its small share from the TPES, it grew significantly in 2015 from the 2014 level at 3.8%—biggest among all fuel sources in APEC—owing to the 28.9% increase in China in the same period. Since 1990, nuclear supply grew by 1.3% CAGR up to 2015 .

Other energy source which include hydro, geothermal and other renewable energy, grew sluggishly in 2015 against 2014 by 0.5%. While also with a modest share—about 8% of the APEC TPES—its CAGR over the period 1990 to 2015 was notable at 3.5%.

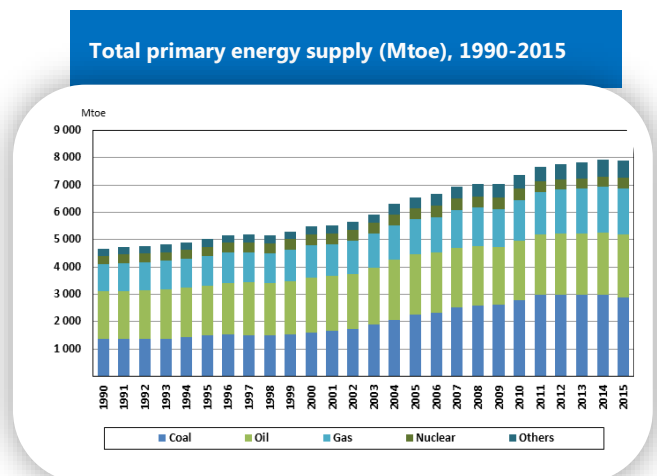


Figure 4

### Primary energy mix by region

Fossil fuels dominated the primary energy mix in APEC with more than 80% share on average from 1990 to 2015. Shares of each fuel in 2015 remained almost the same since 2010 in total APEC, but mixes of primary energy per region, varied.

For example, oil was the main energy source in most regions in APEC, ranging on average from 20 to 40% of the respective regions' primary energy mixes in 2015. In China however, coal dominated the primary energy mix with 68% of its total supply while gas was the major fuel in Russia, accounting for more than 50% of its primary energy mix. (Figure 5).

### Indigenous production

Indigenous energy production increased marginally (0.1%) in 2015 (7 704 Mtoe) from the 2014 levels (7 695 Mtoe). Although total energy production in APEC did not drop from 2014 to 2015, lower growth rates (as compared with growth rates observed in the previous year) were seen in oil (5.7 to 2%) and other fuels (5.4 to 0.5%)

CAGR in 2015 from 1990 dropped by one percentage point, which was at 2.1% for the last four years (2011-14) (Figure 6).

### Self-sufficiency

The overall self-sufficiency level (Indigenous production/Total primary energy supply) in APEC was 97.7% in 2015. A minimal increase over the 2014 level (97.3%) but still comparable to the high levels observed since 1990 (Figure 7). The self-sufficiency ratio of oil was the lowest (80%) among all the fuels in APEC in 2015.

### Net imports by region

Total imports bounced back in 2015 with 3% increase after dropping (1%) the previous year. The APEC region as a whole remained a net importer. Its net imports (*Imports – Exports*) reached 432 Mtoe in 2015; 5% lower than net import levels observed in 2014. Between the periods 1990 to 2015, the CAGR of net imports was 4.3% (Figure 8). On regional level, China, other north-east Asia and the US were the usual net importers in APEC, while the rest of the regions were net exporters.

Primary energy mix by region, 2015

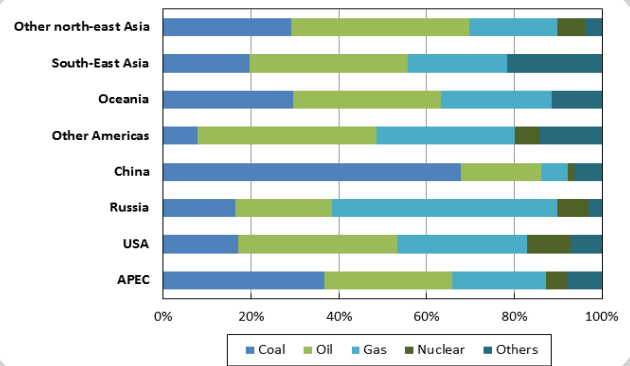


Figure 5

APEC Indigenous production (Mtoe), 1990-2015

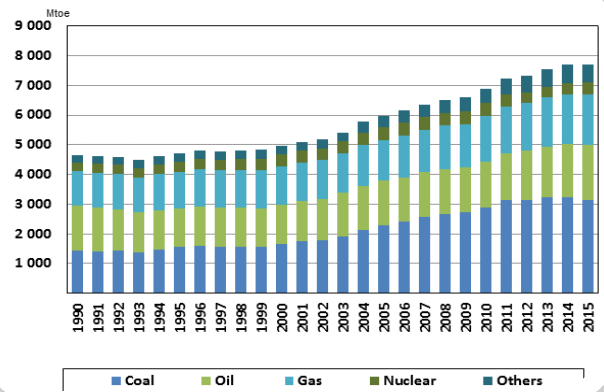


Figure 6

APEC energy self-sufficiency, 1990-2015

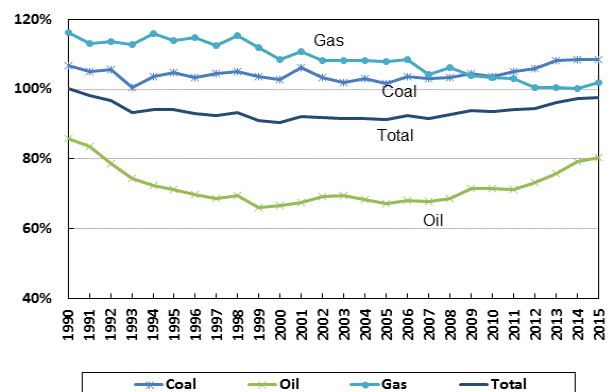


Figure 7

Net imports by region, 1990-2015

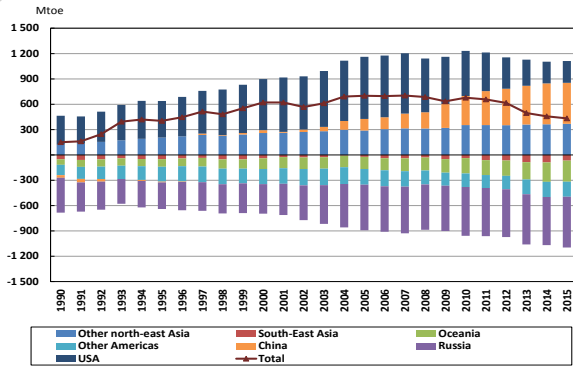


Figure 8

## Power generation

With electricity demand in APEC continuously increasing, power generation between 1990 and 2015 expanded by 3.2% CAGR. In 2015, power generation grew modestly by one percentage point (1.1%) in 2015 to reach 15 336 TWh against the 2014 levels of 15 165 TWh.

Electricity sourced from fossil fuels continued to dominate the total power generation in APEC with over 70% share in 2015, albeit its very minimal drop (0.04%). This was far below its CAGR from 1990 to 2015 at 3.4% (Figure 9). Power generated from hydro and nuclear came second (15% share) and third (10% share), respectively of APEC’s power generation in 2015.

Although its combined share to total power generation was modest (5.2% share), the increase from other power sources [other renewables (13%) and geothermal (3%)] offset the almost negligible slide in thermal power generation in 2015.

### Power generation mix by region

Given that fossil fuels dominated power generation in APEC, the power generation mixes by region in 2015 consequently sourced mostly from coal, oil or gas (Figure 10). For example, coal dominated the respective power generations of China (71%), Oceania (55%), other north-east Asia (37%) and the US (34%); while in Russia (50%) and South-

Power generation by type, 1990-2015

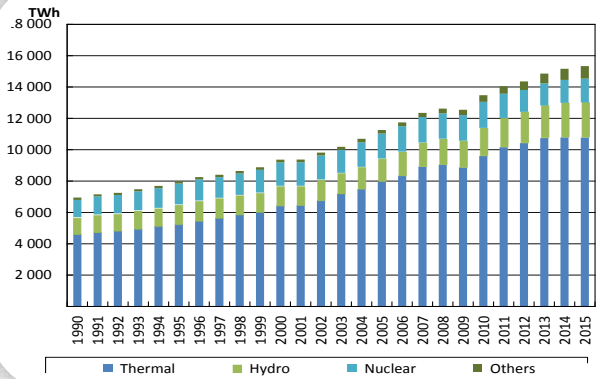


Figure 9

East Asia (42%), power generation were sourced mainly from gas. Only in other Americas where generation came mostly from renewables—by hydro (40%).

Trends in power mixes in APEC likewise varied in 2015 compared to 2014. The notable 13% expansion of power generation from other sources (renewables) to reach 741 TWh in 2015 was influenced by the significant increases in all regions, but mostly by South-East Asia (30.6%) and China (24.6%). Electricity output from nuclear at 1 515 TWh in 2015—which has bounced back since 2013—was driven mainly by China (28.9%) and other north-east Asia (3.5%), while output from geothermal was robust in Oceania (7.4%) and other Americas (5.5%). Electricity generation from

Power generation mix by region, 2015

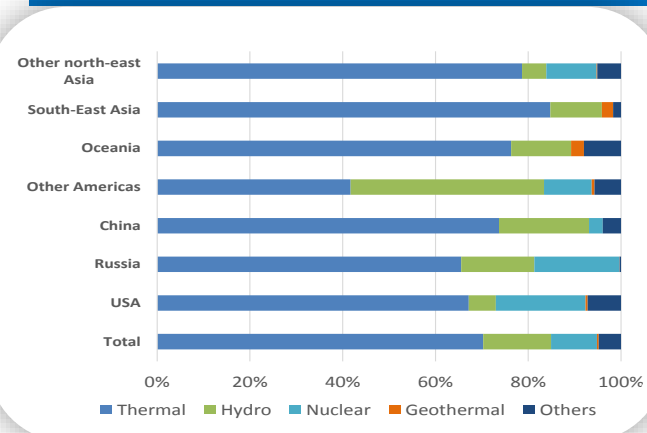


Figure 10

hydro dropped in most of the regions in APEC in 2015 but was offset by increases in China (6.2%) and other north-east Asia (4.2%) and finally managed to post 2 241 TWh of hydropower generation .

## Energy intensity

### Final energy intensity

Final energy intensity [*Total final energy consumption/GDP(2010)USD PPP*]\* in APEC continued to be on a downward trend for the last two decades. A 28% energy intensity reduction was noted from 1990 to 2015, representing a compounded annual growth rate of 1.8%. This could be attributed to the continued energy efficiency efforts or structural changes in APEC. In 2015, final energy intensity was recorded at 110 toe/million (2010) USD PPP corresponding to 3% improvement from the 2014 final energy intensity level of 114 toe/million (2010) USD PPP (Figure 11).

\* excludes non-energy

## Energy per capita

### Energy consumption per capita

Despite the strong GDP exhibited by APEC in the last five years, its energy consumption per capita was maintained at 1.7 tonnes of oil equivalent (toe) since 2012 (Figure 12). Higher energy per capita requirements were seen in most advanced economies such as Canada (biggest at 4.8 toe) and the United States (second biggest at 4.4 toe).

While China and South-East Asia reflected strong overall economic development in recent years, energy demand per capita in both regions remained well below the APEC average. For example, China's final energy consumption per capita in 2015 was 1.2 toe and that of South-East Asia was 1.4 toe, on average.

Final energy intensity, 1990-2015

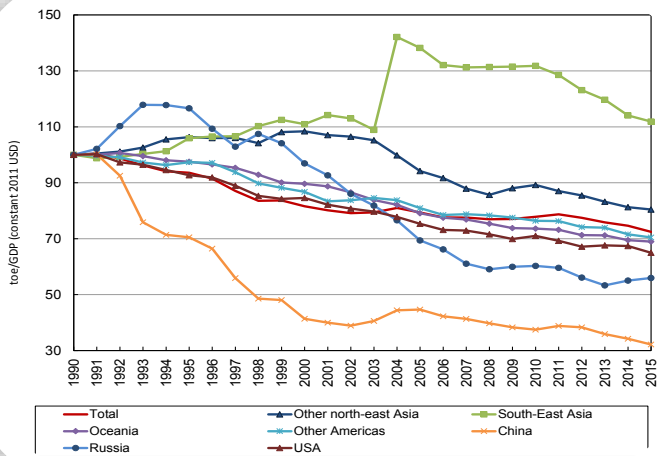


Figure 11

Consumption per capita, 2015

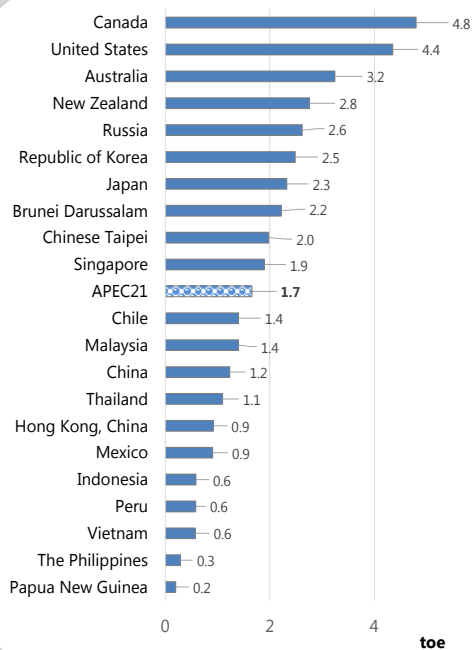


Figure 12

## Energy demand trends in APEC

### Total final energy consumption by sector

Total final energy consumption (TFEC) in APEC reached 4 728 Mtoe in 2015, an almost negligible increase (0.02%) from the 2014 levels of 4 727 Mtoe. If consumption for non-energy use is added, total final consumption was 5 250 Mtoe. Between 1990 and 2015 TFEC had increased more than 50% with a compounded annual growth rate (CAGR) of 1.8%.

In 2015, industry was the leading consuming sector (39%) followed by the buildings sector [(32% residential, commercial and agriculture sub-sectors combined)] then the transport sector (29%) (Figure 13). While the industry was the major energy consuming sector in APEC, it declined by 1.8% from its 2014 consumption levels to reach 1 849 Mtoe in 2015. If non-energy use is included, total final industry consumption reached 2 372 Mtoe or more than 40% of total final consumption in 2015.

Non-energy use in industry should not be overlooked, having increased faster than the other major energy sectors (2.8% from 2014 to 2015; 3.6% CAGR from 1990 to 2015). The transport and buildings sectors, posted positive CAGR between the periods 1990 and 2015, but the buildings sector, though very minimal, fell short of its previous year's CAGR (1.5% in 2014 to 1.4% in 2015) while transport sector's was maintained at 1.9%.

The surge of energy consumption in APEC's transport sector (2.3%) in 2015 was due largely to robust demand growths in most of the regions in APEC in the last two decades, but mostly backed by strong consumption in China (5.5%), other north-east Asia (3.9%) and South-East Asia (3.5%). Rapidly increasing income per capita and urbanisation contributed to the growth of transport demand in APEC. High consumption growths in China (6.4%), Oceania (3.2%) and other north-east Asia (2.3%) contributed to the very modest 0.2% increase in the buildings sector in APEC in 2015. Meanwhile, the decline in the industry energy consumption was driven mostly by

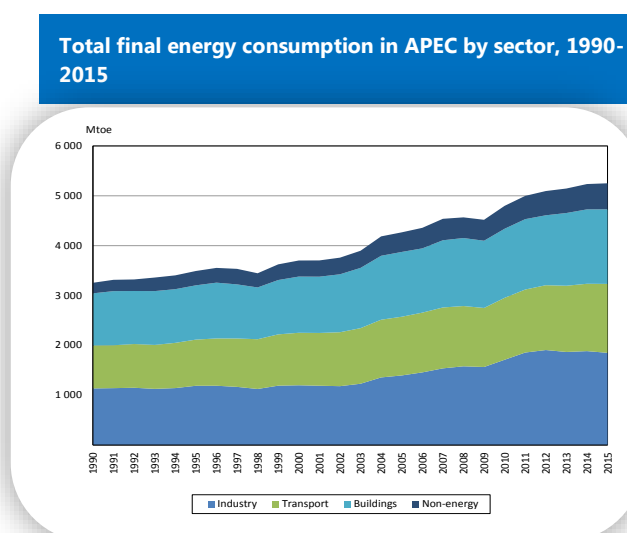


Figure 13

drops in China (3%), US (2.5%) and Russia (1.4%)—three of APEC's largest energy consumers.

Sectoral consumption levels by region likewise varied in 2015. Energy consumption in industry (60% of APEC TFEC) was largest in China, owing to the economy's rapid growth in industrial activity over the last two decades that resulted in its emergence as the 'factory' of the world. The size and high consumption levels of buildings in the United States and China put their combined share at more than 60% of the total APEC buildings consumption in 2015. Consumption in the transport sector dominated the US (45%) and Oceania's respective final energy consumption.

### Final energy consumption by energy source

Oil dominated final energy consumption in APEC over the last two decades. It accounted for the lion's share (36%) of the TFEC in 2015, electricity came next with a 24% share and then coal with 16% (Figure 14).

Most of the fuel sources exhibited negative growths in 2015 compared to the energy consumption in 2014, except for oil and electricity, up by 2.7% and 1.4%, respectively. These offset the negative consumptions of coal (3.9%), gas (2.8%) and other energy sources [(renewables) (1.7%)].



**Total final energy consumption by energy source, 1990 and 2015**

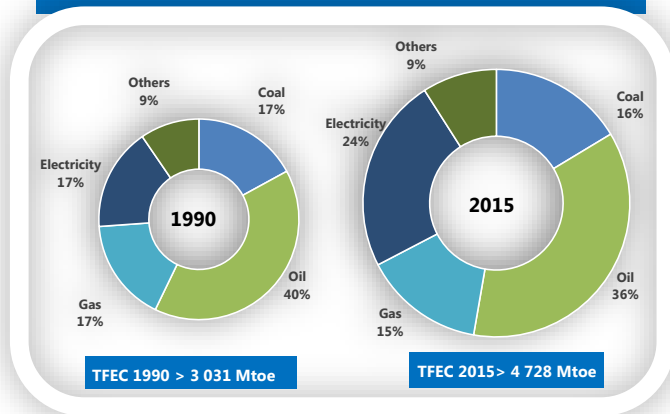


Figure 14

**CO<sub>2</sub> emission in the APEC region, 1990-2015**

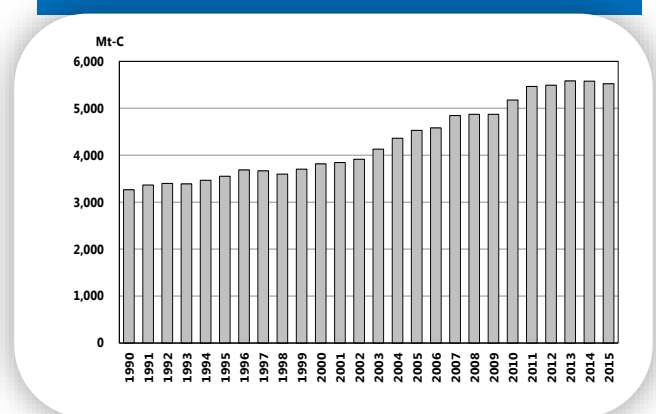


Figure 15

## CO<sub>2</sub> emissions

The estimated CO<sub>2</sub> emissions from fuel combustion in APEC was 5 522 Mt-C in 2015 (Figure 15). This represented a slight drop of 1% from 5 578 Mt-C in 2014 or 2.1% CAGR between 1990 to 2015.

### Notes:

All energy data came from APEC c/o APERC/ESTO while GDP, population and all other macro-economic indicators from World Bank.

## Contact Us

For comments and suggestions, please contact

### EGEDA Coordinating Agency

Inui bldg. Kachidoki, 13-1, Kachidoki 1,  
Chuo-ku, Tokyo, 104-0054,  
Japan

Phone: +81-3-5144-8551

Facsimile: +81-3-5144-8555

e-mail: esto@aperc.ieej.or.jp

Visit us on the web at <http://www.egeda.ewg.apec.org/>