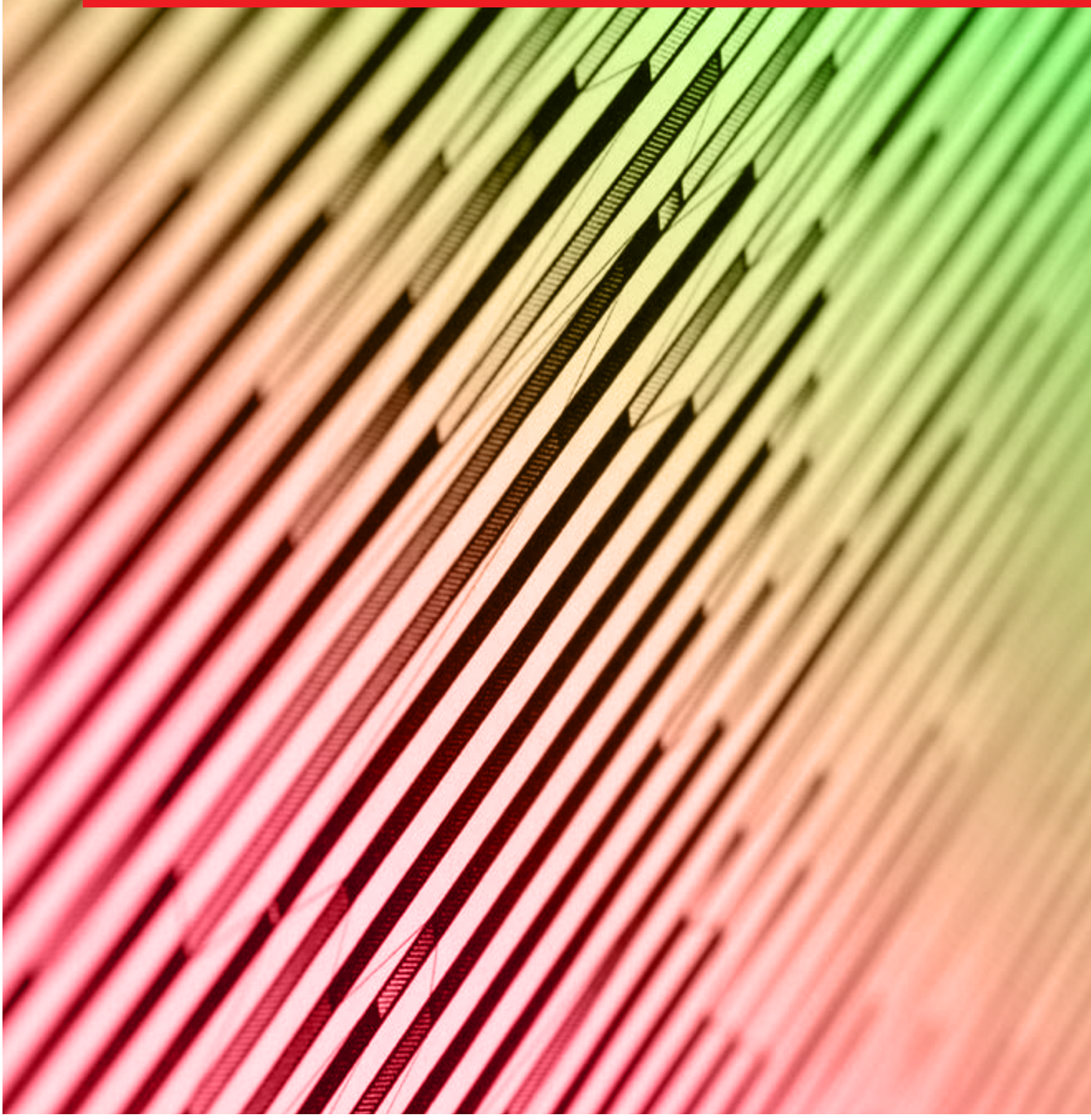
Coal information: Overview



statistics

International Energy Agency
Secure Sustainable Together

2017

The following analysis is an overview from the publication *Coal Information 2017*.

Please note that we strongly advise users to read definitions, detailed methodology and country specific notes which can be found online under *References* at www.iea.org/statistics/topics/coal/

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COAL OVERVIEW

Summary

World coal production declined in 2016 by 458 Mt, which is the largest decline in absolute terms since IEA records began in 1971. This decline, which doubles the one seen in 2015, was the result of a multitude of factors, among them, the setting quotas for mine operating days in the People's Republic of China.

In addition, coal demand for power generation fell in the People's Republic of China, the United States and the United Kingdom, all witnessing the growth of gas generation.

With lower demand, less coal was produced in the United States, leading India to be the second largest producer with 708 Mt in 2016 overtaking for first time the US production.

Production of steam coal, coking coal and lignite all fell in 2016. Conversely, international trade increased in 2016 as imports grew by 1.5% to 1 331.3 Mt. The People's Republic of China increased imports to 255.6 Mt, 25% above volumes of 2015, while Indian imports decreased to 200.1 Mt, or 7.2%. Despite the decline of Indian imports, the People's Republic of China and India, were in 2016 both, the two largest producers and importers.

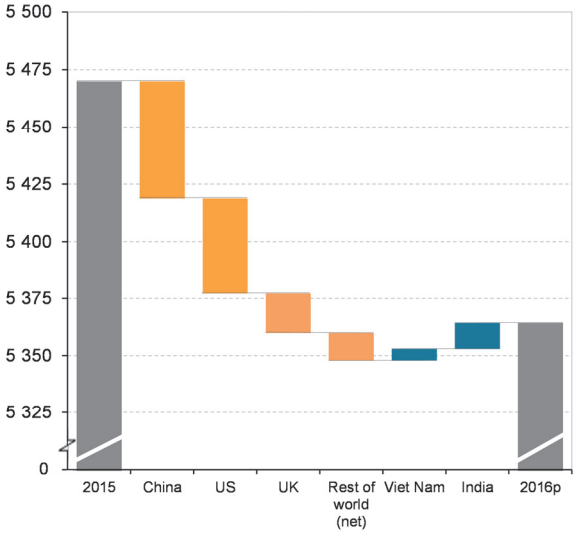
In total, across Asia Oceania region increased their imports to 973.0 Mt, representing a 72.9% of global imports, showing the key role of this region in coal trade.

Australia and Indonesia remained the world's largest coal exporters in 2016. Additionally, South Africa, Colombia and Mongolia hit records exports in 2016, exceeding 2015 levels by 1.3%, 7.1% and 78.3% respectively.

India's coal consumption increased by 2.1% in 2016, continuing 18 years of constant growth, while consumption in the People's Republic of China declined by 1.8% in 2016. Meanwhile, United States' consumption declined by 7.8% but Indonesia saw an increase of 3.8%, continuing the 10.2% increase reported in 2015.

Electricity generation from coal-fired power plants in OECD countries fell by 6.1% to a new low of 3 029 TWh in 2016, while total gross electricity production grew by 0.4% compared to 2015.

Figure 1: World coal consumption variation 2015-2016 (Mtce)



Production

Total world coal production

World coal production declined in 2014 for the first time this century. This decrease continued through 2015 and accelerated in 2016 to 458 Mt, or 6.3% lower, as combined production of all coal types fell to its lowest level since 2010.

This reduced level, however, was still 2.63 Gt (56.7%) higher than production in 2000.

Table 1: Total world coal production[1] (Mt)

	2014	2015	2016p
Steam coal	6 010.1	5 834.6	5 407.0
Coking coal	1 108.7	1 081.1	1 074.3
Lignite	815.4	811.1	783.3
Total[2] coal	**7 934.1**	**7 726.8**	**7 268.6**
Peat	15.2	10.1	..[3]
Oil Shale/sands	21.4	20.0	..[3]

1. Production includes recovered slurries and similar sources.
2. Total coal comprises steam coal, coking coal and lignite, so excludes peat, and oil shale and oil sands even though they are shown here for completeness.
3. Peat and oil shale and oil sands data are not currently compiled on a provisional basis for non-OECD countries.

The People's Republic of China remained the world's leading coal producer, as it has been since 1985, with 3 242.5 Mt of total coal produced –320.7 Mt, 9.0% lower than in 2015. Falling production of United States in 2016 continued an eight-year decline since 2008, decreasing to 743 Mt in 2016, 17.4% lower than in 2015, and the lowest level since 1978.

Putting these two declines in some context, there are currently only nine coal producing countries that produce more than 100 Mt/y; China's decline was more than the entire 2016 production of South Africa, and the United States decline was more than the entire 2016 production of Colombia, the world's 5th and 4th largest coal exporters respectively.

Other countries that saw noticeable year-on-year decline in 2016 were Kazakhstan and Germany with a provisional fall of 9.4 Mt and 9.1 Mt respectively. Declines in Ukraine were due to turmoil in the Eastern regions of Donetsk and Luhansk in the second half of 2014 continuing through 2015 and 2016.

Table 2: Major coal producers[1] (Mt)

	2014	2015	2016p
PR of China	3 640.2	3 563.2	3 242.5
India	657.4	683.1	707.6
United States	918.2	813.7	671.8
Australia	488.8	512.4	503.3
Indonesia	488.3	453.5	460.5
Russian Federation	332.9	351.7	365.5
South Africa	260.5	258.6	256.9
Germany	186.5	184.7	175.6
Poland	137.1	135.8	130.9
Kazakhstan	114.0	107.3	97.9
Other	*710.2*	*662.8*	*656.1*
World	**7 934.1**	**7 726.8**	**7 268.6**

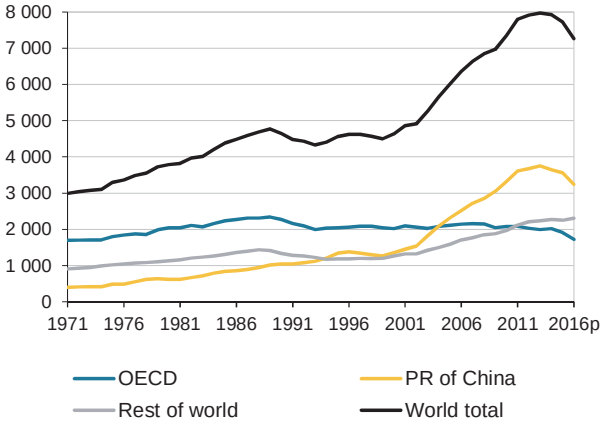
1. Production includes recovered slurries and production from other sources.
Data for Australia and India are provided on a fiscal basis.

In this general trend of declining coal production, among the ten largest producers, only India (+24.5 Mt), Russia (+13.8 Mt) and Indonesia (+7 Mt) increased production in 2016. Indonesia, one of the world's leading steam coal producers and exporters, decreased production in 2015 by 34.8 Mt. Despite the slight recovery of production in 2016, current levels are still 5.7% lower compared to 2014.

Since 2000, coal production in the People's Republic of China has increased by 139.3%, despite falling by 13.5% since 2013. In comparison, the OECD total coal production declined by 14.7% for the same period, being the fall in 2016 the largest annual decline.

Historically, OECD coal production as a percentage of global production was 56.6% in 1971 but has become 23.7% in 2016.

Figure 2: World total coal production (Mt)



Trade

World coal trade

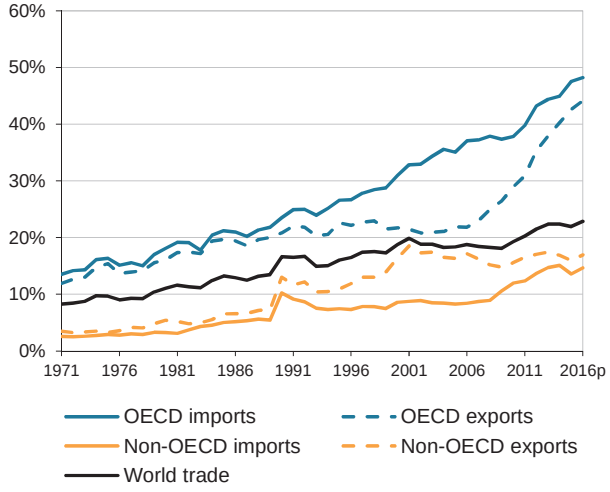
Export trade of all types of coal in the world increased by 1.9% in 2016, from a level of 1 308.1 Mt in 2015 as steam coal exports increased by 14.6 Mt (1.5%) and coking coal exports increased by 10.2 Mt (3.4%). The 2016 level is 21.7% above 2010 level, and total exports have more than doubled (105.3%) since 2000.

Table 3: World coal trade (Mt)

	2014	2015	2016p
Steam coal exports	1 048.6	995.3	1 010.4
Coking coal exports	312.4	303.9	314.1
Lignite exports	8.4	8.9	9.0
Steam coal imports	1 112.1	1 038.5	1 045.0
Coking coal imports	295.3	267.9	282.1
Lignite imports	5.2	5.1	4.2
Total exports	1 369.3	1 308.1	1 333.5
Total imports	1 412.5	1 311.5	1 331.3
Balancing item	*43.2*	*3.4*	*-2.2*

Note: The balancing item is the difference between total coal imports and total coal exports. This is primarily due to the different coal classification methodologies used by the importing and exporting countries, which does not hold on a global basis. It also occurs because of coal in-transit, coal that is unaccounted for, and reporting discrepancies by importing and exporting countries.

Figure 3: Steam and coking coal trade as a percentage of consumption



Overall, global trade reached 1 333.5 Mt in 2016, 17.9% of coal consumption on an energy basis.

Global trade has been growing faster than global consumption on a relatively consistent basis, as evidenced in the chart above which shows regional trade as a portion of consumption on an energy basis. However in 2015, world trade decreased slightly at 21.9% of consumption, and increased in 2016 to 22.8%, the highest level.

Exports

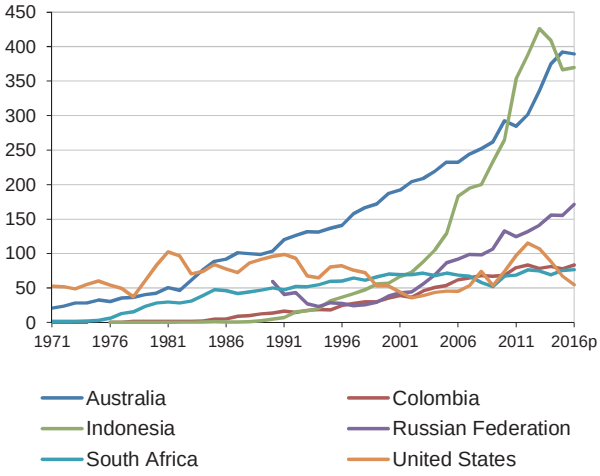
Australia and Indonesia remained the world's largest coal exporters in 2016, with 29.2% and 27.7% of exports on a tonnage basis. Despite its decline in domestic consumption, the Russian Federation, third in the rank, contributed with 171.1 Mt – representing a share of 12.8%.

South Africa, Colombia and Mongolia hit records exports in 2016, exceeding 2015 levels by 1.3%, 7.1% and 78.3% respectively.

The combination of the ten largest exporting countries shipped 95% of global coal exports during 2016.

Indonesian coal export rose slightly by 0.9% in 2016, increasing to 368.9 Mt from 365.7 Mt in 2015, driven by high imports to the People's Republic of China. Despite the continued declines in Chinese coal demand, imports increased as a consequence of the reduction in its domestic production. This rise benefited Indonesia allowing the recovery of its exports that had fallen by 16% compared to 2013 levels. Exports to the People's Republic of China reached 98.7 Mt representing 26.7% of the total Indonesian exports in 2016.

Figure 4: Total coal exports by major exporters (Mt)



The decline of United States exports by 18.5% promoted the rise in Colombian exports which hit a record of 83.3 Mt in 2016 with Colombia exporting 92.1% of its coal production. While coal production and exports increased by 5.8% and 7.1% respectively, domestic consumption decreased to 7.2 Mt – a decline of 7.1%. Traditionally, the market for Colombian coal has been Europe and North America. However, Colombian coal exports to Asia grew in 2016, with Japan and Korea ramping up.

Table 4: Major coal exporters (Mt)

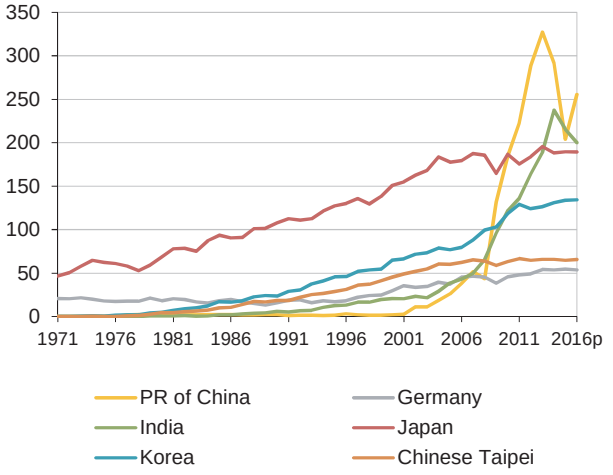
	2014	2015	2016p
Australia	375.0	392.3	389.3
Indonesia	409.2	366.7	369.9
Russian Federation	155.5	155.2	171.1
Colombia	81.2	77.8	83.3
South Africa	69.0	75.5	76.5
United States	88.2	67.1	54.7
Netherlands[1]	31.3	36.6	40.6
Canada	34.5	30.5	30.3
Mongolia	19.8	14.5	25.8
Kazakhstan	30.9	31.2	25.7
Other	*74.7*	*60.7*	*66.3*
World	**1 369.3**	**1 308.1**	**1 333.5**

1. For 2013 data and onwards, the Netherlands made a conscious decision to stop trying to account for coal in transit. As a consequence there was a very large increase in both their imports and exports leading Netherlands to be the 7th largest coal exporter despite having no indigenous production and the world's 6th largest coal importer.

Data for Australia are provided on a fiscal basis.

Imports

Figure 5: Total coal imports by major importers (Mt)



Total world coal imports were 1 331.3 Mt in 2016, a 1.5% increase from 2015 numbers. The main contributor to this rise was the People's Republic of China whose imports increased by 25.2% in 2016, to 255.6 Mt, reversing partially the 30.0% drop seen in 2015.

Table 5: Major coal importers (Mt)

	2014	2015	2016p
PR of China	291.6	204.1	255.6
India	237.6	215.6	200.1
Japan	188.1	189.6	189.4
Korea	131.0	133.9	134.5
Chinese Taipei	65.8	64.8	65.6
Netherlands[1]	47.3	57.1	55.5
Germany	53.8	54.5	53.6
Turkey	29.8	34.0	36.2
Malaysia	21.7	25.5	28.9
Russian Federation	26.8	24.1	24.0
Other	*319.0*	*308.3*	*287.9*
OECD Americas	*35.2*	*35.5*	*35.0*
OECD Asia Oceania	*330.7*	*335.1*	*333.1*
OECD Europe	*273.5*	*265.3*	*239.0*
OECD Total	***639.4***	***635.9***	***607.1***
Africa + Mid. East	*15.1*	*14.5*	*14.6*
Other Asia Oceania	*682.5*	*587.2*	*636.9*
Oth. Europe + Eurasia	*50.1*	*47.3*	*47.1*
Other Americas	*25.4*	*26.7*	*25.6*
Non-OECD Total	***773.1***	***675.6***	***724.2***
World	**1 412.5**	**1 311.5**	**1 331.3**

1. For 2013 data and onwards, the Netherlands made a conscious decision to stop trying to account for coal in transit. As a consequence there was a very large increase in both their imports and exports leading Netherlands to be the 7th largest coal exporter despite having no indigenous production and the world's 6th largest coal importer.

Data for India and Japan are provided on a fiscal basis.

Traditionally an exporter, Viet Nam turned into an importer in 2005. Imports by Viet Nam have been growing since then to reach 13.3 Mt in 2016. This is 6.4 Mt up compared to 2015, the second largest increase with Australia as its biggest supplier.

In contrast to these increases, significant declines occurred in 2016, most notably in India (-15.5 Mt) and the United Kingdom (-15.9 Mt).

Looking at the OECD Asia Oceania and non-OECD Asia Oceania (including China) regions combined, their total imports increased to 973.0 Mt (72.9% of all imports) from 922.3 Mt, or 70.3% in 2015, with the top five individual importers being from this area, as has been the case since 2009. Although China is responsible for a significant proportion, Japan, Chinese Taipei and Korea imported significant quantities of steam coal for electricity generation and coking coal for steel production in 2016.

The next five largest importing countries were from Europe or Eurasia. However their combined 2016 imports of 198.2 Mt were still less than either India's or the People's Republic of China's alone.

Consumption

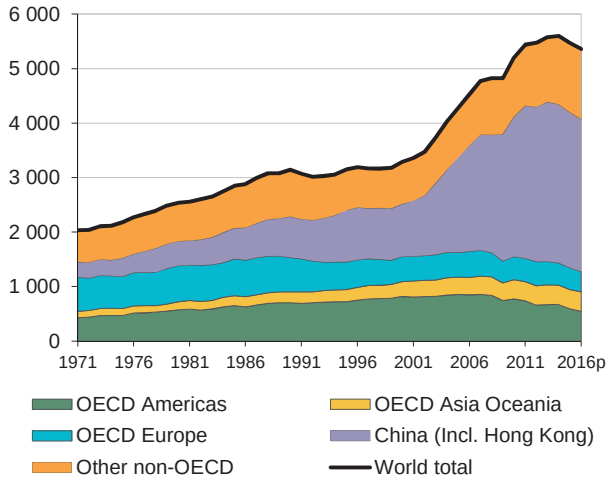
Total coal consumption[1]

In 2016, total global coal consumption in energy terms decreased by 1.9% or 105.7 Mtce, as OECD consumption decreased by 70.8 Mtce (5.3%) and non-OECD countries decreased consumption by 34.9 Mtce (0.9%). The new OECD coal consumption level of 1 273.1 Mtce was the lowest level since 1979 and was 23.5% lower than the maximum coal consumption by OECD countries of 1 665.3 Mtce in 2007.

Consumption in the People's Republic of China declined by 1.8% in 2016, or 51.2 Mtce to 2 787.5 Mtce, as a result of several factors such as the change in the economic growth model and the air pollution concerns.

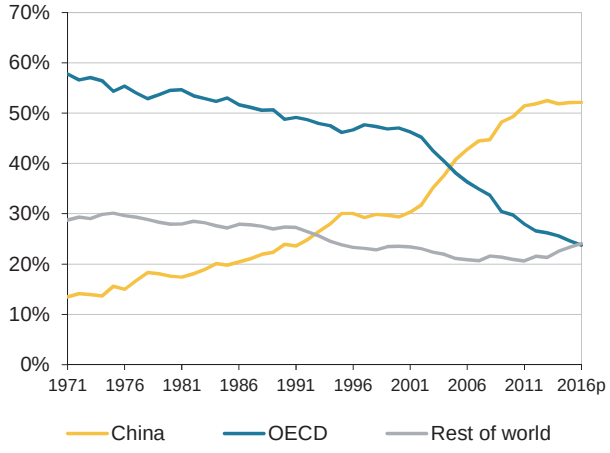
1. Total coal refers to the sum of anthracite, other bituminous coal, coking coal, sub-bituminous coal and lignite, converted to a common energy unit, million tonnes of coal equivalent (Mtce). Consumption data for the provisional year (2016p) for non-OECD countries, unless supplied, are estimated from production and trade data obtained from partner countries and other secondary sources. Stock changes are usually not accounted for.

Figure 6: World coal consumption (Mtce)



Steel production and cement manufacture are industries strongly dependant on coal, with China the world's largest producer. In 2015 the People's Republic of China produced 446 Mt of coke oven coke (66.0% of world production), 804 Mt of crude steel (49.6% of world production), 696 Mt of pig iron (59.9% of world production), and around 2.35 Gt of cement (57.3% of world production)[2].

Figure 7: Shares in world coal consumption (%)



India's consumption grew by 2.1% in 2016 to reach 549.8 Mtce continuing with the trend of the last 18 years, while in 2016, the United States' consumption declined by 7.8% from 535.6 Mtce to 494.1 Mtce.

2. Iron and steel data are provided by the World Steel Association and cement data by the United States Geological Survey.

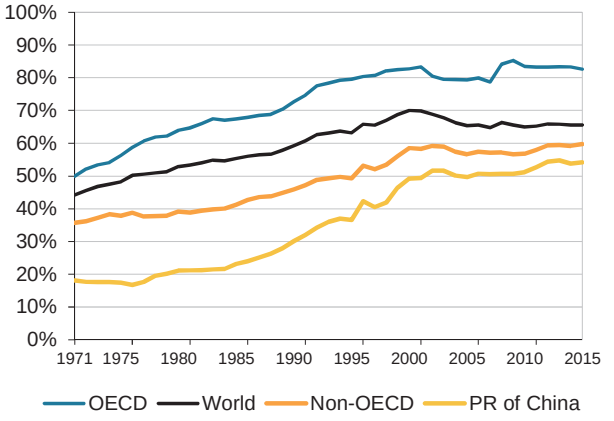
This means that the United States has slipped to become the third largest coal consumer on an energy basis, being overtaken by the People's Republic of China in 1987 and India in 2015.

Domestic coal consumption in Indonesia increased by 3.8% in 2016 to reach 60.8 Mtce. The country has kept a constant growth pace during the last five years, reflected an increase of 22.4 Mtce or 58.3% since 2011.

Consumption changes in the United States and the United Kingdom were a key driver of changes to OECD total consumption as United States consumption declined by 41.6 Mtce, United Kingdom by 17.2 Mtce, and the other 33 countries in the l lower coal use for power generation, with increasing in the use of natural gas and renewable sources.

Uses of coal

Figure 8: Percentage of primary coal used for electricity and commercial heat production

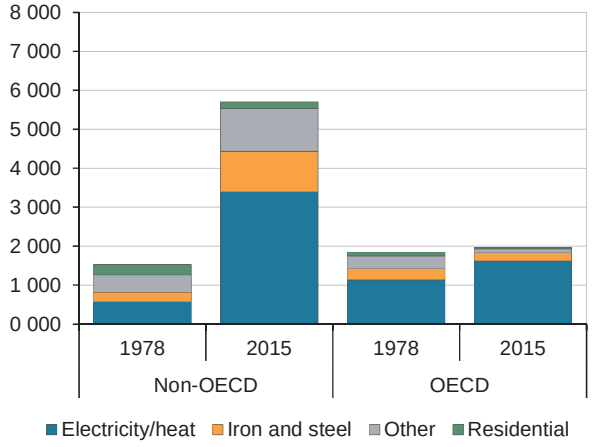


Coal comprises steam coal, coking coal and lignite. Power and commercial heat produced from derived products is not shown here, and instead counts as consumption in transformation to manufacture the secondary fuel.

Coal continues to be primarily used for the generation of electricity and commercial heat, with 65.5% of primary coal being used for this purpose globally in 2015, and 82.7% in OECD countries.

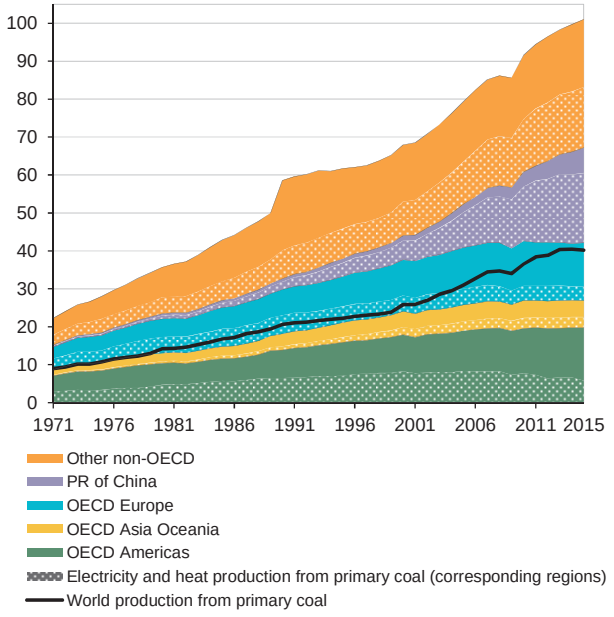
Coal is also essential for the iron and steel industry and has increased substantially during the last 40 years, driven primarily by increased production in China. The share of non-OECD countries is 82.8% of the total global consumption, or 1.0 Gt.

Figure 9: Primary coal's OECD and Non-OECD breakdown by broad activity (Mt)



Residential also contains data for the Commercial and public services sector. Iron and steel includes coke oven coke manufacture and PCI/GCI. In addition to other conventional consumption, Other includes non-specified industry, which may contain iron and steel consumption, and also non-energy uses.

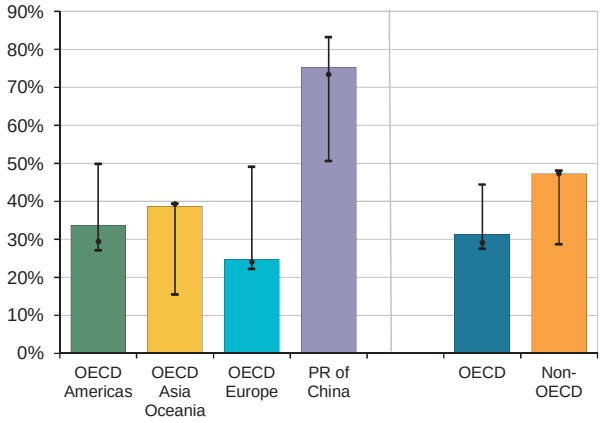
Figure 10: Electricity and commercial heat production, outputs by region (EJ)



In OECD countries in 2016, the share of electricity and heat produced from primary coal as a fuel fell to a new low of 27.5%, down from 29.2% in 2015 and 44.4% in 1985.

Looking at the three OECD regions, we see differing pathways, with OECD Europe declining to 22.2% in 2016 from 49.1% in 1971, while the OECD Americas dropped from 41.0% in 1971 to 27.1% in 2016. Meanwhile in OECD Asia Oceania, generation from coal has risen from 18.0% in 1971 to 39.4% in 2016.

Figure 11: Share of electricity and heat produced from primary coal in 2015 (%)



Each vertical line illustrates the historical highest-lowest value (top-bottom). The round point corresponds to 2014 level.

To date, despite the wide variety of factors influencing positive and negative growth in this regard, the global share of heat and power generated from coal has remained around 40% over the last 40 years of data as generation outputs have grown from 22.3 Exajoules (EJ) in 1971 to 101.0 EJ in 2015.

Gross electricity production in 2016 in the OECD (excluding generation from pumped storage plants) remained almost constant at 10 897 TWh, an increase of 0.4% compared to 2015, while the share of electricity generated from coal-fired plants in OECD countries fell by 6.1% to 3 029 TWh.

Heat produced in combined heat and power (CHP) or heat only plants was 2 999 PJ during this period, down 1.4% from 3 040 PJ, while the share of heat produced from coal-fired plants in OECD countries declined to 690 PJ from 725 PJ in 2015.

If we look at electricity and heat generated in 2016 and adopt 2015 efficiencies, the potential coal inputs in OECD countries for electricity and heat generation fell to 1 064.8 Mtce – a potential decrease of 60.1 Mtce or 5.6%. Following the same trend we see a higher theoretical decrease in United States, down from 486.8 Mtce in 2015 to 446.5 Mtce in 2016 – an 8.3% decline.