



GLOBAL THERMAL COAL SUPPLY FUNDAMENTALS

Coal is the most widely mined mineral on earth and is used to produce almost a third of the world's energy. It is likely that coal use, at least in unabated form, will reduce in the long term, but it is difficult to envisage a rapid and significant reduction in demand considering the current commitment to electricity generation, the development of abatement technologies and potential new uses for coal.

The long-term availability of coal at economically viable production costs is significant for the global energy supply. Since the coal industry developed into a global commodity through seaborne trade in the 1980s, the widespread geographic distribution of coal deposits has reduced supply risks.

Coal reserves are defined as the part of a resource that can be extracted economically. Several reporting codes for reserves and resources exist in different countries but all tend to follow broadly the principles and format of the widely used JORC code, developed in Australia. Generally, reserves are defined by an economic evaluation of the viability of the mining process, which usually includes a conceptual feasibility study. Such studies assess the coal quality and volume to be produced, its market acceptability, the economic yield when processed and the cost of logistics in transporting the coal to a selected market. A professional with at least five years of relevant experience in the commodity is usually required to perform the study.

The selling price of coal is a significant and variable determinant in the economic viability of a coal reserve; it is often defined by the quality of the coal produced, especially the heat value, although other parameters are important. For the expert required to define a coal reserve, selecting the future coal price is an important criterion in determining the economic viability, as the production cost is generally well defined and less variable than the pricing, especially when related to international markets.

Thus long-term coal reserves can be assessed and compared on a country-by-country basis to see if the finite nature of any mineral reserve is likely to impact coal supplies in the medium to long term. The BP Statistical Review is a frequently cited source for data on coal reserves. It suggests hard coal reserves are about 750 billion tonnes (Bt), or, potentially at least 100 years of supply at current demand, but there is little information provided on the criteria used by each reporting country, if the parameters they use are comparable from country to country, or when the estimate was updated.

Global coal production rates have stabilised at approximately 8 Bt/y since 2010 but as resources deplete there is increasing pressure on the remaining deposits to supply markets. It is assumed that international coal pricing will stay in a price range similar to the predicted long-term trend. If overall demand stays close to current levels, almost 160 Bt of additional coal will be needed by 2040, representing approximately half of historic coal production. To achieve this volume, the major producing countries will need to largely maintain their current output. Commonly reported global reserve figures suggest a significant long-term supply is possible, even at increased production rates, but the weaknesses in the assessments have been noted.

Thus, the major coal-producing countries are reviewed and the main findings are:

- Australia – has significant coal reserves, especially of coking coal, but new projects are more remote and higher cost, requiring additional infrastructure. Permitting and environmental controls are becoming more onerous.
- China – is the largest coal producer and user as almost half of the total coal is produced and used in China. Reserves are depleting at a rate of over 3 Bt/y. Newer mines are nearly all underground and becoming deeper, exceeding the 1000 m depth which is the traditional limit of economic extraction. A significant upward re-rating of reserves in recent years has been completed without clear evidence of how this has been achieved.
- Russia – has significant reserves but coal for export markets needs to be transported up to 5000 km to the ports. Newer coal mines and mine extensions are exploiting deeper seams which are more technologically challenging. As the European markets decline considerable new rail infrastructure is required to increase export volumes to Asia.
- India – has the second-largest coal demand but internal reserves are largely low quality and located far from key coal users. There is considerable debate on the likely long-term demand but the expectation is that Indian coal reserves will remain adequate to meet future demand.
- South Africa – has the most limited reserve base of the major coal producers. Additional resources are more technically challenging and geographically remote, which increases production costs. A decline in production is likely from 2030.
- Indonesia – Significant coal reserves exist but the limited logistics in Kalimantan, the main production region, mean future costs will rise and coal quality will tend to decline. As meeting short term immediate domestic coal demand is a concern for the government it is likely that coal exports levels have peaked.
- Canada – the reserve base is adequate to maintain production but logistics and environmental pressures mean increased production is unlikely.
- Colombia – coal reserves and coal quality are declining, as is demand in the traditional markets, so it is unlikely that additional production will be realised.

Other minor producers do not have the capability to increase production significantly. Similarly, no known major new sources of coal are likely to be developed that might be able to supplement traditional coal producers in a meaningful way, apart from one in Mongolia that would be difficult to export.

Global coal reserves are almost certainly adequate to meet demand to 2040 but production may decline in some countries. Few new producers are likely to emerge. Supplies of some coals may be more limited and the geographic sourcing may change. This could prompt coal users to consider increasing security of supply by seeking long-term contracts as opposed to relying on the spot market.

The International Centre for Sustainable Carbon (ICSC) is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the International Centre for Sustainable Carbon do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

Each executive summary is based on a detailed study which is available separately from: www.sustainable-carbon.org. This is a summary of the report: Global thermal coal supply fundamentals by Graham Chapman, ICSC/318, ISBN 978-92-9029-641-6, 89 pp, February 2022.