Coal

Coal currently provides 40% of the world's electricity needs. It is the second source of primary energy in the world after oil, and the first source of electricity generation. Since the beginning of the 21st century, it has been the fastest-growing global energy source. The last decade's growth in coal use has been driven by the economic growth of developing economies, mainly China. Irrespective of its economic benefits for the countries, the environmental impact of coal use, especially that coming from carbon dioxide emissions, should not be overlooked. Despite positive efforts to build more efficient plants, to retrofit old plants and to decommission the oldest, least efficient ones, the current pace is far from what is needed. Carbon capture and storage (CCS) is the most promising technology to reach near-zero CO_2 emissions from large CO_2 sources. Although it is developing, it is far from the required deployment-level to keep CO_2 emissions at acceptable levels.

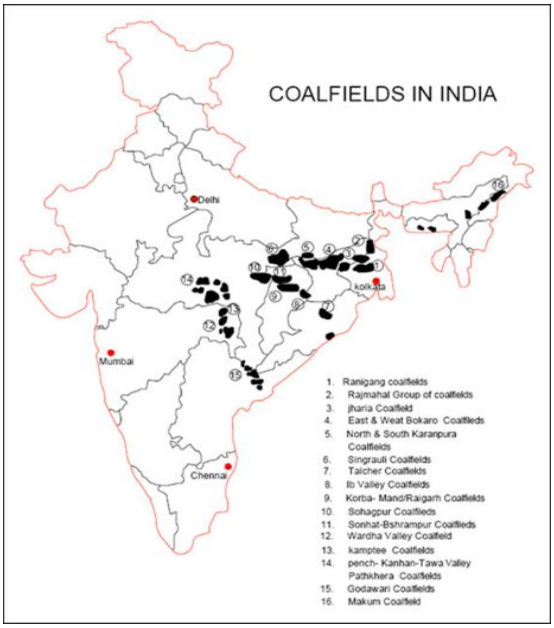
Coal plays a significant role in driving the economies of all industrialized nations and will retain this role for years to come. As with all commodities, coal prices respond to global demand cycles. Overall supply is shaped by production capacities in coal-producing countries and other factors such as shipping costs, availability of land-based transportation infrastructure, production disruptions due to weather or labor issues and government regulations.

However, rapidly developing Asian economies and stable demand for power from the developed world offer significant opportunities to cost-efficient coal producers and accordingly add even more importance to the international coal trade.

Domestic Scenario

The coal deposits in India are primarily concentrated in the Gondwana sediments occurring mainly in the eastern and central parts of Peninsular India, although Gondwana coal deposits also occur in Assam and Sikkim in north eastern part of the country.

The Tertiary coal-bearing sediments are found in Assam, Arunachal Pradesh, Nagaland and Meghalaya. As a result of exploration carried out by GSI, CMPDI and other agencies; 298.91 billion tonnes (including that estimated in Sikkim) coal reserves up to 1,200 m depth have been established in the country as on 1.4.2013. Out of these reserves, 123.18 billion tonnes are proved reserves, 142.63 billion tonnes are indicated reserves and the remaining 33.10 billion tonnes are in inferred category. Of the total reserves, the share of prime-coking coal is 5.31 billion tonnes, medium-coking & semi-coking is 28.75 billion tonnes and non-coking coal including high sulphur is 264.85 billion tonnes. Statewide/coalfield-wise and statewide/type wise reserves of coal as on 1.4.2013 .2, respectively.



Domestic Production

The provisional total production of coal in 2012-13 was around 556.40 million tonnes which was higher by 3% as compared to the previous year. Chhattisgarh continued to be the largest coal producing state with a share of about 21.2% followed closely by Jharkhand and Odisha with contributions of 20% and 19.8%, respectively, to the national output. Next in order of share in the total production were Madhya Pradesh (13.6%), Andhra Pradesh (9.6%), Maharashtra (7%), West Bengal (4.8%) and Uttar Pradesh 2.9 percent. The remaining 1.1% of coal production was accounted for by Arunachal Pradesh, Assam, Jammu & Kashmir and Meghalaya.

Number of Coal Mines

State	2011-12	2012-13 #
Andhra Pradesh	50	50
Arunachal Pradesh	1	1
Assam	7	6
Chhattisgarh	61	60
Jammu & Kashmir	7	4
Jharkhand	172	176
Madhya Pradesh	71	71
Maharashtra	57	58
Meghalaya	1	0
Odisha	28	28
Uttar Pradesh	4	4
West Bengal	100	101
India	**559**	**559**

Relates to number of mines as on 31.03.2013

During the year 2012-13 coal mining was confined mainly to the public sector which contributed 91.5% to the national production. In 2012-13, out of the total production of coal, 9.3% was coking coal and the rest 90.7% was non-coking coal. As in the earlier years, bulk of the coking coal production i.e. about 85.8% was reported from the public sector. Grade wise analysis of coking coal in 2012-13 revealed that washery grade IV had the maximum share at 69.1%, followed by washery grade III (24%), washery grade II (3.3%) and washery grade I (0.5%). The remaining 3.1% production of coking coal was of steel grade I, steel grade II, semi-coking grade I and SLVI. Out of the total production of coking coal in India, bulk quantity i.e. 99% was produced in Jharkhand followed by Madhya Pradesh with 0.6 percent. The remaining 0.4% was contributed by Chhattisgarh and West Bengal.

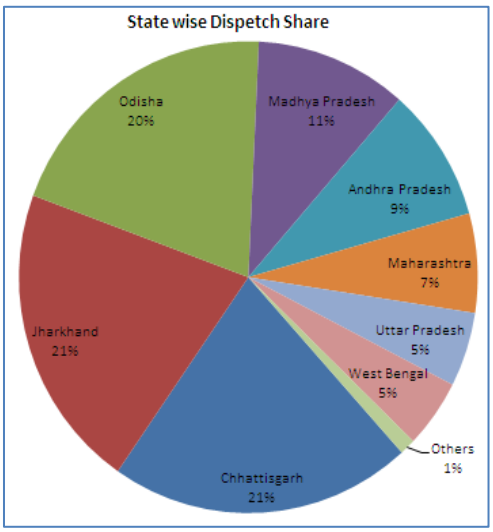
During 2012-13, barring a nominal quantity (7.9%), the balance entire production of non-coking coal (92.1%) came from the public sector. Out of the total non-coking coal production, 23.9% was of G11 grade, followed by 16.1% of G13 grade, 13.2% of G9 grade, 11.7% of G10 grade, 7.3% of G12 grade, 6.9% of G7 grade, 4.8% of G8 grade, 4.5% of G6 grade, 3.5% of G4 grade and 3.0% of G5 grade. The remaining 5.1% production was contributed by G1, G2, G3, G14, G15, G16 and G17 grades of non-coking coal. Chhattisgarh was the largest producing state of non-coking coal in 2012-13 which alone accounted for 23.3% of the national output. Next in order were Odisha with a contribution of (21.8%), Madhya Pradesh (15%), Jharkhand (11.9%), Andhra Pradesh (10.5%), Maharashtra (7.8%), West Bengal (5.3%) and Uttar Pradesh (3.2%). The remaining 1.2% production came from the states of Assam, Arunachal Pradesh, Jammu & Kashmir and Meghalaya.

A total of 559 coal mines (as on 31.03.2013) in India reported production in 2012-13. Out of these, Jharkhand accounted for 176 mines while West Bengal for 101 mines, Madhya Pradesh (71), Chhattisgarh (60), Maharashtra (58), Andhra Pradesh (50) and Odisha (28). The remaining 15 mines have been from the states of Arunachal Pradesh, Assam, Jammu & Kashmir, Meghalaya and Uttar Pradesh. In 2010-11, there were 11 large mines each producing more than 10 lakh tonnes of coal during the year. The bulk of the production was contributed by 142 mines with annual output ranging between 5,00,001 to 10 lakh tonnes. 283 mines whose individual production varied between 50,001 to 5 lakh tonnes. 123 small mines each producing up to 50,000 tonnes.

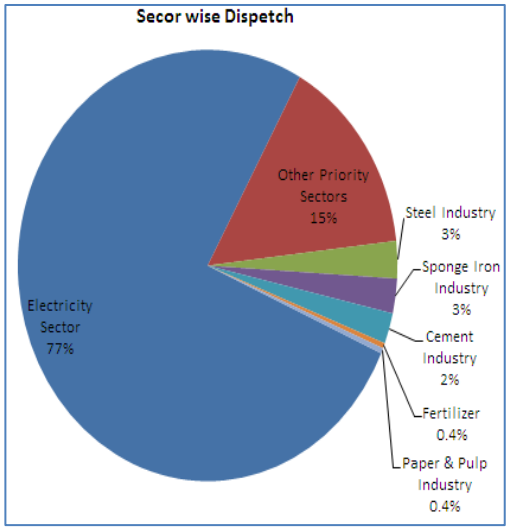
Interstate Trade

Dispatches of raw coal at 567.1 million tonnes in 2012-13 were higher by around 5.9% as compared to those in the previous year. Chhattisgarh was the leading state in the dispatches in 2012-13 and accounted for 21.3% of the total dispatches. The states next in order were Jharkhand (21%), Odisha (20.1%), Madhya Pradesh (10.7%), Andhra Pradesh (9.2%), Maharashtra (6.8%), Uttar Pradesh (5.1%) and West Bengal (4.7%).

The remaining 1.1% dispatches were shared by Meghalaya, Assam, Arunachal Pradesh and Jammu & Kashmir. During the year 2012-13, state wise analysis revealed that dispatches of coal increased in the states of Andhra Pradesh, Chhattisgarh, Jharkhand, Maharashtra, Odisha, Uttar Pradesh and West Bengal.



The remaining states of Assam, Arunachal Pradesh, Jammu & Kashmir, Madhya Pradesh and Meghalaya were decreased as compared to that in the previous year. Of the total dispatches of raw coal affected in 2012-13, a sizeable share of 76.4% was made to the Electricity Sector. As much as 2.8% was made to the Steel Industry, 2.6% to the Sponge Iron Industry, 2.3% to the Cement Industry, 0.4% each to the Fertilizer and Paper & Pulp Industry. The remaining 15.1% was made for other priority sectors including Textile & Rayons, Cokeries, Chemical and Other Basic Metals. During the year 2011-12, the total dispatches of raw coal, a sizeable share of 75% was made to the electricity sector. As much as 3% each was made to the steel industry and sponge iron industry, 2.4% to the cement industry, 0.5% to the fertilizer, 0.4% to the paper & pulp industry. The remaining 15.7 % was made for other priority sectors including chemical, cokeries textile & rayons and other basic metals.



Grading system adopted in Indian Coal Industry

CIL currently sells seven varieties of thermal coal (and limited quantities of coking coal), benchmarked against useful heat value (UHV). An Indian nomenclature developed in the 1970's, UHV defines energy (kilo calorie) in every kilogram of coal after discounting the moisture and ash content. Indian coal is classified into two main categories, namely, coking and non-coking. Coking coal is a type of coal from which, on carbonization, coke suitable for use in metallurgical industries, particularly in iron and steel industries, can be produced. Parameters determining coking property of coal are coking index, volatile matter (VM %), vitrine %, crucible swell no., fluidity, reflectance, etc. Although for commercial gradation, ash percentage is the sole criterion, for semi-weakly-coking coal, along with ash percentage, moisture percentage too is considered as an added criterion. For non-coking coal, an empirical formula is used to determine Useful Heat Value (UHV) of coal in kcal/kg.

Parameters for grading of Coal

Grades of Coking Coal

Grade	Ash Content
Steel Grade - I	Not exceeding 15%
Steel Grade -II	Exceeding 15% but not exceeding 18%
Washery Grade -I	Exceeding 18% but not exceeding 21%
Washery Grade -II	Exceeding 21% but not exceeding 24%
Washery Grade -III	Exceeding 24% but not exceeding 28%
Washery Grade -IV	Exceeding 28% but not exceeding 35%

Grades of Semi-coking and Weakly Coking Coal

Grade	Ash + Moisture Content
Semi coking grade - I	Not exceeding 19%
Semi coking grade - II	Exceeding 19% but not exceeding 24%

Grades of NEC Coal

Grades	UHV (Kcal/Kg)	Corresponding Ash% + Moisture %age
A	6200-6299	18.85 - 19.57
B	5600 - 6199	19.58 - 23.91

Grades of Non-coking Coal

Grade	Useful Heat Value (UHV) (Kcal/Kg) UHV= 8900-138(A+M)	Corresponding Ash% + Moisture % at (60% RH & 40°C)	Gross Calorific Value GCV (Kcal/ Kg) (at 5% moisture level)
A	Exceeding 6200	Not exceeding 19.5	Exceeding 6454
B	Exceeding 5600 but not exceeding 6200	19.6 to 23.8	Exceeding 6049 but not exceeding 6454
C	Exceeding 4940 but not exceeding 5600	23.9 to 28.6	Exceeding 5597 but not exceeding. 6049
D	Exceeding 4200 but not exceeding 4940	28.7 to 34.0	Exceeding 5089 but not Exceeding 5597
E	Exceeding 3360 but not exceeding 4200	34.1 to 40.0	Exceeding 4324 but not exceeding 5089
F	Exceeding 2400 but not exceeding 3360	40.1 to 47.0	Exceeding 3865 but not exceeding. 4324
G	Exceeding 1300 but not exceeding 2400	47.1 to 55.0	Exceeding 3113 but not exceeding 3865

Grading as per GCV Value

Grades	GCV Range (kcal/kg)
G1	GCV exceeding 7000
G2	GCV exceeding 6701 and 7000
G3	GCV exceeding 6401 and 6700
G4	GCV exceeding 6101 and 6400
G5	GCV exceeding 5801 and 6100
G6	GCV exceeding 5501 and 5800
G7	GCV exceeding 5201 and 5500
G8	GCV exceeding 4901 and 5200
G9	GCV exceeding 4601 and 4900
G10	GCV exceeding 4301 and 4600
G11	GCV exceeding 4001 and 4300
G12	GCV exceeding 3701 and 4000
G13	GCV exceeding 3401 and 3700
G14	GCV exceeding 3101 and 3400
G15	GCV exceeding 2801 and 3100
G16	GCV exceeding 2501 and 2800
G17	GCV exceeding 2201 and 2500

In order to adopt the best international practices, India decided to switch over from the grading based on Useful Heat Value (UHV) to the grading based on Gross Calorific Value (GCV); and, therefore, on 16.01.2011 the Ministry of Coal notified the switch over. As per the new system, the following nomenclature has been introduced for gradation of non- coking coal.

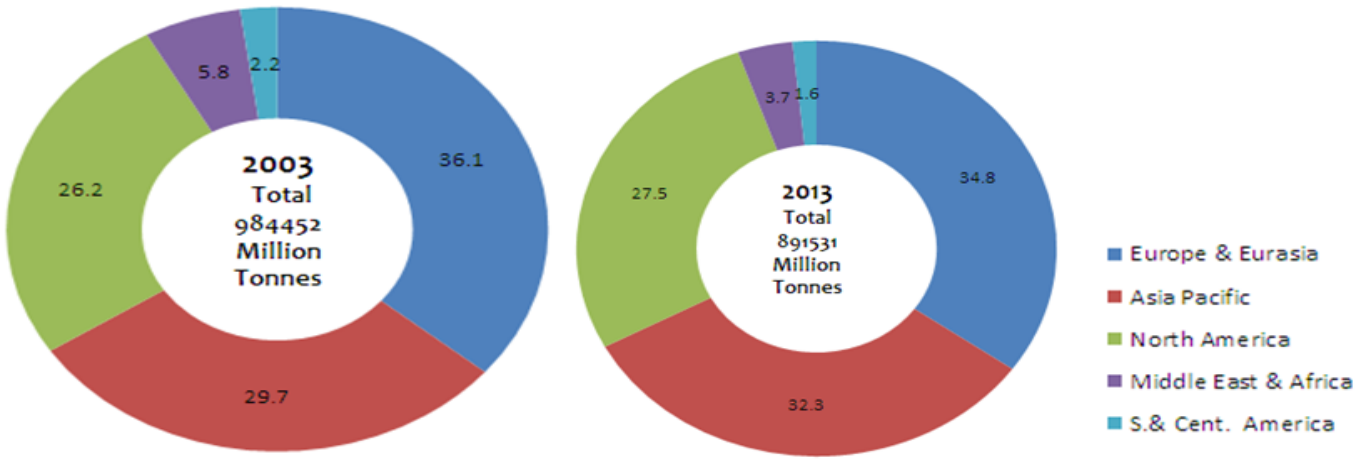
Based on the GCV ranges of proposed gradation and erstwhile gradation, a Concordance Table has been generated for better understanding. However, it may be noted that this concordance does not depict exact one-to-one relation between the two systems.

Concordance Table	
Old grading based on UHV	New grading based on GCV
A	G1.G2.G3
B	G4,G5
C	G6
D	G7,G8
E	G9,G10
F	G11, G12
G	G13, G14
Non-coking coal Un-graded	G15, G16, G17
Source: Coal Directory 2012-13, Coal Controller's Organization, Kolkata.	

Coal Reserves

Coal is the fuel of choice in many parts of the world. In 2013, it reached its highest market share of global energy consumption in over 40 years. Even as fears grow that its high carbon emissions make it the biggest cause of climate change, use of coal for power generation and other purposes grew by 3 percent in 2013, faster than any other fossil fuel. Its share of the world energy basket went above 30 percent for the first time since 1970.

Distribution of Coal Reserves in 2003 and 2013



Source: World Energy Resources 2013 survey, World Energy council, Figures in Percentage

International Scenario

From the adjacent table we can see that the global production over the years have shown gradual improvement. It showed an increase of about 23 per cent since 20012-13. And, the imports and exports have up by 23 per cent and 24 per cent respectively. The positive fact about the coal trade is the level of strong in global trade.

Global Coal Balance sheet

Year	Production	Consumption	Import	Export
2008-09	6777540	6654778	951520	968307
2009-10	6896064	6727524	944512	947507
2010-11	7256983	7153200	1053057	1099358
2011-12	7660089	7515615	1103191	1167294
2012-13	7887748	7665254	1217918	1282668

Source: US Energy Information Administration

World Coal Production (Million MT)

Country	2008-09	2009-10	2010-11	2011-12	2012-13
China	2811421	2995345	3230154	3518073	3651760
NorthAmerica	1142226	1048640	1064451	1076812	1003801
UnitedStates	1063047	975154	983722	993937	922116
India	517104	557844	562312	574950	589347
Indonesia	248766	291247	325000	360336	442808
Australia	392251	407898	424402	402237	420737
Russia	304962	275991	321701	321932	353940
SouthAfrica	252213	249489	254522	252757	259302
Germany	194381	183623	182303	188561	196990
Poland	143329	134586	132682	138509	143514
Other	292160	223754	224266	168014	96567
World	6777540	6896064	7256983	7660089	7887748

Source: US Energy Information Administration

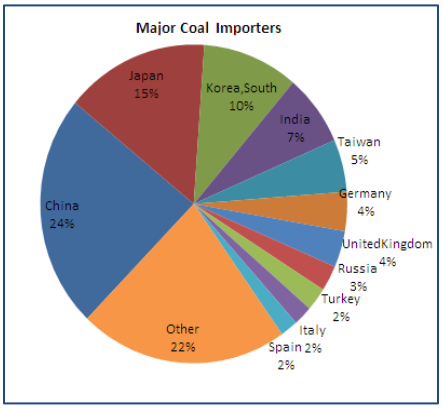
World Coal Consumption (Million MT)

Country	2008-09	2009-10	2010-11	2011-12	2012-13
China	2736980	3012418	3271177	3587130	3765412
NorthAmerica	1088719	970081	1018099	971904	867040
UnitedStates	1016544	904896	951196	909859	806655
India	561956	623265	634296	653487	675416
Russia	226611	185141	221726	222742	248750
Germany	243018	224861	232201	237905	244427
SouthAfrica	196727	192164	190235	186340	187178
Japan	184887	164651	186993	174952	183190
Australia	139636	143652	138055	133613	136627
Poland	135093	127830	134146	139055	133053
Other	124607	178565	175077	298627	417505
World	6654778	6727524	7153200	7515615	7665254

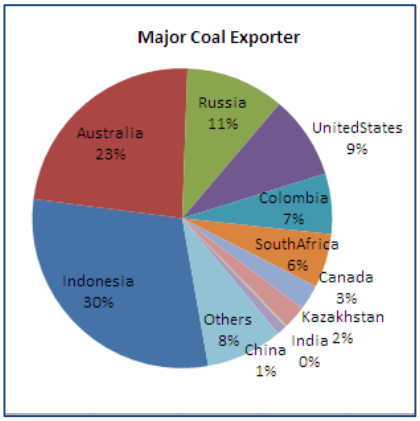
Source: US Energy Information Administration

Global Trade Scenario for Coal

Coal is used to generate more than thirty-percent of the world's electricity. In addition to being a key fuel, it is also used in a wide range of industrial applications across many different industries. In recent years, low natural gas prices - along with the high demand for coal across Asia and Europe - have created a shift in the industry and present new opportunities in the global coal markets.



From the analysis of the production and consumption figures, it is realized that India produces 589347 MT of Coal against the consumption requirement of 675416 MT. The top four importing nations accounts for 56 per cent of the total global imports of which a whopping 24 per cent is done only by China. The second most important destination is Japan contributing to 15 per cent of the total imports. The other countries worth mentioning are South Korea and India.



The major countries involved in the export of Coal are explained by the following chart. As per the details Indonesia exports 30 per cent of the total global exports of Coal. The other exporting country closely competing with

Indonesia in exporting Coal in the world is Australia with the global share of 23 per cent. The other exporting nations worth mentioning are Russia, US and Colombia.

Major Importers of Coal in World (Million MT)

Country	2008-09	2009-10	2010-11	2011-12	2012-13
China	40340	125999	163175	182092	288907
Japan	186807	165188	187516	176058	184584
South Korea	97125	99676	114131	125341	123107
India	56491	77675	81962	83453	88162
Taiwan	64242	58706	63443	66691	64864
Germany	49802	41653	50035	51250	48449
United Kingdom	44597	38345	26654	32553	45008
Russia	31431	24365	25736	27744	31541
Turkey	19705	20638	21506	23987	28826
Italy	25331	18921	21736	23299	24144
Spain	21171	17159	13021	16333	22582
Other	314479	256187	284143	294390	267743
World	951520	944512	1053057	1103191	1217918

Source: U.S. Energy Information Administration

Major Exporters of Coal in World (Million MT)

Country	2008-09	2009-10	2010-11	2011-12	2012-13
Indonesia	199947	233431	267201	300662	382610
Australia	252189	261747	292621	284536	301515
Russia	101147	108303	135091	127123	136731
UnitedStates	75730	54797	75458	98183	114958
Colombia	68549	67574	69843	80784	83672
SouthAfrica	57891	51977	66396	68807	74349
Canada	33099	28828	33493	34081	35226
Kazakhstan	33147	28638	31392	30370	31913
India	2993	2579	2604	2627	2093
China	57501	22893	24658	24989	13775
Others	86114	86740	100601	115131	105826
World	968307	947507	1099358	1167294	1282668

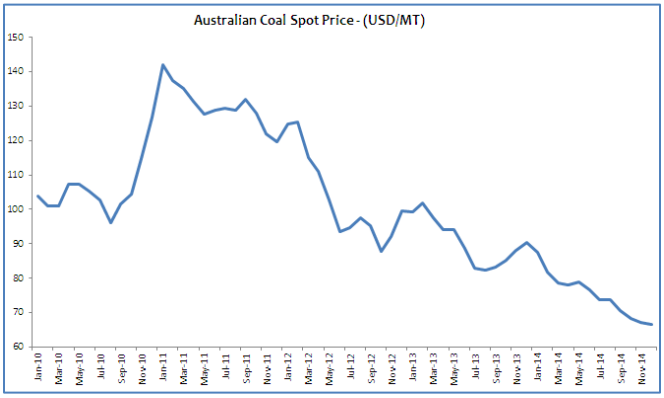
Source: U.S. Energy Information Administration

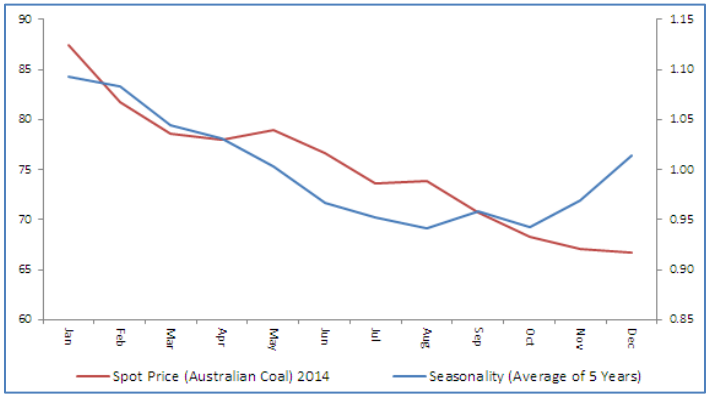
The main factor influence Coal prices hits 4-year low as downward trend continues

- Prices for power-plant coal in the U.S., Europe and Asia have fallen four consecutive years, while the metallurgical variety, used to forge steel, has dropped three years, as supply outstrips demand.
- Cheaper diesel prices as a result of crude oil near a five-year low has reduced mining costs for companies in Australia and Indonesia, slowing production cuts that are needed to alleviate the glut.
- The Australian coal industry faces significant economic challenges, as a number of factors of oversupply and weaker than expected demand growth combine to put downward pressure on prices, thereby seriously impacting on the financial viability of coal mines.
- Established coal markets for Australian thermal coal such as Japan, India and China are undergoing structural changes as renewables gain market share and policy choices diminish coal's short and long term viability.
- The Australian dollar has strengthened against the US dollar, compounding the continued decline in the thermal coal price, down 22% year-on-year to a 4-year low of US$73/tonne.
- The coal price is weakened by excess supply and lowers than expected demand growth, particularly in China, making Australian mine development less financially attractive.

- China's annual coal imports have declined in the past six years – but the 2008 dip is mitigated by the global financial crisis and is the exemption in an otherwise decade of continued growth and the coking coal imports last year amounted to 62.4M tonnes, down 17% y/y from 75.4M tonnes.

Price Trend Analysis





Coal prices have historically been lower and more stable than oil and gas prices. Coal is likely to remain the most affordable fuel for power generation in many developing and industrialized countries for decades.
In countries with energy intensive industries, the impact of fuel and electricity price increases is compounded. High prices can lead to a loss of competitive advantage and in prolonged cases, loss of the industry altogether. Countries with access to indigenous energy supplies, or to affordable fuels from a well-supplied world market, can avoid many of these negative impacts, enabling further economic development and growth. As per the seasonality the prices are expected to maintain a weak trend in the next 3 -4 month amidst absence any major spurt in demand or supply hurdles.