

# COAL IN COLOMBIA

Colombia has a relatively small proportion of the world's proven coal reserves. World hard coal reserves have been estimated at 411,321 million t, while those of Colombia are an estimated 6434 million t, or less than 2% of the world's reserves, placing it ninth on the 2009 World Energy Council league table. In terms of world mining statistics, a similar story emerges: world hard coal production in 2009 was 5990 million t. In the same year, Colombia produced 73 million t, or 1.22% of the total. In

terms of world coal trade, however, Colombia is a far more important player: in 2009, total world exports were 836 million t, while Colombia exported 69 million t, or 8.25% of the total, placing it fourth on the league table.

## Geology

Coal is widespread in Colombia, occurring in stratigraphic units ranging in age from Lower Cretaceous to Upper Oligocene, with a wide range of rank and quality from lignite to anthracite, including met coals.

Geological structures can be complex: folding, faulting and overthrusting, with consequent repetition of seams that may result in multiple seam sites with seams up to 7 m or more in thickness and amenable to opencast operations. In less favourable conditions, seams are thinner and more widely separated by interburden and at best are amenable to underground mining.

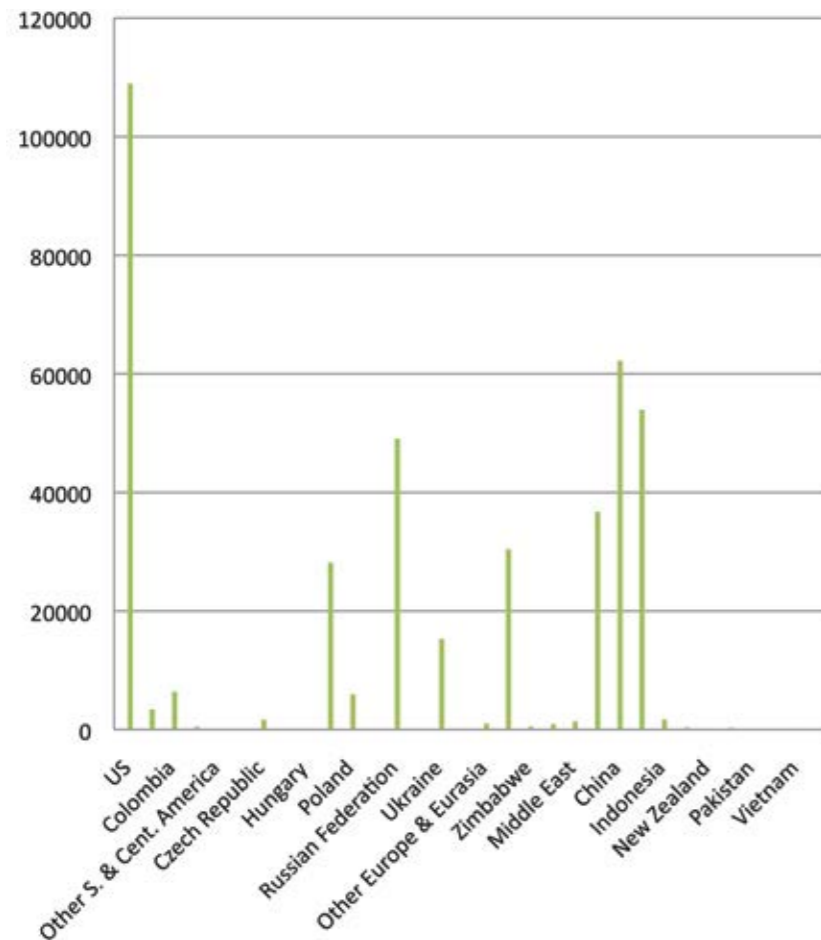
Coal production is dominated by thermal coal production from the Eocene Cerrejón formation in the Guajira department and the Palaeocene

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and Lower Eocene Los Cuervos formation in the Cesar department.

The physiography of Colombia is dominated by the western, central and eastern cordilleras of the Colombian Andes, divided by the valleys of the Magdalena, Cauca and other rivers. The

locations of the Guajira and Cesar deposits in the flatter lowlands of the César-Ranchería river valleys, along with favourable geological conditions, have been factors in the development of world class, low operating cost, opencast mines in these areas.



Global proven resources 2010. (Source: PB/World Energy Council.)

Table 1. World coal production and exports (2009)

Producers	Hard coal (million t)	Brown coal (million t)	Net exporters	Hard coal (million t)
China	2971	-	Australia	262
US	919	66	Indonesia	230
India	526	35	Russia	93
Australian	335	64	Colombia	69
Indonesia	263	38	South Africa	67
South Africa	247	0	US	33
Russia	229	68	Vietnam	25
Kazakhstan	96	5	Kazakhstan	22
Poland	78	57	Canada	20
Colombia	73	0	Czech Republic	4
Rest of the world	253	580	Others	11
<b>Total</b>	<b>5990</b>	<b>913</b>	<b>Total</b>	<b>836</b>

Colombian mining costs for thermal coals from these mines are competitive with those of Indonesia and Australia, amongst other low cost producers. The deposits are in the César-Ranchería basin of tertiary age, which includes all the mines within the Cesar and Guajira provinces (including the Cerrejón complex). The basin is bounded by the east-west striking Oca fault to the north, by the igneous massif of the Sierra Nevada de Santa Marta to the northwest, by the Perija mountains to the southeast, and by a system of large faults to the west.

### Guajira

The main producer in the Guajira department is the Cerrejón mine, owned and operated by a consortium of BHP Billiton, Anglo American and Xstrata. The surface mineable reserves for the current contract are reported to be 330 million t, with total proven reserves to a depth of 300 m reported to be 3000 million t. Total production in 2009 from the Cerrejón basin, as reported by the Colombian Institute of Geology and Mining, Ingeominas, was 31.4 million t. Production from the mine is transported by rail to Puerto Bolívar on the Caribbean for export.

The typical regional geological structure of the basin consists of southeast and northwest dipping thrust sheets, probably splay off the Cerrejón thrust to the southeast, which are broken up by east-west and northwest-southeast striking steeply dipping strike-slip/normal and reverse faults. Broad open folds occur between the large thrust faults. To the northwest, the coal bearing strata are limited by the Ranchería thrust. Strata within the César-Ranchería basin have an average dip of about 15° to the southeast. Thrusts have produced repetition of the coal bearing strata at the Cerrejón mine and have favourably impacted on stripping ratios.

### Cesar

In Cesar, the largest producer is the La Loma (Pribbenow) mine, owned and operated by Drummond, which has also recently begun operations on the Descanso mine. Adjacent mines include La Francia (Goldman Sachs), Calenturitas (Prodeco/Glencore International), and El Hatillo (Vale).

In 2009, Drummond production at La Loma and at Descanso was 18.4 million t and 2.2 million t respectively, while the total production from the department of Cesar was 34 million t.

The main producing region is centred on the town of La Loma and the La Loma syncline, with the nearby La Jagua de Iberico syncline holding some higher calorific value (CV) coals, but production and reserves are more limited. The coal bearing strata in the

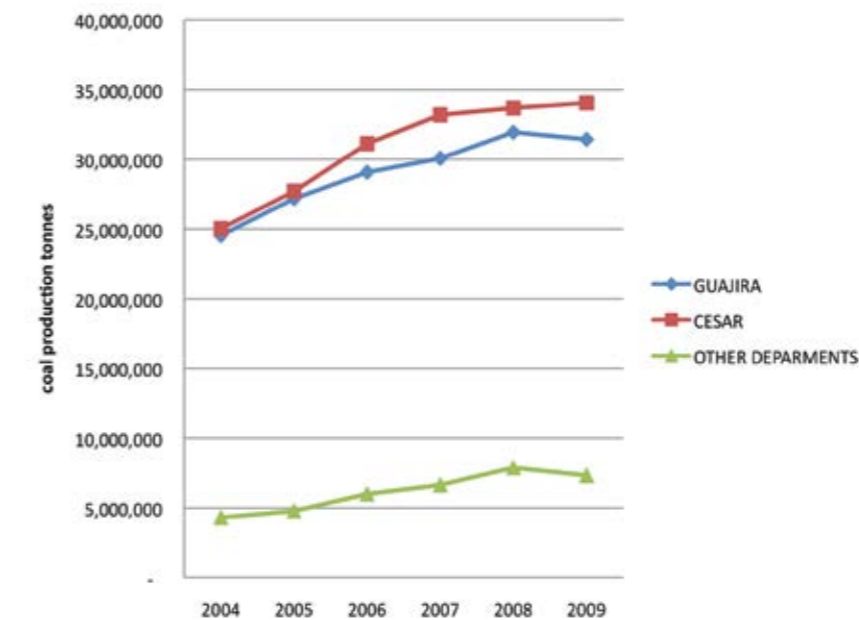
region are contained within the tertiary age (Palaeocene) Los Cuervos formation, which is divided into three members: the upper, middle and lower. The lower member comprises predominantly claystones and siltstones with layers of sandstone and occasional coal seams. The middle member is the main productive member and comprises a sequence of claystones, siltstones, sandstones and up to 60 coal seams. The upper member comprises predominantly sandstones intercalated

with siltstones and claystones. The Los Cuervos formation is between 245 and 1600 m thick and is unconformably overlain by the Miocene to Pliocene Cuesta formation.

The deposits lie on the various limbs of the faulted La Loma syncline, whose main axis lies in the La Loma licence and trends north-east south-west. A series of thrusts, the El Hatillo, La Loma and El Tigre faults, displace the coal bearing strata, which appear on the El Descanso licence, as the northwestern limb of the Descanso syncline.



Main coal occurrences in Colombia.



Colombian coal production by department.

### Other departments

Production from the other departments is much more limited, much of it coming from low productivity, labour intensive underground mines, with few mines producing in excess of 100,000 tpa. It should be noted, however, that some departments have high CV, met or anthracitic coals that may command premium prices and offer opportunities for future development under suitable geological, mining and infrastructure conditions.

### Coal quality

Colombia's coal exports are a low ash, low sulphur thermal coal, the benchmark CV from Puerto Bolívar being 11,300 Btu/lb. The International Energy Agency in the Key World Energy Statistics for 2010 has expressed the energy values in thermal coals for the world's top 10 producers in terms of tonnes of oil equivalent (toe) for 2009. Colombian coals, at 0.65 toe/t, rank second only to Australian coals (0.69 toe/t).

### Infrastructure

The main infrastructure in place for transport to and at the exporting terminals is currently undergoing expansion and revision. The bulk of coal from the main export producing regions in the northeast of the country is transported by rail, whereas the smaller producers in the centre and centre east of the country use road.

### Rail

Production from the Cerrejón mine is transported by rail some 135 km north to Puerto Bolívar on the Caribbean coast. Transportation from the Cesar coalfield use part of the Fenoco (Ferrocarriles del Norte de Colombia S.A.) network northwest to Santa Marta also on the Caribbean coast.

Following representations by a group of local coal producers, ownership of the Fenoco railroad has recently changed as a number of producers, including Coalcorp, Caribe (Vale) and Prodeco, have purchased stakes in the rail line. This has enabled producers other than Drummond, which previously used the full capacity of the railroad, to access the railway to transport coal north to the

Caribbean port of Santa Marta. The Fenoco railway is a high-capacity narrow gauge railroad capable of accommodating unit train rolling stock at overall tonnages of about 5000 t/train. Drummond and Prodeco currently ship coal production from their nearby mining operations to their ports at Santa Marta on this railroad. Upgrade of the line to meet the new

capacity is well underway: additional spurs and passing places are already in place and the construction of a parallel line to further increase capacity is also well advanced.

Road transport to the Caribbean ports remains an alternative option and the Colombian Government has stated its commitment to upgrading the road transport infrastructure.


## Ports

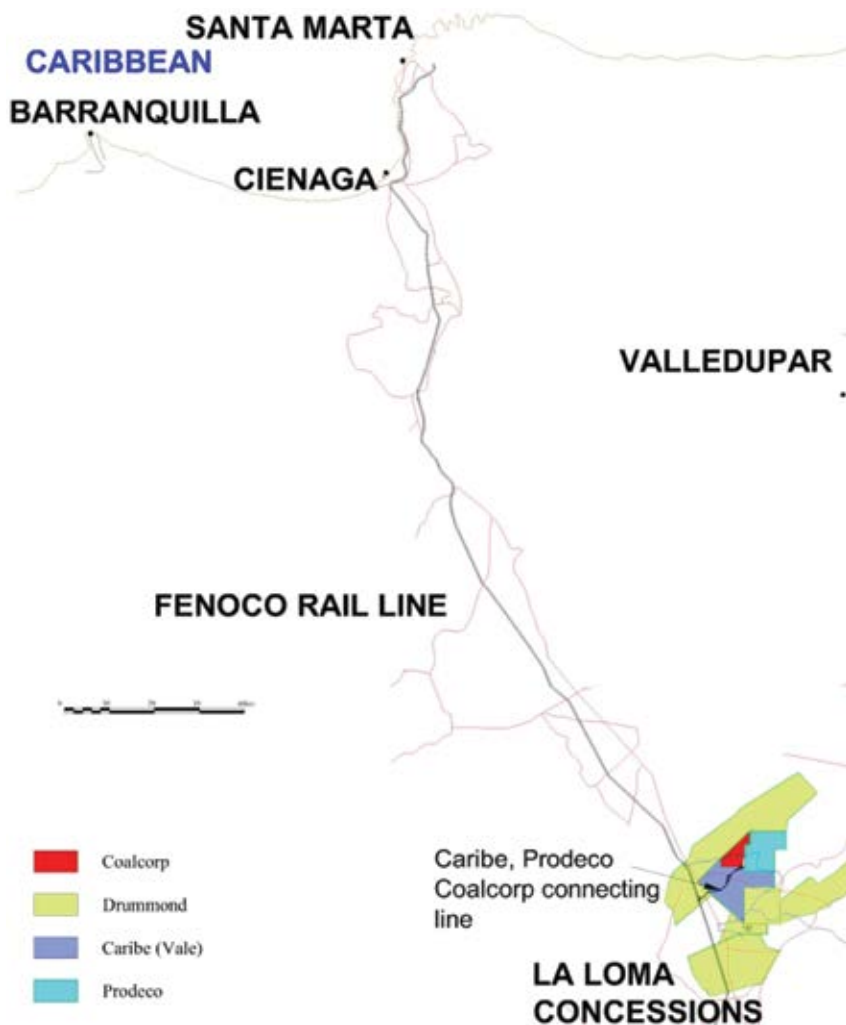
The Colombian Government has expressed opposition to barge loading operations in Santa Marta and new ports are being planned to replace existing port capacity. As a result, a consortium of coal mining companies, led by Prodeco, is planning to construct Puerto Nuevo, a new, multi-user, direct ship-loading port facility at Ciénaga on the Caribbean coast to the south of Santa Marta and linked into the Fenoco railroad system. The capacity at Puerto Nuevo is planned to be in excess of 30 million tpa.

Existing port facilities in Santa Marta include those operated by the mining companies and the publicly owned port at Carbosan, which is planning the addition of rail access to the port. Plans are also underway for construction of a new direct loading facility at Puerto Drummond to replace the existing barge loading operations.

## Coal trade

Current work on widening the Panama Canal, planned for completion in 2014, is seen as a key opportunity to increase the thermal coal exports to the Pacific market as it would allow capesize vessels to avoid travelling around the Cape of Good Hope, saving a significant number of days travelling time. Historically, Colombia has been dominant in the Atlantic coal trade, serving both the eastern seaboard of the US and European markets. There has been a recent shift in world trade: coal from the Richards Bay coal terminal in South Africa, which previously competed with Colombian coals in Europe, has been diverted to Asian markets, while Colombian coal now competes with Russian coal in Europe. Exports to the US have also declined, while South America and Asia are growing in importance as markets.

Security in Colombia improved significantly under the regime of the previous president, Alvaro Uribe, and the country's stability, fiscal and tax structures are viewed as favourable for foreign investment in mining. The coal industry is an important contributor to the economy of the country and is recognised as such. 



Fenoco rail links and ports.

Table 2. Summary of coal properties by department/coal zone

Zone	Thermal	Met	Anthracite	CV (Btu/lb)
Guajira	Y			11,586
Cesar	Y			11,655
Cordoba	Y			9280
N. Santander	Y	Y		12,653
Santander	Y	Y	Y	12,790
Cundinamarca	Y	Y		11,862
Boyaco	Y	Y	Y	12,781
Antioquia	Y			10,336
Valla Cauca	Y			11,016