

4 Brazil



4.1 Summary of Coal Industry

4.1.1 ROLE OF COAL IN BRAZIL

Brazil is the world's eighth largest energy consumer and the third largest in the Western Hemisphere, trailing the United States and Canada (EIA, 2013). Total primary energy consumption in the country has been increasing in recent years, but coal only accounted for approximately 5 percent in 2011 compared to 35 percent from hydroelectricity and 47 percent from oil and other liquid fuels. The country's domestic annual coal production is approximately 6.3 million tonnes (Mmt) (EIA, 2014). Brazil's annual coal consumption, however, was estimated at 24.8 Mmt in 2012, relying on 18.0 Mmt of coal imports for its energy requirements (EIA, 2014).

Brazil has recoverable coal reserves of approximately 6.6 billion tonnes, the third largest reserves in the Western Hemisphere, after the United States and Colombia (EIA, 2014). Table 4-1 presents most recent statistics for coal mining in Brazil.

Table 4-1. Brazil's Coal Reserves and Production

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2011)	0	6,630.0	6,630.0	14 (0.75%)
Annual Coal Production (2012)	3.26	3.04	6.3	31 (0.08%)

Source: EIA (2014)

Demand for metallurgical coal in Brazil, the world's ninth-largest steel producer in 2011, accounts for 84 percent of the region's coal consumption from 2010 to 2040, with demand for steel in both domestic and international markets expected to increase throughout that period (EIA, 2013).

Brazil's coal mining operations are concentrated in the southern states of Santa Catarina (46 percent), Rio Grande do Sul (53 percent), and Paraná (1 percent) as shown in Figure 4-1.

Figure 4-1. Brazil's Coal Fields



Source: Maps of World (2010)

4.1.2 STAKEHOLDERS

Table 4-2 lists potential stakeholders in Brazilian coal mine methane (CMM) development.

Table 4-2. Key Stakeholders in Brazil's CMM Industry

Stakeholder Category	Stakeholder	Role
Mining companies	▪ Companhia Riograndense de Mineracao (CRM)	Project hosts
	▪ Copelmi Mineracao Ltda.	
	▪ Carbonifera Palermo Ltda.	
	▪ Nova Prospera Mineracao S.A.	
	▪ Carbonifera Metropolitana S.A.	
	▪ Carbonifera Criciuma S.A.	
	▪ Companhia Carbonifera de Urussanga	
	▪ Carbonifera Treviso S.A.	
	▪ Carbonifera Barro Branco S.A.	
	▪ Ibracoque Mineracao Ltda.	
	▪ Companhia Brasileira Carbonifera Ararangua	
	▪ Industria Carbonifera Rio Deserto Ltda.	

Table 4-2. Key Stakeholders in Brazil’s CMM Industry

Stakeholder Category	Stakeholder	Role		
Government Groups	<ul style="list-style-type: none"> ▪ Carbonifera Belluno Ltda. ▪ Companhia Carbonifera Catarinese (CCC) ▪ Campanhia Carbonifera do Cambui ▪ Klabin S.A. 	Licensing and permitting		
	<ul style="list-style-type: none"> ▪ Ministry of Environment ▪ Ministry of Mines and Energy (MME) ▪ National Department of Mineral Production ▪ Coal Mining Industry Union of the State of Catarina ▪ Sindicato da Industria da Extracao de Carvao do Estado de Santa Catarina (SIECESC) 			
	Developers		<ul style="list-style-type: none"> ▪ See http://www.epa.gov/coalbed/networkcontacts.html 	Project opportunity identification and planning
	Engineering, Consultancy, and Related Services		<ul style="list-style-type: none"> ▪ See http://www.epa.gov/coalbed/networkcontacts.html 	Technical assistance
	Universities		<ul style="list-style-type: none"> ▪ Federal University of the State of Rio Grande do Sul 	Technical assistance
			<ul style="list-style-type: none"> ▪ Associação Beneficente da Indústria Carbonífera de Santa Catarina (SATC) 	

4.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

As previously stated, the Brazilian coal industry’s mining operations are concentrated in three southernmost states. It has 15 coal mining companies, all owned by Brazilian investors. The main producers that have underground mines are the following:

Companhia Riograndense de Mineração (CRM) (State of Rio Grande do Sul) – CRM, a state-owned company, is the largest Brazilian coal producer with a current output of nearly 2.4 Mmt per year (CRM, 2014). Most of CRM’s output comes from surface mines, but it has two underground mines. Mina do Leão I is 125 meters deep, has two shafts, and is highly mechanized, but underground production halted in 2002 due to high costs. The mine remains open as an opencast mine. Mina do Leão II is six km from Mina do Leão I and has a projected capacity of 2.4 Mmt/year of run-of-mine (ROM) coal, using the longwall method at an average depth of 200 meters.

Carbonifera Criciuma S.A. (State of Santa Catarina) – The Verdinho Mining Unit II—the company’s underground mine—began operations in 1982, is approximately 170 m deep, and has a capacity of 2.8 Mmt/yr ROM (CC, 2014).

Industria Carbonifera Rio Deserto Ltda. (State of Santa Catarina) – This company has two underground mines: Mina do Trevo in the municipality of Siderópolis producing 1.6 Mmt ROM annually; and Mina Barro Branco in the municipality of Lauro Muller producing 0.85 Mmt of ROM annually. Both are room and pillar mines. The company is also responsible for providing coal to Tractebel, the largest private energy generator in Brazil (RD, 2014).

Carbonífera Metropolitana S.A. (State of Santa Catarina) – This company has an annual output of nearly 1.2 Mmt ROM and 0.6 Mmt of processed coal. It has two underground room and pillar mines, Esperança and Fontanella, both in the municipality of Treviso. The Esperança mine was opened in

1984 with a nominal annual capacity of 3.0 Mmt ROM, and the Fontanella mine was opened in 1985 with a nominal annual capacity of 2.4 Mmt ROM.

Carbonífera Belluno Ltda. (State of Santa Catarina) – This company has three coal mines, only one of which is underground (Meia Encosta Fiorita), located in the municipality of Siderópolis. The company’s total output is nearly 0.24 Mmt of processed coal. Its underground mine has a nominal capacity for 0.36 Mmt ROM annually.

Companhia Carbonífera Catarinense (CCC) (State of Santa Catarina) – It has two underground mines, named Bonito I and Novo Horizonte. Both are room and pillar mines (Vasconcelos, 2006).

In the near term, coal consumption in Brazil’s electricity sector is set to increase with the completion of the Pecem I, Pecem II, and Itaqui power plants (EIA, 2013). Since 2011, Brazil has expanded its coal-fired power generation by 1,440 MW as shown in Table 4-3 (GEO, 2014). The number of coal-fired plants had remained unchanged for many decades, until these new projects were commissioned.

Table 4-3. Brazil’s Coal-Fired Power Plants

Name of Plant	Year Commissioned/Last Unit Installed	Generating Capacity (MW)	Location (State)
Porto do Itaqui	2012	360	Maranhao
Porto do Pecem	2011/2012	1080	Ceara
President Medici (Candiota)	1974/2010	796	Rio Grande do Sul
Jorge Lacerda Thermal	1965/1997	857	Santa Catarina
Figueira	1963/1974	20	Parana
Charqueadas	1962/1969	72	Rio Grande do Sul
St. Jerome (UTSJ) Thermal	1953/1955	20	Rio Grande do Sul

Source: GEO (2014)

4.2 Overview of CMM Emissions and Development Potential

The Global Methane Initiative (GMI) International CMM Projects Database currently identifies no projects in Brazil, in operation or development. Updates on future CMM projects in Brazil can be found at <https://www.globalmethane.org/coal-mines/cmm/index.aspx>.

4.2.1 CMM EMISSIONS FROM OPERATING MINES

Methane emissions in Brazil totaled 63.0 million cubic meters (m³) in 2000, are expected to increase to 102.2 million m³ by 2015, and then further increase to 146.4 million m³ by 2030 (see Table 4-4).

Table 4-4. Brazil's CMM Emissions (million cubic meters)

Emissions	2000	2005	2010	2015 (projected)
Total CH ₄ Emitted	63.0	72.1	80.5	102.2

Source: USEPA (2012)

4.2.2 CMM EMISSIONS FROM ABANDONED COAL MINES

No data were found quantifying methane emissions from abandoned mines.

4.2.3 CBM FROM VIRGIN COAL SEAMS

No data were found quantifying production from virgin coal seams.

4.3 Opportunities and Challenges to Greater CMM Recovery and Use

Brazil has signed and ratified both the UNFCCC and the Kyoto Protocol (see Table 4-5). As a party to the Kyoto Protocol, CMM projects in Brazil can be expected to benefit from revenues deriving from the sale of carbon emission reduction credits.

Table 4-5. Brazil's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 4, 1992	February 28, 1994
Kyoto Protocol	April 29, 1998	August 23, 2002

Source: UNFCCC (2014)

Brazil's National Plan on Climate Change (Plano Nacional sobre Mudança do Clima or PNMC, in Portuguese), finalized in December 2008 and last amended in 2010, established a voluntary national greenhouse gas (GHG) reduction target of between 36.1 percent and 38.9 percent of projected emissions by 2020 (CPW, 2014). Unlike other top GHG-emitting countries, however, more than 75 percent of Brazil's emissions are attributed to deforestation, agriculture, and land use change rather than with energy consumption (Yale, nd). In international climate negotiations (e.g., COPs), Brazil typically coordinates with the other BASIC nations (i.e., Brazil, South Africa, India, China) and hosted the Rio+20 United Nations Conference on Sustainable Development in 2012.

4.3.1 MARKET AND INFRASTRUCTURE FACTORS

Brazil's coal mining industry has become increasingly important in recent years attributable to periods of economic uncertainty, instability in the energy sector, and a resulting shift in energy policy. Santa Catarina, the largest coal-producing state, has been the primary beneficiary of the industry's increase in status and importance. However, it also faces increased scrutiny from environmental groups concerned about the negative socioeconomic and environmental impacts caused by the growing industry.

On the technology front, groups are working in Brazil's mining regions to implement Integrated Resource Management techniques. These technical improvements are intended to reduce transportation costs, reduce waste and harmful emissions, and increase the scale of production to increase domestic coal supplies and reduce reliance on imports. Thus far, efforts have resulted in the 1989 establishment of an association of coal mining companies in the State of Santa Catarina, the Sindicato da Industria da Extração de Carvão do Estado de Santa Catarina (SIECESC). SIECESC actively works with the Brazilian Ministry of Environment, the Ministry of Mines and Energy, the National Mineral Production Department (NMPD), and several international organizations to devise strategies to implement regional and global sustainable mining and industry development. In Santa Catarina, for example, SIECESC is coordinating a recovery project (i.e., Project for Environmental Recovery Carboniferous Basin Southern Santa Catarina) to restore lands previously degraded through mining activities and whose results are already being noted (CPRM, 2002).

4.3.2 REGULATORY INFORMATION

Aiming to adjust the current mining regulation and simplify mining procedures, the creation of a new agency—the National Mining Agency—has been proposed, similar to those already in place for petroleum and electricity regulation (the National Petroleum Agency and the National Electric Energy Agency, respectively). The new agency will regulate, supervise, encourage, and increase the development of mineral policy, including the penalties applied to irregular mining activities. These roles have been performed to date by DNPM, which is the entity in charge of authorizing research, permits, and mineral mining concessions, and for other relevant aspects of the industry. Under the new proposal, DNPM is expected to be disbanded, with its functions encompassed by the new agency (ILO, 2011). Despite the new mining agency, no information on regulations pertaining to CMM development in Brazil was found.

4.4 Profiles of Individual Mines

No information profiling individual Brazilian mines was found.

4.5 References

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