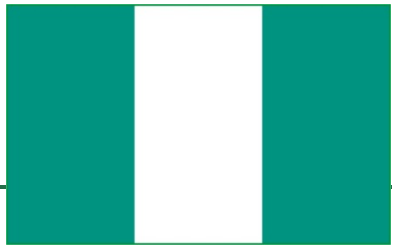
24 Nigeria



24.1 Summary of Coal Industry

24.1.1 Role of Coal in Nigeria

Nigeria ranks low in worldwide coal production, with less than 30 thousand tonnes of coal production in 2012 (Table 22-1). Nigeria estimated its coal reserves at more than 2 billion tonnes, with approximately 650 million tonnes (Mmt) as proven (OnlineNigeria, 2014). Other sources cite different estimates, however, as shown in Table 22-1. Although coal was the first energy resource to be exploited by Nigeria, a transition to diesel fuel for rail transport and to gas for electricity generation led to a decrease in coal production. Coal production has dropped significantly from its high of almost 1 Mmt in 1959.

Table 24-1. Nigeria'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)	21.0	169.0	190.0	50 (0.021%)
Annual Coal Production (2012)	0.03	0	0.03	65 (0.0004%)

Source: EIA (2014)

Nigeria's coal resources are located in the Cretaceous Anambra and Makurdi Basins, and Afikpo Syncline (see Figure 24-1) and occur in two levels: the lower Mamu Formation and the upper Nsukka Formation. Coal seams occur in three main stratigraphic levels (Ogunsola, 2008):

- The brown coals (lignite) of Ogwashi-Asaba Formation of Miocene to Pliocene ages
- The upper and lower sub-bituminous coal measures of Maastrichtian age
- The bituminous coals of the Awgu shales of Coniacian age

Its sub-bituminous coal is low in sulfur and ash content, making it attractive for export to Ghana and Egypt and by European nations as well. Nigeria has Africa's largest deposits of lignite. According to a 1987 Federal Republic of Nigeria document, reserves from coal seams in excess of 1 meter thick are: Ogboyoga (100 Mmt) in the north, and Okaba (70 Mmt), Orupka (60 Mmt), Ezimo (50 Mmt), and Enugo (50 Mmt) in the south (OnlineNigeria, 2014).

Figure 24-1. Nigeria's Coal Fields

Source: CIA (2010), *EarthByte (2008)

Table 24-2 identifies potential stakeholders in Nigerian coal mine methane (CMM) development.

Table 24-2. Key Stakeholders in Nigeria's CMM Industry

Stakeholder Category	Stakeholder	Role
Mining Companies/Equity Owners	▪ Kogi State Government* ▪ Nigerian Coal Corporation (NCC) ▪ Behre Dolbear and Company Inc.	Owner/operator Owner/operator Technical Expertise
Developers, Engineers, Consultancy and Related Services	▪ See http://www.epa.gov/coalbed/networkcontacts.html	Project opportunity identification, planning and assistance
Natural Gas Transmission & Distribution Companies	▪ British Gas ▪ BP ▪ Chevron ▪ Conoco ▪ Deminex ▪ ENI/Agip ▪ ExxonMobil	Gas distribution

Table 24-2. Key Stakeholders in Nigeria's CMM Industry

Stakeholder Category	Stakeholder	Role
Regulatory Agencies	▪ Nigerian National Petroleum Corporation – Department of Petroleum Resources	CMM project promotion, registration of exploration and development companies
Government Groups	▪ Ministry of Mines and Steel Development ▪ National Chamber of Commerce, Industries – Mining and Agriculture ▪ Federal Ministry of the Environment	Granting and approval of leases
	▪ Mining Cadastre Office	Responsible for mineral titles
	▪ Mines Inspectorate Department	Health and Safety administration and enforcement
	▪ Small Scale Mining Department	Organization, support and assistance to small scale miners

Sources: EIA (2013); *USGS (2014)

24.1.2 STATUS OF COAL AND THE COAL MINING INDUSTRY

The Nigerian government is seeking to increase the country's level of coal utilization to help stem the loss of its forests to domestic fuel-wood harvesting and to help reduce its overdependence on oil. At present, however, coal remains the smallest contributor to the overall fuel mix. As per the International Energy Agency (IEA), coal is not part of Nigeria's total primary energy supply in 2011 (IEA, 2013).

Current uses for coal in the country are in cement production, brick factories, foundries, laundries and bakeries, tire manufacture, battery manufacture, and domestic cooking fuel (i.e., smokeless coal briquettes). Nigerian coal can be blended with imported coals for coke production, and it is projected that as much as 200,000 tonnes per year of Nigerian coal could be directed to supply coke to the Ajaokuta Steel Plant once it begins full operation. Using coal to manufacture smokeless briquettes for home cooking fuel has the added benefit of producing by-products such as gases, ammonia, tar oils, and various aromatics that can be used as chemical feedstocks. Nigeria has also determined that its coal is suitable fuel for use at the abandoned Oji Power Station, as well as at other proposed power generation facilities.

Nigeria's generation capacity was 6,000 MW in 2012, of which 79 percent was fired by fossil fuels, principally natural gas. Generation capacity is projected to increase to 25,000 MW by 2020, and fossil fuels are expected to account for 20,000 MW of the total capacity (EIA, 2013; Essien & Igweonu, 2014). Plans call for coal to provide for a significant portion of the projected electric power demand due to Nigeria's large reserve base. By 2020, almost 14 percent of generation capacity is expected to be coal-fired growing to 15.6 percent by 2030 (Sambo, 2008). Consequently, coal demand is projected to increase. In addition to such domestic uses, Nigeria estimates that export demand for its coal could reach 15 Mmt per year (M2M, 2006).

Table 24-3 provides an overview of coal mines and mining methods used in Nigeria.

Table 24-3. Nigeria's Coal Mines

Mine	Coal Type	Estimated Reserves (million tonnes)	Proven Reserves (million tonnes)	Depth of Coal (m)	Mining Method(s)
Okpara	▪ Sub-bituminous	100	24	180	Underground
Onyeama	▪ Sub-bituminous	150	40		Underground
Ihioma	▪ Lignite	40	N/A	20-80	Surface
Ogboyoga	▪ Sub-bituminous	427	107	20-100	Surface and underground
Ogwashi Azagba/Obomkpa	▪ Lignite	250	63	15-100	Surface and underground
Ezimo	▪ Sub-bituminous	156	56	30-45	Surface and underground
Inyi	▪ Sub-bituminous	50	20	25-78	Surface and underground
Lafia/Obi	▪ Bituminous (cokable)	156	21.42	80	Underground
Oba/Nnewi	▪ Lignite	30	N/A	18-38	Underground
Afikpo/Okigwe	▪ Sub-bituminous	50	N/A	20-100	Underground
Amasiodo	▪ Bituminous	1,000	N/A	563	Underground
Okaba	▪ Sub-bituminous	250	73	20-100	Surface and underground
Owukpa	▪ Sub-bituminous	75	57	20-100	Surface and underground
Ogugu/Awgu	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Afuji	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Ute	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Duho	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Kurumu	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Lamja	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Garin Maigunga	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Gindi Akwati	▪ Sub-bituminous	N/A	N/A	N/A	Underground
Janata Koji	▪ Sub-bituminous	N/A	N/A	N/A	Underground

Sources: M2M (2006); Ogunsola (2008)

24.2 Overview of CMM Emissions and Development Potential

The Global Methane Initiative (GMI) International CMM Projects Database currently identifies no CMM recovery projects in Nigeria (GMI, 2014). Updates on future CMM projects in Nigeria can be found at https://www.globalmethane.org/coal-mines/cmm/index.aspx.

24.2.1 CMM Emissions from Operating Coal Mines

Table 24-4 reports Nigeria's historical and projected CMM emissions.

Table 24-4. Nigeria's CMM Emissions (million cubic meters)

Emissions	2000	2005	2010	2015 (projected)
Total CH_4 Emitted	23.8	63.7	67.2	70.7

Source: USEPA (2012)

24.2.2 CMM Emissions from Abandoned Coal Mines

No data quantifying methane emissions from abandoned mines were found.

24.2.3 CBM from Virgin Coal Seams

No data quantifying methane production from virgin coal seams were found.

24.3 Opportunities and Challenges to Greater CMM Recovery and Use

Nigeria has signed and ratified the UNFCCC and has ratified the Kyoto Protocol (see Table 24-5). As a non-Annex 1 country, Nigeria is eligible to host Clean Development Mechanism (CDM) projects that can earn revenue from the sale of carbon credits. While there are some CDM projects related to landfill gas and fugitive emissions (e.g., oil and gas systems) in Nigeria, there are presently no CDM projects related to coalbed/mine methane (UNEP, 2014).

Table 24-5. Nigeria's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 13, 1992	August 29, 1994
Kyoto Protocol	---	December 10, 2004 (Acceptance)

Source: UNFCCC (2014)

The Government of Nigeria acknowledged the importance of developing a national response to climate change, and took steps to build a governance structure to manage the issue. The Government first created a national focal point: the Special Climate Change Unit (SCCU) within the Federal Ministry of Environment and also mobilized the Inter-ministerial Coordinating Committee on Climate Change (BNRCC, 2011). In 2010, the National Assembly passed a bill to create a National Climate Change Commission, which facilitated coordination and support for the multi-level and cross-sectoral adaptation responses, development of a National Climate Change Policy for Nigeria, and of a Nationally Appropriate Mitigation Action (NAMA) programme. In 2011, the Government of Nigeria and a number of civil society organizations embarked upon the development of an initial adaptation strategy and climate change action plan for Nigeria. In September 2012, the Federal Executive Council approved the adoption of the National Policy on Climate Change and Response Strategy (NPCC-RS) as a national document for implementing climate activities in Nigeria (Daily Independent, 2012).

24.3.1 MARKET AND INFRASTRUCTURE FACTORS

Nigeria's robust natural gas industry provides a market conducive to CMM development. The expected increase in gas infrastructure will enhance the ability to move drained CMM from the wellhead to market. On the other hand, Nigeria has such substantial gas resources that supplemental streams captured at coal fields may appear relatively insignificant in comparison, thereby diluting interest in CMM development. Also, the amount of CMM that can be recovered in conjunction with coal mining has been reduced over time.

24.3.2 REGULATORY INFORMATION

Nigeria has the largest natural gas reserves in Africa and is among the top 10 holders of natural gas proven reserves in the world. However, due to inadequate gas infrastructure, Nigeria has flared as much as 75 percent of the gas it produces, accounting for about 10 percent of all gas flared worldwide in 2011 (EIA, 2013). New Nigerian policy seeks to reduce gas flaring by using the gas as feedstock in liquefied natural gas (LNG) processing facilities.

The national government, specifically the Nigerian Coal Corporation (NCC), owns 100 percent of the Nigerian coal industry, but the government's monopoly of coal mining is being relaxed. Beginning in 1990, the NCC initiated efforts to privatize the coal industry by entering into several different joint venture arrangements. While the initial joint ventures have not been successful, the privatization efforts are still being pursued (Ogunsola, 2008).

As part of Nigeria's general privatization plan for the energy sector, the NCC is itself being put up for sale by the Bureau of Public Enterprises (BPE), with some assets being sold individually to pay off accumulated debt (Compass, 2009a; Compass, 2009b). Also, as part of the privatization plans, the coal resources of Nigeria have been divided into 10 prospective blocks and put up for auction. Nine of the blocks were bid for and won by four companies – one Nigerian and three foreign – with the expertise and finances to make use of the resources (Africa, 2010). These sales to capable companies should improve the investment and development climate.

The government also regulates and supervises natural gas production through the Nigerian National Petroleum Corporation (NNPC), formed in 1977. In 1988, the NNPC was commercialized into 12 strategic business units (or subsidiaries), covering the entire spectrum of oil industry operations: exploration and production, gas development, refining, distribution, petrochemicals, engineering, and commercial investments. In addition to these subsidiaries, the industry is also regulated by the Department of Petroleum Resources (DPR), a department within the Ministry of Petroleum Resources, that ensures compliance with industry regulations, processes applications for licenses, distributes leases and permits, and establishes and enforces environmental regulations (NNPC, 2014). The Nigerian Gas Company Limited (NGC), one of the 11 NNPC subsidiaries, is charged with the responsibility of developing an efficient gas industry to fully serve Nigeria's energy and industrial feedstock needs through an integrated gas pipeline network (NGC, 2014).

Currently, there exist two types of gas operator agreements in Nigeria: joint operating agreements and production sharing agreements. Coal mining leases can be obtained either through an approved (by the Ministry of Mines and Steel Development) acquisition of an existing mining property or by applying for a Prospecting Right or License. Gas producers must perform gas field optimization analyses on their concessions and the government is responsible for optimization of gas field development overall.

Nigeria's efforts to wean its population away from harvesting timber for cooking fuel may stimulate coal production and CMM development. As mentioned above, however, the current low level of coal production in the country is not conducive to a robust CMM development industry.

24.4 Profiles of Individual Mines

Adequate data to profile individual mines is not available.

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