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Crude Oil and Natural Gas Production in Africa and the Global Market Situation

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1 - Introduction

Africa is well endowed with abundant crude oil (“oil”) and natural gas (“gas”). African net oil exporters include: Algeria, Angola, Cameroon, Chad, Democratic Republic of Congo, Congo Republic, Equatorial Guinea, Gabon, Libya, Nigeria, and Sudan. Other producers are Cote d’Ivoire, Egypt, Mauritania, South Africa, and Tunisia. Emerging and potential oil producers are Ghana, Kenya, Liberia, Mozambique, Niger, Sao Tome & Principe, Sierra Leone, Somalia, Tanzania, and Uganda. With respect to gas, Algeria, Egypt, Equatorial Guinea, Libya, Mozambique and Nigeria are net exporters while other producers include Angola, Cameroon, Congo, Cote d’Ivoire, Gabon, Morocco, Senegal, South Africa, and Tanzania. Oil and gas resources are central to the economic growth and fiscal situations of an increasing number of countries. However, for many of them, the resource curse syndrome, oil/gas price volatility, oil- and gas-related social and political conflicts and poor oil/gas revenue management have largely eroded the significant gains from higher but volatile export revenues. Therefore, countries with new oil and gas discoveries are going to face a great managerial challenge to avoid the

resource curse syndrome. This brief examines the recent reserves, production, consumption, supply and export of oil and gas as well as their price movements and outlook.

2. Crude Oil and Gas Reserves

Africa’s share of global crude oil reserves stands at 9.6 percent, ranking third region globally (see Table 1). The majority of African oil reserves is located in Libya, Nigeria, Algeria, Angola, and Sudan, which together account for more than 90 percent of the continent’s reserves. Libya and Nigeria account for 3.3 and 2.8 percent, respectively, of world reserves. There is growing knowledge about Africa’s proved oil reserves, which rose from 53.3 billion barrels in 1980 to 117.0 billion barrels in 2005 and to 127.7 billion barrels in 2009.

While OPEC struggles to keep up supply, the gap between potential reserves and current oil output in many African states is tremendous with emerging with emerging new producers like Ghana and Uganda, among others as indicated in Table 2.

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Table 1: Africa's Proved Crude Oil Reserves

Billion barrels		2005	2009
Algeria	Volume	12.3	12.2
	Share	10.5	9.6
Angola	Volume	9.0	13.5
	Share	7.7	10.6
Chad	Volume	0.9	0.9
	Share	0.8	0.7
Rep. of Congo	Volume	1.9	1.9
	Share	1.6	1.5
Egypt	Volume	3.7	4.4
	Share	3.2	3.4
Equatorial Guinea	Volume	1.8	1.7
	Share	1.5	1.3
Gabon	Volume	2.1	3.7
	Share	1.8	2.9
Libya	Volume	41.5	44.3
	Share	35.4	34.7
Nigeria	Volume	36.2	37.2
	Share	31.0	29.1
Sudan	Volume	6.4	6.7
	Share	5.5	5.2
Tunisia	Volume	0.6	0.6
	Share	0.5	0.5
Other Africa		0.6	0.6
Africa	Volume	117.0	127.7

Source: Statistical Review of World Energy 2010

Table 2: Estimated Crude Oil Reserves from Africa's Emerging/Potential Producers

Country	Estimated Crude Oil Reserves (billion barrels)
Ghana	3.21
Kenya	1.52
Liberia	No estimate avail.
Mozambique	3.03
Niger	0.34
Sao Tome and Principe	1.05
Sierra Leone	No estimate avail.
Somalia	4.02
Tanzania	No estimate avail.
Uganda	2.06
Total	15

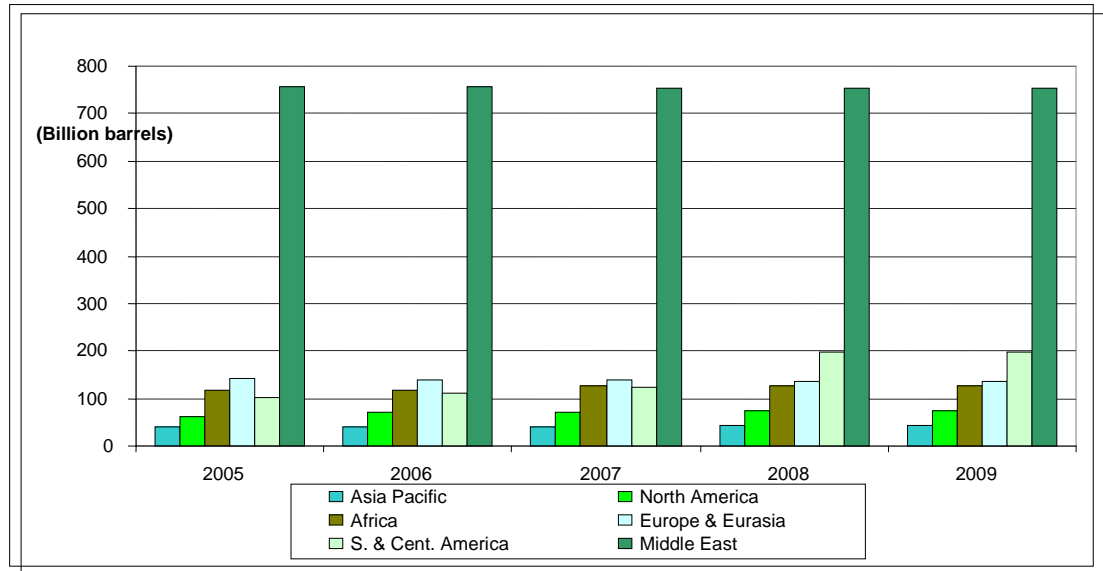
Sources: Reuters estimates.

“Proved natural gas reserves in Africa are concentrated mainly in four countries – Algeria, Egypt, Libya and Nigeria.”

Figure 1 presents a comparative summary of proved crude oil reserves in various regions of the world. It shows that the Middle East region has remained the dominant region, accounting for 56.6 percent of estimated world proven oil reserves in 2009. Africa ranks fourth, with 9.6 percent of global reserves.

The geographical distribution has remained relatively unchanged in the past three decades. The OECD region, which includes the major oil- and gas-consuming countries in the world, accounts for less than 7.0 percent of global reserves.

Figure 1: Proved Crude Oil Reserves by World Regions, 2005-2009



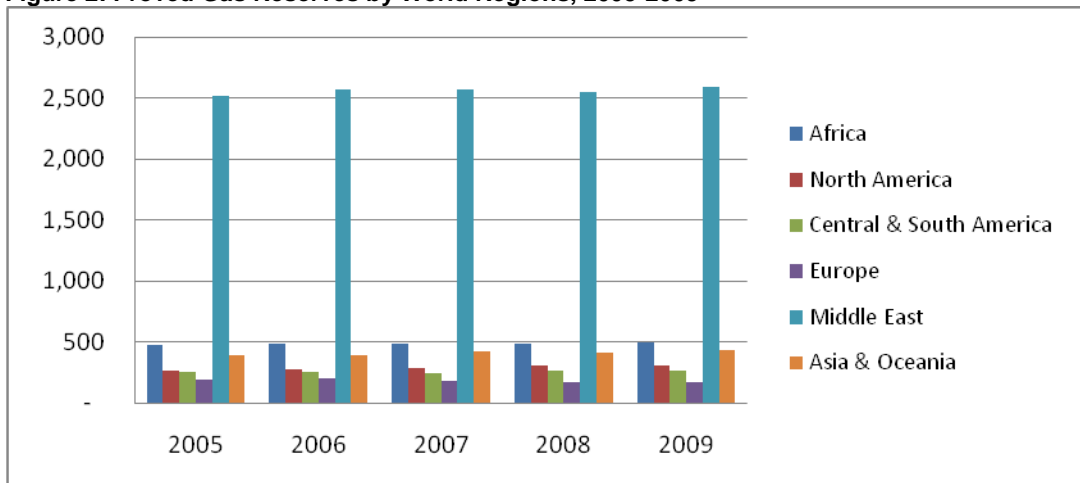
Source: AfDB Statistics Department, using data from Statistical Review of World Energy 2010

Proved natural gas reserves in Africa are concentrated mainly in four countries – Algeria, Egypt, Libya and Nigeria – which possess 91.5 percent of proved reserves. At the end of 2009, the proved gas reserves shares were Nigeria (35.7 percent), Algeria (30.6 percent), Egypt (14.6 percent), Libya (10.5 percent), and others (8.6 percent).

Globally, almost three-quarters of the world’s natural gas reserves are located in the Middle East and Europe/Eurasia.

At the end of 2009, the Middle East alone accounted for 40.6 percent of proven global gas reserves. Africa’s share was only 7.9 percent (see Figure 2).

Figure 2: Proved Gas Reserves by World Regions, 2005-2009



Source: AfDB Statistics Department, using data from BP Statistical Review of World Energy 2010

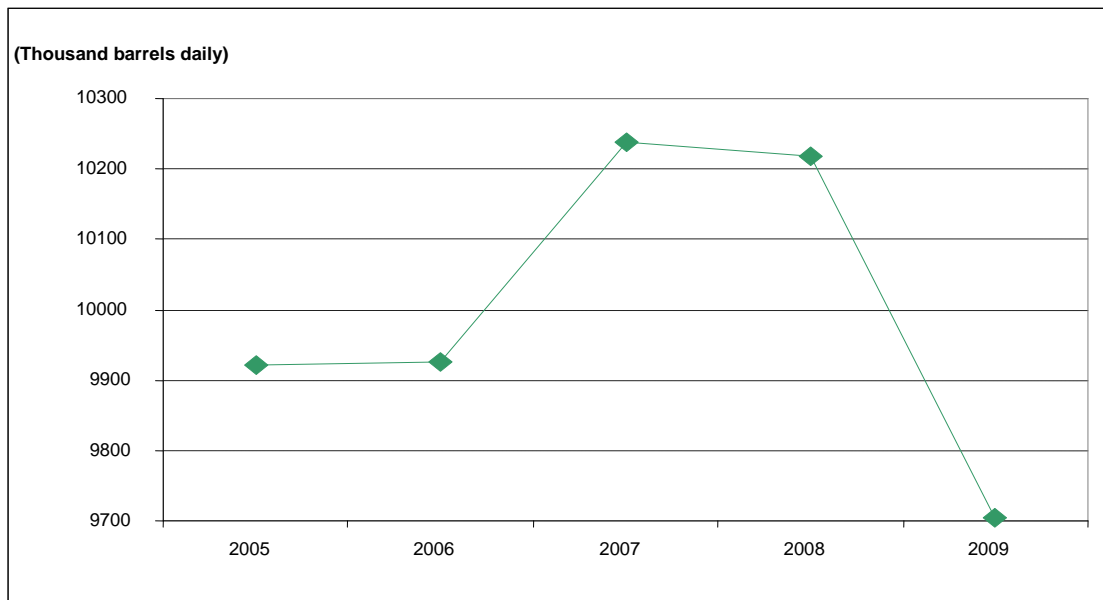
“...the Middle East alone accounted for 40.6 percent of proven global gas reserves. Africa’s share was only 7.9 percent.”

3. Production of Oil and Gas

African countries' oil production trend between 2005 and 2009 is shown in Figure 3. The figure shows that Africa's production rose from 9,921 thousand barrels per day in 2005 to 10,238

thousand barrels per day in 2007 before falling to 9,705 thousand barrels per day in 2009.

Figure 3: Africa Crude Oil Production, 2005-2009

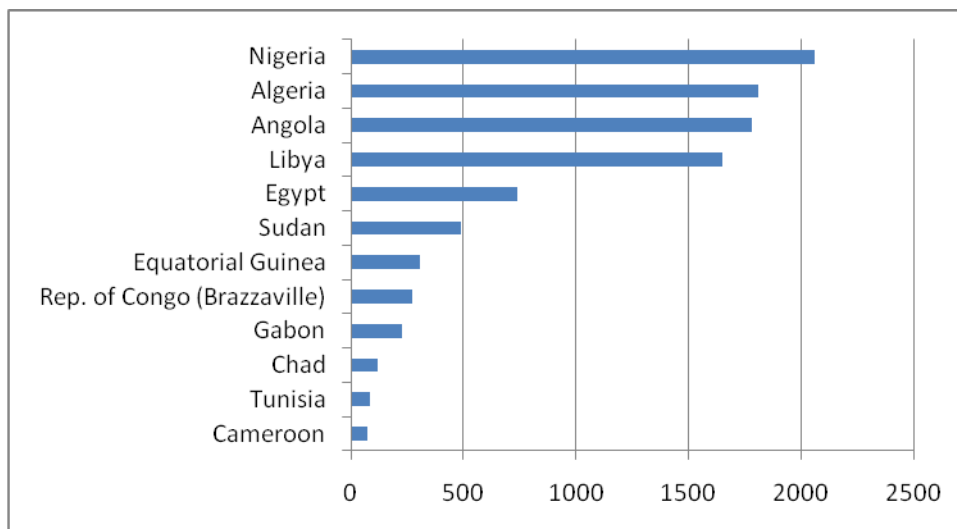


Source: AfDB Statistics Department, using data from Statistical Review of World Energy 2010

“...Africa’s oil production rose from 9,921 thousand barrels per day in 2005 to 10,238 thousand barrels per day in 2007 before falling to 9,705 thousand barrels per day in 2009.”

Figure 4 presents African countries' oil production shares in 2009. The four major oil producers in Africa together account for 77 percent of the continent's production.

Figure 4: Africa: Oil Production by Country, 2009 (Thousand barrels daily)



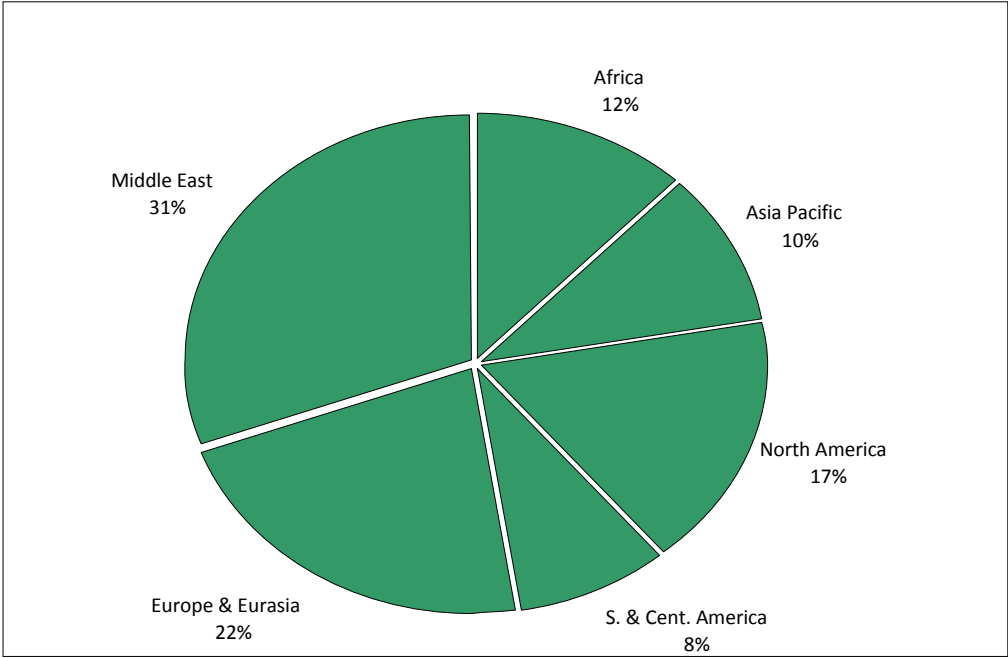
Source: AfDB Statistics Department, using data from Statistical Review of World Energy 2010

“Natural gas production in Africa rose from 17 billion cubic feet in 2005 to 20.7 billion cubic feet in 2008, before falling to 19.7 billion cubic feet in 2009 in spite of a large production capacity.”

Globally as with reserves, the largest production (31 percent) came from the Middle East at the end of 2009, with Africa’s share standing at 12 percent (see

Figure 5), down from 12.6 percent attained in 2007.

Figure 5: Crude Oil Production Share by World Regions, 2009

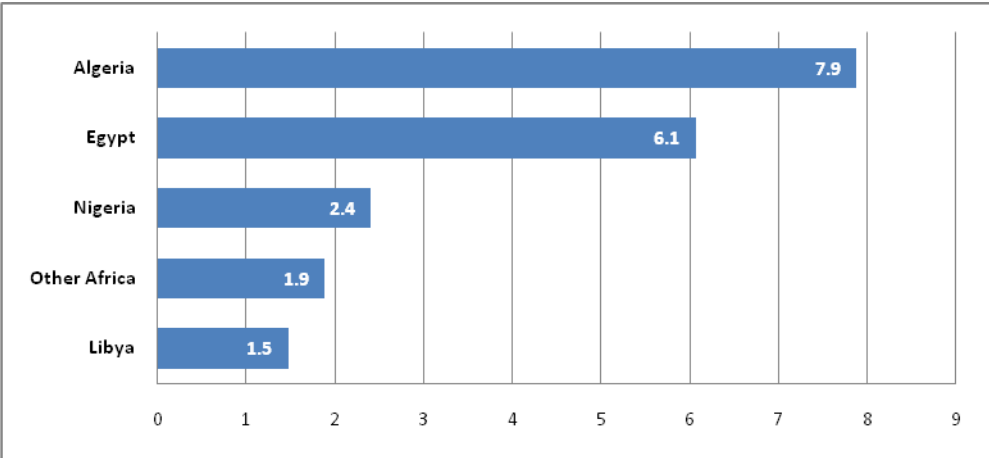


Source: AfDB Statistics Department, using data from Statistical Review of World Energy 2010

Natural gas production in Africa rose from 17 billion cubic feet in 2005 to 20.7 billion cubic feet in 2008, before falling to 19.7 billion cubic feet in 2009 in spite of a large production capacity. Algeria is the leading African producer of natural gas, representing 2.7 percent of the total world share in 2009, followed by Egypt (2.1 percent) and Nigeria (0.8 percent). On a continental basis, Algeria’s share in 2009 stood

at 40 percent followed by Egypt (30.7 percent),Nigeria (12.2 percent), Libya (7.5 percent), and others (9.6 percent). Figure 6 highlights the production levels of the individual countries in 2009. On a global basis, the largest production (26 percent) came from North America at the end of 2008, with Africa’s share standing at only 7 percent (see Figure 7).

Figure 6: Africa: Gas Production by Country, 2009 (Billion cubic feet per day)

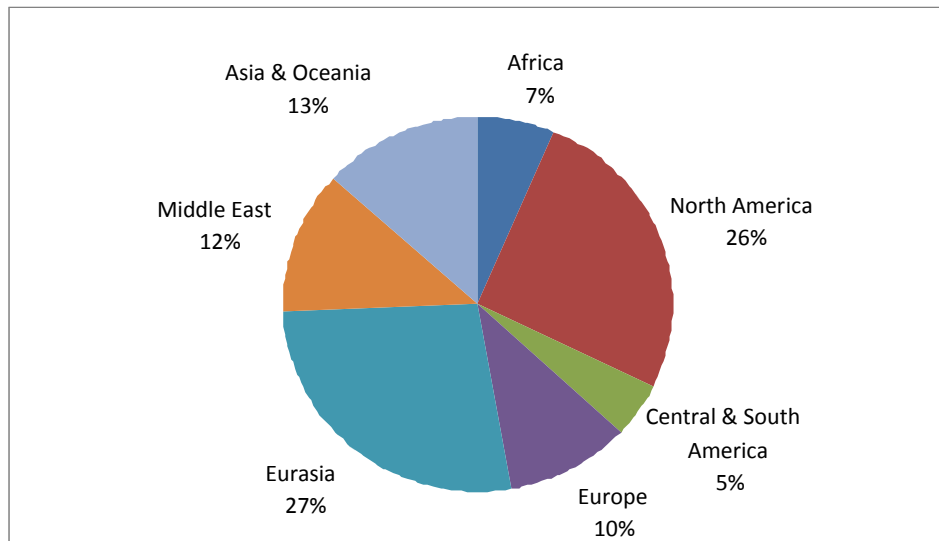


Source: AfDB Statistics Department, using data from BP Statistical Review of World Energy 2010

“...the largest production (26 percent) came from North America at the end of 2008, with Africa’s share standing at only 7 percent.”

“One can reasonably assume that the region’s low consumption of crude oil and hence low share of energy reflect its low access to affordable commercial energy as well as its low level of development.”

Figure 7: Gas Production Share by world Regions, 2008



Source: AfDB Statistics Department, using data from BP Statistical Review of World Energy 2010

4. Oil and Gas Consumption

Table 3 shows the growing pattern of crude oil consumption in Africa. Consumption of crude oil in Africa has grown steadily, with total consumption in 2009 at 3.1 million barrels per day. However, this only represents about 3.7 percent of global consumption. Although Africa accounts for about 15 percent of the world’s population, it consumes only 3.7 percent of global commercial energy.

One can reasonably assume that the region’s low consumption of crude oil and hence low share of energy reflect its low access to affordable commercial energy as well as its low level of development, industrialization, and technological advancement. Paradoxically, Africa’s share in global crude

oil production is about 12 percent, as noted earlier.

Consumption of natural gas in Africa is still very low. Only countries like Egypt, Algeria, and South Africa have relatively high consumption levels (see Table 4). This is mainly associated with previous investments and with the high economic performance of these countries. Africa’s natural gas consumption in 2005 was 7.7 billion cubic feet (BCF) per day; this increased to 9.3 BCF/day in 2008 and falling slightly to 9.1 BCF/day in 2009, representing about 3.2 percent of global consumption.

“Consumption of natural gas in Africa is still very low. Only countries like Egypt, Algeria, and South Africa have relatively high consumption levels...”



Table 3: Oil Consumption * (Thousand barrels daily)

Country	2005	2009	Change 2009 over 2008 (%)	2009 share of total (%)
Algeria	251	331	6.5%	0.4%
Egypt	629	720	3.6%	0.9%
South Africa	516	518	-2.9%	0.6%
Other Africa	1405	1513	0.3%	1.8%
Total Africa	2800	3082	1.1%	3.7%
Total World	83513	84077	-1.7%	100.0%
of which: European Union #	15204	14143	-4.4%	17.3%
OECD	49489	45327	-4.8%	53.4%
Former Soviet Union	3798	3965	-4.0%	4.7%
Other EMEs	30226	34785	2.8%	41.9%

Source: BP Statistical Review of World Energy

Table 4: Natural Gas: Consumption (Billion cubic feet per day)

Region	2005	2009	Change 2009 over 2008	2009 share of total
Total North America	75.0	78.5	-1.2%	27.8%
Total S. & Cent. America	11.9	13.0	-4.2%	4.6%
Total Europe & Eurasia	107.8	102.4	-6.8%	35.9%
Total Middle East	27.0	33.4	4.4%	11.7%
Algeria	2.2	2.6	5.5%	0.9%
Egypt	3.1	4.1	4.4%	1.5%
Other Africa	2.4	2.4	-16.9%	0.8%
Total Africa	7.7	9.1	-1.9%	3.2%
Total Asia Pacific	38.5	48.0	3.4%	16.8%
Total World	267.8	284.5	-2.1%	100.0%
European Union	47.8	44.5	-5.9%	15.6%
OECD	136.4	139.2	-3.1%	49.1%
Former Soviet Union	56.7	54.1	-7.3%	19.0%
Other EMEs	74.7	91.2	2.9%	32.0%

Source: BP Statistical Review of World Energy

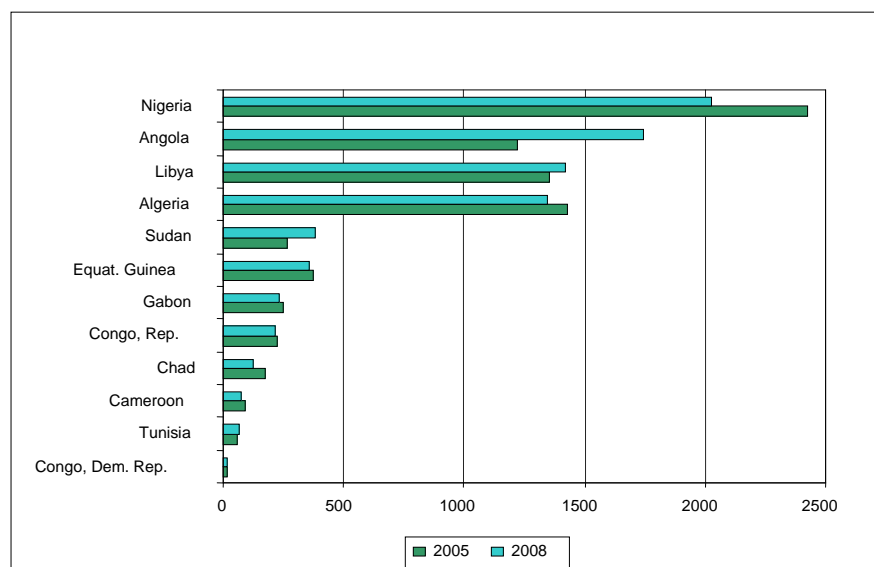
5. Crude Oil and Gas Trade

Figure 8 shows the export volumes of crude oil by African countries. African countries exported 19 percent of the global total in 2008. Export values are shown in Table 5. Export receipts as a percentage of GDP rose from 14.4 percent in 2004 to 22.3 percent in 2008 but these averages mask country differences. Its share in total exports

averaged 41 percent in 2004 and 52.2 percent in 2008 while oil export as a percentage of government domestic revenues averaged 69 percent in 2008.

“Oil export receipts as a percentage of GDP rose from 14.4 percent in 2004 to 22.3 percent in 2008 but these averages mask country differences.”

Figure 8: Africa: Crude Oil Net Exporters



Source: AfDB Statistics Department and US Energy information administration

Table 5: African Countries' Oil Exports as % of GDP, Total Exports and Government Domestic Revenue, 2004-2008

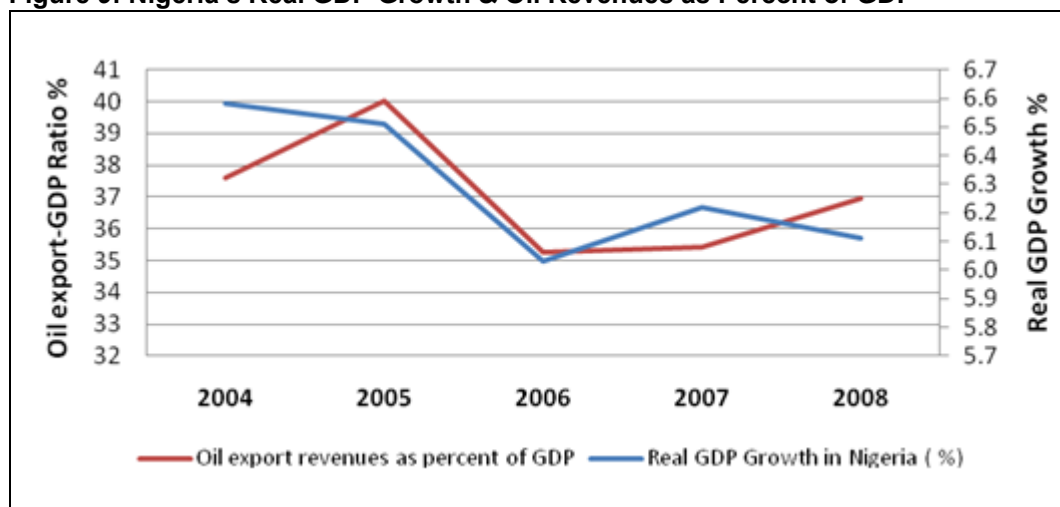
Countries	Value of Oil exports (Billion USD)		Oil exports as % of GDP		Oil exports as % of total exports		Oil exports as % Government Revenue	
	2004	2008	2004	2008	2004	2008	2004	2008
Algeria	31.6	77.1	37.0	45.9	97.9	97.8	102.0	110.7
Angola	12.4	61.7	62.8	72.6	92.3	96.5	170.3	143.8
Cameroon	1.1	2.7	6.9	11.4	40.1	47.3	43.4	55.0
Chad	1.7	3.8	38.8	45.1	78.8	89.6	255.5	164.8
Congo, Dem. Rep.	0.4	0.8	5.5	6.8	19.9	11.9	47.8	33.2
Congo, Rep.	2.7	7.5	58.4	71.0	79.0	95.5	191.3	136.3
Cote d'Ivoire	1.2	3.0	7.8	12.7	17.5	29.5	42.3	62.7
Egypt, Arab Rep.	3.9	11.2	5.0	6.8	37.4	38.2	23.7	27.5
Equatorial Guinea	4.6	14.3	96.1	88.4	97.4	99.3	313.4	182.9
Gabon	3.4	7.5	47.4	52.0	83.5	81.0	161.3	161.6
Libya	19.5	60.7	58.7	72.6	95.7	98.6	109.5	103.9
Mauritania	0.0	0.3	0.0	9.4	0.0	18.4	0.0	42.4
Nigeria	33.0	74.3	37.6	36.9	89.5	92.2	106.3	109.2
Sudan	3.1	11.9	14.4	20.6	82.8	96.2	73.1	94.4
Africa	120.1	341.6	14.4	22.3	41.0	52.2	53.2	69.2

Source: AfDB database & WEO 2010. IMF

Figure 9 shows that Nigeria's real GDP growth had a largely positive association with oil export revenues, implying that oil export revenue volatility was immediately reflected in the economic growth volatility in Nigeria, just as in other African countries that depend largely on single commodities for foreign exchange earnings.

There is therefore an urgent need for monocultural economies to diversify their revenue bases in order to reduce the dependence on single commodities.

Figure 9: Nigeria's Real GDP Growth & Oil Revenues as Percent of GDP



Source: Statistics Department, African Development Bank

Oil imports for some African countries, averaging 2% of global oil imports. It clearly shows Africa's limited significance with respect to crude oil imports as well as derived products, as opposed to its significant contribution to basic world crude oil exports (see Table 6) Consequently, oil imports account for a relatively small proportion of GDP (see Table 7).

However, oil imports accounts for a good chunk of total imports and government revenues and this partly accounts for poor external account balance of most net oil-importing countries. Figure 10 illustrates the relative oil import positions of the major net oil importing countries in Africa in 2005 and 2008.

“Oil imports for some African countries, averaging 2% of global oil imports. It clearly shows Africa’s limited significance with respect to crude oil imports as well as derived products...”

Table 6: Imports of Crude Oil* (Thousand Barrels Per Day)

Country	2004	2005	2006	2007	2008
Cote d'Ivoire	71.8	68.6	80.9	82.0	82.0
Ghana	32.2	30.1	14.3	41.0	42.0
Kenya	40.8	36.1	34.1	33.0	32.0
Morocco	118.8	129.6	125.2	126.0	131.0
Senegal	22.2	21.0	7.5	15.0	14.0
Sierra Leone	5.3	6.0	4.5	0.0	0.0
South Africa	470.5	537.5	442.5	451.0	470.0
Zambia	10.9	11.4	11.6	13.0	14.0
Net Importers	772.4	840.3	720.7	761.0	785.0
Africa	872.7	988.6	868.7	895.4	923.2
Africa (% of World Total)	2.0	2.2	2.0	2.0	2.0
World	43543.1	44291.9	44376.6	44461.6	46160.0

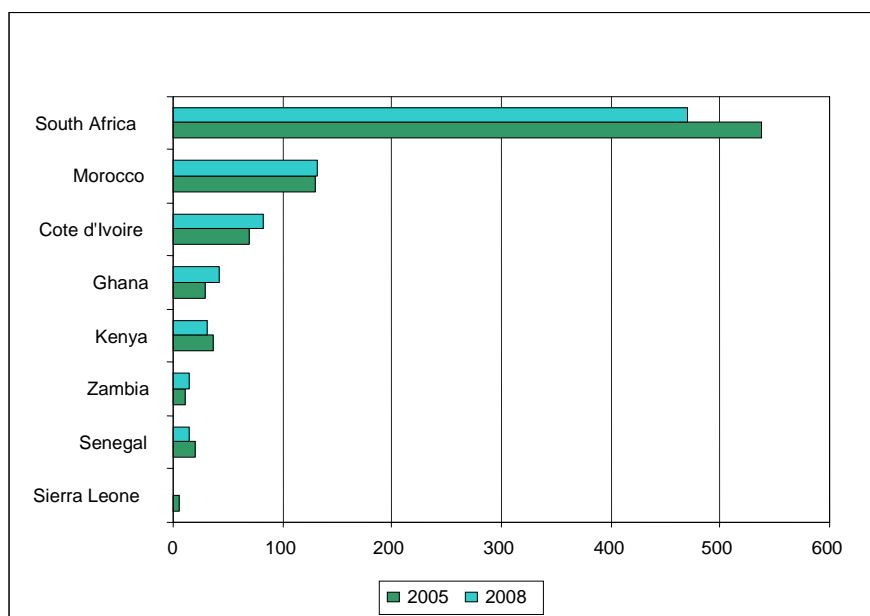
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Source: AfDB Statistics Department and US Energy information administration



Table 7: African Net Oil Importers: Value and as % of GDP, Total Imports and Government Domestic Revenue, 2004-2008

Year	Africa			
	Value of Oil Imports (Billion USD)	Oil imports as % of GDP	Oil imports as % of total imports	Oil imports as % of government domestic revenue
2004	26.8	3.2	12.9	11.9
2005	36.8	3.7	11.3	12.6
2006	46.9	4.2	12.7	13.1
2007	52.1	4.0	11.3	13.3
2008	70.2	4.6	12.1	14.2

Figure 10: Africa Crude Oil Net Importers (Thousand barrels daily)

Source: AfDB Statistics Department and US Energy information administration

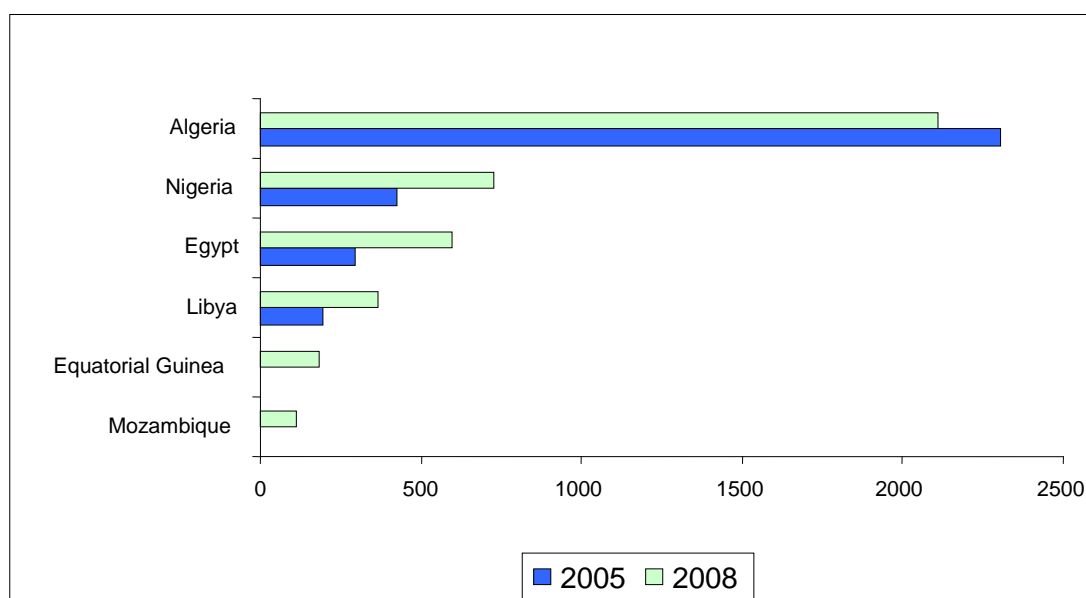
Figure 11 shows the export volumes of natural gas by major African exporters, with Algeria accounting for the highest export volumes of 51.5 percent of the total. In contrast however, Mozambique had the lowest export volumes of 2.8 percent. In 2008, African countries exported only 11.8 percent of the global total gas exports, though this represented some increase from the level of 9.5 percent in 2004.

Export values, which showed an increasing trend from US\$16.4 billion in 2004 to US\$37.5 billion in 2008, are shown in Table 8 while exports as a percentage of GDP are presented in Table 9. Gas export receipts as a proportion of government domestic revenues averaged 7.6 percent in 2008.



“Export values, showed an increasing trend from US\$16.4 billion in 2004 to US\$37.5 billion in 2008.”

Figure 11: Africa Natural Gas Exporters (Billions Cubic Feet)



Source: AfDB Statistics Department and US Energy Information Administration

Table 8: Africa: Value of Natural Gas Exports (Million USD)

Country	2004	2005	2006	2007	2008
Algeria	13053.9	21094.9	15061.9	14773.7	19276.9
Egypt	235.9	2679.3	4132.2	4016.5	5466.1
Equatorial Guinea	0.0	0.0	0.0	361.7	1673.4
Libya	456.8	1767.9	2078.3	2520.9	3359.8
Mozambique	0.0	0.0	317.9	734.0	1033.8
Nigeria	2676.4	3891.3	4298.5	5542.5	6638.2
Africa	16423.0	29433.3	25888.9	27949.3	37448.2
Africa (%World Total)	9.5%	10.6%	11.8%	11.7%	11.8%
World	173369.9	277792.3	219345.4	238550.3	316921.6

Source: AfDB Statistics Department and US Energy Information Administration

Table 9: African Countries' Natural Gas Exports as % of GDP, Total Exports and Government Domestic Revenues, 2004 and 2008

Indicator	Year	Algeria	Egypt	Equatorial Guinea	Libya	Mozambique	Nigeria	Africa
Natural gas Exports as % of GDP	2004	15.3	0.3	0.0	1.4	0.0	3.0	2.0
	2008	11.5	3.3	10.3	4.0	10.4	3.3	2.4
Natural Gas Exports as % of Total Exports	2004	43.5	2.1	0.0	2.2	0.0	7.7	6.8
	2008	26.9	18.9	10.5	5.4	35.9	7.3	6.5
Natural Exports as % Government Domestic Revenues	2004	42.2	1.4	0.0	2.6	0.0	8.6	7.3
	2008	27.7	13.4	21.3	5.8	40.7	9.8	7.6

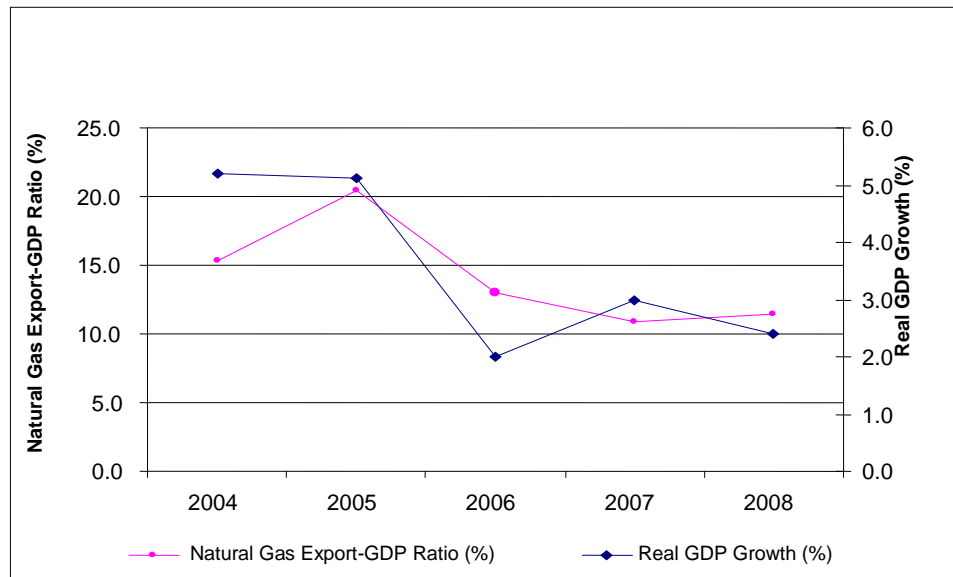
Source: AfDB Statistics Department and US Energy Information Administration.

“There is an urgent need for improved management of natural revenues to promote sustainable growth and development of African economies...”

Natural gas imports for major importers in Africa averaged just 0.5 percent of global imports in 2008, rising from 0.2 percent in 2004. Three major importers in the Continent that year were South Africa (65 percent), Tunisia (25 percent) and Morocco (10 percent). As Figure 12 shows, Algeria’s real GDP growth had had a poor positive

association with natural gas export revenues, indicating that gas export revenues do not have significantly positive effect on the countries’ economic growth. There is therefore an urgent need for improved management of natural revenues to promote sustainable growth and development of African economies.

Figure 12: Algeria’s Real GDP Growth & Natural Gas Export Revenues as Percent of GDP



Source: AfDB Statistics Department and US Energy Information Administration

6. Oil and Gas Price Movements

A barrel of crude oil that was trading between US\$18 and US\$23 in the 1990s; crossed the US\$40 mark in 2004; and rose to about US\$60 from 2005. During the summer of 2007, the price of one barrel of crude oil jumped above US\$70 and even crossed the US\$147 mark in July 2008. Figure 13 displays the price trend of Brent crude oil between 1995 and early June 2010. The oil price had the greatest price gain among key commodities in 2008 and ironically about the highest loss (with natural gas and metals) in 2009 consequent upon the financial crisis.

After the price collapse of late 2008 and early 2009, recovery commenced in the second quarter of 2009 and reached its recent peak in April 2010 before the recent high volatility. However, spot crude oil prices were volatile from May 2010, with the Euro zone debt crisis triggering a meltdown in both financial and oil

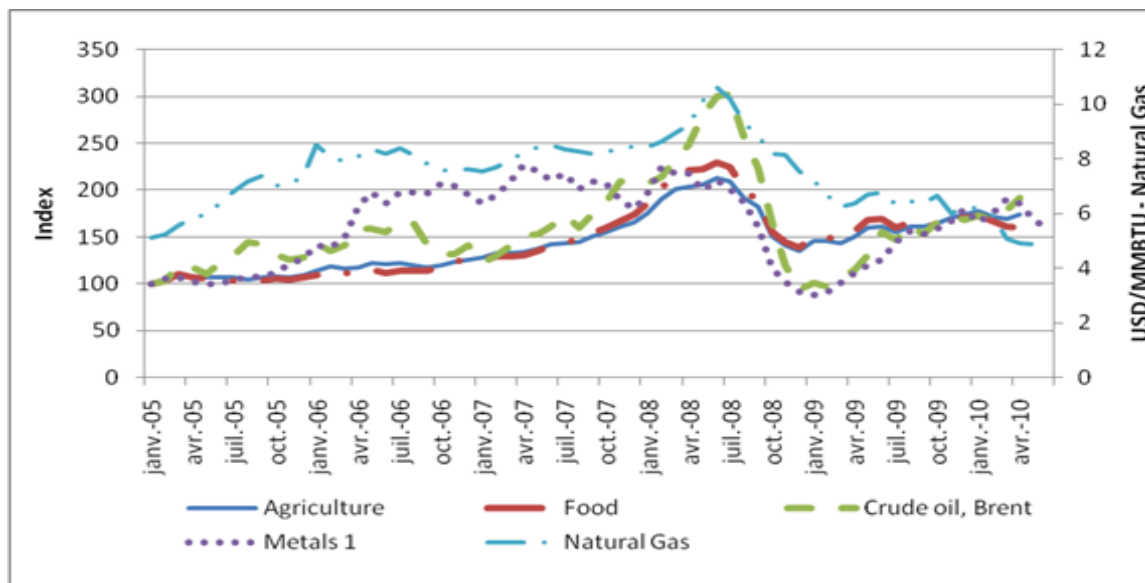
markets and setting in motion a sea change in market sentiment.

Table 10 presents the spot and futures prices for Brent and New York Mercantile Exchange (NYMEX) West Texas Intermediate (WTI) for the period, 2005 to 2010 on annual, quarterly and monthly basis.

Since January 2005, natural gas prices had experienced some volatility (see Figure 13). It hit a trough of US\$2.4 in August 2009 due to the financial crisis that adversely affected commodity prices. Natural gas prices hit their high early in 2010 as cold weather during the winter drove up heating demand. However, prices have since fallen back to under US\$4 per Million Metric British Thermal Units (MMBtu).

“After the price collapse of late 2008 and early 2009, recovery commenced in the second quarter of 2009 and reached its recent peak in April 2010 before the recent high volatility...”

Figure 13: Monthly Price Index of Oil, Natural Gas, Metals, Agriculture Commodities and Food



Source: Authors with data from World Bank & Bloomberg

Table 10: Trend in the Spot and Futures Crude Oil, 2005-2010

Annual	2005	2006	2007	2008	2009	2010
WTI crude Future		67.5	71.3	100.8	72.4	81.4
WTI crude spot	56.6	66.1	72.2	99.9	62.0	78.1
Brent crude Future		66.7	70.9	102.6	72.2	80.7
Brent crude spot	54.5	65.5	73.1	98.0	62.3	77.7
Natural Gas Future USD/MMBtu	6.4	8.0	8.2	9.0	6.5	5.2
Natural Gas Spot USD/MMBtu	8.9	6.7	7.0	8.9	3.9	4.7

Quarterly	Q1- 2009	Q2- 2009	Q3- 2009	Q4- 2009	Q1- 2010	Q2- 2010	Q3- 2010
WTI crude Future	60.6	70.5	76.0	82.0	82.1	82.6	78.4
WTI crude spot	43.2	59.7	68.1	76.0	78.8	77.9	77.3
Brent crude Future	60.3	70.0	75.9	82.0	81.0	82.1	77.5
Brent crude spot	45.3	59.3	68.5	75.3	77.0	78.8	77.2
Natural Gas Future USD/MMBtu	6.7	6.6	6.4	6.3	5.7	5.0	4.8
Natural Gas Spot USD/MMBtu	4.5	3.7	3.2	4.4	5.1	4.3	4.6

Monthly	Jan- 10	Feb- 10	Mar- 10	Apr- 10	May- 10	Jun- 10	Jul- 10	Aug- 10
WTI crude Future	82.8	79.7	83.4	88.9	80.5	78.5	77.6	79.4
WTI crude spot	78.4	76.4	81.3	84.5	73.7	75.4	76.4	78.6
Brent crude Future	81.9	78.5	82.3	88.6	80.3	77.7	76.4	79.2
Brent crude spot	76.9	74.7	79.2	85.1	76.1	75.3	75.8	79.2
Natural Gas Future USD/MMBtu	6.2	5.9	5.1	4.9	4.9	5.2	4.9	4.6
Natural Gas Spot USD/MMBtu	5.8	5.3	4.3	4.0	4.1	4.8	4.6	4.5

Source: Bloomberg

7. Crude Oil and Gas Price Drivers and Outlook

What factors are behind these price volatilities? As with other commodities, factors such as sentiment regarding the recovery in the underlying global economy (including manufacturing and construction data from the U.S. and China, which are major oil consumers), market sentiment generally expressed in equity markets and expectations of a tighter or loose physical market going forward are important in dictating price direction of crude oil. In particular, in addition to the response to the Euro zone debt crisis, oil prices are also being affected by weak underlying fundamentals, including weak global demand, sluggish economic recovery, less than expected growth in non-manufacturing sector, and of course, weak U.S. employment and consumer data. China's slowing economic growth is also raising concerns about energy demand. In addition, the pace of manufacturing growth in China slowed in June 2010 as government steps to cool the property market and curb bank lending combined with a faltering global recovery.

Dollar exchange against major currencies is a critical factor affecting oil price movements. Dollar-denominated commodities like crude oil tend to move inversely to the U.S. currency. In addition, since the early 2000s, commodities such as oil have gone through a process of "financialization", driven by the desire to diversify portfolios in the wake of the equity market bubble in 2000 and by the thinking (rightly or wrongly) that commodities provide a hedge against inflation. This has informed recent investor's behavior in trading in and out of commodities such as oil as an asset class, thus further adding to the price volatility. IEA's forecast for 2011 shows that global daily crude oil consumption will climb 1.3 million barrels, or 1.6 percent, to average 87.8 million a day, compared to an estimate 86.5 million for 2010. Thus means that the rate of demand growth for 2011 will be less than 2010's 2.1 percent due to increased fuel efficiency in the organization for Economic Co-operation and Development (OECD) countries. It is also assumed that the oil price in 2011 would average US\$79.40/bbl. On the other hand, it has been posited that warmer weather and increased production from shale gas fields are the likely causes of gas price falls.

Many producers continue to drill in shale gas regions in order to maintain their leases. Available evidence shows that since bottoming out in July 2008, the rig count has increased 52 percent, with 63 percent of that increase attributable to horizontal rigs. This means that the price outlook for natural gas will remain weak throughout 2010 and in fact, within the short-term. We see nothing very positive on the horizon to push gas prices above their recent trading range for the rest of this year. In addition, in an era of technological progress, greater convergence between global gas markets and the declining relevance of established pricing patterns in the continental European pipeline business appear to be the norm in the short- to medium-term.

8. Is Gas Going to be a Dominant Source of Future Energy Source?

By energy source, the projected increase in natural gas consumption is second only to coal: natural gas currently accounts for 20 percent of global electricity production, second only to coal at 41 percent. In the power sector, natural gas is an attractive choice for new generating plants because of its relative fuel efficiency. Natural gas also burns more cleanly than coal or petroleum products. As more governments begin implementing national or regional plans to reduce carbon dioxide emissions, they may encourage the use of natural gas to displace liquids and coal. The steady increase in the use of natural gas in power generation has resulted in a greater interdependence between gas and electricity markets. Even in developing countries, gas use in energy generation is also increasing. The low price trend of gas further puts it in a better competitive position relative to coal, especially in Europe. Another factor going for gas is that among fossil fuels it has the lowest carbon dioxide emissions (21 percent compared to 44 percent for coal and 35 percent for oil). It has also been estimated that 10 percent coal displacement by natural gas would result in 1.1 billion tons of carbon dioxide by 2030. All these indicate that gas-fired power generation could become the swing resource utilization to provide flexibility in power systems with large shares of intermittent renewable generation.

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"The low price trend of gas further puts it in a better competitive position relative to coal, especially in Europe. Another factor going for gas is that among fossil fuels it has the lowest carbon dioxide emissions (21 percent 35 percent for oil)..."

However, there remains the challenge of reducing vented carbon dioxide emissions (estimated at between 50 and 324 MCO₂/yr by 2020) from natural gas production. Apart from technical and funding challenges, wide cost variations (see Table 11) create uncertainty for policymakers in making effective decisions on emissions reduction in gas

production and processing. Table 12 presents the comparative average abatement costs (2010 and 2020) and the early opportunity (2010) marginal abatement cost curve (MACC).

Table 11: Estimated Costs of reducing vented emissions from natural gas production

Source (\$/tCO ₂ stored)	Year	Capture			Transport	Storage (saline)			Total	Abate (GtCO ₂) 2030-2050
		SC Coal PC (new)	SC Coal PC (retro)	IGCC (new)		Wells etc (onshore)	Wells etc (onshore)	Monitor		
IPCC SRCCS	2005	29-51	45-73	13-37	0-5	0.2-6.2	0.5-30.2	0.3	14-109	0.1-0.6
IPCC FAR	2008			15-75					22-42	0.7
IEA ETP	2008			40-90					50-109	2-4
EC CCS IA	2007							(6-20)	31-50	0.5
Mckinsey MACC	2009	46	54						46-54	3.3-4.1
Stern Report	2006	19-49*							19-49	4
MIT (latest)	2008	52.2*							52	-
Carnegie-Mellon	2007	60.9*		32.4*	(3.1)	(5)			32-61	-

* Includes transport and storage

Source: Zakkour (2009)¹

NB: tCO₂=total carbon dioxide; IPCC SRCCS = Intergovernmental Panel on Climate Change Special report on carbon Dioxide capture and Storage; IPCC FAR=IPCC Fourth Assessment Report; IEA ETP International Energy Agency Energy Technology Perspectives; EC CCS IA= European Commission Carbon Capture and Geological Storage Impact Assessment; Mckinsey MACC = Mckinsey marginal abatement cost curve; MIT=Massachusetts Institute of Technology; SC Coal PC= supercritical coal/pulverized coal; IGCC=International green Computing Conference; GtCO₂=Gigatons of carbon dioxide.

A related concern is the oil and gas systems methane emissions (57 percent of total), which the Intergovernmental Panel on Climate Change (IPCC) has classified as the second most important greenhouse gas, accounting for about 18 percent of total radiative (climate) forcing, or about one-third of that of carbon dioxide.

Overall, global anthropogenic methane emissions are projected to increase by 23 percent to 7,904 million metric tons of carbon dioxide equivalent (MMTCO₂E) by 2020².

“Overall, global anthropogenic methane emissions are projected to increase by 23 percent to 7,904 million metric tons of carbon dioxide equivalent (MMTCO₂E) by 2020...”

¹ Zakkour, P (2009), Reducing vented emissions from natural gas production, Presented at the Natural Gas Utilisation and Climate Change Extractive Industries Week, World Bank, Washington, DC, March 2009.

² See Fernandez, R. (2009), Methane to Markets: Oil and Gas Systems Methane Emissions -A Greenhouse Gas Reduction and Revenue Generating Opportunity, Presented at the Extractive Industries Week, World Bank, Washington, DC, March 2009.

Table 12: Estimated Costs of reducing vented emissions from natural gas production –all “early opportunities”⁽¹⁾

	2010		2020	
	Abatement potential (MtCO ₂)	Average Cost (\$/tCO ₂)	Abatement potential (MtCO ₂)	Average Cost (\$/tCO ₂)
NGP	219	18	318	14
Ammonia	97	62	97	62
Fertilizer	97	92	12	92
Ethanol	14	104	14	103
Refineries	292	115	292	115
Hydrogen	6	115	6	115
Cement	600	138	600	138
Coal power	0	n.a.	93	36
Gas power	0	n.a.	28	48
Total	1,240	-	1,455	-

Notes: IPCC defines early opportunities as projects that (are likely to) ‘involve CO₂ captured from a high purity, low-cost source, the transport of CO₂ over distances of less than 50 km, coupled with CO₂ storage in a value-added application such as EOR’. Early opportunities here include longer transport distances and lower purity sources (e.g. cement).

Source: Zakkour (2009)²

It is estimated that 100 billion cubic meters of natural gas is vented or lost through fugitive emissions from the oil and gas sector worldwide each year. Since methane is 21 times as potent a greenhouse gas as carbon dioxide, these emissions add more than 1000 million metric tons of carbon dioxide equivalent to the atmosphere annually. In addition, global gas flaring results in 400 million metric tons of carbon dioxide to the atmosphere annually. The good news is that it has been estimated that over 30 percent of these emissions could be captured at a profit and therefore billions of dollars are lost annually without action. Though, in some cases, infrastructure and market barriers exist, today technologies do exist to detect, measure, capture and use vented or fugitive methane emissions thus providing cost-effective methane mitigation opportunities and further increase gas-power generation and utilization.

9. Conclusion

It is recognized today that short- to medium-term oil market trends are hinged on two main factors:

“...short- to medium-term oil market trends are hinged on two main factors: the threat to global economic recovery from OECD sovereign debt issues, and the sustainability of Chinese oil demand growth...”

“The successful pathway to fully harnessing the benefits of having oil endowment in Africa is nested in good institutions and governance, and sound economic policies...”

the threat to global economic recovery from OECD sovereign debt issues, and the sustainability of Chinese oil demand growth. Given these factors, the global oil market appears subdued. On the other hand, in Africa’s crude oil-dependent economies, the current price volatility can result in growth instability. Growth volatility, in turn, can result in these countries’ inability to achieve higher levels of living standards. Crude oil endowment, like other natural resources, is a source of wealth if well managed, to support growth and development. This involves converting the wealth into physical and human capital to increase and sustain economic growth, and alleviate poverty. The successful pathway to fully harnessing the benefits of having oil endowment in Africa is nested in good institutions and governance, and sound economic policies. These are indispensable conditions not only for efficient management of oil revenue but also for these countries to diversify away from crude oil dependence.

“The current gas glut is likely to persist for some time to come, with severe repercussions on pricing but it provides new opportunities for consumers and gas-fired power generation and utilization...”

While gas is potentially the fuel of choice in the foreseeable future, the cost and technological challenges to the profitable reduction of carbon dioxide and methane (through carbon capture and storage) from gas production and processing remain huge. In addition, trading in emission certificates would make natural gas significantly more competitive vis-à-vis fossil alternatives since it is widely accepted that the combustion of natural gas emits less carbon dioxide than hard coal and lignite.

The current gas glut is likely to persist for some time to come, with severe repercussions on pricing but it provides new opportunities for consumers and gas-fired power generation and utilization. However, for gas producers it is not yet celebration time while the momentum towards the formation of an Organization of Gas Exporting Countries (“Gas OPEC”) will wane.

