



## OIL AND GAS

### Introduction

In 1956, 50 years ago, the first commercial quantities of oil were found in West Africa, in the Niger Delta basin of Nigeria. It did not take long before the region became known for holding some of the largest reserves of oil and gas in the world. In the short span of twenty years, Nigeria became Africa's top oil producer. During the 1980s and 90s, under the effect of the oil price shocks and ensuing low world prices and significant political transformations (outside and inside Africa), interest in African oil declined.

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But the new century has again led to a surge in demand for African oil and gas. All major international energy firms are heavily investing in Africa, wells are being drilled along the entire coast, from Morocco in the North to Namibia in the South as well as in the interior. Production and proven reserves have attained new heights. Currently, several factors are influencing oil production in West Africa: strong world demand, prices at levels not seen in almost thirty years, new technologies in oil and gas exploration and production, etc.

This chapter of the *Atlas on Regional Integration* will show the current situation of world oil and gas production and the role West African oil and gas is predicted to play over the next decades. It will also highlight some of the future challenges and stakes in the region.

## I. The World of Oil

### 1.1 Still Thirsty

In a simplified way, the world of oil can be divided into two "blocks". One, high consumption net-importing block composed of North America, Europe and Asia Pacific and another one, net-exporting low-consumption composed of the Middle East, former Soviet Union,

**Table 1. Top 10 Consumers, Importers and Exporters in 2005**  
(in million barrels per day and % of World Total)

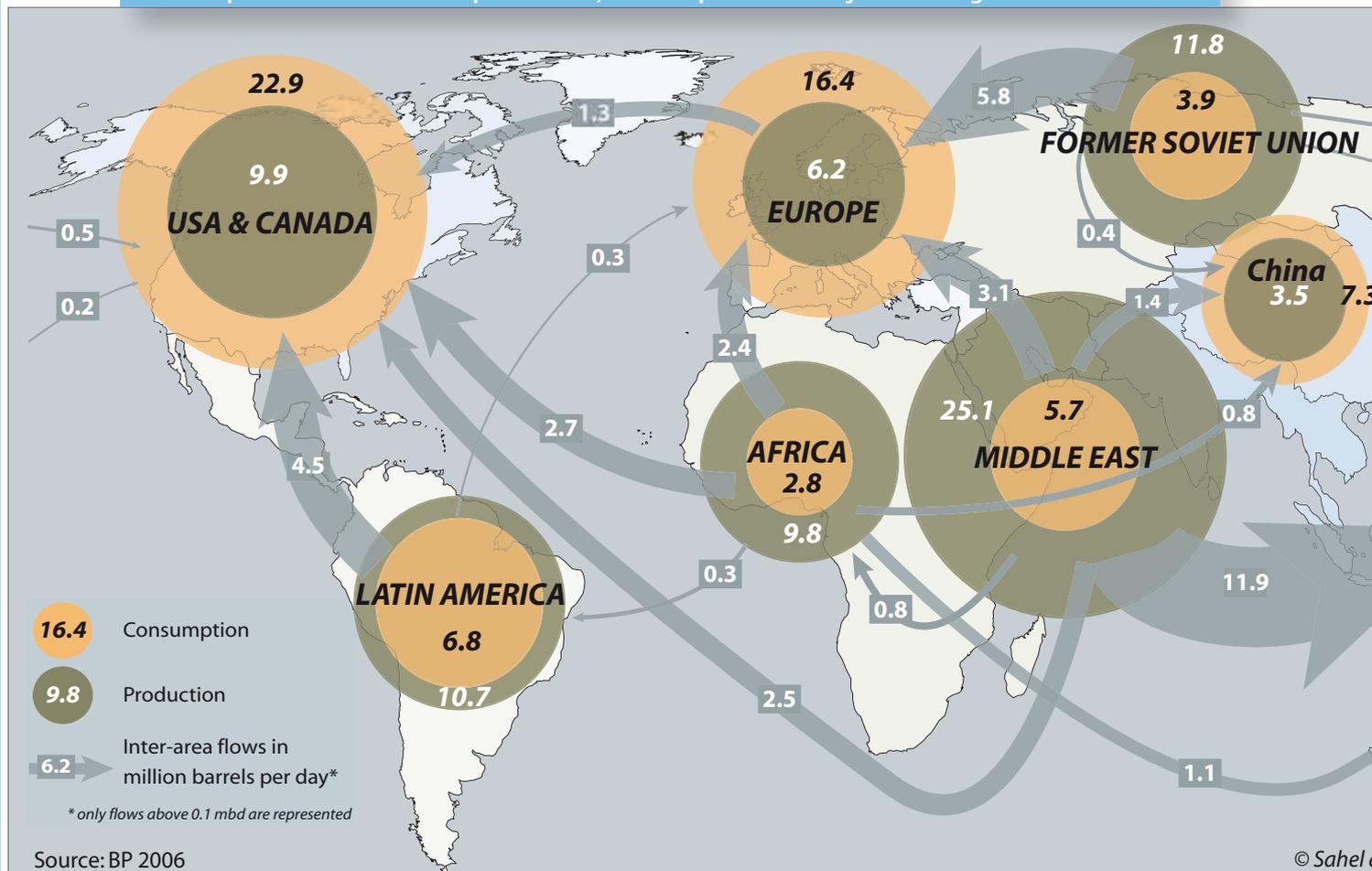
Rank	Consumption		Imports		Exports	
1	USA	20.7 (24.6%)	USA	13.8 (27.7%)	Saudi Arabia	9.1 (18.3%)
2	China	7.3 (8.9%)	Japan	5.4 (10.7%)	Russia	6.8 (13.6%)
3	Japan	5.4 (6.4%)	China	3.7 (7.4%)	Norway	2.7 (5.4%)
4	Russia	2.8 (3.4%)	Germany	2.6 (5.2%)	Venezuela	2.5 (5.3%)
5	Germany	2.6 (3.2%)	South Korea	2.3 (4.6%)	Iran	2.4 (4.8%)
6	India	2.5 (3.0%)	France	2.0 (3.1%)	United Arab Emirates	2.4 (4.8%)
7	South Korea	2.3 (2.7%)	India	1.7 (3.4%)	Kuwait	2.4 (4.7%)
8	Canada	2.2 (2.6%)	Italy	1.7 (3.4%)	Nigeria	2.3 (4.6%)
9	France	2.0 (2.4%)	Spain	1.6 (3.2%)	Mexico	1.8 (3.6%)
10	Mexico	2.0 (2.3%)	Netherlands	1.0 (2.1%)	Algeria	1.8 (3.5%)

Source: BP 2006

Africa and Latin America. (see Map 1). The last decade witnessed only two major changes to this configuration. First, the emergence of Russia and other countries of the former Soviet Union as major crude petroleum exporters (due to large exploration investments and a decline in domestic demand) and second, soaring oil demand, notably in China and India.

The USA accounts for respectively 25% and 28% of total world consumption and imports. In 2005, China was the world's second largest oil consumer and India was sixth. China's 7.2% average annual

Map 1. Crude Petroleum production, consumption and major inter-regional flows in 2005



1. Oil intensity here is defined as the amount of oil consumed per unit of GDP.
2. Russia is by far the largest producer in this group accounting for 80% of production and 90% of exports.
3. If not specified otherwise, all estimates are from the 2004 World Energy Outlook Reference Scenarios. The reference scenario is calculated on the assumption that no major energy policy changes will take effect between now and 2030. The alternative policy scenario from the WEO 2004, that includes changes in policies, estimates world oil demand 10% lower than in the reference scenario. The lower demand is principally attributed to increased energy efficiency in transport.

increase in oil consumption during the last ten years made it the third largest importer of oil, only ten years after having been a net-exporter. China's imports grew at an annual rate of 23% during the same period. Oil consumption in Europe remained relatively stable since 1980, reflecting on the one hand energy diversification and energy efficiency efforts and on the other hand slower population growth. Overall for OECD countries a decrease in oil intensity<sup>1</sup> has been observed during the last decades.

Accounting for almost one third of production and half of inter-regional exports, the Middle East is the world's petrol station. Although, Africa accounts for 12% of global production at best, it is the second largest exporting region with 16% of total exports. Today, Africa accounts for a quarter of European imports and 20% of USA and China's imports. The countries of the former Soviet Union<sup>2</sup>, together account for 15% of world production and 14% of exports.

World refining capacity is still heavily concentrated in importing regions, with USA & Canada, Europe and Asia Pacific, each accounting for around 20% of global capacity. The former Soviet Union, Latin America and the Middle East have an installed refining capacity of 10 % each. Africa accounts for 4% of total refining capacity, of which only 13% is in West Africa.

## 1.2 Global Trends: More will be Flowing

Estimates from the IEA<sup>3</sup> predict a 60% increase in world energy demand over the period 2002 - 2030, with fossil fuels continuing to dominate the energy mix (oil will account for 35% and gas for 25% of total energy demand in 2030). World oil consumption is predicted to increase to 121 million barrels per day (mbpd) in 2030, up from 82 mbpd today.

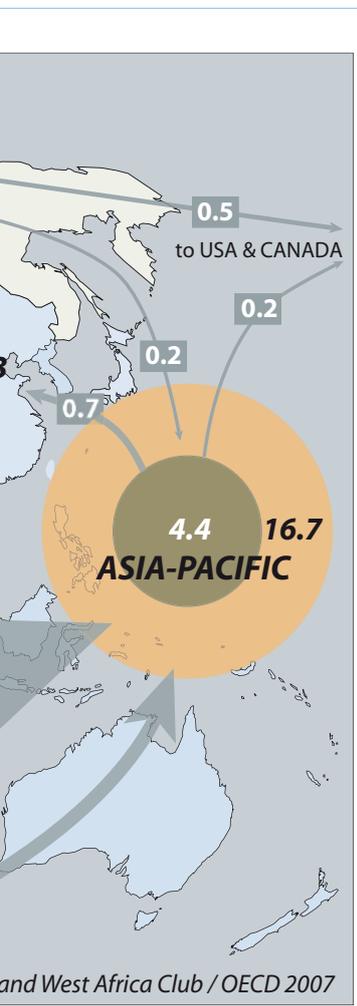
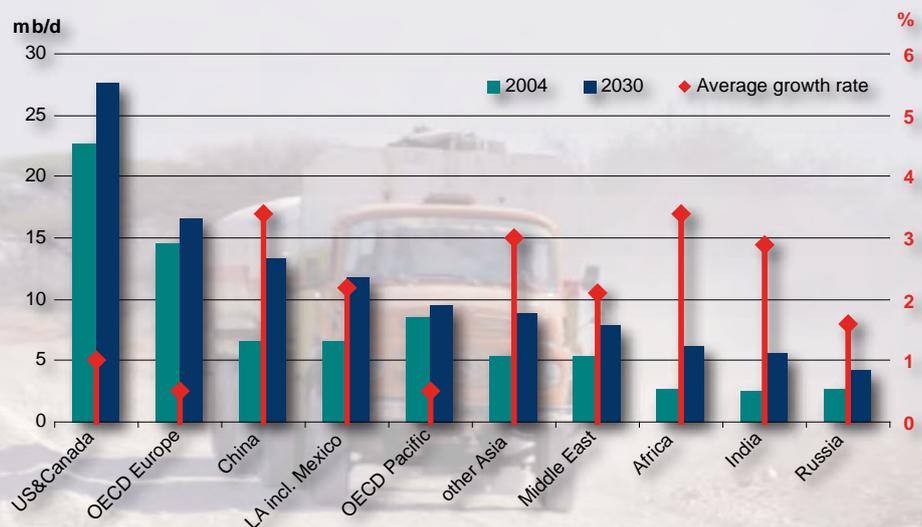
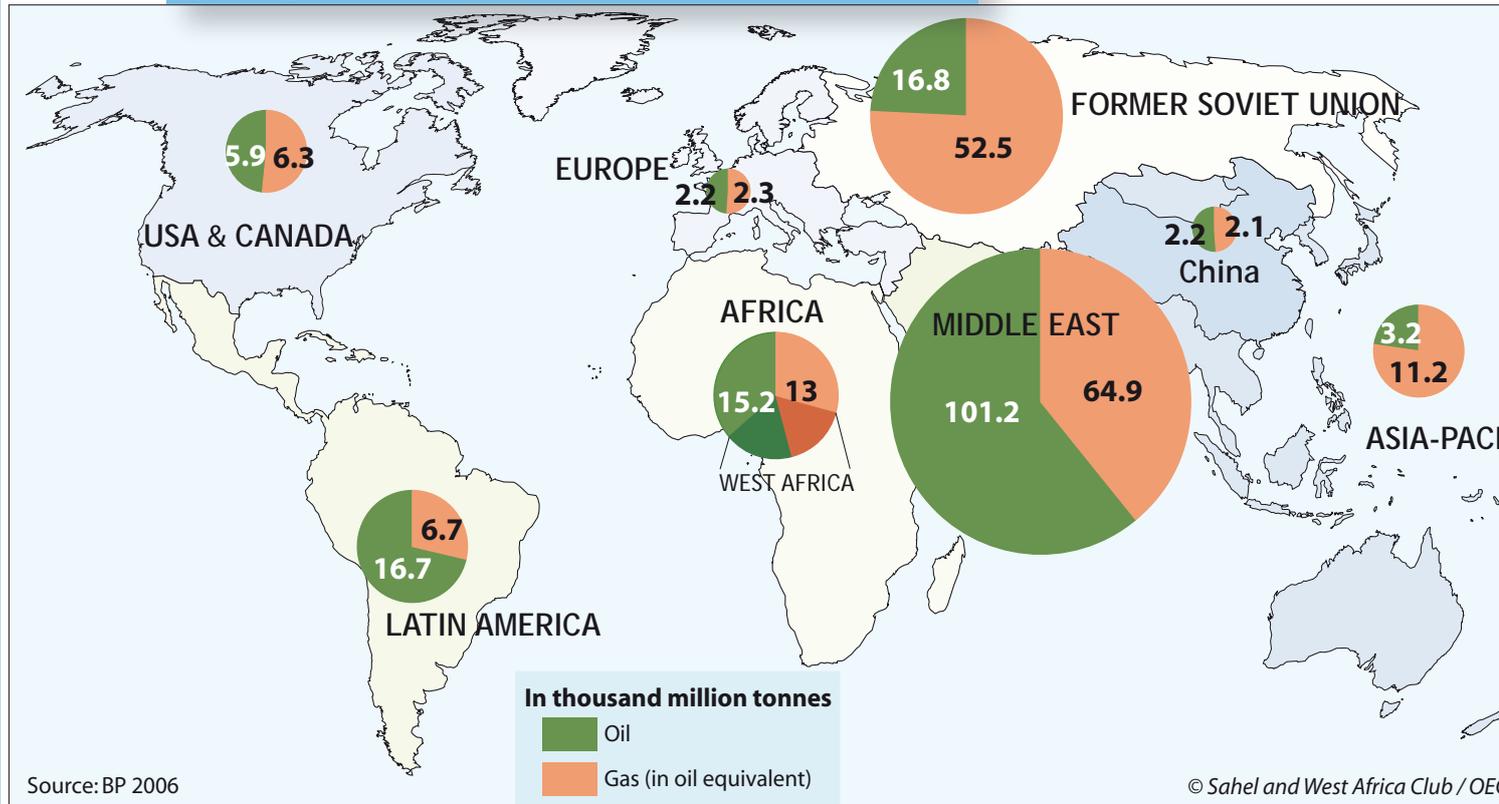


Figure 1. Projected Oil Consumption in 2030



Source: World Energy Outlook (WEO) 2004, IEA/OECD

Map 2. Proven Reserves of Oil and Gas at the End of 2005

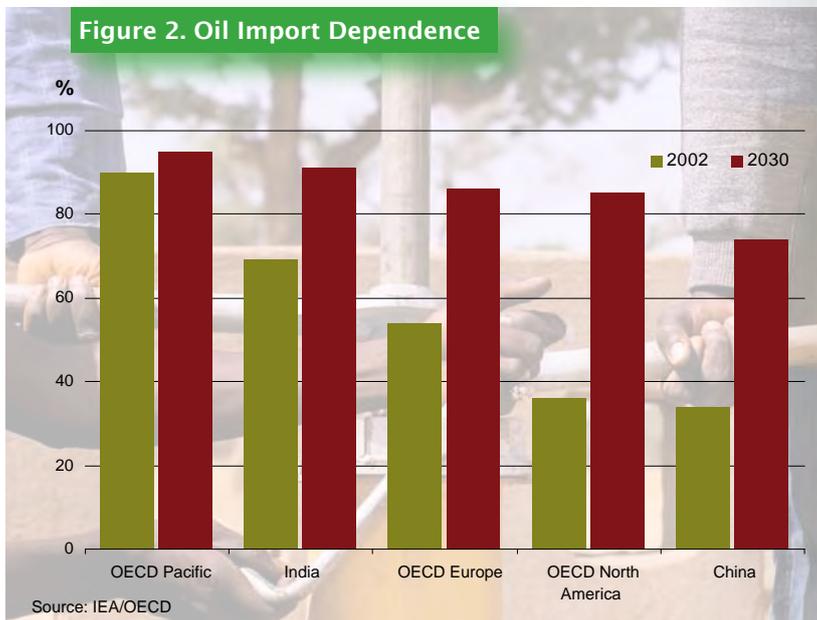


The transport sector will continue to dominate oil demand and increase its share in total to 54% by 2030. In addition, the transport sector will account for two thirds of the total increase in oil consumption.

Oil demand will grow fastest in developing countries, increasing its share in world oil demand from just under 30% in 2002 to 40% in 2030. The IEA estimates that Africa will see the fastest increase in oil consumption, with 3.4% annually between now and 2030. Nevertheless, it will still account for only 5% of total world oil consumption at the end of that period. China's oil consumption will increase at 3.4% annually and reach 13.3 mbpd, or 11% of world total. OECD countries will remain the largest oil consumers, accounting for 47% of total consumption in 2030, down from 59% in 2002.

However, it is changes in production that will have the strongest impacts on the world oil market. The naturally very uneven distribution of proven reserves of oil and gas

Figure 2. Oil Import Dependence



4. These chokepoints are the Strait of Hormuz, the Strait of Malacca, Suez Canal and the Bosphorus. Today, 35 million barrels pass through these narrow sections every day. Accidents or attacks that could lead to temporary closure of these maritime routes would heavily disrupt world oil supply.
5. Liquefied Natural Gas.

will lead to further concentration of production and exporting regions (see Map 2). Especially OECD countries will see their production drop. Europe's production will decline to a third of today's level and the USA & Canada will experience a 30% decline in production.

The increase in demand will primarily be met with production increases in the Middle East where half of combined world proven oil and gas reserves are located. The Middle East will contribute 70% to the total increase in production and account for 43% of total world production in 2030. The remaining 30% will come from the other main production areas, former Soviet Union, Africa and Latin America. But inter-regional exports from Latin America will decrease with internal consumption offsetting production increases.

The decline in production in main consumption regions will lead to higher oil-import dependence (see Figure 2) and consequently increase the volume of inter-regional trade flows significantly. Oil flows from one region to another will more than double between now and 2030, reaching 65 mbpd. This will not only add to the price of oil (transport costs) but also to the risk of supply disruptions at the major chokepoints in the maritime oil trade<sup>4</sup>.

Today's energy security strategies of the major importing countries already put a premium on oil from exporting regions that are easily accessible, hence reducing the transport time and cost and improving supply security. This is the case for off-shore and coastal oil from the West African and Latin American coasts. It takes two weeks for Nigerian oil to reach the American market compared to six weeks for oil from the Middle East. In addition, importing regions also seek to diversify import origin to reduce dependence on individual oil exporting countries.

## II. The World of Natural Gas: LNG<sup>5</sup>

### Opening New Possibilities

Today, natural gas is the world's third largest energy source, after oil and coal, accounting for 21% of total primary energy use.

**Box 1. Natural Gas** is a fossil fuel like oil and coal. Geological conditions needed to trap gas underneath the ground make that the majority of gas found was in course of oil exploration. Today, gas provides 21% of the world primary energy supply. 37% of gas consumed is used for heat and power generation, 26% by residential and commercial users and 24% by industry. "Despite rising prices, after 2010, natural gas will remain the most competitive fuel in new power stations in most parts of the world, as it is the preferred fuel for high-efficiency combined-cycle gas turbines (CCGT's). Natural gas has inherent environmental advantages over other fossil fuels, including lower carbon content and fewer emissions of noxious gases." (World Energy Outlook - WEO 2004).

**Table 2. Top 10 Gas Consumers, Importers and Exporters in 2005**  
(in billion cubic meters and % of World total)

Rank	Consumption		Imports		Exports	
1	USA	634 (23%)	USA	122 (16.9%)	Russia	151 (20.9%)
2	Russia	405 (14.7%)	Germany	91 (12.6%)	Canada	104 (14.1%)
3	United Kingdom	95 (3.4%)	Japan	76 (10.5%)*	Norway	79 (10.9%)
4	Canada	91 (3.3%)	Italy	73 (10.1%)	Algeria	65 (9.0%)
5	Iran	89 (3.2%)	Ukraine	59 (8.2%)	Netherlands	47 (6.5%)
6	Germany	86 (3.1%)	France	49 (6.8%)	Indonesia	36 (5.0%)
7	Japan	81 (2.9%)	Spain	33 (4.6%)	Malaysia	29 (4.0%)*
8	Italy	79 (2.9%)	South Korea	30 (4.2%)*	Qatar	27 (3.7%)*
9	Ukraine	73 (2.6%)	Turkey	27 (3.7%)	Germany	15 (2.1%)
10	Saudi Arabia	70 (2.5%)	Belgium	22 (3.0%)	Australia	15 (2.0%)*

Source: BP 2006

\* 100% in the form of LNG

With strong demand growth projected over the next decades, primarily from the power sector in developing countries, gas consumption will almost double between now and 2030 and reach 4,900 billion cubic meters (bcm), replacing coal as the world's 2nd most important energy source. Due to the high costs of transporting gas, and therefore the need for production sites to be close to consumption areas, gas exports and imports are heavily concentrated in a few countries (see Table 2). Today, only 26% of gas consumption is traded (compared to 62% of oil), with pipelines accounting for 74% of total gas movements and Liquefied Natural Gas (LNG) for the remainder.

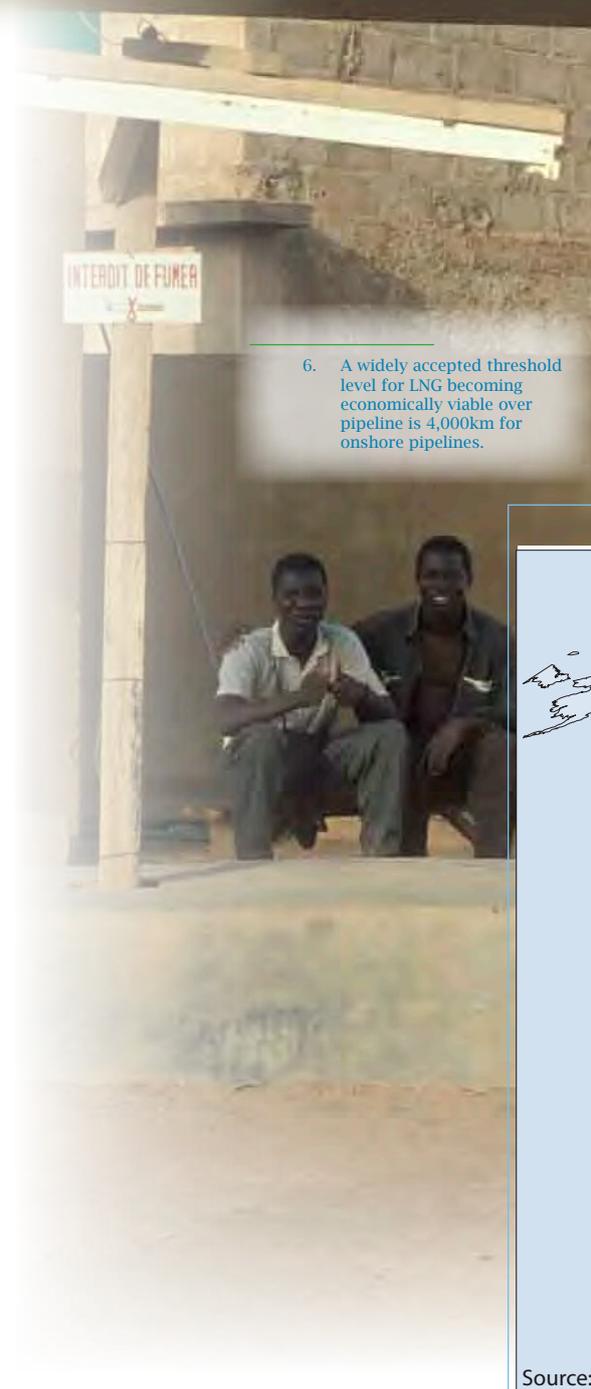
**P**roven reserves of gas have increased steadily over the last decades and outpaced production by a wide margin. Although, Russia, Iran and Qatar hold 57 % of global gas reserves, gas is more widely distributed than oil. Nonetheless, gas import dependence of OECD countries will also increase, particularly in Europe. Europe will import 80% of its total consumption by 2030 (an increase from 49% today). Consequently, inter-regional trade of gas is projected to triple.

**L**NG trade (see Box 2) will expand rapidly and account for 50% of total gas trade by 2030. The development of LNG will globalise the gas market by creating links between continents, which until today were too distant as to allow for gas trade<sup>6</sup>. This will especially benefit production in Africa. Already today Nigeria, holding Africa's largest gas reserves, is the world's 7th LNG exporter.

### III. Africa

#### 3.1 The New Surge for African Oil and Gas

**A**t the beginning of this century, Africa is (again) receiving plenty of attention with respect to its natural resources. Although, it can not match resources in the Middle East and Russia, Africa will play an important role in diversification strategies and become a central part of energy security policies in all major importing regions.



6. A widely accepted threshold level for LNG becoming economically viable over pipeline is 4,000km for onshore pipelines.

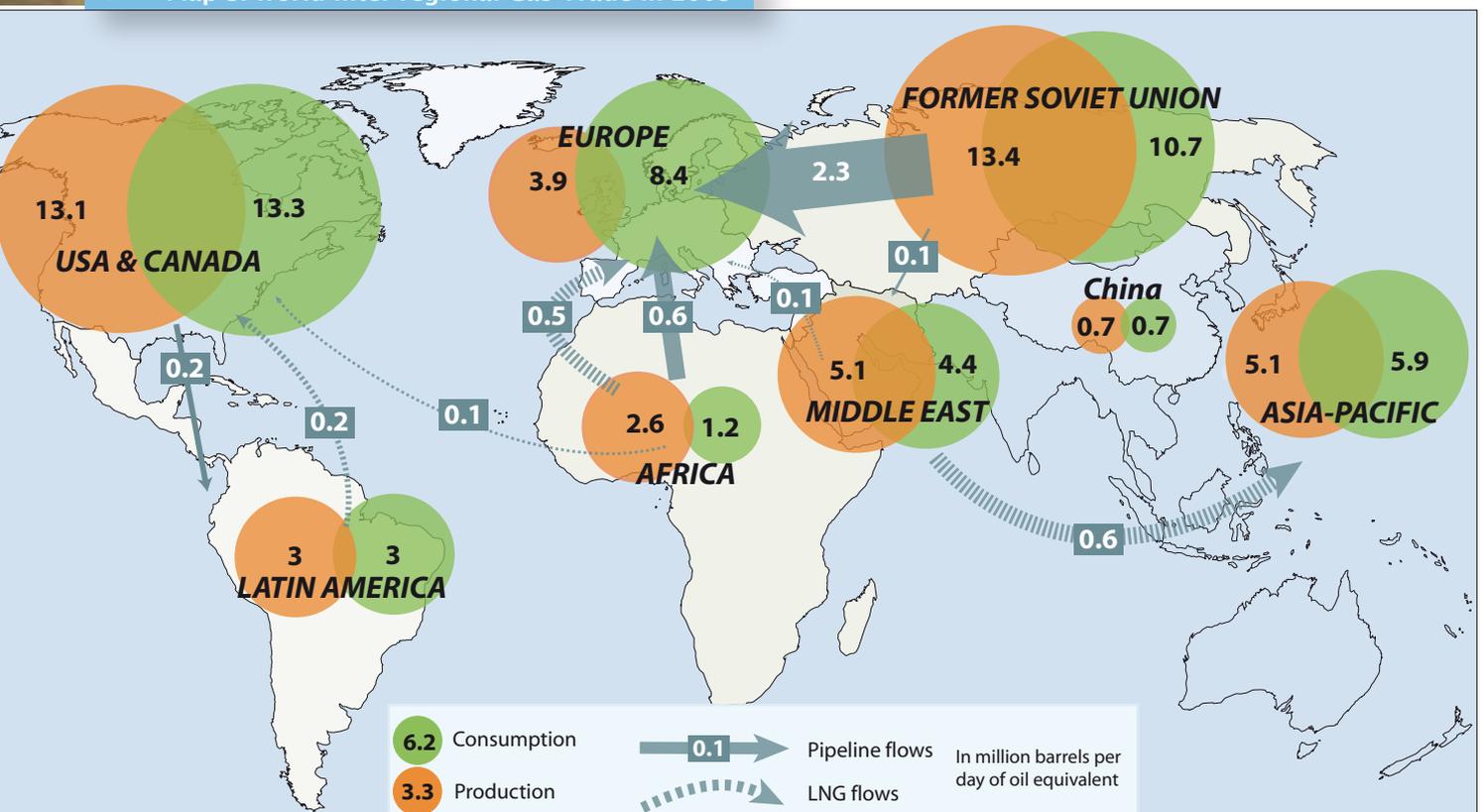
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**Box 2. LNG** is a liquid that forms when natural gas has been cooled to -162C (liquefaction). Prior to the liquefaction process, oxygen, carbon dioxide, sulphur compounds, water and other impurities are removed from the gas. LNG has a volume that is 600 times smaller than that of gas and is the only viable form to transport gas other than pipelines. Arrived at its destination LNG is warmed into a gas again (regasification) and introduced into pipelines to reach consumers. Although, first liquefaction dates back to 1873 it was only in 1961 that the first liquefaction plant was commissioned in Arzew, Algeria. Technical improvements leading to significant reduction in LNG unit costs, increases in ship capacity and strong demand for gas have led to a boom in LNG during the last years. Today, there are 15 production sites in 13 countries exporting to 14 countries a combined volume of 130 million tonnes a year using 179 operational ships. Japan is the biggest importer, accounting for 40% of all LNG traded. Malaysia and Qatar are the two biggest exporters accounting for 15% each. The IEA predicts a near doubling of LNG production over the next five years to reach a capacity of 255 million tonnes by 2010. Nigeria will become one of the biggest exporters, satisfying the rapidly growing markets in Europe and the USA. In addition, LNG development has led and will continue to lead to significant reductions of gas flaring and venting, especially in Nigeria, and thereby reduce environmental degradation.

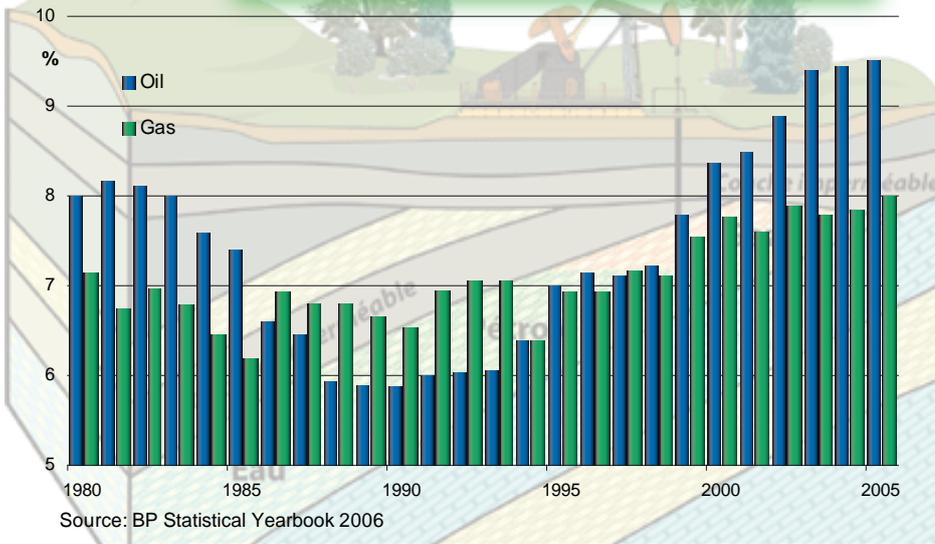
In 2004, Africa supplied 25% of Europe's, 20% of USA & Canada's and China's crude oil imports (see Maps 1 and 6). Gas exports are following an equally positive trend (see Figure 3).

There are several external and internal factors that have contributed to the recent developments vis-à-vis African oil and gas. The internal factors that contribute to the boom in production are:

Map 3. World Inter-regional Gas Trade in 2005



**Figure 3. Africa's Share in World Proven Reserves**



7. Given the distribution of world reserves Middle Eastern countries will see their share in world exports considerably increase over the next years; the "Russian gas crisis" of January 2006 has also reminded European countries of the risks of strong import concentration.
8. Off-shore oil and gas exploration also allows for direct shipping from production sites to markets and thereby reducing significantly the possibilities of production disruptions caused by attacks. This is reducing risks for oil companies that are producing in "unstable" regions.
9. The world's largest proven oil reserves in the Middle East (and to a lesser extent in Russia) are predominantly controlled by large state companies, e.g. Saudi Arabia-ARAMCO the largest oil company in the world with a production of 9.1 mbpd in 2005.

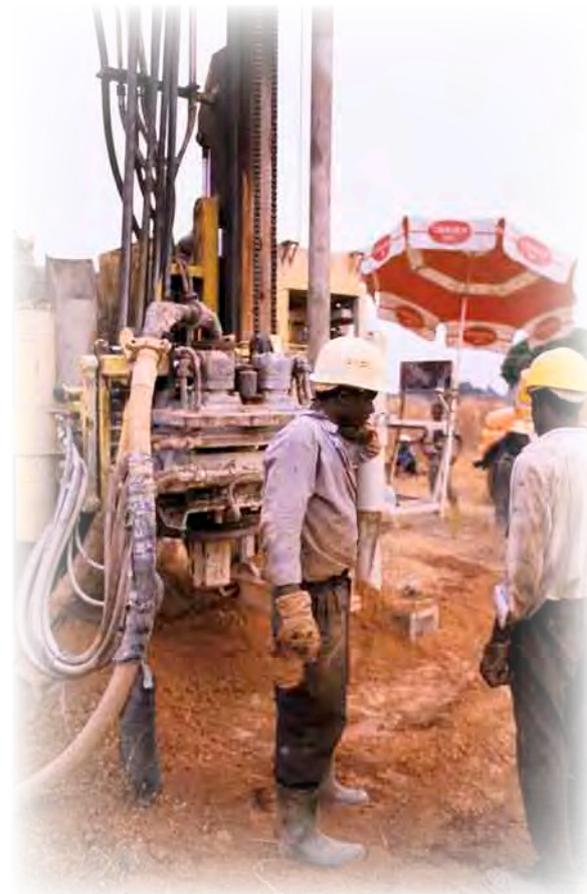
- End of civil wars (Angola).
- Proximity to North American and European markets.
- Significant growth in domestic (or regional) demand. Particularly for gas production, domestic/regional demand is a major factor given the significant transport and storage costs for gas. Gas demand in Africa is projected to increase four-fold between now and 2030, the second fastest growth rate after China.

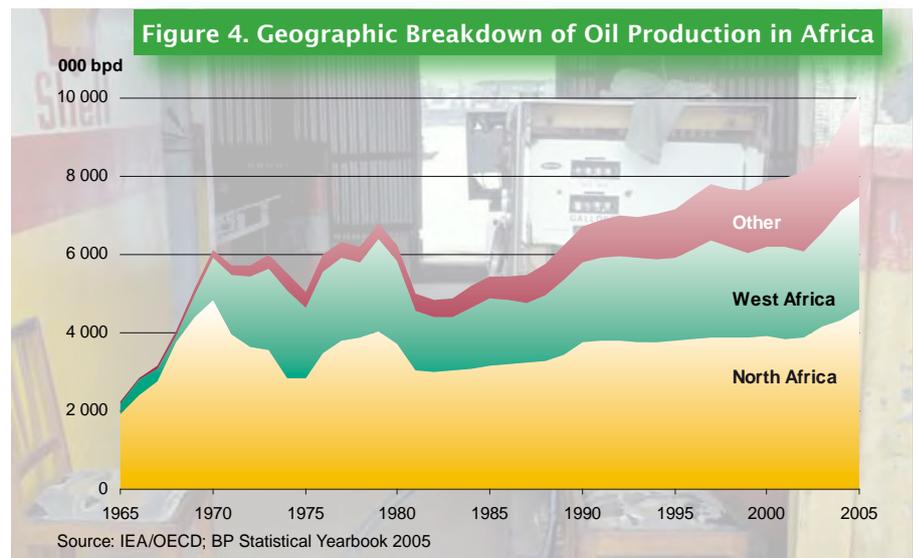
The global factors are:

- Intensified efforts by importing countries to lower dependence on too few exporting countries<sup>7</sup>.
- Improvements in technology have led to significant cost reductions in off-shore oil exploration and production (where most of Sub-Saharan African oil is found<sup>8</sup>), in LNG production and transport (see Box 2) and to improvements in reserve recovery.
- High world market prices encourage investments in exploration, also in previously unprofitable (or risky) locations.
- Limited access to other major oil reserves, notably in the Middle East<sup>9</sup>.
- Growing world demand, driven by China and India (that are also investing in countries where perceived risks are very high e.g. Sudan).

### 3.2 Production is Keeping up with Expectations

In 2006, Africa has 17 crude oil producing countries. Africa's biggest oil producer is Nigeria with 2.6 million barrels per day or 25% of total African production. North Africa accounts for the largest share in production, 45%, but its share has been decreasing constantly. Between 1980 and 2005, Africa witnessed the emergence of several new producing



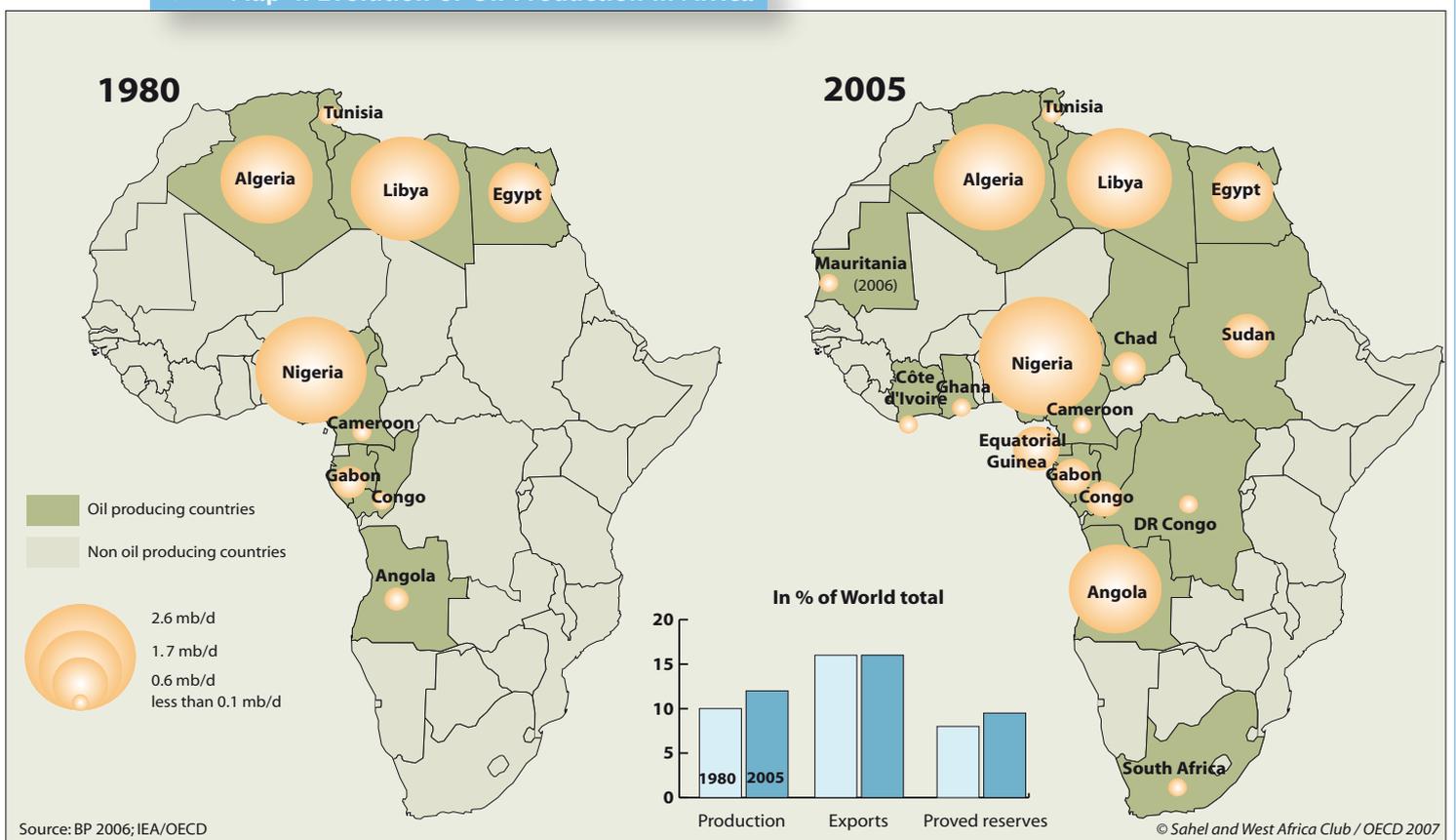


10. "Oil majors" are the biggest publicly traded oil companies in the world, Exxon Mobil and Chevron of the US, Total of France, BP of UK and Royal Dutch/Shell (UK/Holland), each producing between 1.6 to 2.6 million barrels of crude oil per day. In general, these companies are only active in areas that promise significant discoveries.
11. Reserves found and proven in 2005.

countries (Chad, Sudan, Mauritania, Equatorial Guinea) as well as the increase in production in some others (Angola, Nigeria, Libya, Congo) (see Map 4). In addition, in several other countries, particularly in West Africa, exploration activities are underway (see Chapter 4.2).

All "oil-majors"<sup>10</sup> are active in Africa and are expanding their activities. In 2005, Africa accounted for half of Total's and ENI's production; one third of Exxon's revenues, 60% of BP's and 33% of Exxon's oil reserve additions<sup>11</sup> and 47% and 43% of undeveloped acreage of Total and Exxon respectively.

Map 4. Evolution of Oil Production in Africa



Concerning natural gas, large scale production is concentrated in North Africa, accounting for 82% of total production of which Algeria represents two-thirds. North Africa benefited from both its proximity to European markets allowing for the construction of a well developed pipeline system linking production sites to Spain and Italy and significant domestic demand. In 2005, Nigeria accounted for 15% of African gas production up from 4% ten years earlier. But with the rapid growth of LNG and domestic demand, Sub-Saharan African countries will, over the short to medium term, increase its share. The construction of the West African gas pipeline (due to come on stream in 2007) and the construction and planning of several LNG liquefaction plants should more than double Nigeria's production over the coming years. Other LNG liquefaction plants are being built in Angola and Equatorial Guinea.

As regards reserves, North Africa accounts for the largest oil and gas reserves, followed by West Africa. At the individual country level, Nigeria accounts for the largest combined oil and gas reserves, followed by Libya and Algeria (see Map 7).

## IV. West Africa

### 4.1 Nigeria and the Newcomers

After initial unsuccessful exploration attempts in the early 20<sup>th</sup> century it was in 1956 that commercial quantities of oil were struck in Nigeria. 20 years later Nigeria had become Africa's largest oil producer with 2.2 mbpd. With the fall in world oil prices in the first half of the 1980s Nigerian production fell significantly<sup>12</sup>. Production began increasing again from 1987 making Nigeria the only major oil and gas producer of the region.

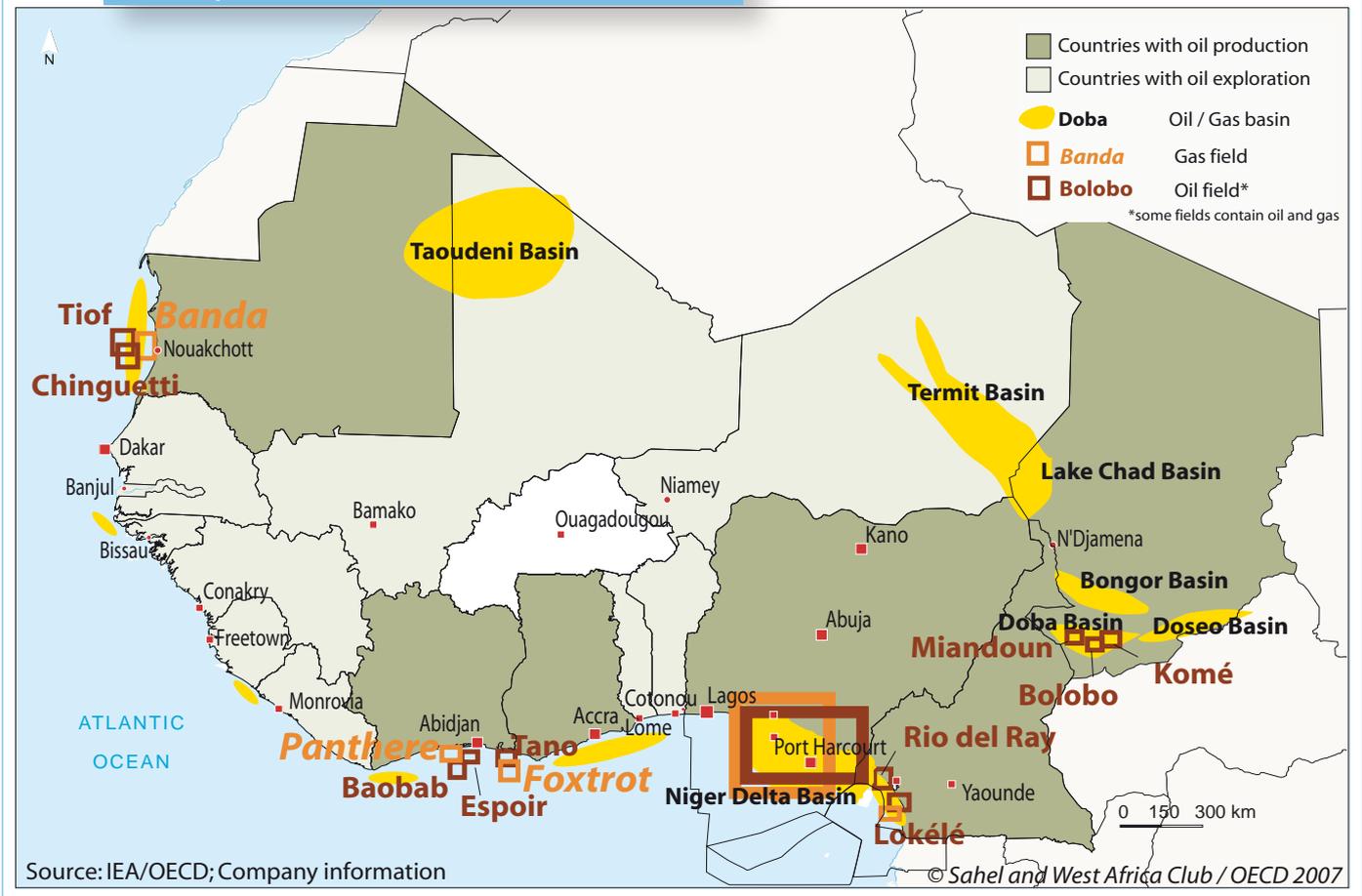
Today, Nigeria accounts for 86% of total West African oil production and almost all gas production. The majority of its reserves are found in the Niger delta basin, an area of 75,000km<sup>2</sup> which stretches into Cameroon and Equatorial Guinea (see Map 5). In January 2006, Nigeria's proven oil reserves stood at 35.9 billion barrels, equal to 32% of total African and 3% of world proven reserves. In addition, it has proven gas reserves of 5.2 trillion m<sup>3</sup>, 36% of total African and 2.9% of world proven reserves. During the last ten years Nigeria's oil production increased by an annual average of 3% reaching 2.6 mbpd and gas production by 18% to 20 billion m<sup>3</sup> per year. Oil and gas production will significantly increase over the coming years with recent discoveries coming on stream and additional LNG plants becoming operational.

Cameroon started producing oil in 1977 and reached a production peak as early as 1985 at 181 kbpd. Its current production is evaluated at 54 kbpd. Nevertheless, some major oil companies are still present in Cameroon and investing in exploration activities. Cameroon's oil reserves are estimated at 700 million barrels.



12. The oil price shocks (1st 1973, 2nd 1979) were the results of reductions in OPEC production quotas to provoke an increase in world oil market prices. Nigeria became a full member of OPEC in 1971.

Map 5. Main Oil and Gas Fields in West Africa

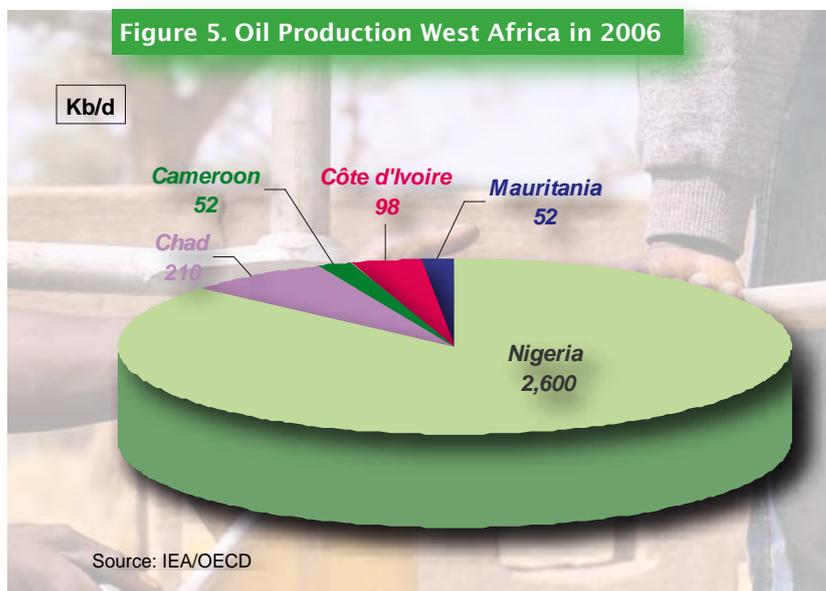


However, one major development during recent years was the emergence of three new production countries: Chad, Côte d'Ivoire and Mauritania. Chad, who started producing oil only in 2003, after several promising discoveries in the 1970s, is already the regions second largest producer with 210 kbpd in 2006. Chad's oil production comes from two fields in the Doba basin, Komé and Miandoun and is exported through the Doba

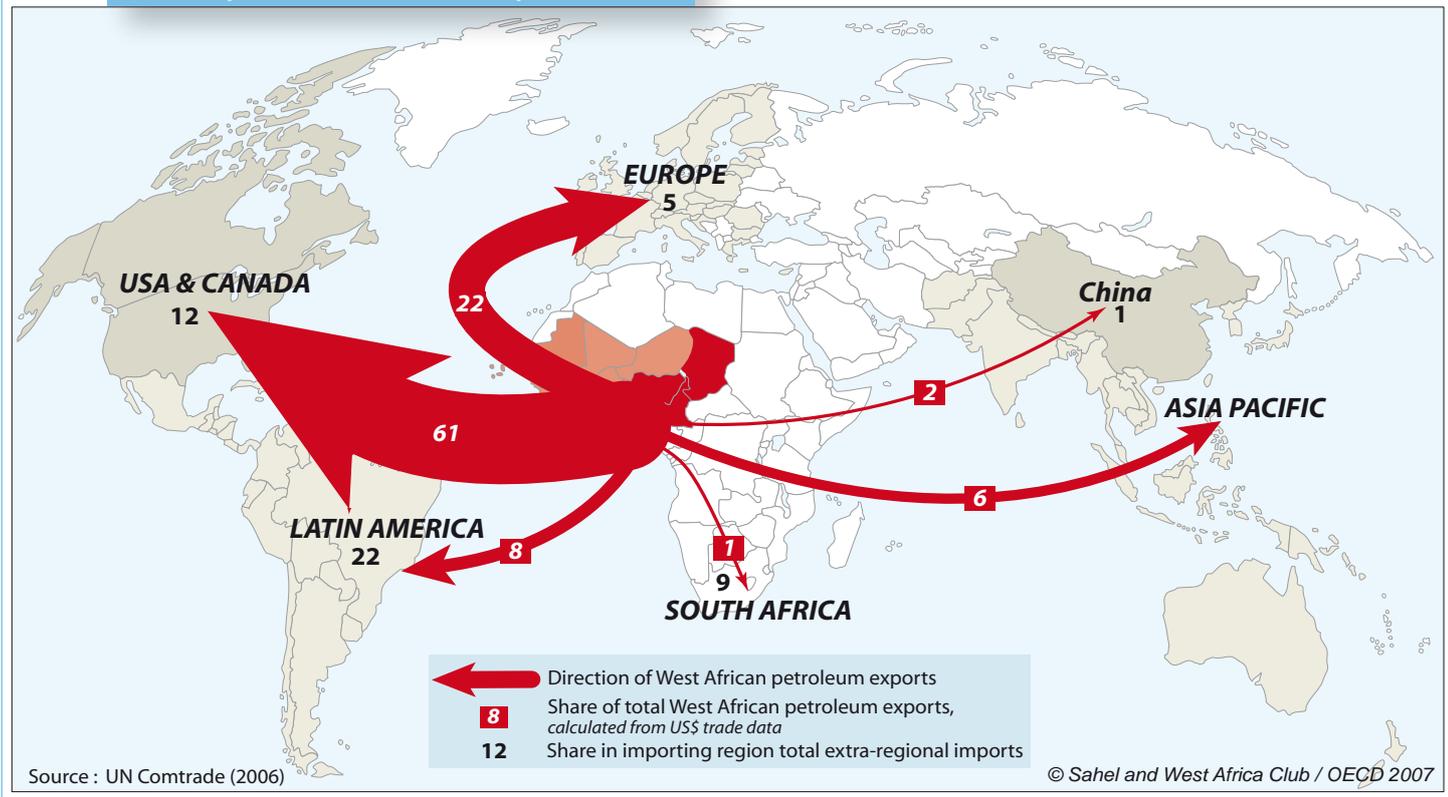
- Kribi pipeline. The Bolobo field is close to coming on-stream and will add to current production levels. With continued exploration activity by major oil companies in several new fields, notably in the Doseo and Lake Chad basins, Chad's proven reserves are now estimated at 900 million barrels.

Côte d'Ivoire, the regions third largest oil producer with a daily production of 98,000 barrels, has estimated proven oil reserves of 100 million barrels. The majority of its oil wells, 86%, are located in shallow marine areas off the

Figure 5. Oil Production West Africa in 2006



Map 6. West African Oil Exports in 2005



coast. Production is concentrated in the Esplor and Baobab fields that came on stream in 2002 and 2005 respectively. Gas was first discovered in the 1980s but only recently has its development begun. Gas production in 2003 was 1.46 billion m<sup>3</sup> with estimated reserves of 31 billion m<sup>3</sup>.

In February 2006, Mauritania joined the club of oil producers. Production at the Chinguetti oilfield averaged 52,000 bpd. Mauritania's oil and gas production will soon increase with the developments of the Banda (gas field), Tiof and Tevet coming on stream. Mauritania has proven oil reserves of 1 billion barrels placing it second in West Africa.

Ghana is West Africa's smallest producing country with a daily production of 6,000 bpd. Exploration activities are currently underway with renewed interest in exploration and production licenses from several independent oil companies.

#### 4.2 Prospects: The Big Rush

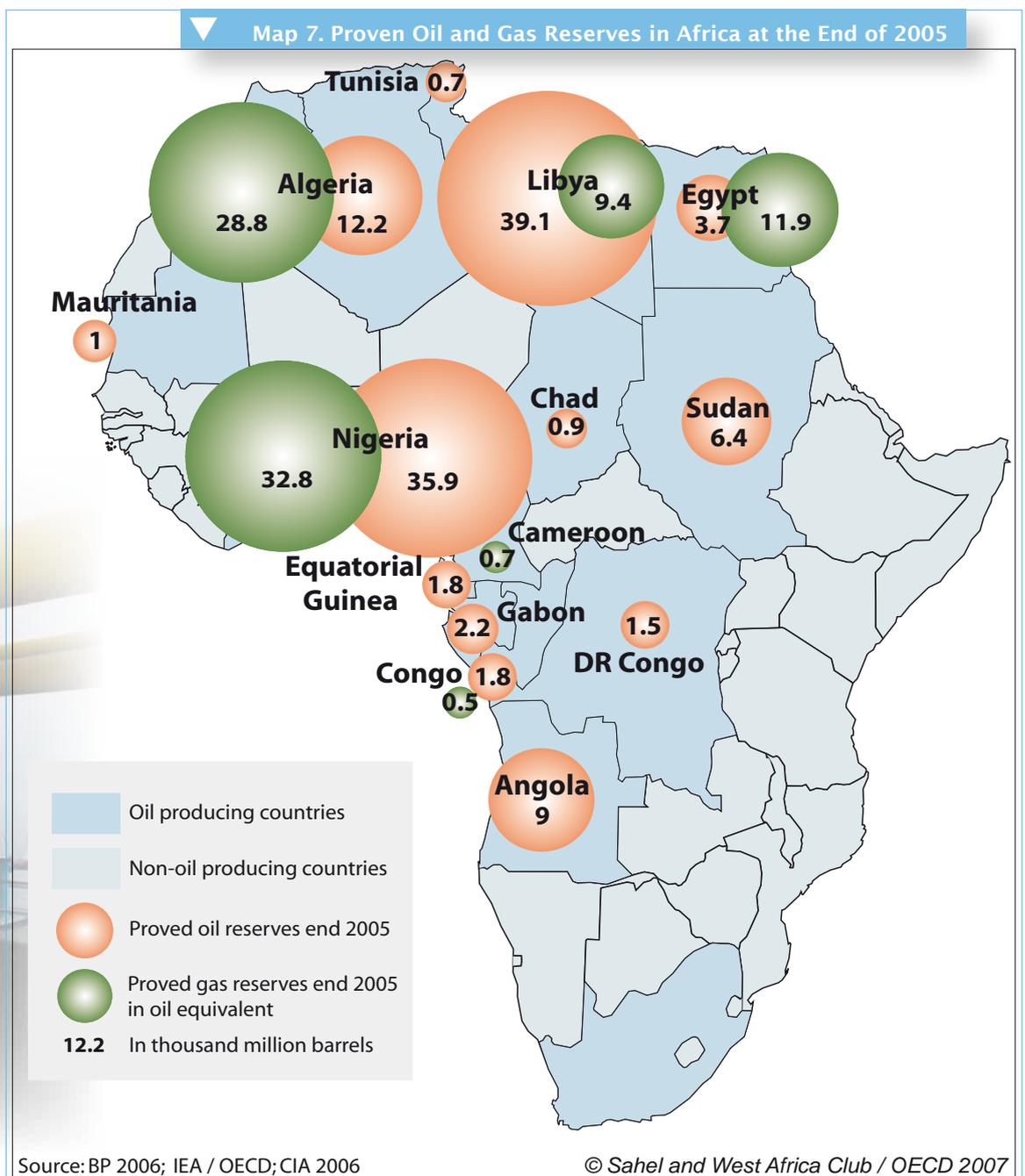
Expectations by countries and oil companies for discovering sizeable new oil and gas reserves in the region are currently very high. Exploration and seismic research activities are underway in all West African countries, except Burkina Faso and Cape Verde. But undoubtedly, prospects for new significant discoveries are highest in the already producing countries like Nigeria, Chad and Mauritania. For example, Nigeria has set a target of increasing proven oil reserves to 40 billion barrels and production capacity to 4 mbpd in 2010. It also plans to triple gas production by 2009. This will further bolster its dominant position in the region. But other countries in the region also show significant



potential to increase their oil and/or gas production or develop new production. These countries are Chad, Mauritania, Côte d'Ivoire and Cameroon and prospects for new discoveries are promising in Mali and Niger and some coastal countries. This is underlined by the presence of some "oil majors" like Total in Mauritania, Exxon in Chad, Cameroon and Niger and also of Chinese oil companies. The China National Petroleum Corporation (CNPC) has exploration agreements in Chad, Mauritania and Niger, SINOPEC in Mali and Côte d'Ivoire<sup>13</sup> and China National Off-shore Oil Corporation (CNOOC) is active in Nigeria.

In other coastal countries, Senegal, the Gambia, Guinea-Bissau, Guinea, Liberia, Sierra Leone, Ghana, and Togo, hopes of finding oil fields containing economically viable quantities of oil and gas also exist. Many independent international oil companies are active in these countries

13. In cooperation with India's Oil and Natural Gas Corporation (ONGC) and Oil India.



and have, over the last decade, found several oil and gas fields, but production has not yet begun. Exploration licenses are being bought or renewed by these companies, several of which have a large part of their exploration activity focused on the region underlining their continued interest and expectations.

All these factors seem to confirm that West African oil production will continue to increase in coming years without significantly changing the regional composition of production.

In terms of gas exploration and production the situation is different. Although, gas reserves were discovered at the same time as oil, commercial production only started recently. For the most time associated gas<sup>14</sup> has been flared or simply vented by oil producers. In 2003, Nigeria, where 95% of gas reserves are associated, flared and vented close to 20 bcm of gas<sup>15</sup>, the largest volume in the world. Calculated as quantity of gas flared per barrel of oil produced, Cameroon was the world leader with 65 cm per barrel. The three main barriers identified to gas utilisation [i) lack of efficient regulation; ii) poor access to local, regional and international gas markets; and iii) financing constraints for projects that reduce gas flaring (GCFR 2002)] have in recent years significantly been reduced in Nigeria. Nigeria's 2004 Strategy Gas Plan sets out an end to gas flaring by 2008 and encourages gas production through various incentive measures like fiscal and tax benefits and credit at subsidised rates of interest. In addition, demand for gas, one crucial factor in promoting gas production, is increasing rapidly in the region, as well as in other markets, and will spur regional gas production.

Nigerian LNG production capacity, currently at 22 bcm per year, is projected to increase to 73.7 bcm per year by 2010<sup>16</sup>, placing Nigeria second in world LNG production capacity behind Qatar. Domestic demand is projected to triple between now and 2010 with the largest share coming from the power generation sector. Demand for Nigerian gas elsewhere in the region will also increase significantly. However, significant investments, private as well as public, are needed to achieve these targets. The West African Gas Pipeline (WAGP) from Ecravos (Nigeria) to Cotonou (Benin), Lome (Togo) and Tema and Takoradi (Ghana), privately financed, under a World Bank (see Box 4) guarantee scheme highlights the positive impact of regional cooperation, strong demand, effective regulation and financing on the gas sector and hence electricity generation.

To date the only other country that could become an LNG exporter is Mauritania where initial proposals are being discussed. One decisive factor will be the discovery of sufficiently large gas reserves. Countries like Cameroon, Ghana, Côte d'Ivoire, and to a lesser extent Senegal, will increase production to meet internal demand, principally from the power generation sector. Cameroon has already launched projects to monetise its natural gas reserves that are estimated at 300 bcm with proven reserves of 160 bcm in the Rio del Ray field. Gas production is projected to come on-stream in early 2007.

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14. Associated gas is natural gas which is found in association with crude oil, either dissolved in the oil or separate as free gas above the oil.
  15. This quantity could produce more than 100 terawatt-hours of electricity, equivalent to total power consumption of Sub-Saharan Africa excluding South Africa or if exported to US and European markets earn US\$10 billion (World Bank, 2004).
  16. 5.4 bcm capacity is under construction - completion 2007; 24.5 bcm are in engineering phase - completion 2009-10 and 27.2 bcm are planned - completion 2010 (IEA 2006).

### 4.3 Politics and Economics

Fossil fuels play a very important role in the economics and politics of every country. Exports and imports of oil and gas account for the largest share of trade in Nigeria, Cameroon, Chad and Mauritania<sup>17</sup> (see Table 3).

**Table 3. Oil and Gas Exports in 2005**

	Exports (in million US\$)	% of total exports	% of GDP
Cameroon	1,660	50	10
Chad	2,017	96	37
Nigeria	41,039	95	41

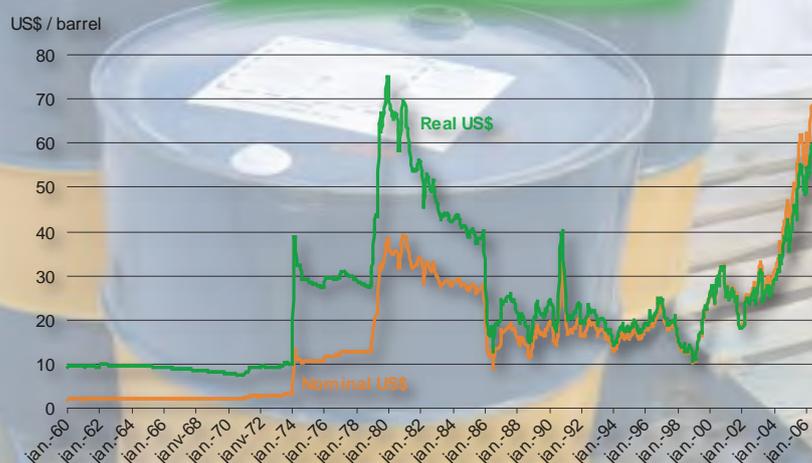
Source: Comtrade Database; World Development Indicators (WDI)

With real oil prices at its highest level since the early 1980s and no imminent reasons to believe in a substantive reversal, the oil sector will continue to dominate these countries economies. Indeed, due to the price increases over the last two to three years Nigeria's oil revenues have almost doubled from 22 billion US\$ 2003 to 40 billion US\$ in 2005. The positive impact for exporting countries is naturally mirrored by an increased import bill in net importing countries<sup>18</sup>.

In Senegal for instance, petroleum imports more than doubled between 2002 and 2005 from 300 million US\$ to more than 700 million US\$<sup>19</sup>, a trend observed in all countries in the region. Also the share of oil imports in total imports has increased to around 20% in most countries and exceeding 1/3 in others. Thus, oil price fluctuations impact significantly and have worsened the external balance in net-importing countries. A problem that is further aggravated by countries' export concentration in a few raw materials that are also subject to important price fluctuations.

But these price increases also have a direct impact on consumers via petrol prices. In most countries petrol prices have increased between 40-50%. Given the already important share of transport cost in total factor cost, especially in land-locked countries, this increase had repercussions on most consumption products. The importance of oil consumption in these economies can be illustrated by comparing oil consumption per GDP across countries. Table 4 shows that West African countries consume on average 30% more oil per unit of GDP produced than the average EU country. Four out of the eight West African countries cited in the Table consume more oil per unit of GDP than the USA. Even considering under-accounting of

**Figure 6. Crude Oil Price Since 1960**



Source: UNCTAD; IMF

17. Data on Mauritania is not yet available.

18. Also affecting crude oil exporting countries like Nigeria, where imports of petroleum products increased from 0.6 bn US\$ in 2002 to 1.8 bn US\$ in 2005. Petroleum product prices are in addition to crude prices influenced by other factors like variations in seasonal demand and refining capacities and can therefore exhibit distinctive movements

19. This is not due to increased (re-) exports to Mali.

GDP (due to a large informal economy) or overestimating petrol consumption, the overall picture is clear. The reasons explaining the relative importance of oil consumption are several: large share of trade in GDP necessitating exporting of primary raw materials and importing consumption goods; geography (large size of countries, access to sea); the quasi total absence of alternatives to road transport and a relatively high share of oil in electricity generation either in thermal power generation plants or in private diesel generator units<sup>20</sup>. With 50% of oil consumption in the transport sector and a high share of traded products, oil price increases impact most sectors of the economy<sup>21</sup>.

This not only impacts the economies vulnerability to oil price increases, but also on policy options to mitigate its effects. Whereas in industrialised countries increases in oil prices will lead, even in the short term, to reduction in consumption by using alternatives or by simply reducing consumption. In West Africa the absence of alternatives and the share of oil consumption in productive sectors reduce the possibilities of short term adjustments through changes in consumption patterns. Policies should therefore focus on medium to long term consumption and cost reductions by providing alternatives to road transport i.e. rail or water ways; cheaper import costs (infrastructure); diversification of primary energy sources especially in electricity generation.

The analysis of the price structure of one litre of petrol (Super 91) in Burkina Faso in April 2006 shows the percentage of taxes in the pump price. Half of the taxes are accounted for by a tax on petroleum products (TPP) and the other half is made up by VAT (34%) and customs (16%). Government budgets depend, to varying degrees, on the taxation of petroleum products: 18% in Ghana, 7% in Burkina Faso (TPP only), 12% in Guinea and 15% in Senegal. With some of these taxes levied as a percentage of value (i.e. customs and VAT) government revenues have increased thanks to an increase in world oil prices. Although, there is no need to discuss the importance of government revenue, however questions concerning the economic impact of these taxes must be addressed.

## V. Conclusion: Need for Regional Cooperation?

The current euphoria of oil production and exploration in West African countries is overshadowing one important aspect of the region: most countries still depend exclusively, or almost exclusively, on imports to satisfy their domestic demand. Although, the region is among the world's largest exporter of crude oil, it imports the majority of its petroleum products (refined crude petroleum) from outside the region.

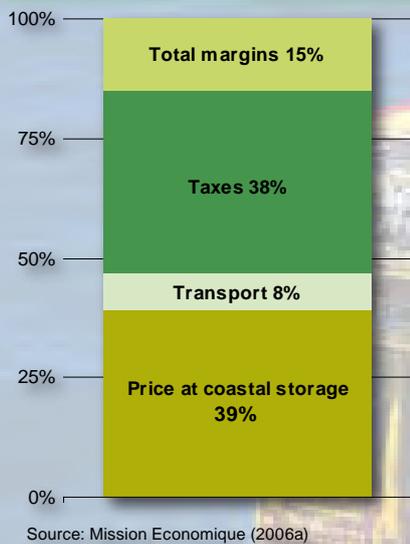
**Table 4. Oil Intensity of Selected Countries in 2005**

	GDP in billion US\$	Oil consumption in kbpd	Thousands of US\$ of GDP per barrel of daily oil consumption
Benin	4.3	14	306
Burkina Faso	5.2	8	646
Cameroon	17.0	23	738
Côte d'Ivoire	16.1	22	730
Ghana	10.7	45	238
Mali	5.1	8	638
Nigeria	99.0	321	308
Senegal	8.3	34	245
France	2,110	1,961	1,076
United States	12,455	20,655	603

Source: BP Stat; Energy Information Administration (EIA); WDI

20. According to data from the IEA, the share of oil in electricity generation in Africa was 13% in 2002 as compared to 6% in OECD countries.
21. Chad's only major power station is fuelled by oil. Due to the high price of oil, Chad's electricity costs are among the highest in the World (EIA).
22. The flows in Map 8 are Petroleum and Petroleum products (SITC code S3-33) and could in theory include crude petroleum. If some flows include crude petroleum, its share will be negligible given the limited refining capacity and the large imports of crude petroleum from other countries.
23. In 2005, West Africa imported from outside the region 2.8 billion US\$ worth of petroleum products, compared to official intra-regional flows of 0.6 billion US\$. Nigeria accounts for close to 60% of total extra-regional imports. The major exporter to the region is the European Union, accounting for 75% followed by Brazil and India representing 12% and 7% respectively. With the recent price hikes in petroleum and petroleum products these imports account for a rapidly growing share in total imports.
24. With low crude oil prices during the period 1980-2000 refining margins were very low which resulted in underinvestment in refining capacities in many areas of the world.
25. Tema Oil Refinery has been upgraded to 45,000 barrel per day capacity in 1999, Cameroon's national oil refinery SONARA has just announced an US\$ 383 million upgrade of its Limbé refinery, China's CNPC has manifested interest in Nigeria's Kaduna refinery with an obligation of re-establishing its 110,000 barrel per day capacity.
26. As might be the case with the Kaduna refinery.
27. E.g.: Negotiations are currently underway to privatise Tema Oil Refinery and expand capacity to 110,000 bpd.

**Figure 7. Price Composition of Petrol in Burkina Faso**



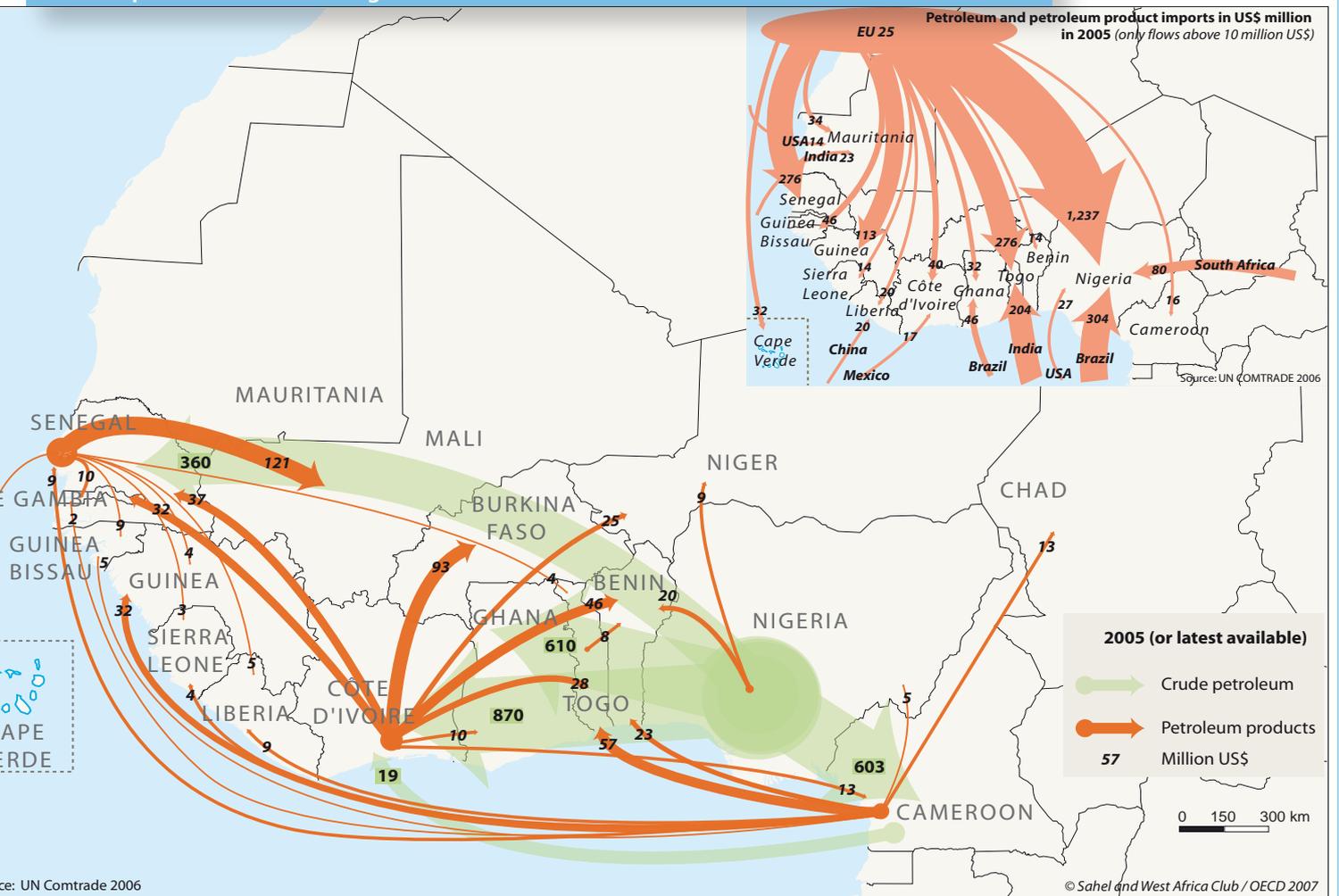
Source: Mission Economique (2006a)

Extra-regional imports of petroleum products<sup>22</sup> are 4.5 times larger than intra-regional flows<sup>23</sup>.

Although, Nigeria, Côte d'Ivoire, Cameroon, Ghana and Senegal have operating refineries, its actual operating capacities are insufficient to assure the supply of the regional market. West Africa has experienced decades of underinvestment<sup>24</sup> in its refineries that have resulted in low capacity utilisation and inefficient distillation processes. Today, the actual petroleum product production in West Africa is estimated at 385,000 barrels per day (installed capacity 620,000 bpd) which contrasts with at least 400,000 barrels per day demand in Nigeria alone and around 600,000 barrels per day in the region.

Nevertheless, the region is witnessing several positive developments that could significantly change the regional outlook in the near future. Strong and rapidly growing regional demand and high oil prices generate renewed interest from private investors in refineries<sup>25</sup>. A trend that is also favoured by states actively seeking to reduce dependence on imports and that benefit from strengthened bargaining positions vis-à-vis oil companies trying to acquire exploration and production licenses<sup>26</sup>. But also other political developments like de-regulation of petrol pricing and privatisation<sup>27</sup> are significantly improving the region's attractiveness.

**Map 8. Inter and Intra-regional Flows of Petroleum and Petroleum Products in 2005**



**D**emand projections by refinery operators are already made based on assumptions at the regional level. The regional market is thus the logical operating environment and internalised by private operators. Regional integration organisations like ECOWAS and UEMOA can assist in this process of “private sector regional integration” by further promoting the free flow of products, harmonisation of fiscal policies and quality standards and by incorporating these aspects in the planning of infrastructures like storage, ports and land transport.

**R**egional gas market integration is at a more advanced level. Gas markets are in general still predominantly “regional” markets given their characteristics in terms of transport and storage<sup>28</sup>. The West African Gas Pipeline (see Box 4) might be the best example for regional energy (in particular electricity) market integration. It shows on the one hand achievements of governments and regional institutions and on the other, the willingness of international companies to invest in the regional market.

**A**lthough, regional oil and gas markets are still in its infancy the signs for the medium term are encouraging. The regional oil market will, notably in the case of successful oil explorations in the region’s landlocked areas (Mali, Niger), need to find ways to maximise benefits for exporting countries but also the region. Nevertheless, oil will remain less important than gas on the regional level. A regional gas market is a crucial step towards regionally integrated electricity markets.

**Box 3. Intra-regional flows** of petroleum and petroleum products represent only a small fraction of total flows and are structured around the five countries producing petroleum products in their refineries.

Nigeria exports around 2.4 bn US\$, or 5% of its total production, of crude oil to Cameroon, Côte d’Ivoire, Ghana and Senegal. These countries produce some estimated 180,000 bpd of petroleum products, half of which are used to satisfy domestic demand. The other half is exported within the region. Côte d’Ivoire accounts for 50% of total regional product flows, or around 45,000 bpd. Cameroon and Senegal make up, at roughly equal shares, the other half of intra-regional flows. These flows are relatively evenly distributed according to demand size, with a large share of Ivorian exports directed towards Nigeria. Total intra-regional flows of petroleum products account for some 25% of total imports.

However, besides these “traditional” exporters Togo emerged as a new regional distribution hub. With the Ivorian crisis Togo has become the region’s land-locked countries main transit market, as illustrated by its significant imports from outside the region. According to figures from Mali’s Office National des Produits pétroliers (ONAP), 42% of the country’s imports came from Togo in 2003.

Another phenomenon of intra-regional trade is a significant volume of unrecorded, i.e. smuggled, petroleum flows between Nigeria and its neighbours.

28. Although, LNG developments are changing this rapidly, pipelines are the most efficient way of trading.  
29. A possible extension, notably to Abidjan, has already been envisaged.

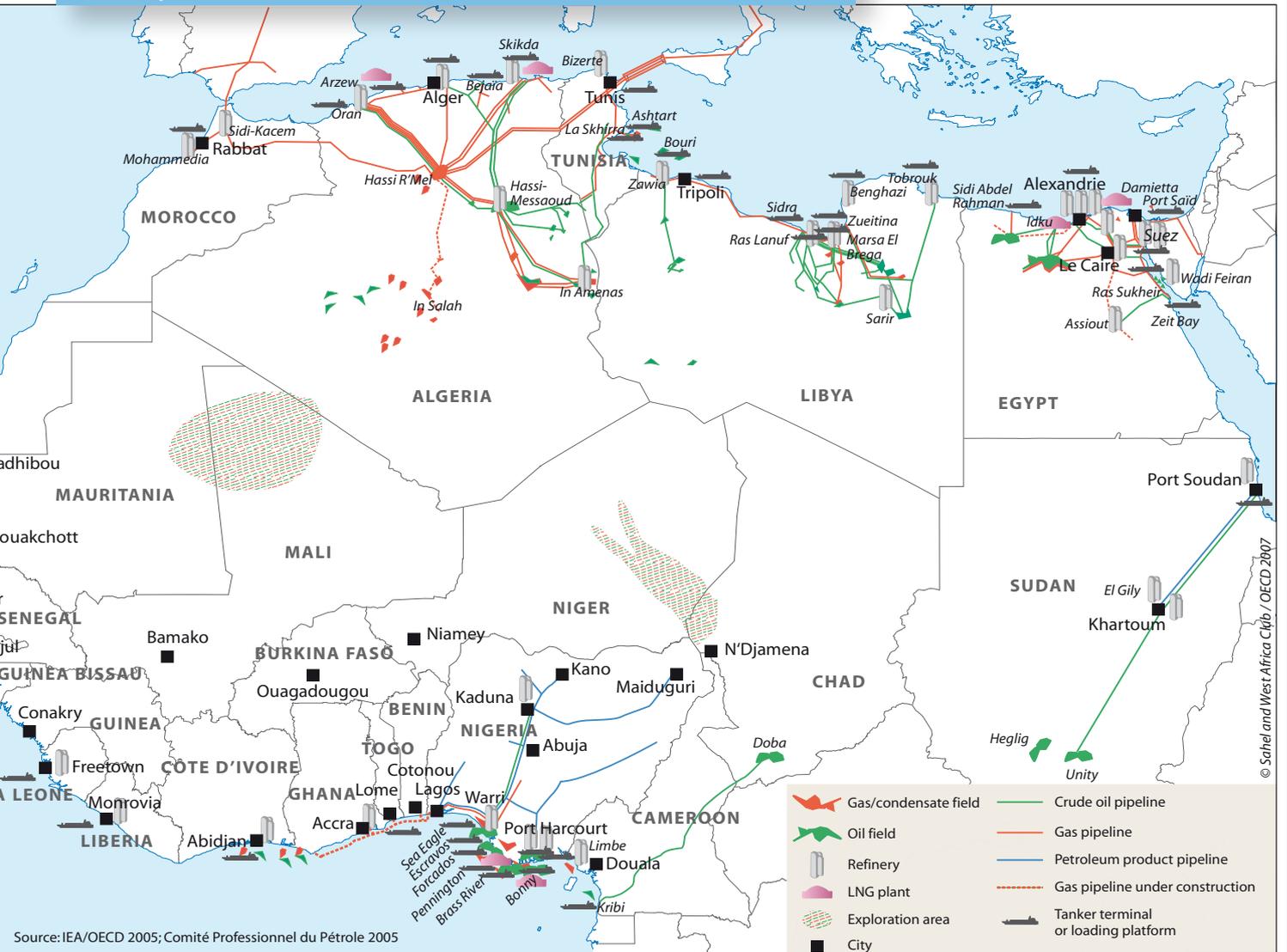


**Box 4. The West African Gas Pipeline** will carry over a distance of 678 km natural gas from Nigeria’s Niger Delta to customers in Benin, Togo and Ghana<sup>29</sup>. This 600 million US\$ project was first conceived in 1995 by the governments of Benin, Ghana, Nigeria and Togo, under the auspices of ECOWAS, and is expected to be completed in the first half of 2007. The shareholders of the West African Gas Pipeline Company (WAPCo) are Chevron (36.7%), the Nigerian National Petroleum Corporation (25%), Shell (18%), Ghana’s Takoradi Power Company (16.3%), Société Togolaise de Gaz (2%) and Société Béninoise de Gaz (2%). The World Bank through its Multilateral Investment Guarantee Scheme has provided risk insurance of 125 million US\$ for this project.

The pipeline, majority of which is located off-shore, has metering stations in Cotonou, Lomé, Tema and Takoradi and is expected to have a maximum capacity of 13 million cubic meters. The gas will help generate and additional 2,500 GWh (gigawatt hours) of electricity a year. It is an important component of the development of the West African Power Pool that will link power generation across a regional transmission grid to countries across the region.

In addition to the economic benefits, the pipeline is also having important benefits on the environment by reducing gas flaring in Nigeria.

Map 9. Oil and Gas Infrastructure in North and West Africa in 2005



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**International Energy Agency**  
**United Nations COMTRADE**

## Glossary

**Barrel:** A unit of volume equal to 159 litres or 42 U.S. gallons

**Basin/sedimentary basin:** Refers to any geographical feature exhibiting subsidence and consequent infilling by sedimentation. As the sediments are buried, they are subjected to increasing pressure and begin the process of lithification. Sedimentary basins are the location for almost all of the world's hydrocarbon reserves.

**Crude Oil:** Crude oil is a mineral oil of natural origin comprising a mixture of hydrocarbons and associated impurities, such as sulphur. It exists in the liquid phase under normal surface temperature and pressure and its physical characteristics (density, viscosity, etc.) are highly variable.

**Energy source:** Any substance or natural phenomenon that can be consumed or transformed to supply heat or power. Examples include petroleum, coal, natural gas, nuclear, biomass, electricity, wind, sunlight, geothermal, water movement, and hydrogen in fuel cells.

**Field:** An area consisting of a single reservoir or multiple reservoirs all grouped on, or related to, the same individual geological structural feature and/or stratigraphic condition.

**Flared:** Gas disposed of by burning in flares usually at the production sites or at gas processing plants

**Fossil Fuels:** An energy source formed in the earth's crust from decayed organic material. The common fossil fuels are petroleum, coal, and natural gas.

**Natural Gas:** Natural gas comprises gases, occurring naturally in underground deposits, whether liquid or gaseous, consisting mainly of methane.

**Petroleum Products:** Petroleum products are any oil-based products which can be obtained from primary distillation and are normally used outside the refinery industry.

**Primary energy:** All energy consumed by end users, excluding electricity but including the energy consumed at electric utilities to generate electricity.

**Proved reserves:** Estimated quantities of energy sources that analysis of geologic and engineering data demonstrates with reasonable certainty are recoverable under existing economic and operating conditions. The location, quantity, and grade of the energy source are usually considered to be well established in such reserves.

**Refined petroleum products:** Refined petroleum products include but are not limited to gasolines, kerosene, distillates (including No. 2 fuel oil), liquefied petroleum gas, asphalt, lubricating oils, diesel fuels, and residual fuels.

**Refinery:** An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

