UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

# COMMODITIES AT A GLANCE

## Special issue on energy

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## INTRODUCTION

This edition of the Commodities at a Glance has been prepared by the Special Unit on Commodities (SUC) of UNCTAD. The publication aims to collect, present and disseminate accurate and relevant statistical information linked to international primary commodity markets in a clear, concise and friendly format.

For further information about this publication, please contact the Special Unit on Commodities (SUC), UNCTAD, Palais des Nations, CH-1211 Geneva 10, Switzerland, tel. +41 22 917 5676, email: commodities@unctad.org.

## STATISTICAL DATA SOURCES

All statistical data sources for this publication are indicated under each specific graph.

## NOTES

The third revision of the Standard International Trade Classification has been used throughout this document for trade statistics.

## COPYRIGHT



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# Facts and figures:
# PRIMARY ENERGY

## Making news this quarter

This quarter's edition of UNCTAD's Commodities at a Glance describes world energy trade, price, production and consumption trends, with a particular focus on Africa. Over the last three decades, world consumption of primary energy nearly doubled from 280 quadrillion British thermal unit (BTU) in 1980 to 490 quadrillion Btu in 2008 (see Figure 4). A number of factors have been attributed to this dramatic increase in consumption including global economic growth, rapidly industrializing developing countries, increasing world population and urbanization. Over the next two decades, the world population is forecast to grow from approximately 7 billion to 8.32 billion, [1] with the likelihood of rising demand for primary energy resources. International Energy Agency (IEA) projections suggest that between 2008 and 2035 global demand for such resources will increase by 36 per cent or 1.2 per cent per year on average. [2] Most of this projected increase is expected to come from non-OECD countries, particularly India and China, accounting for 18 per cent and 36 per cent respectively of this increase. [3] The Middle East is expected to experience the most rapid demand growth at 2 per cent per year largely due to fast growing energy demand sectors, such as petrochemical industries and power generation. Demand in Africa, particularly sub-Saharan Africa, is also expected to grow as electricity supply needs to increase in response to population growth. However, a lack of infrastructure in the region is expected to limit access to primary energies, and demand growth is projected to match the world average at 1.2 per cent per year. Together, non-OECD countries will account for about 93 per cent of global primary energy demand growth by 2035. [4]

Since the 1970s, there have been significant changes in the composition of primary energy produced globally (see Figure 2). Crude oil production has decreased from 46 per cent of total primary energy in 1970 to 33 per cent in 2010; and by 2035 it is expected to decline further to 26 per cent. [5] Coal production was also in decline until the late 1990s, but the trend has reversed and coal production increased by 3.7 percentage points from its share of 24 per cent of total energy produced in the 1990s. The resurgence in coal use is driven by the growing number of power generation plants to meet high energy demand, particularly from China which consumed 48.2 per cent of total global coal consumption in 2010 and accounted for about two thirds of global production growth in 2010. [6]

[1] UNDESA, Population Division, Population Estimates and Projection Section; *http://esa.un.org/unpd/wpp/unpp/p2k0data.asp*
[2] IEA, *World Energy Outlook 2010*. *http://www.iea.org/weo/docs/weo2010/*
[3] IEA, *World Energy Outlook 2010*. *http://www.iea.org/weo/docs/weo2010/*
[4] IEA, *World Energy Outlook 2010*. pp 49. *http://www.iea.org/weo/docs/weo2010/.*
[5] IEA, *World Energy Outlook 2010*. pp 399. *http://www.iea.org/weo/docs/weo2010/*
[6] BP, *Statistical Review of World Energy*. June 2011. http://bp.com/statisticalreview.

Natural gas consumption on the other hand has maintained steady growth since 1970 largely due to increases in the United States, the Russian Federation, China and India. By 2010, its share of the total energy market had increased to 23.8 per cent of world total primary energy consumption.[7] Overall, the market share of fossil fuels decreased between 1970 and 2010, while demand growth is expected to average 1.2 per cent per year [8] until 2035, largely due to growing concerns about the consequences of greenhouse gas emissions arising from its use, environmental legislation becoming more effective, the phasing out of fossil-fuel subsidies, increasing use of energy efficient technologies, and a shift to renewable resources as high prices allow other fuels to become economically competitive.

The use of primary renewable energy sources, including hydroelectricity, wind, solar, geothermal, biomass and marine energy is expected to triple between 2008 and 2035 and their combined share in total primary energy demand will increase from its current level of 7 per cent to 14 per cent. [9] In 2010, hydroelectricity consumption grew by 5.3 per cent, the second biggest annual increase in 30 years. This growth was driven mainly by China where more dams have been built to increase electricity production. Africa's consumption increased by 4.5 per cent and is forecast to grow at a rapid pace when new projects such as the recently launched Grand Millennium Dam in Ethiopia are completed. The consumption of other renewable energy resources – wind, solar, biomass etc. - also grew by about 15.5 per cent, driven mainly by China and the United States, together accounting for nearly 70 per cent of the annual global growth.

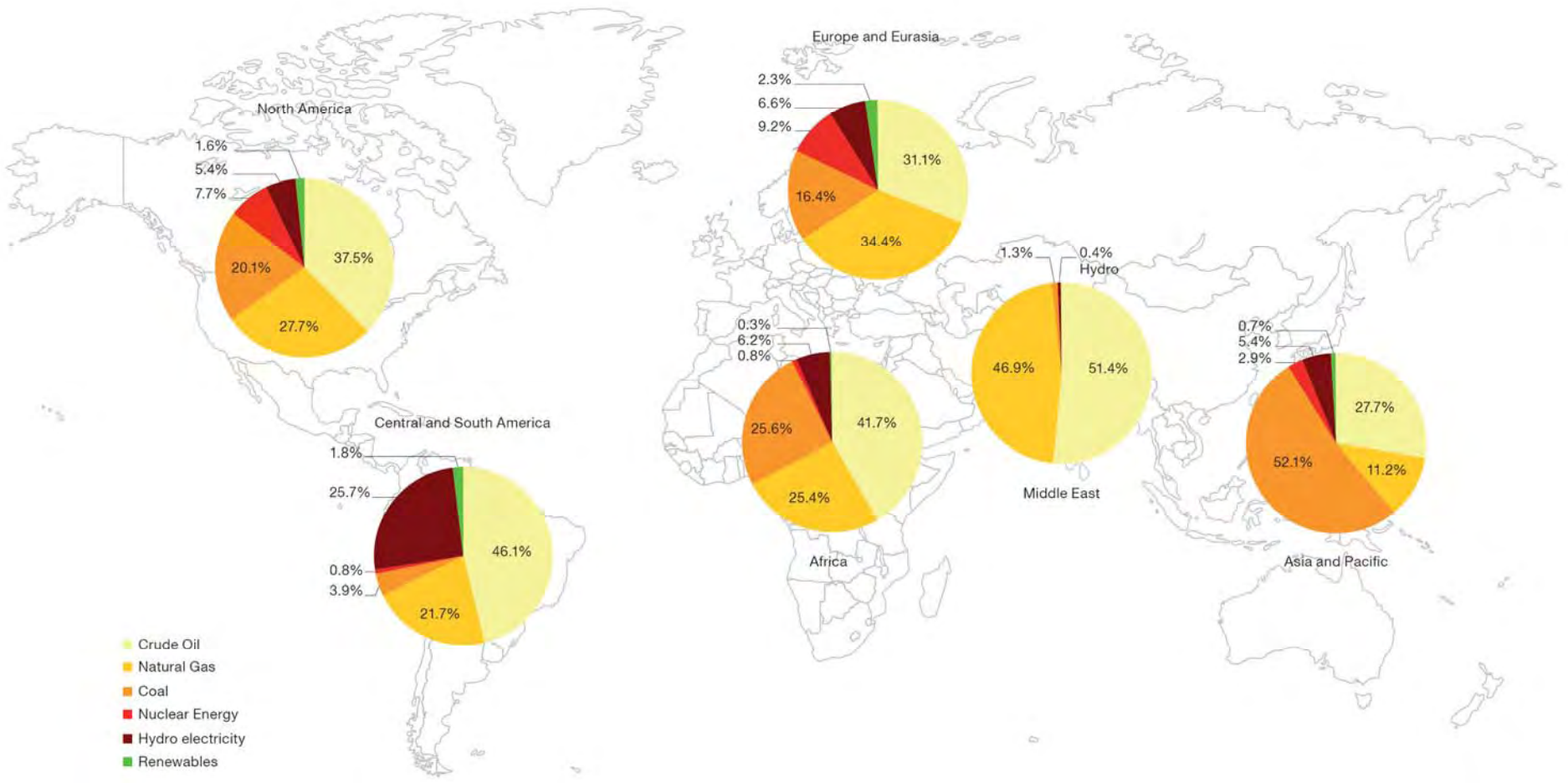
The potential for global growth of renewable energy resources is high but its share in global energy consumption has grown slowly from 0.6 per cent in 2000 to 1.8 per cent in 2010. [10] The relatively slow shift to these modern types of primary energy is due in part to the high capital costs involved in their development and weak policies to promote development and consumption.

In Africa hydro energy projects such as the Grand Inga in Congo could provide 39000 MW of electricity making it the world's largest power plant; [11] the geothermal potential of East Africa's Great Rift Valley is estimated at 6 GW [12] but is currently only used to generate about 150 MW in Kenya. [13] Other renewable energy resources such as solar energy and modern forms of biomass (biofuels) offer huge potential for low carbon energies in Africa.

The use of traditional forms of biomass, such as animal dung, fuel wood and agricultural residues, is likely to continue and are projected to represent 38 per cent of incremental energy demand by 2035. The following sections of this edition of UNCTAD's Commodities at a Glance describe in turn, world oil, gas, coal and renewable energy sectors trade, prices, production and consumption trends in greater detail, with a particular focus on Africa.

[7] BP, *Statistical Review of World Energy*, June 2011. http://bp.com/statisticalreview.
[8] IEA, *World Energy Outlook 2010*. http://www.iea.org/weo/docs/weo2010/
[9] IEA, *World Energy Outlook 2010*, Global Energy Trends.
[10] BP, *Statistical Review of World Energy,* juin 2011. http://bp.com/statisticalreview.
[11] http://www.greenworldinvestor.com/2011/06/30/worlds-largest-power-plant-hydro-dam-grand-inga-39-gw-in-congo-depends-on-inga-3-design-choices/
[12] PNUE, Tapping into the geothermal energy to power the east African region and beyond Kenya; http://www.unep.org/newscentre/default.aspx?DocumentID=2653&ArticleID=8847
[13] PNUE, Full steam ahead towards a green economy in Kenya; http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=664&ArticleID=8691&l=en&t=long

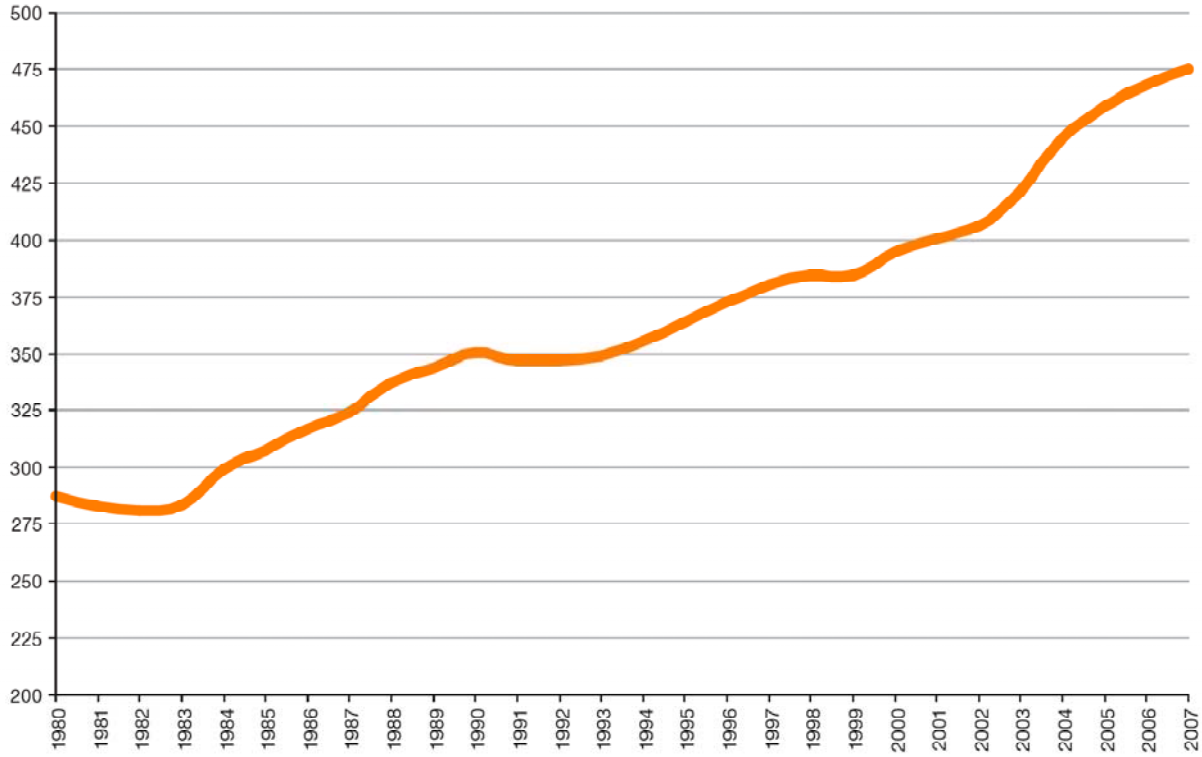
## Map 1. Regional energy consumption mix, 2010 (as a share of total regional consumption)




Source: BP, *Statistical Review of World Energy*, 2011

Note: These figures are computed from data expressed in million tons oil equivalent (Mtoe).

**Figure 1. Historical evolution of world primary energy production, 1980-2007 (quadrillion Btu)**



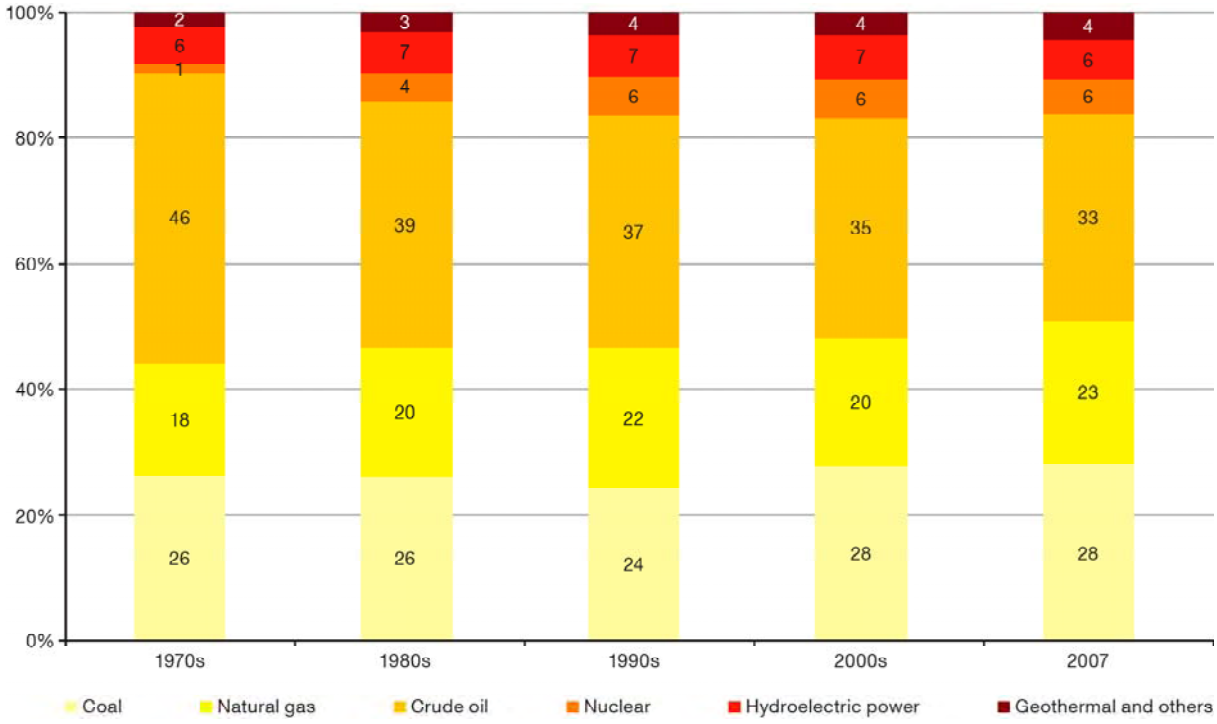

Source: US Energy Information Administration

Note: Btu: British Thermal Unit

**Primary energy exists in a naturally occurring form, such as non-renewable fossil fuels (e.g. coal) or renewables (e.g. solar and wind energy), before being converted into an end-use form.**

**Production of primary energy has almost doubled since 1980 largely due to world population and economic growth. Expert forecasts suggest a continuing trend of increasing production of primary energy as the world population continues to grow and a declining share of fossil fuels in the global energy mix (IEA, *World Energy Outlook 2010*, Global Energy Trends).**

Figure 2. World primary energy production breakdown by energy sources, 1970s, 1980s, 1990s, 2000s, 2007 (as a share of total primary energy production)

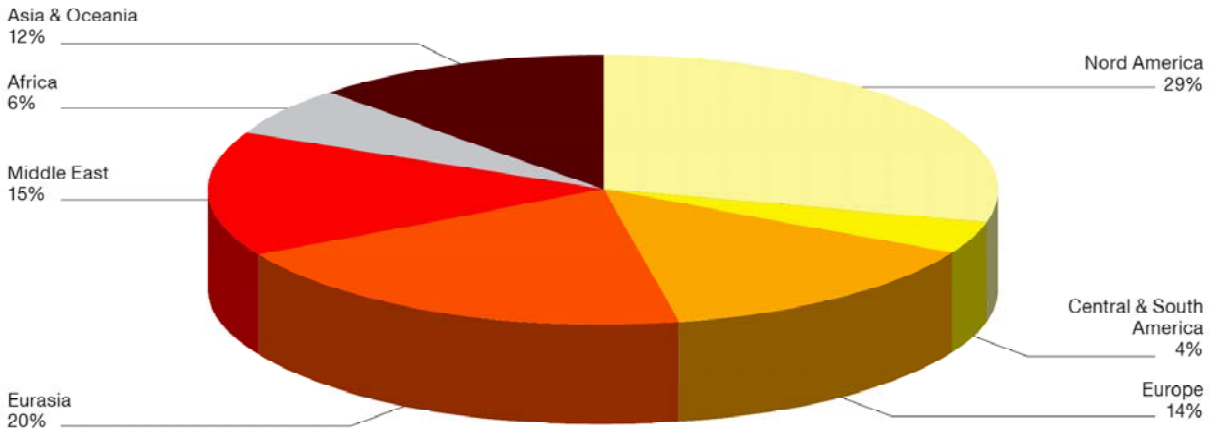



Source: US Energy Information Administration.

Note: These figures are computed from data expressed in quadrillion Btu.

**Fossil fuels dominate the composition of fuels in the global energy mix largely due to a lack of efficient substitutes, rising demand for transport needs as well as rising consumption in the industrial, residential and services sectors in developing countries. Growth in other primary energies have been limited, due in part to safety concerns about nuclear power, environmental concerns over hydroelectricity and renewable energy sources, significant technical challenges in developing systems to effectively and economically capture, store and use the energy when required.**

Figure 3a. Geographical breakdown of world primary energy production, 1980 (as a share of total world primary energy production)



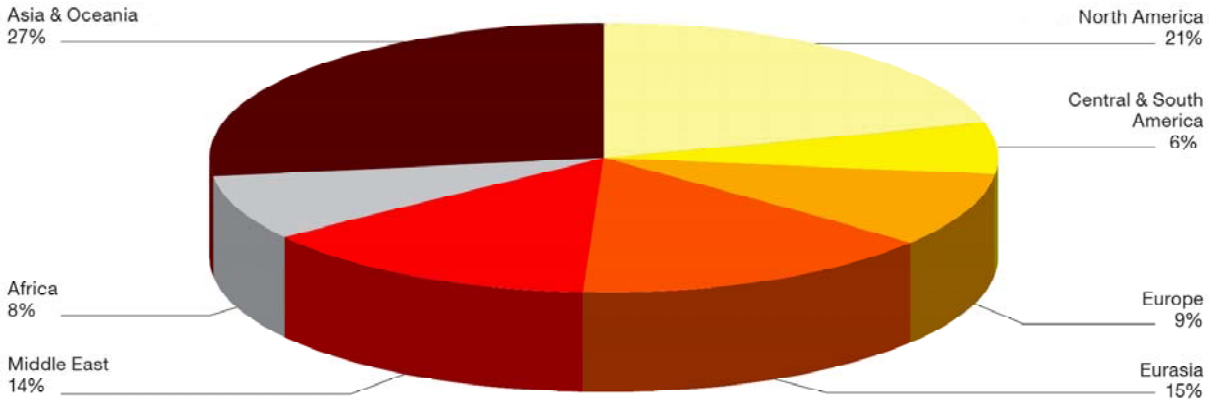

Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu.

**World primary energy production declined significantly in North America and Europe between 1980 and 2008.**

**Production in China and India contributed to boosting production in Asia and Oceania.**

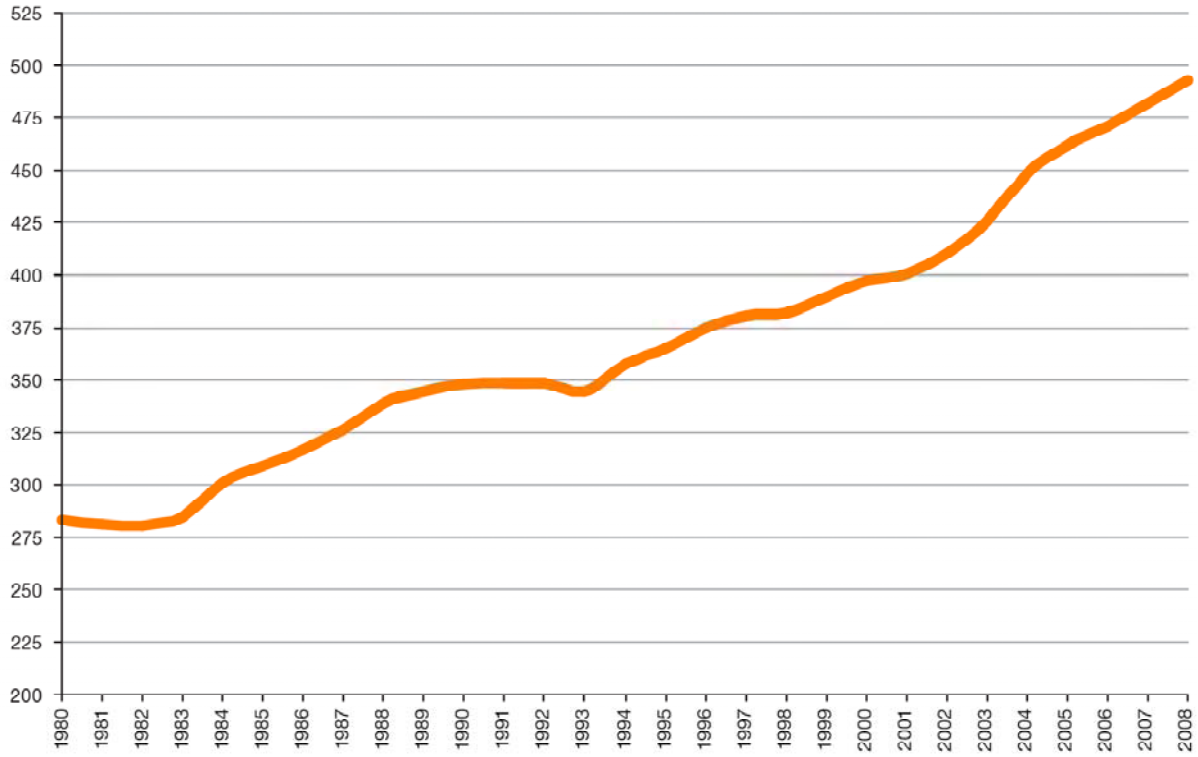
Figure 3b. Geographical breakdown of world primary energy production, 2008 (as a share of total world primary energy production)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu.

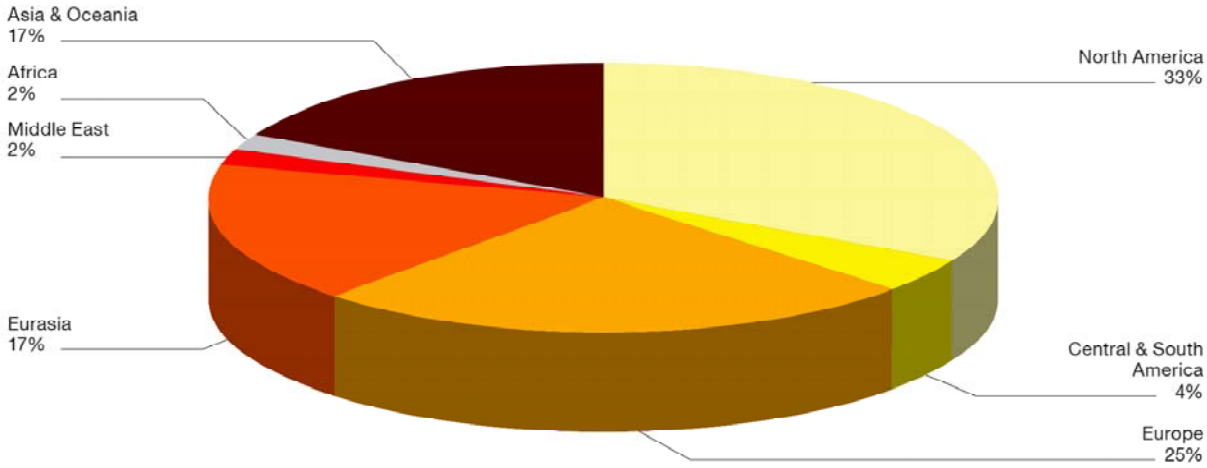
Figure 4. Historical evolution of world primary energy consumption, 1980-2008 (quadrillion Btu)




Source: US Energy Information Administration

**World population and real income growth have been the main drivers of rising primary energy consumption.**

Figure 5a. Geographical breakdown of world primary energy consumption, 1980 (as a share of total world primary energy consumption)




Source: US Energy Information Administration

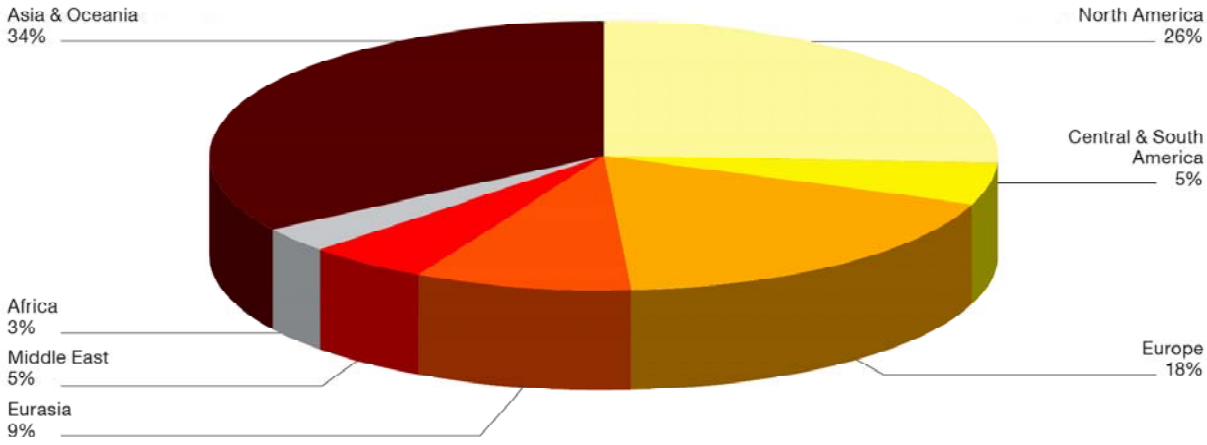
Note: These figures are computed from data expressed in quadrillion Btu.

**Between 1980 and 2007, the consumption of primary energy in industrialized countries declined due to a shift to services and less energy-intensive industries.**

**In contrast, Asia and Oceania have doubled their regional energy consumption.**

**Consumption in Africa remains low due to inadequate energy infrastructure and low income levels.**

Figure 5b. Geographical breakdown of world primary energy consumption, 2007 (as a share of total world primary energy consumption)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu.

# Facts and figures: CRUDE OIL

## Making news this quarter

OPEC countries account for more than 77 per cent of proven crude oil reserves in 2010. [1] Five countries in the Middle East, namely Saudi Arabia, Iran, Iraq, Kuwait, United Arab Emirates and Qatar, hold about two-thirds of the OPEC total and account for the half of the world total. In addition to these, a few countries in Africa –Angola, Nigeria and Libya; North America – Canada and the United States; and Europe and Eurasia – the Russian Federation and Kazakhstan; make the greatest contribution to world reserves estimated at 1.383,2 trillion barrels in 2010. At current rates of production, these reserves are expected to be depleted in 46 years, which raises concerns about the future of crude oil in supplying future primary energy needs (see Figure 6).

Since the 1970s, crude oil reserves have been depleting in some producing countries, such as the United States, Mexico, Norway, the United Kingdom; and discoveries of very large basins of conventional oil are becoming less frequent. However, there is a huge potential for extracting non-conventional resources, such as heavy oils (e.g. Venezuela), oils sands (e.g. Canada) and oil shale (e.g. the United States). The Republic of Congo, Madagascar and a few other countries also have smaller reserves of non-conventional resources (oil sands) which may supplement world oil supplies. The large scale exploitation of reserves of non-conventional resources is yet to begin, because of concerns about the long-run economic viability and potential costs of mitigating environmental impacts in its extraction.

After a drop in production of almost 1.74 million barrels per day in 2009, global crude oil supplies increased by 1.8 million barrels per day (2.3 per cent of the world total production) in 2010. OPEC's contribution to supply increased by 960,000 barrels per day, and non-OPEC supply by 590,000 barrels. [2] Growth in non-OPEC production was led by China, the United States and the Russian Federation, but increased contributions were also made by producers in Africa, including the Republic of Congo, Chad, Sudan, Gabon and Ghana. Approximately 30 per cent of world crude oil production and most of the incremental production to meet rising demand for crude oil originate from OPEC, as non-OPEC countries are usually producing at full capacity.

[1] BP, *Statistical Review of World Energy*. June 2011. http://bp.com/statisticalreview.
[2] BP, *Statistical Review of World Energy*. June 2011. http://bp.com/statisticalreview.

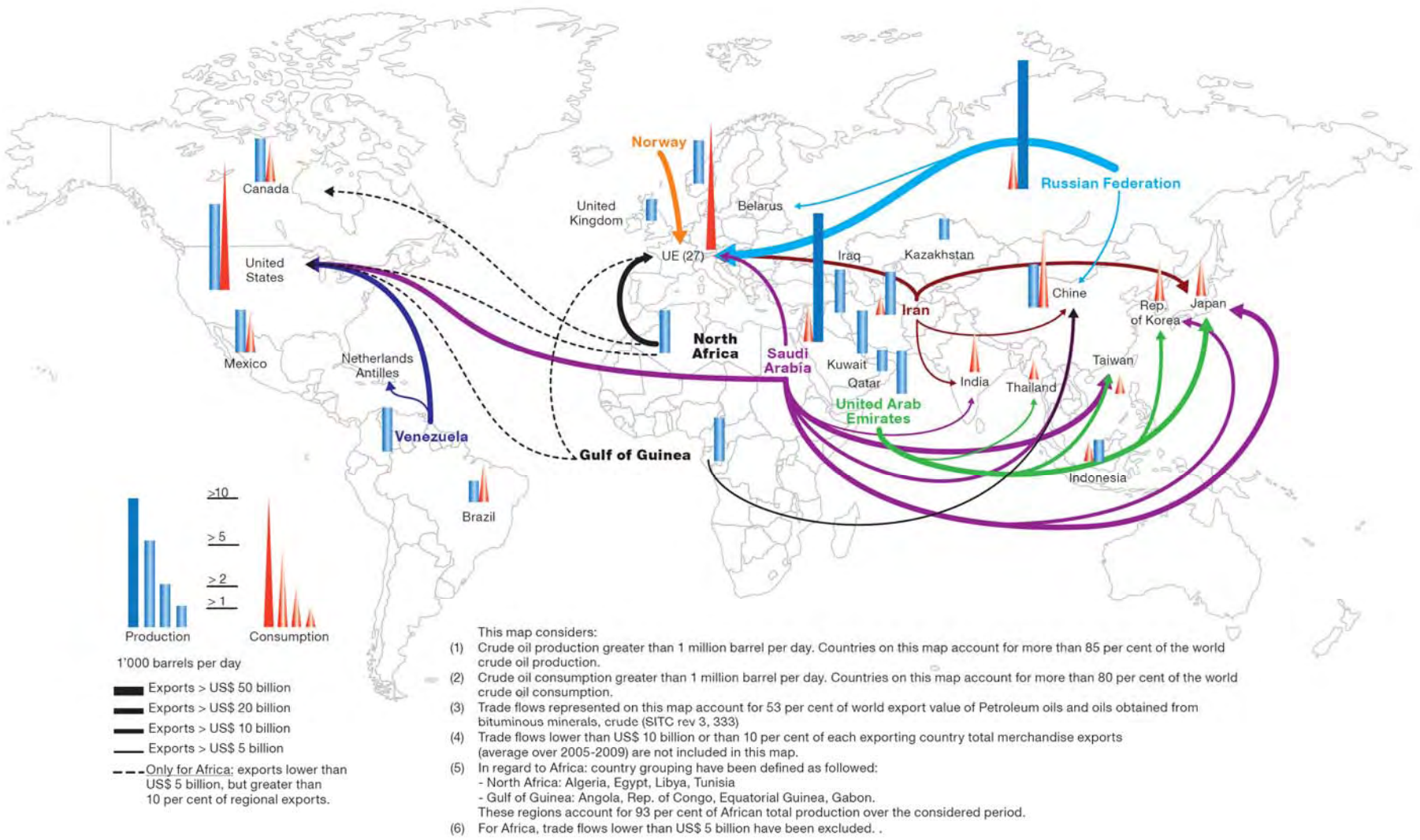
Over the last decade, crude oil consumption increased by almost 14 per cent (10.8 million barrels) driven largely by the global economic growth particularly in China and India, and the rising use of motor vehicles in these emerging affluent countries. IEA, projections show that by 2035, crude oil demand would grow by as much as 36 per cent with non-OECD countries accounting for 93 per cent of the increase in global energy demand, [3] despite measures introduced by governments to promote energy efficiency and to reduce greenhouse gas emissions associated with crude oil use. In Africa, demand for crude oil is primarily driven by growth in demand for refined products but low refinery capacity (see Figure 11) and a lack of infrastructure to distribute oil, has limited the continent's share of world consumption in 2010 to 3.8 per cent of the total. Egypt and South Africa account for a third of African consumption and 0.9 per cent and 0.4 per cent of world consumption respectively. [4]

Crude oil is the most widely traded commodity in the world in terms of volume, value, or carrying capacity. It accounts for more than the two thirds of global oil trade, and is dominated in imports by North America, Europe, and Asia-Pacific and in exports by the other regions. In contrast to natural gas, most trade is conducted in short and long haul shipments but also through pipelines in well integrated markets. African crude oil exports emanate mostly from Nigeria, Angola, Algeria and Libya (see Figure 13b). Most of the crude oil originating from the North Sea and West Africa are traded across the Atlantic Basin, moving to Europe or North America. Some of West Africa's crude is also destined for Asia. However, these markets receive most of their supplies from the Middle East because of its proximity and comparatively lower transportation costs which enable the supplier to maximize net revenues. For intra-regional trade, pipelines offer the most cost effective mode of transportation as compared to rail, barge or road. The extensive network of oil pipelines in North America (within Canada, from Canada into the United States, and within the United States) facilitates transcontinental movements of crude oil.

Excessive oil market volatility has the potential to inhibit demand and reduce the pace of global economic recovery. Higher oil prices could also lead to significant shifts in wealth distribution between different countries. For net-oil exporting countries, the recent high prices can improve the current account, generate government revenues and boost public spending. However, for net-oil importing developing countries, rising oil and food prices have led to high inflation and an increased fiscal burden.

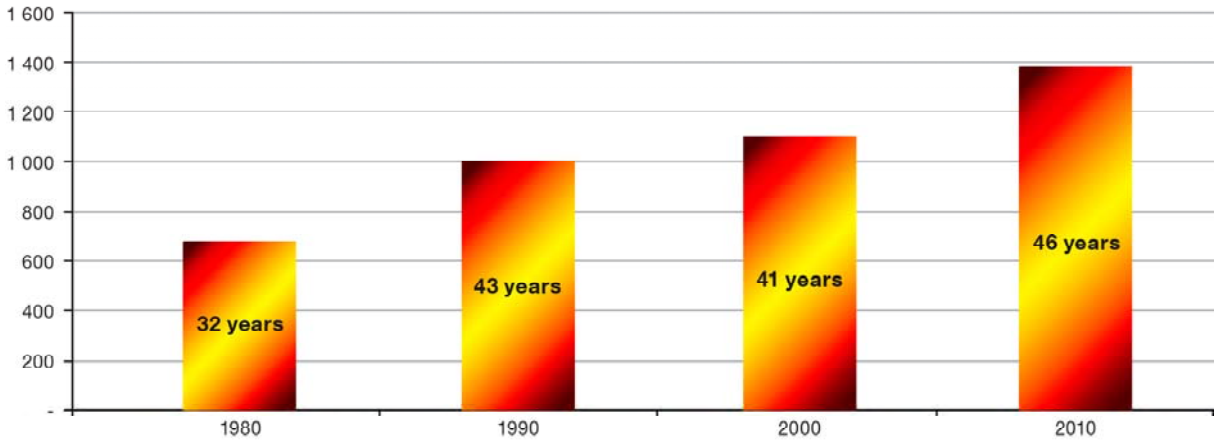
[3] IEA, *World Energy Outlook 2010*, Energy projections to 2035.
[4] BP, *Statistical Review of World Energy*. June 2011. http://bp.com/statisticalreview.

## Map 2. Crude oil: World production, consumption and main trade flows, 2005-2010 average




Source: BP, *Statistical Review of World Energy*, June 2011 and UNCTAD, UNCTADstat in regard to trade value data statistics.

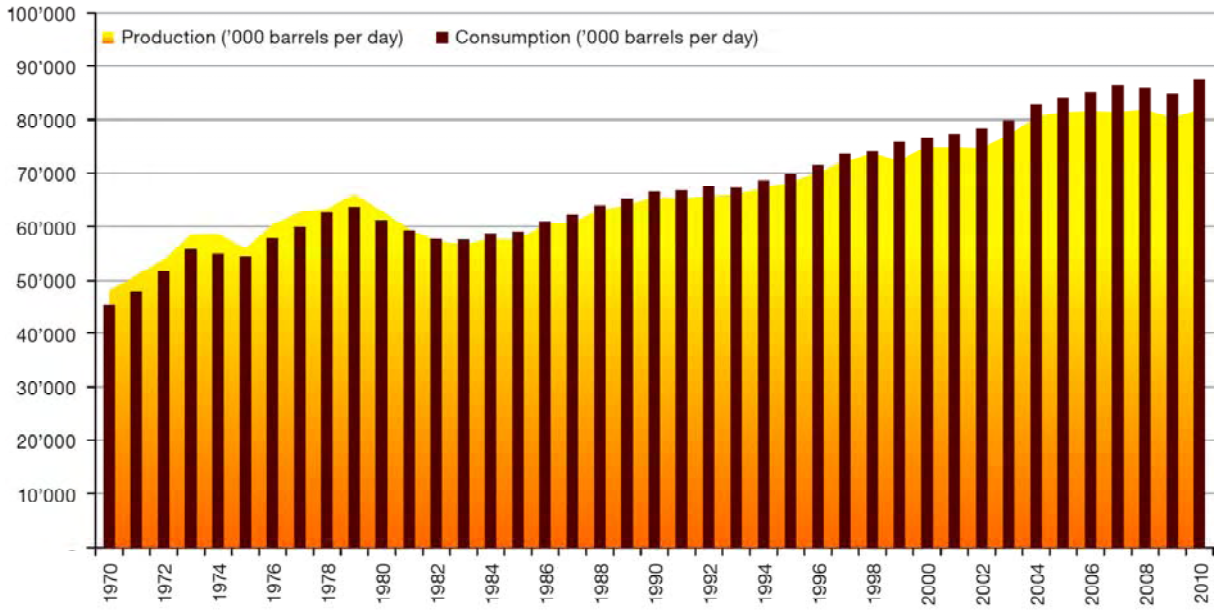
Figure 6. State of world crude oil reserves, selected years, 1980-2010 (as a number of years of production)




Source: BP, *Statistical Review of World Energy*, June 2011

**Over the last decade, the world reserves/production ratio has increased in comparison with the previous decade, due largely to an upward revision of reserves in Venezuela and new reserve discoveries in all other regions.**

Figure 7. Historical evolution of world oil production* and world oil consumption**, 1970-2010 (1'000 barrels per day)



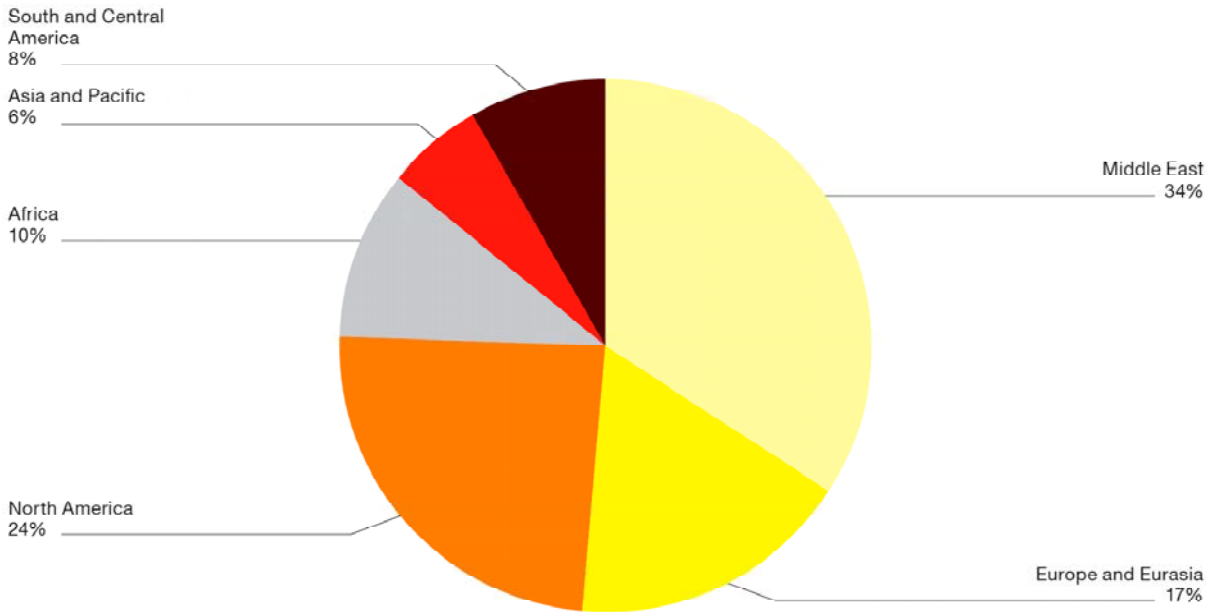

Source: BP, *Statistical Review of World Energy*, June 2011

Note: Differences between world consumption figures and world production statistics are accounted for by stock changes, consumption of non-petroleum additives and substitute fuels, and unavoidable disparities in the definition, measurement or conversion of oil supply and demand data.

* Includes crude oil, shale oil, oil sands and NGLs (the liquid content of natural gas where this is recovered separately). Excludes liquid fuels from other sources such as biomass and coal derivatives.

** Inland demand plus international aviation and marine bunkers and refinery fuel and loss. Consumption of ethanol and biodiesel fuels is also included."

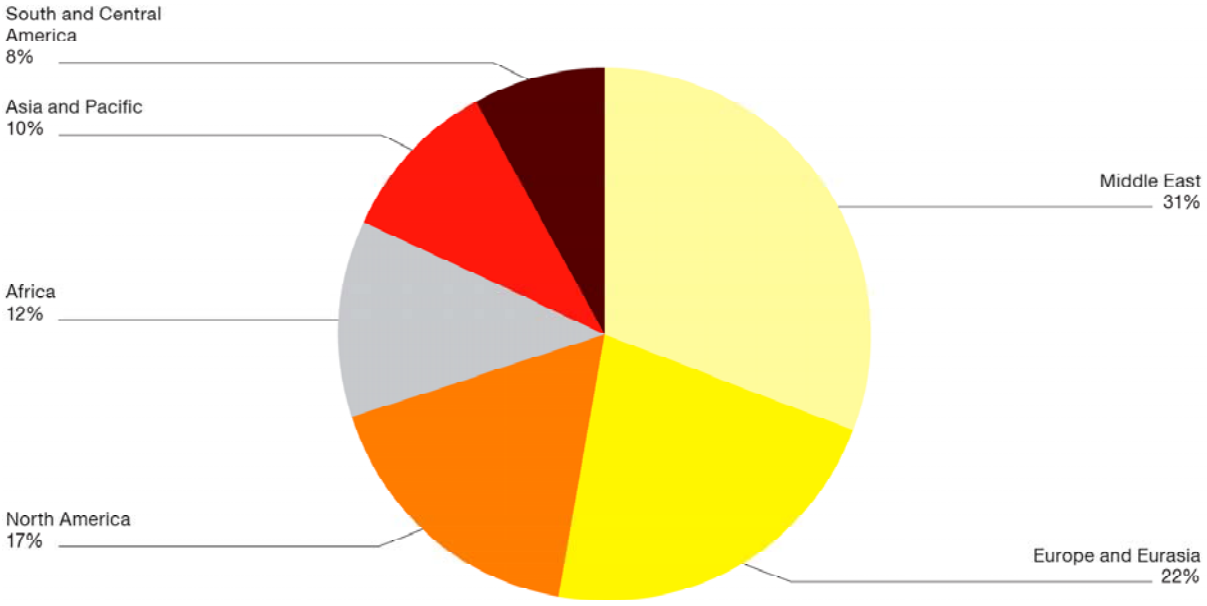
Figure 8a. Regional breakdown of crude oil production, 1970-1975 average (as a share of total world crude oil production)




Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in 1'000 barrels per day.

Figure 8b. Regional breakdown of crude oil production, 2005-2010 average (as a share of total world crude oil production)

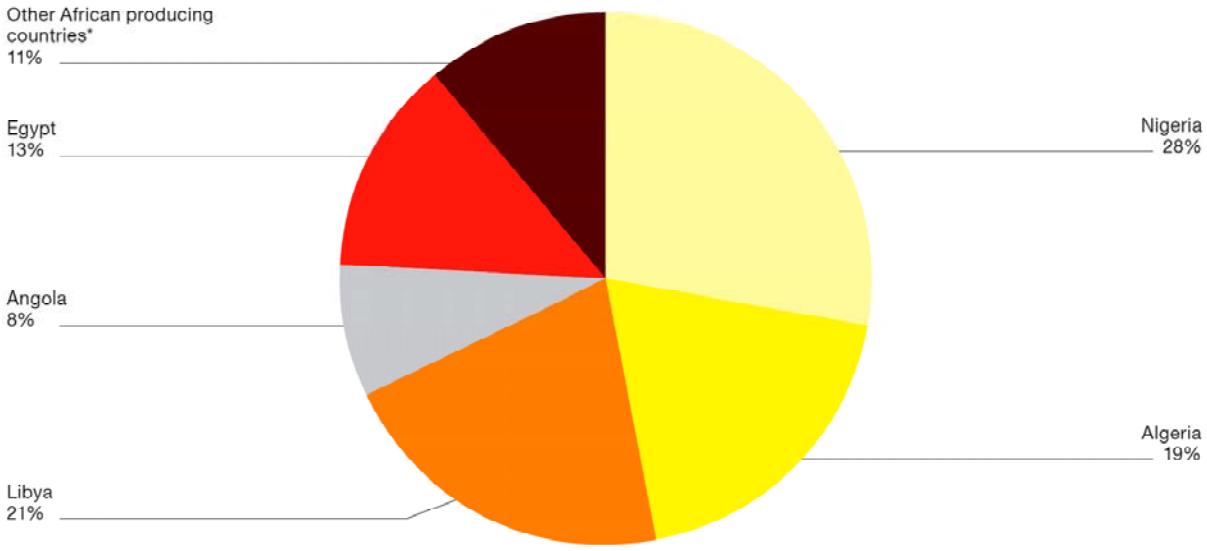



Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in 1'000 barrels per day.

**During the period 1970 to 2010, production in North America declined, whilst production in Asia-Pacific, Europe and Eurasia grew.**

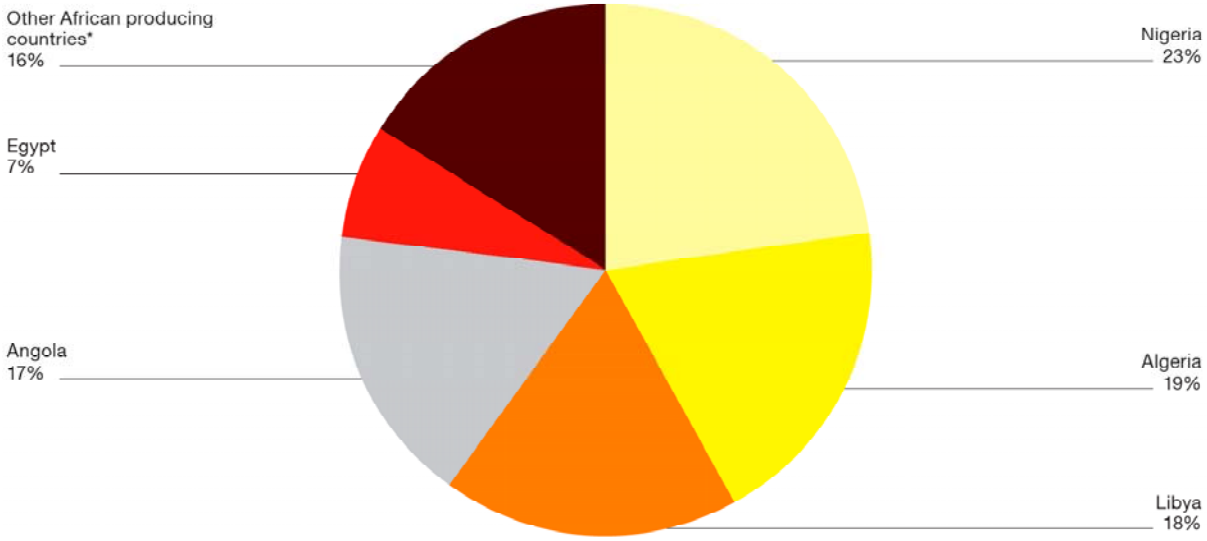
Figure 9a. African Crude oil production by countries, 1970-1975 average (as a share of total African crude oil production)




Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in 1'000 barrels per day.
*Chad, Congo (rep. of), Equatorial Guinea, Gabon, Sudan, Tunisia

Figure 9b. African Crude oil production by countries, 2005-2010 average (as a share of total African crude oil production)

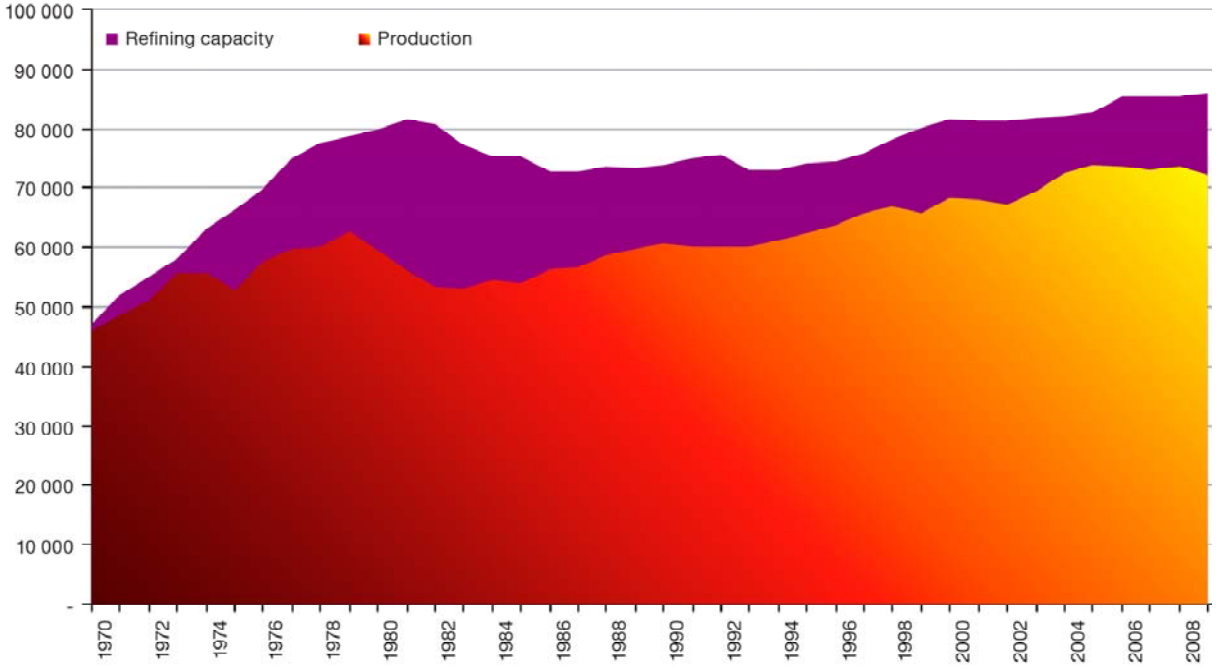



Source: BP, Statistical Review of World Energy, June 2011

These figures are computed from data expressed in 1'000 barrels per day.
*Chad, Congo (rep. of), Equatorial Guinea, Gabon, Sudan, Tunisia

**In Angola the production of crude oil increased from 8 per cent in the early 1970s to 17 per cent in the late 2000s, due to deep offshore oil production coming onstream. Nigeria, remains Africa's largest crude oil producer.**

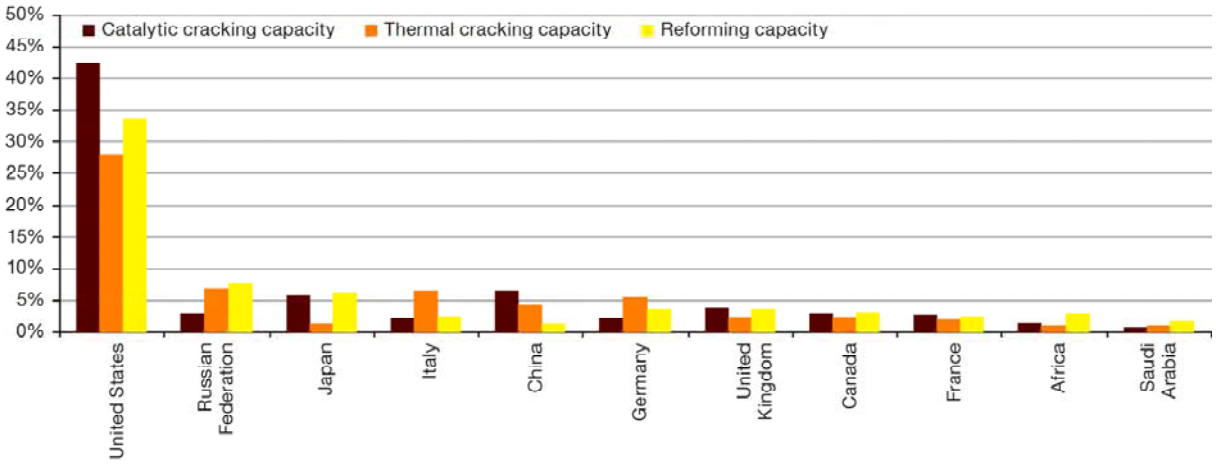
Figure 10. Historical evolution of the world refining capacity, 1970-2009e (1'000 barrels per day)




Source: US Energy Information Administration

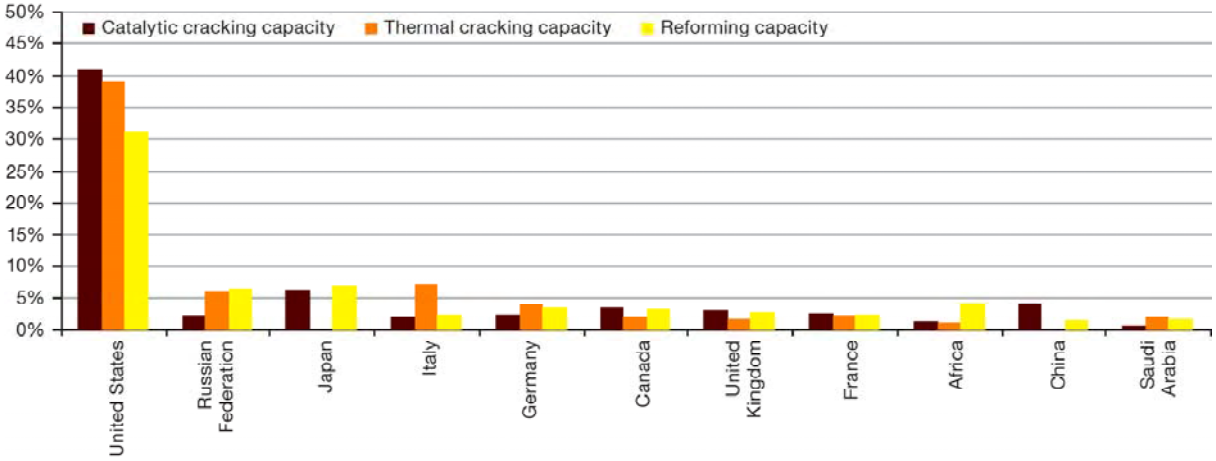
**Refining capacity over the last few years has been stagnant reflecting growing environmental concerns. Also, problems with maintenance, unexpected outages and shutdowns have contributed to the underutilization of refining capacity.**

Figure 11a. National crude oil refining capacity and breakdown by leading operations: distillation (as a share of total world distillation), cracking (as a share of total world cracking) and reforming (as a share of total world reforming), 1996




Source: US Energy Information Administration

Figure 11b. National crude oil refining capacity and breakdown by leading operations: distillation (as a share of total world distillation), cracking (as a share of total world cracking) and reforming (as a share of total world reforming), 2009




Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

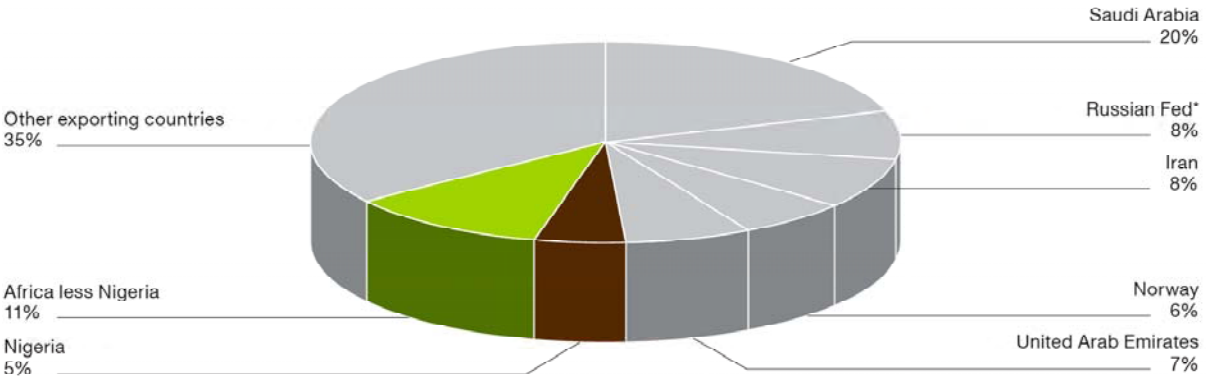
**Definitions**

**Catalytic cracking**: "A refining process which breaks down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules by the action of heat and aided by the presence of a catalyst but without the addition of hydrogen. In this way heavy oils (fuel oil components) can be converted into lighter and more valuable products (notably gasoline and middle distillate components)."

**Thermal cracking**: "A refining process in which heat and pressure are used to break down, rearrange, or combine hydrocarbon molecules. Thermal cracking includes visbreaking, fluid coking, delayed coking, and other similar processes."

**Reforming**: "A refining process using controlled heat and pressure with catalysts to rearrange hydrocarbon molecules in the naphtha (or naphtha-type) feed, thereby converting paraffinic and naphthenic type hydrocarbons (low octane gasoline boiling range fractions) into higher octane stocks suitable for blending into finished gasoline. Since the product of the process, reformate, is richer in aromatics than its feed, naphtha, this process is also used to produce aromatic petrochemicals (Benzene, Toluene and Xylene)."

Figure 12a. World crude oil exports by leading exporting countries, 1990-1995 average (as a share of total world crude oil exports)



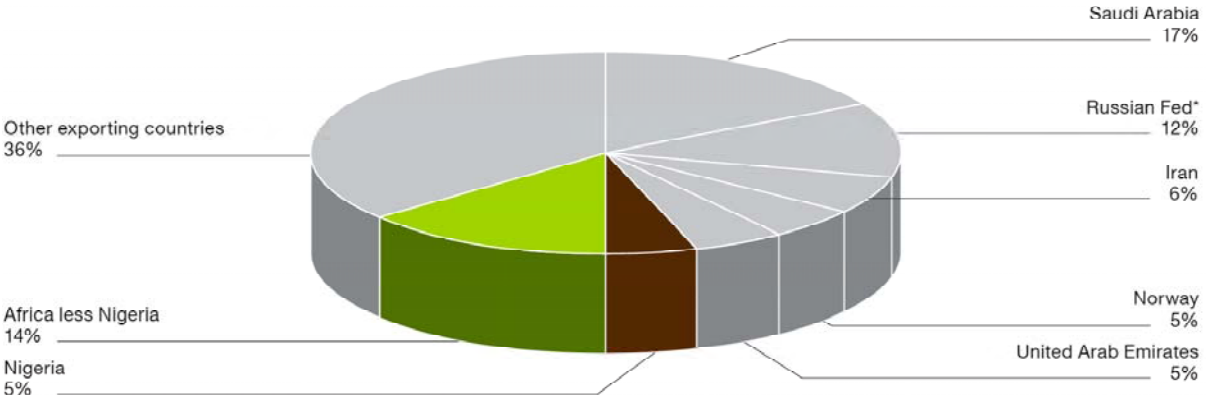

Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

* For the Russian Federation, the first year available is 1992, as this country was part of the "former USSR" total before this date. As a consequence, the average for this country has been computed on the 1992-1995 period.

**Continued growth in African crude oil production is anticipated as new producers (e.g. Ghana and Uganda) raise their production and export levels.**

Figure 12b. World crude oil exports by leading exporting countries, 2005-2009 average (as a share of total world crude oil exports)

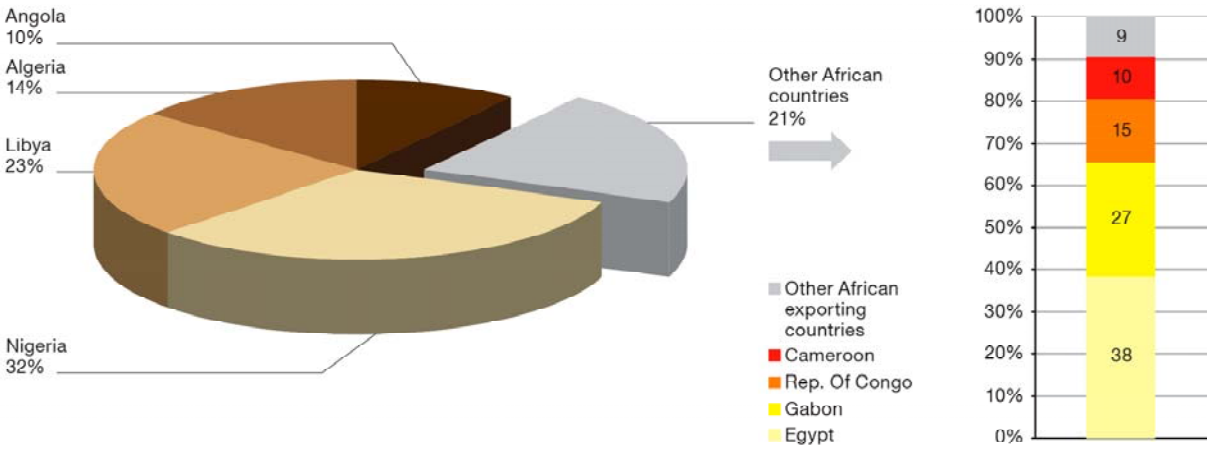



Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

* For the Russian Federation, the first year available is 1992, as this country was part of the "former USSR" total before this date. As a consequence, the average for this country has been computed on the 1992-1995 period.

Figure 13a. African crude oil exports by leading African exporting countries, 1990-1995 average (as a share of total African exports)

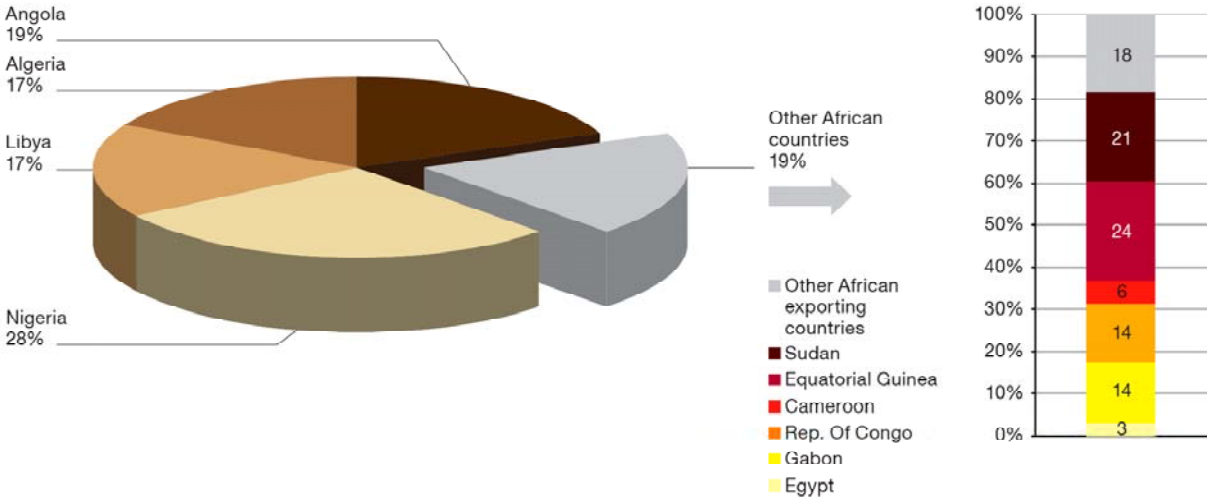



Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

**Nigeria is Africa's leading exporter of crude oil. However, since 1990/1995, other producers such as Angola, Equatorial Guinea, Chad and Sudan have contributed greatly to Africa's export performance.**

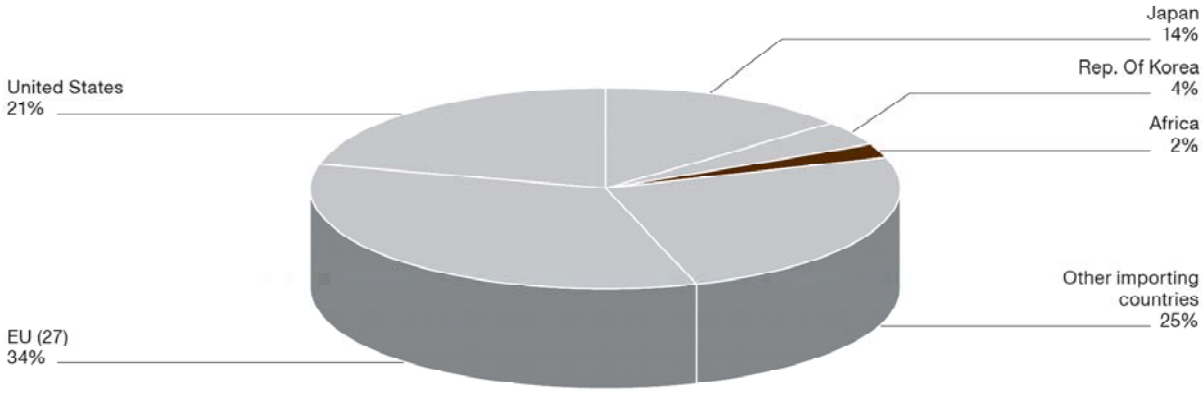
Figure 13b. African crude oil exports by leading African exporting countries, 2005-2009 average (as a share of total African exports)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

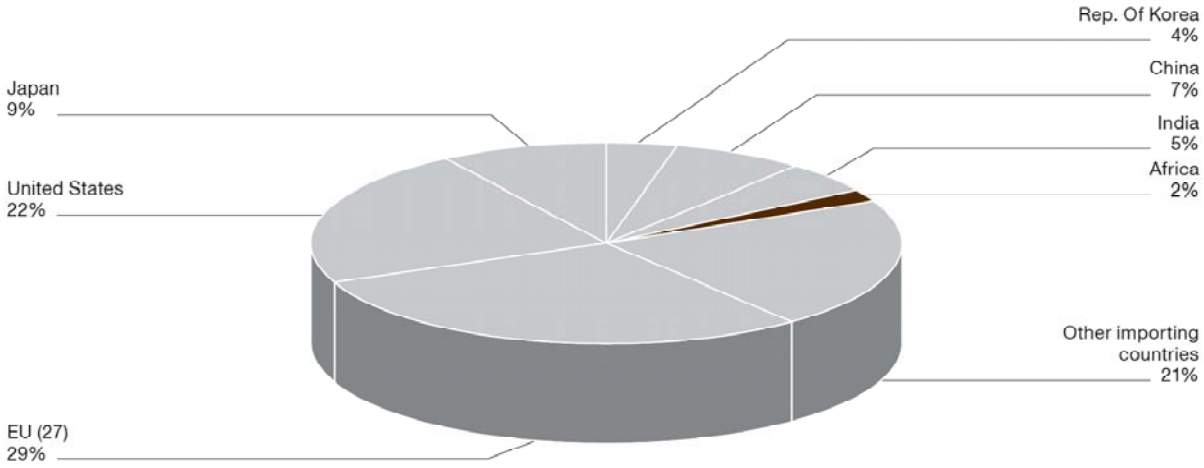
Figure 14a. World crude oil imports by leading importing countries, 1990-1995 average (as a share of total world imports)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

Figure 14b. World crude oil imports by leading importing countries, 2005-2009 average (as a share of total world imports)



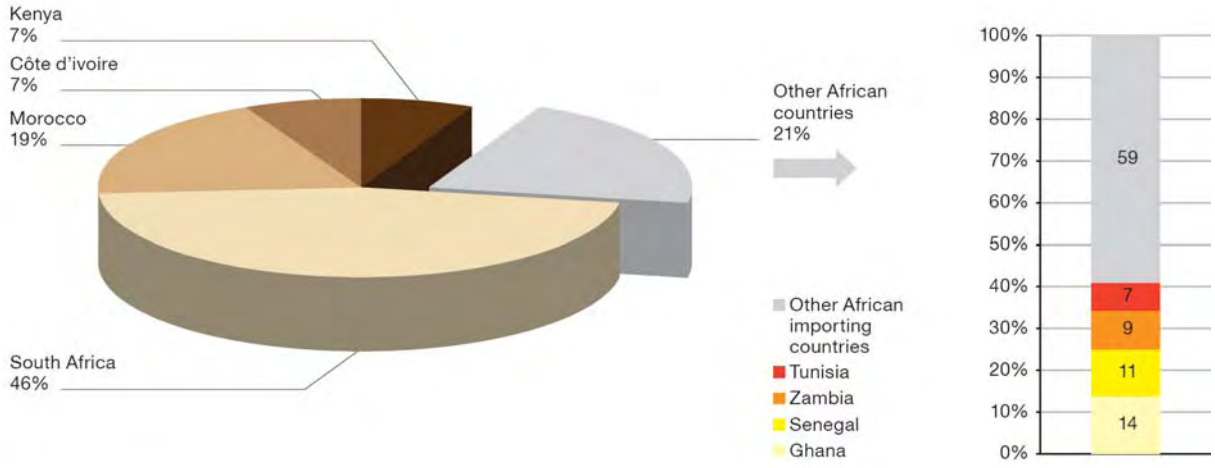

Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

**Crude oil imports fell in the EU (27), largely as a result of the reduction in energy-intensive activities and diversification into other energy sources.**

**Strong economic growth and rising demand have propelled China and India into the group of leading crude oil importers.**

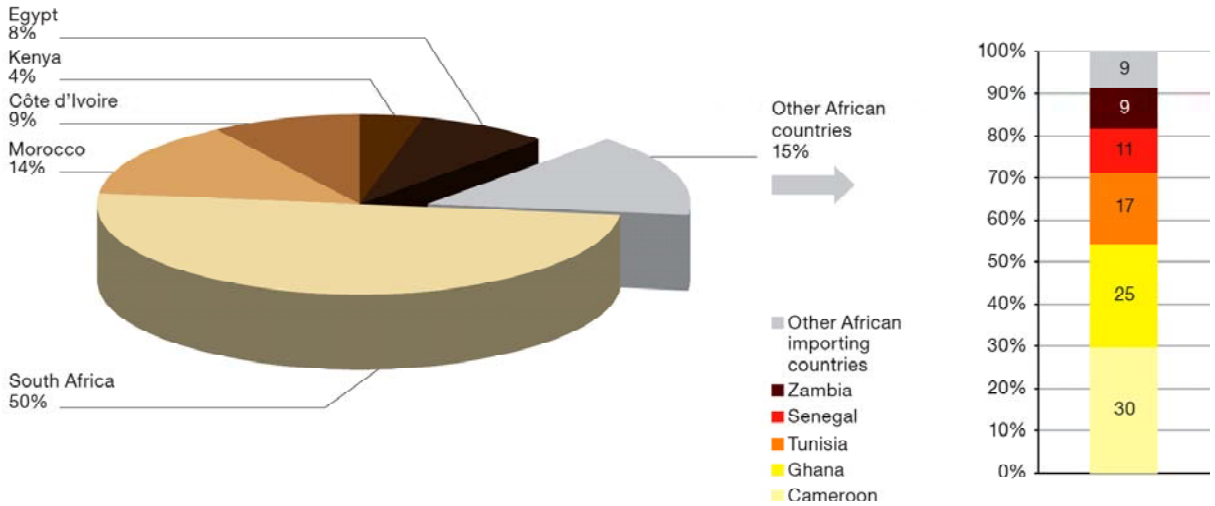
Figure 15a. African crude oil imports by leading African importing countries, 1990-1995 average (as a share of total African imports)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in 1'000 barrels per day.

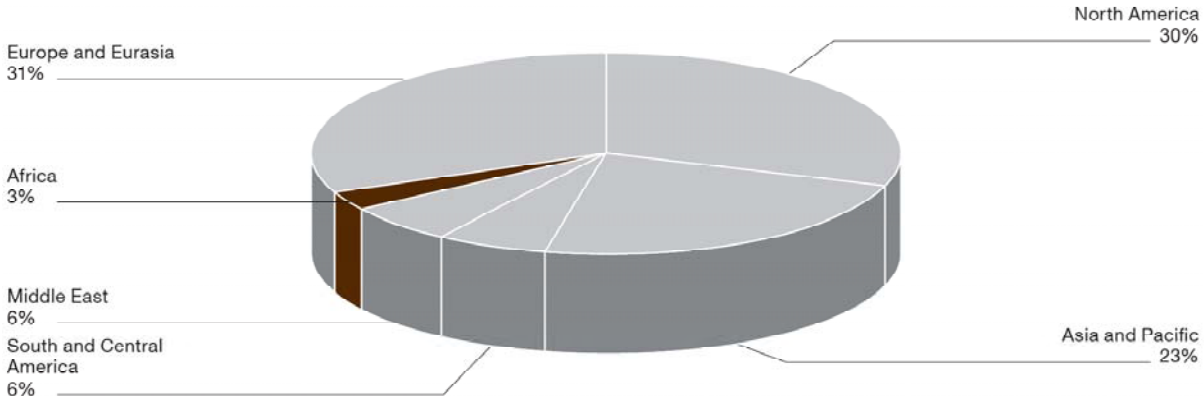
Figure 15b. African crude oil imports by leading African importing countries, 2005-2009 average (as a share of total African imports)




Source: US Energy Information Administration

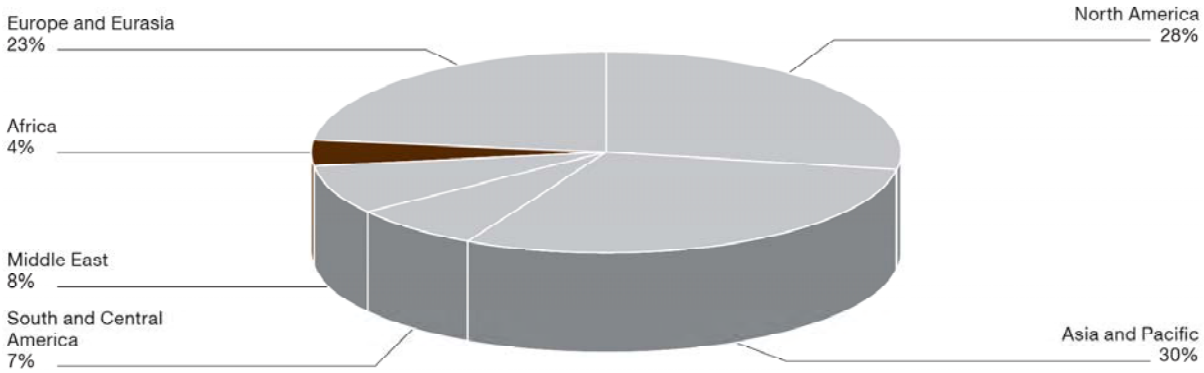
Note: These figures are computed from data expressed in 1'000 barrels per day.

Figure 16a. Regional breakdown of crude oil consumption, 1990-1995 average (as a share of total world consumption)




Source: BP, *Statistical Review of World Energy*, June 2011
Note: These figures are computed from data expressed in 1'000 barrels per day.

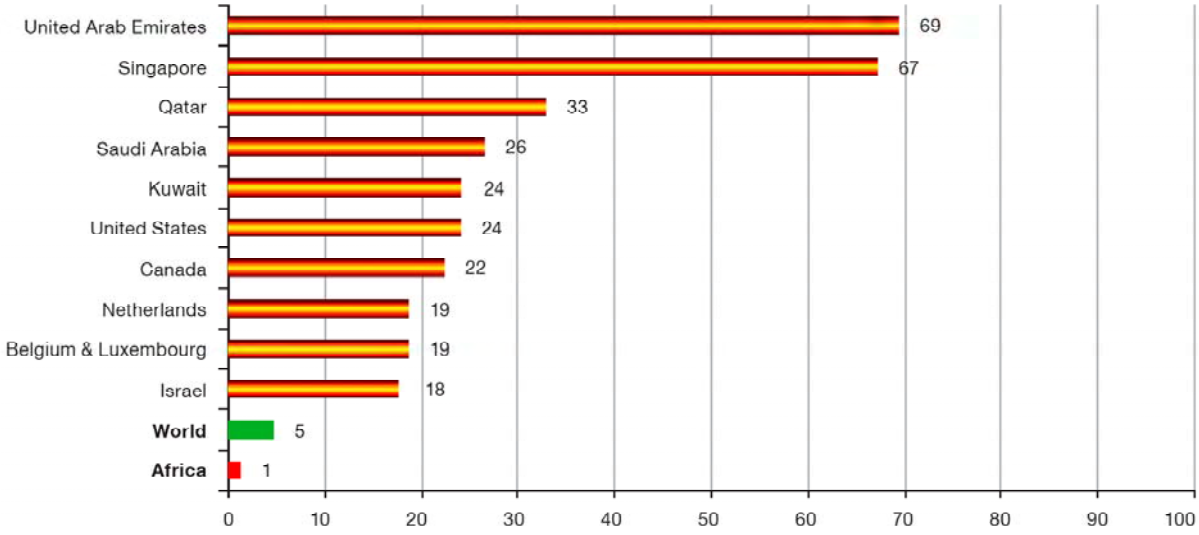
Figure 16b. Regional breakdown of crude oil consumption, 2005-2010 average (as a share of total world consumption)




Source: BP, *Statistical Review of World Energy*, June 2011
Note: These figures are computed from data expressed in 1'000 barrels per day.

**Growth in crude oil consumption has been mainly driven by the Asia-Pacific region.**

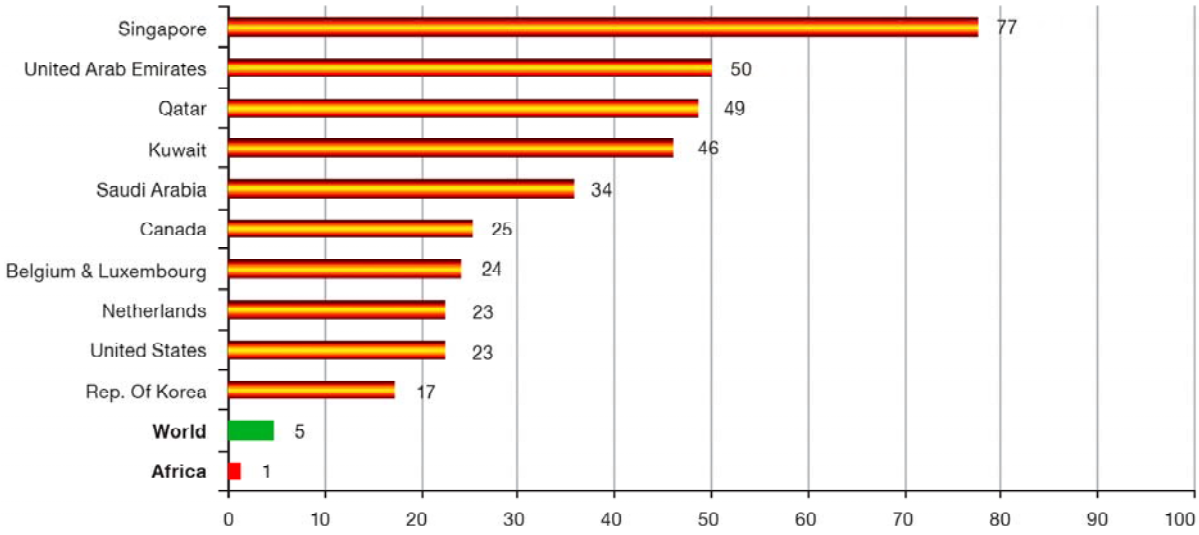
Figure 17a. Leading crude oil consuming countries per capita, 1990-1995 average (barrels per capita and per year)




Source: BP, *Statistical Review of World Energy*, June 2011 (consumption data), UNCTAD, *UNCTADstat* (population data)

Note: Annual consumption per capita has been computed on the basis of 360 days.

Figure 17b. Leading crude oil consuming countries per capita, 2005-2010 average (barrels per capita and per year)



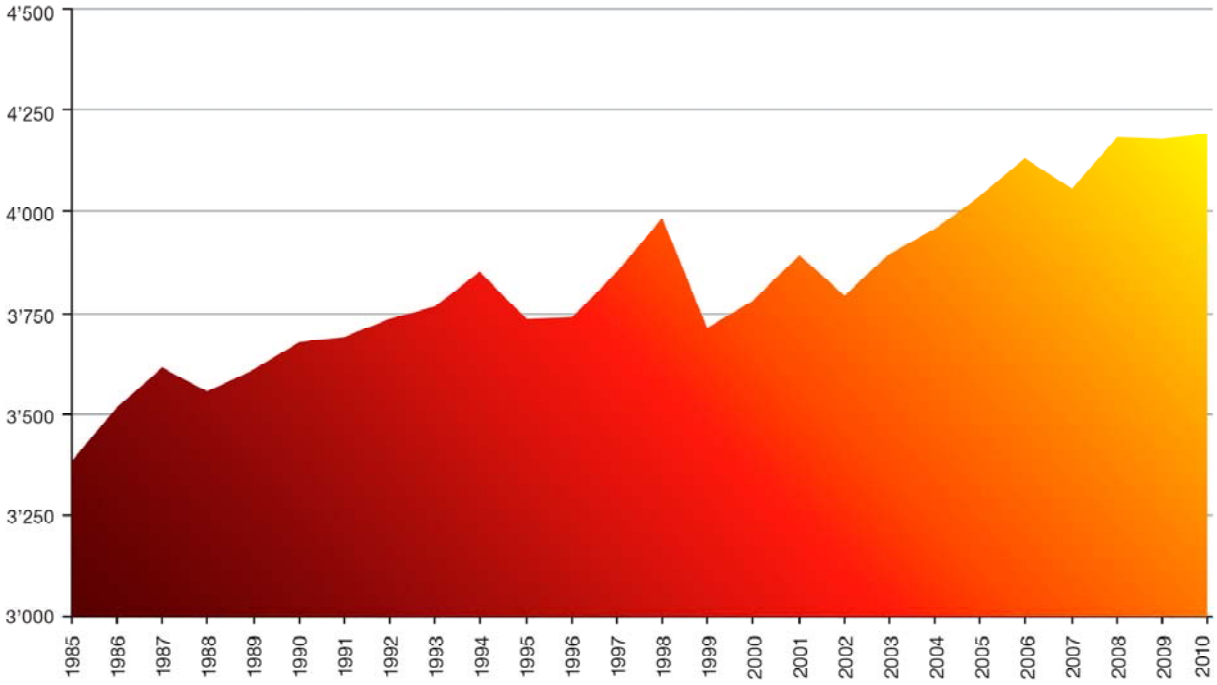

Source: BP, *Statistical Review of World Energy*, June 2011 (consumption data), UNCTAD, *UNCTADstat* (population data)

Note: Annual consumption per capita has been computed on the basis of 360 days.

**Crude oil consumption per capita between the early 1990s and late 2000s has remained stagnant in many industrialized countries despite their economic growth.**

**Africa's per capita energy consumption is well below the world average, and is still dominated by traditional biomass.**

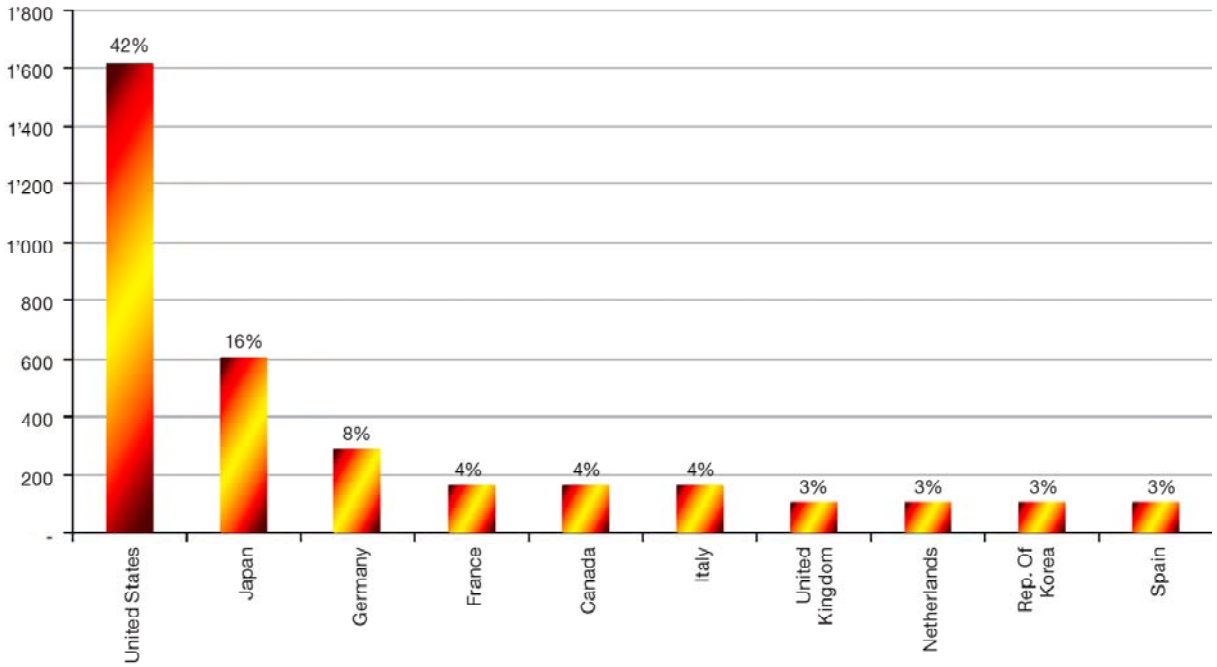
Figure 18. Historical evolution of OECD crude oil stocks, 1985-2010 (million barrels)




Source: US Energy Information Administration

**OECD strategic stocks peaked in 2009 due largely to a glut in the market caused by a decline in demand following the 2008-2009 financial crisis.**

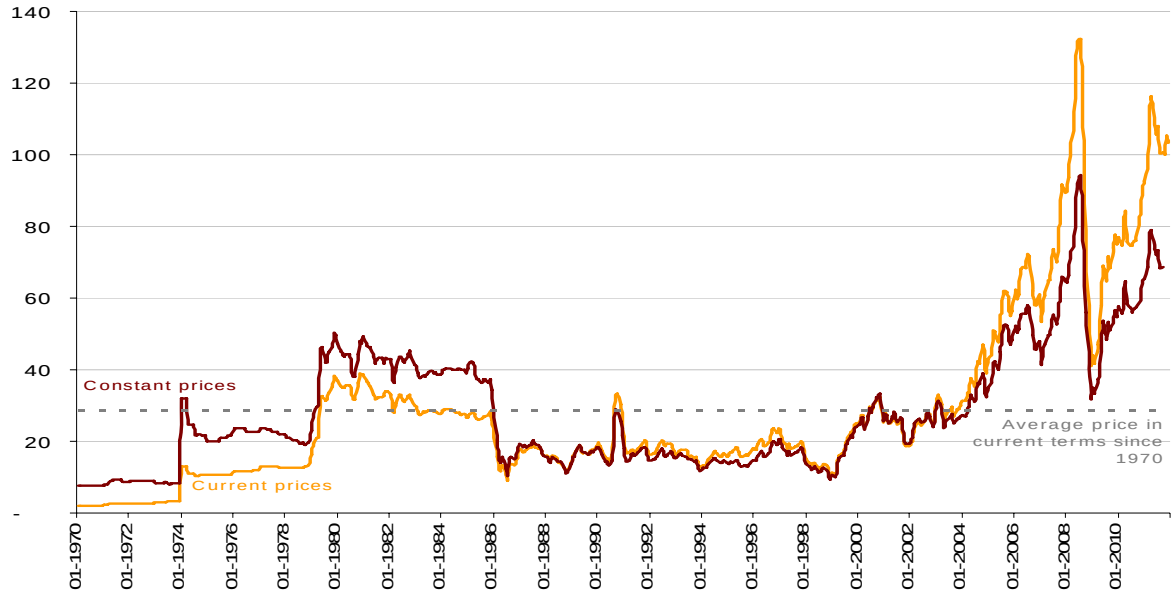
Figure 19. OECD main stockholders, 1985-2010 average (million barrels)




Source: US Energy Information Administration

Note: Percentages indicated on this graph are the share of the stocks hold by each country in total OECD stocks.

Figure 20. Historical evolution of crude oil prices in current and constant terms, January 1970-December 2011 (US$ per barrel)

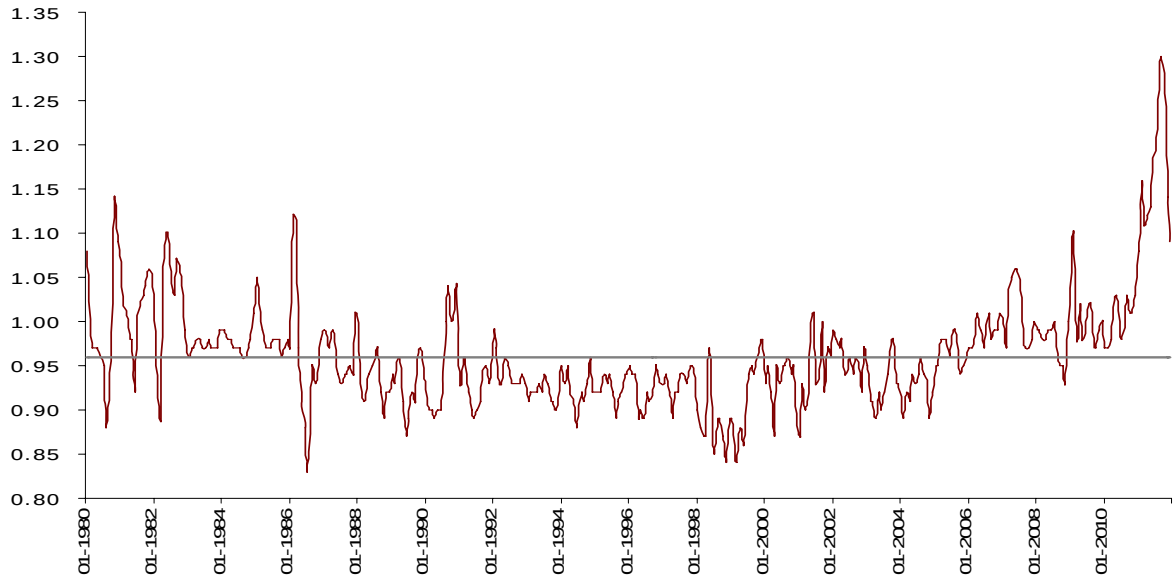



Source: UNCTAD, *UNCTADstat* (Equally weighted average of Dubai/Brent/Texas prices)

Note: To compute constant terms prices, the following deflator has been used: Unit value index of manufactured goods exports by developed market-economy countries (UNSD). At the time of writing, this deflator was only available up to the third quarter of 2011.

**During the period 1970-1999, supply-side factors mainly influenced oil price trends (e.g. the 1973 oil embargo, the 1979 Iranian revolution, the Persian Gulf war of 1991).**

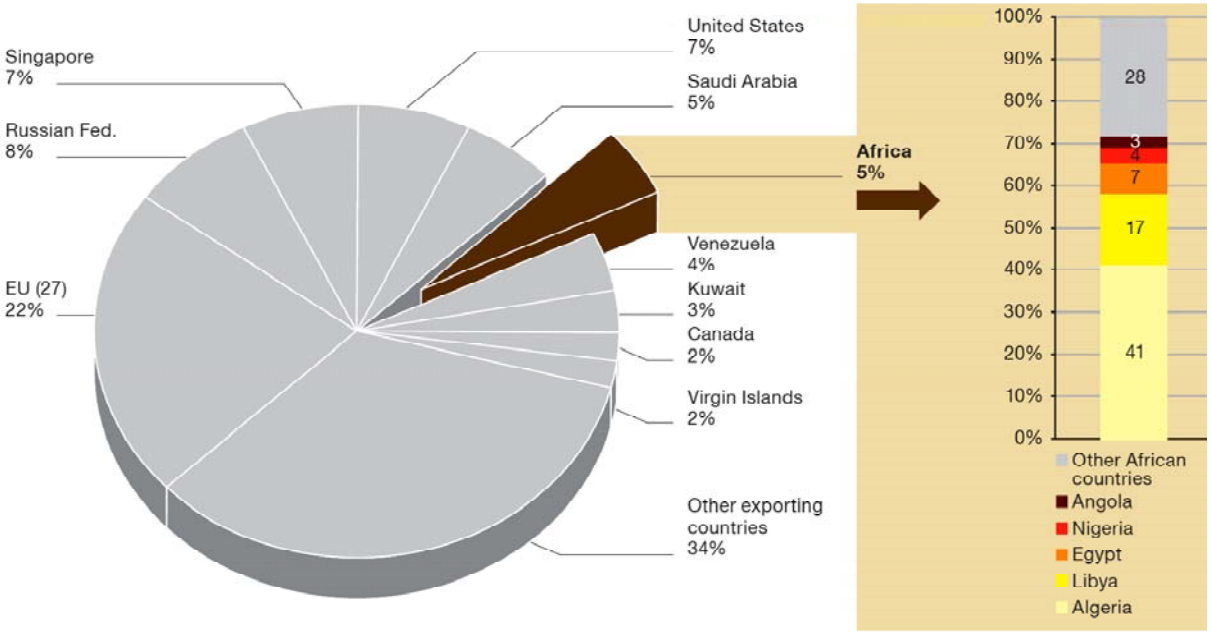
Figure 21. Historical evolution of the brent versus West Texas Intermediate (WTI) price ratio, January 1980-December 2011




Source: FMI, *International Financial Statistics*

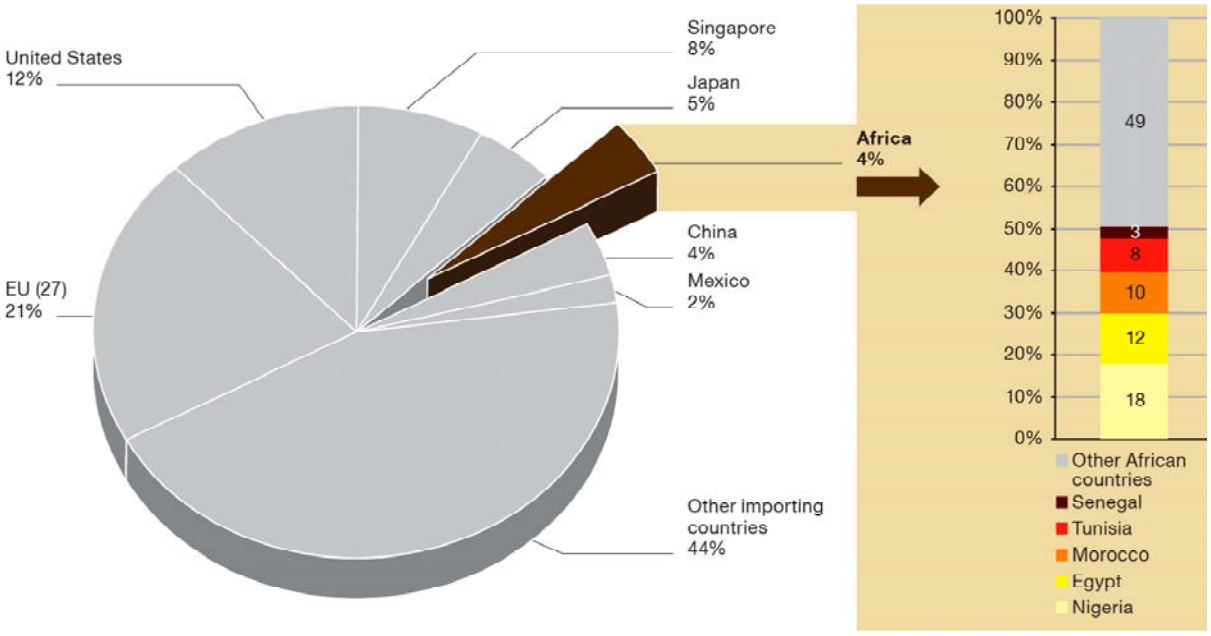
**During the 1980s, 1990s and early 2000s, WTI crude oil mainly traded at a premium to Brent because it is lighter and sweeter, easier and less costly to refine.**

Figure 22. World leading petroleum products exporting countries, 2005-2009 average (as a share of total world exports) and breakdown by leading African exporters



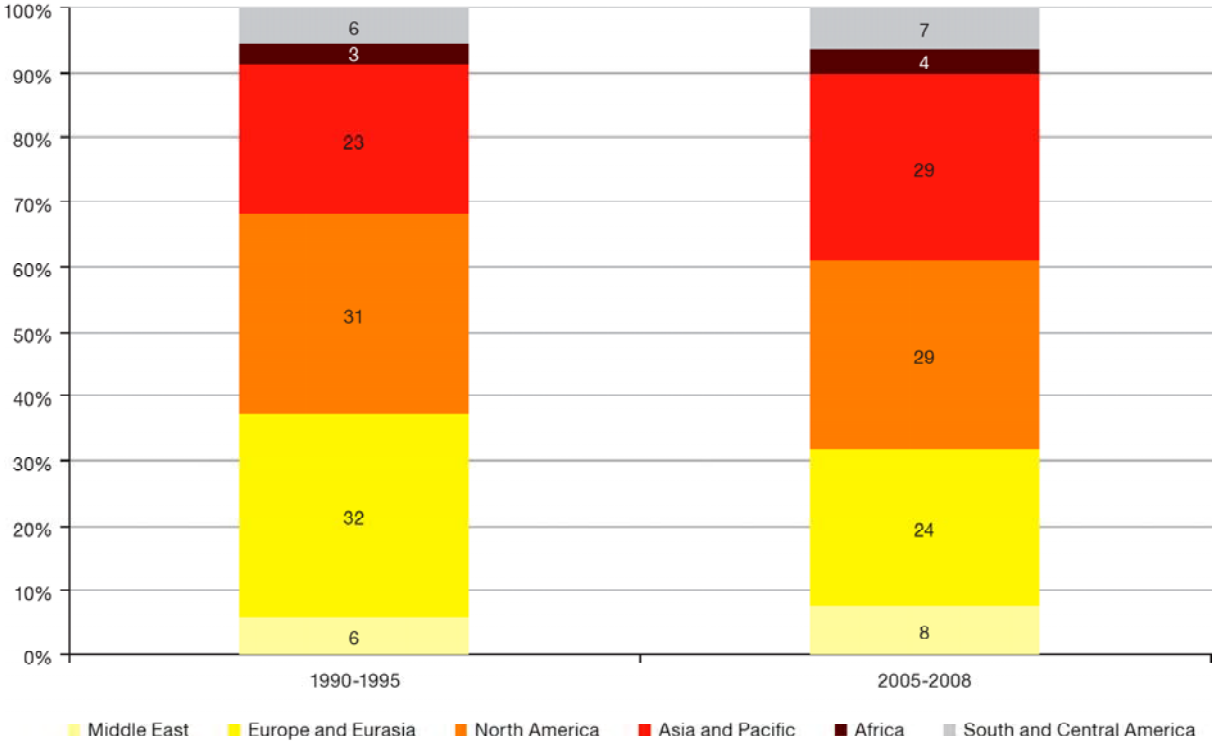

Source: OPEC, *Annual Statistical Bulletin 2009* (table 3.20)

Figure 23. World leading petroleum products importing countries, 2005-2009 average (as a share of total world imports) and breakdown by leading African importers




Source: OPEC, *Annual Statistical Bulletin 2009* (table 3.24)

Figure 24. Breakdown of world demand* for oil products, 1990-1995, 2005-2010 averages (as a share of total world demand)

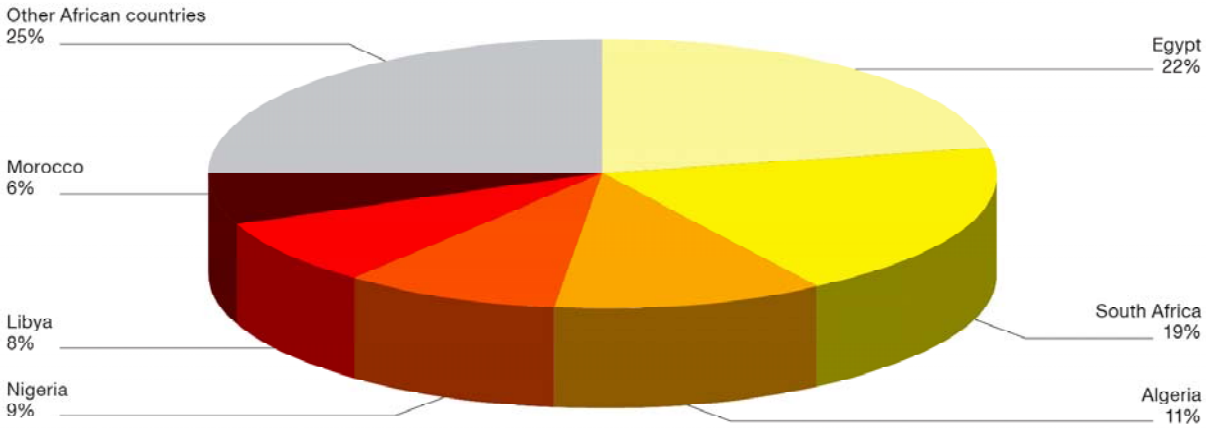



Source: IEA, *Oil information 2010* (table 10), updated using IEA, database

Note: * "demand refers to net deliveries (including refinery fuel and international marine bunkers)".

**A move towards more environmental friendly fuels in the energy mix in Europe and Eurasia has contributed to the declining use of oil products in these regions. In contrast, strong demand from China and India has increased consumption by 6 percentage points in the Asia-Pacific region.**

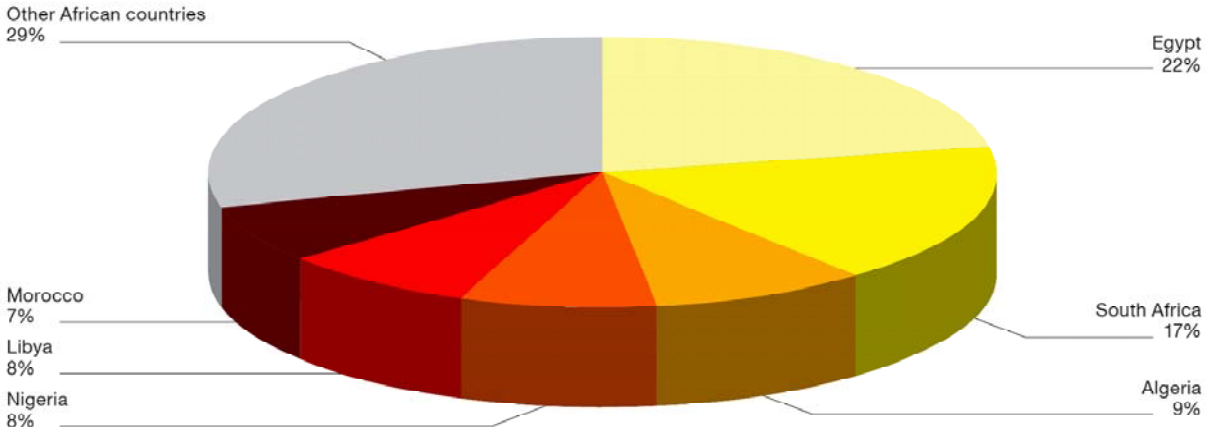
Figure 25a. Breakdown of African oil demand*, 1990-1995 average (as a share of total African demand)




Source: BP, *Statistical Review of World Energy*, June 2011

Note: * "demand refers to net deliveries (including refinery fuel and international marine bunkers)."

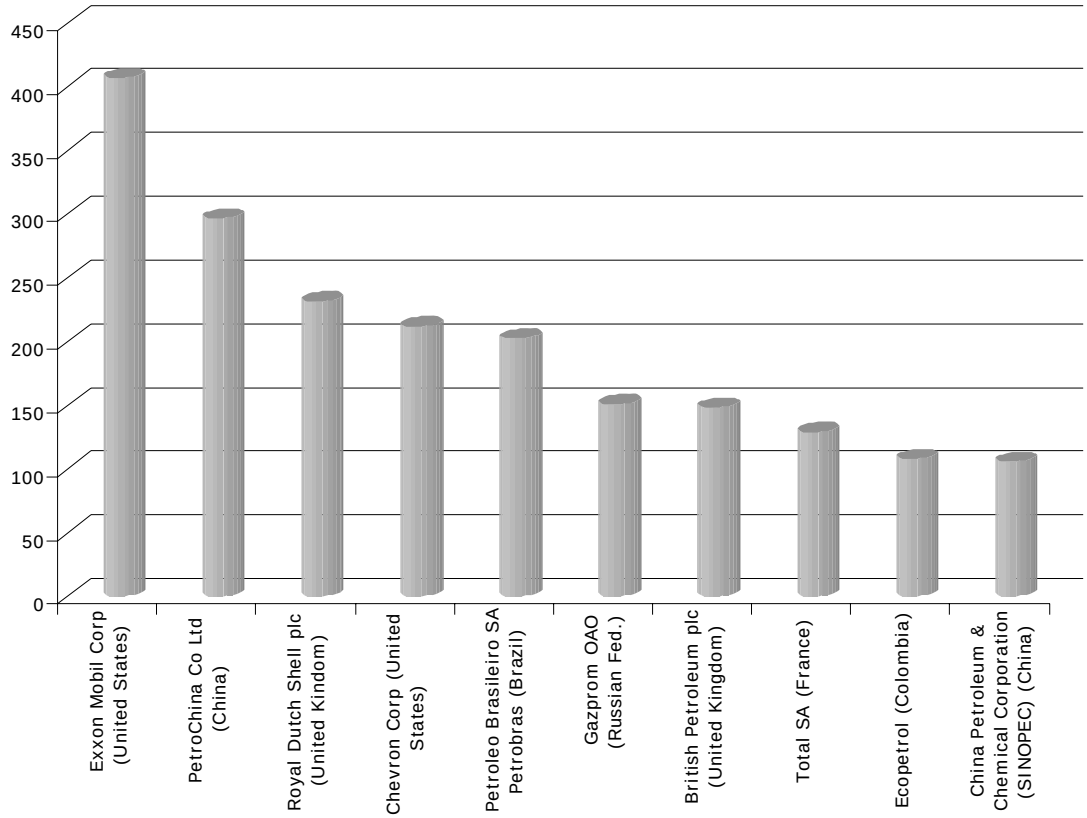
Figure 25b. Breakdown of African oil demand*, 2005-2008 average (as a share of total African demand)




Source: BP, *Statistical Review of World Energy*, June 2011

Note: * "demand refers to net deliveries (including refinery fuel and international marine bunkers)."

Figure 26. Leading companies by market capitalization in the oil and gas sector, as of 2 February 2012 (US$ billion)




Source: Thomson Reuters

# Facts and figures: NATURAL GAS

## Making news this quarter

Natural gas is one of the most widely utilized fossil fuels because of its environmental characteristics - half as much carbon dioxide emitted in natural gas than in coal when burned; together with efficiency in power production, growing demand from the industrial sector, and a wide geographical distribution of reserves across regions. In 2010, the largest reserves were concentrated in the Middle East (40.5 per cent), Europe and Eurasia (33.7 per cent). In Africa, Nigeria, Algeria and Egypt account for 6.4 per cent [1] of the world's total reserves of 187.1 trillion cubic metres. At current rates of production, reserves are expected to be depleted in 59 years (see Figure 27).

Since 1970, world consumption has increased by more than 200 per cent with one of the most rapid year on year growth rate recorded in 2010 at 7.4 per cent. [2] The primary factors that have contributed to increased consumption include economic growth particularly in the Asia-Pacific region, relative fuel prices, and the ease of transporting from remote locations to demand centers when converted into Liquefied Natural Gas (LNG). [3] The top three consumers include the United States, the Russian Federation and Iran, followed by China which increased its year on year demand in 2010 by 21.8 per cent. Overall consumption increased in all regions although relatively moderately in Africa due to a lack of distribution infrastructure and inefficient regulatory frameworks inhibiting widespread domestic use. IEA, projections up to 2035 show that natural gas will continue to grow in the global energy mix, particularly in non-OECD Asia where the fastest growth is expected.

Natural gas markets were well supplied in 2010, largely due to the growth of non-conventional gas production in the United States and growing supplies from producers in the Middle East, which accounted for the largest increase in regional natural gas production. Qatar alone increased production by 30.7 per cent over the previous year (2009) and in Africa, Nigeria's year on year production increased by 35.7 per cent contributing to the global glut. Africa's contribution is expected to grow further, as recent measures to cease flaring gas are likely to add to production levels. IEA, projections through 2035 show that the largest increase in natural gas production would come from the non-OECD where the Middle East, which is expected to increase production by 16 trillion cubic feet followed by Africa at 7 trillion cubic feet, the Russian Federation and other countries from the non-OECD Europe and Eurasia region. [4]

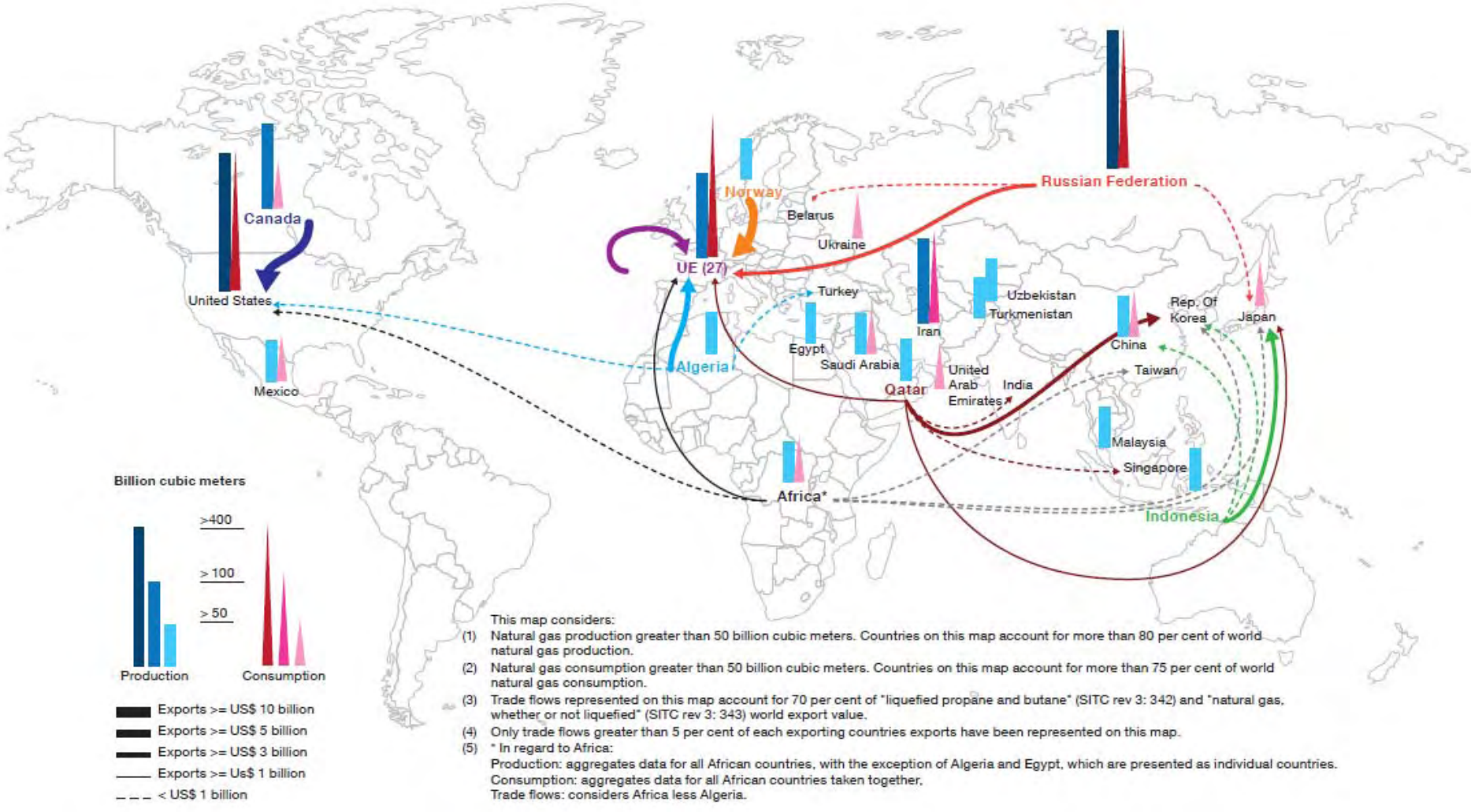
[1] BP, *Statistical Review of World Energy*. June 2011. *http://bp.com/statisticalreview*.
[2] BP, *Statistical Review of World Energy*. June 2011. *http://bp.com/statisticalreview*.
[3] IEA, *World Energy Outlook 2010*. http://www.iea.org/weo/docs/weo2010/
[4] IEA, *World Energy Outlook 2010*. http://www.iea.org/weo/docs/weo2010/

However, excess supplies resulting from the development of shale gas in the United States have a propensity to negatively impact investments in the productive capacity of conventional natural gas in other producing regions and create a supply shortfall in the medium to long term. IEA, projections show that gas supplies would have to be increased by almost 50 trillion cubic feet between 2008 and 2035 to meet demand growth, [5] and this may pose challenges if investments continue to be shelved because of weakened gas prices and a short-life span of non-conventional gas production. The development of shale gas in the United States has made the country a net exporter of natural gas for the first time, but its long-term future is still uncertain because of fears concerning ground water contamination due to the technologies deployed in fracturing gas bearing rock.

The natural gas trade is concentrated in three regional markets: North America, Europe (served by the Russian Federation and Africa) and Asia (linked to the Middle East), in contrast to the fully integrated global crude oil market. There are significant movements of gas within each of these markets, mainly through pipelines - which accounted for about 70 per cent of cross border trade in 2010. Global LNG trade volume in 2010 almost doubled from a decade earlier and accounts for about 30 per cent of total gas traded. The growth in LNG exports was spurred by the Middle East region where Qatar's exports grew by 53.2 per cent in 2010. [6] Africa's contribution to LNG trade has also grown significantly as new LNG plants come on-stream in Nigeria, Equatorial Guinea and Angola. Pipeline trade is also developing in Africa with the completion of the West African Gas Pipeline serving Benin, Togo and Ghana with plans to further extend to Cote d'Ivoire and Senegal. However, the lack of distribution pipelines limits off-take by industrial and domestic consumers to only the power generation sector. Africa's international gas trade through pipelines is conducted mainly by Algeria but planned construction of the 2565 mile long Trans Saharan Gas Pipeline from Nigeria through Niger to Algeria and European markets would further boost trade by supplying 20 billion cubic meters per year. [7] New pipelines currently under construction or planned will increase natural gas exports from Africa to European markets.

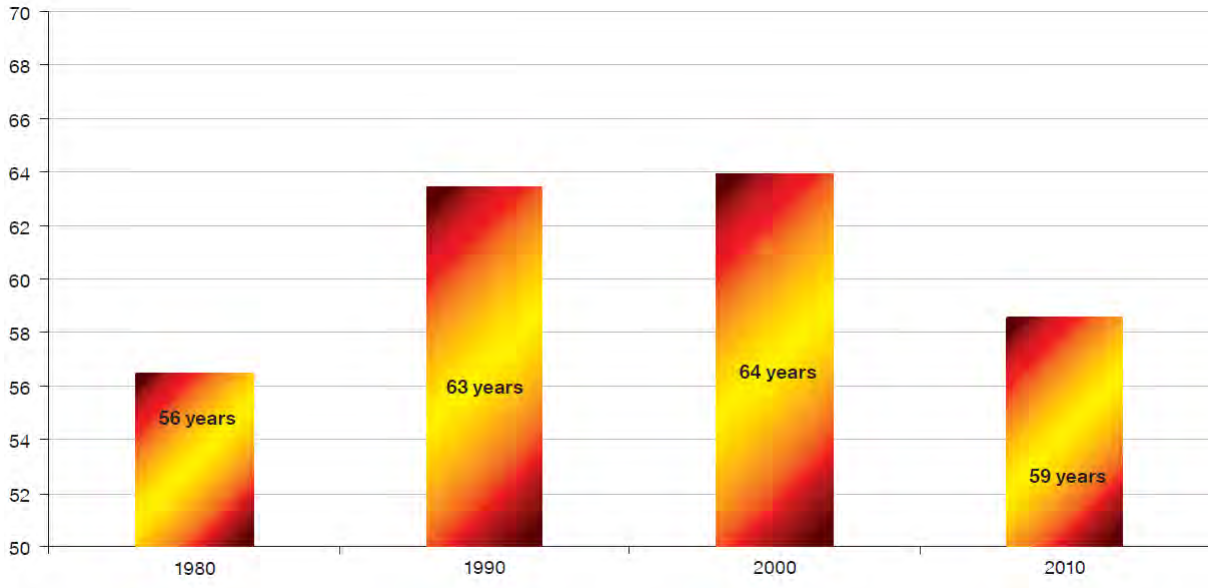
[5] IEA, *World Energy Outlook 2010*. http://www.iea.org/weo/docs/weo2010/
[6] BP, *Statistical Review of World Energy*, June 2011. *http://bp.com/statisticalreview*
[7] Tubb, R. (2011). Worldwide Pipeline Construction Report, *Pipeline and Gas Journal*, August 2011, Vol. 238, No. 8.

Map 3. Natural gas: World production, consumption and main trade flows, 2005-2010 average




Source: BP, *Statistical Review of World Energy*, June 2011 and UNCTAD, UNCTADstat in regard to trade value data statistics.
Note: UE (27) = European Union (27); Taiwan = Taiwan (Province of China).

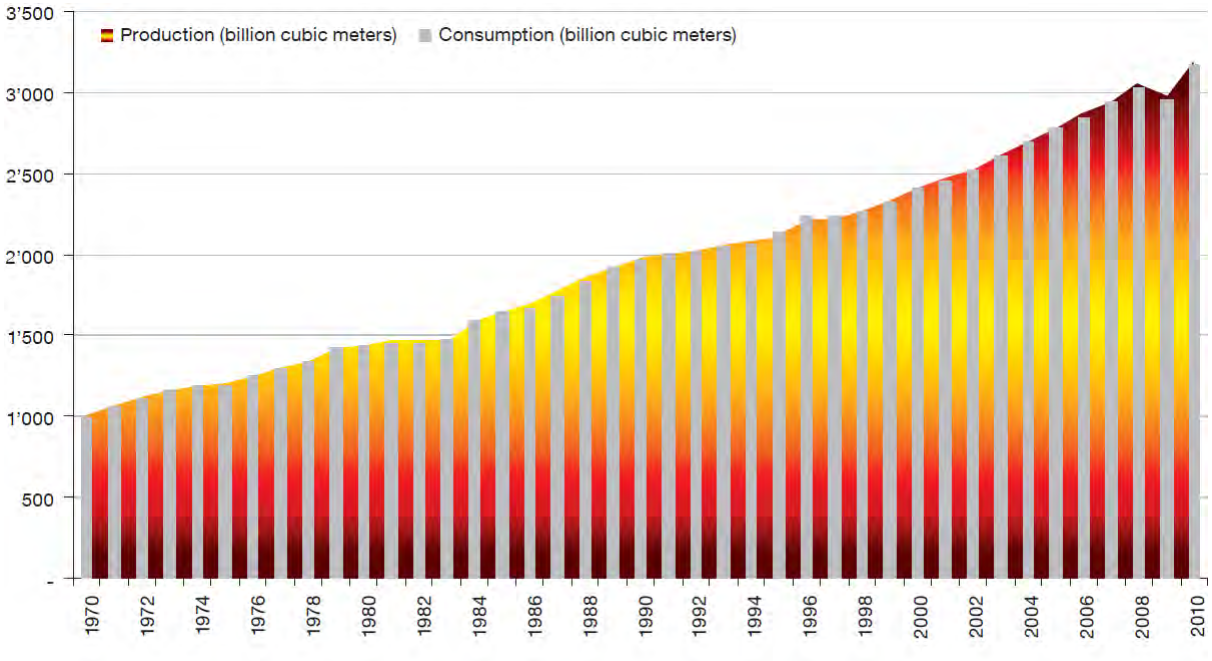
Figure 27. State of world natural gas reserves, selected years, 1980-2010 (as a number of years of production)




Source: BP, *Statistical Review of World Energy*, June 2011

**Demand for natural gas is rising because of its relatively low environmental impacts and its efficiency in power generation.**

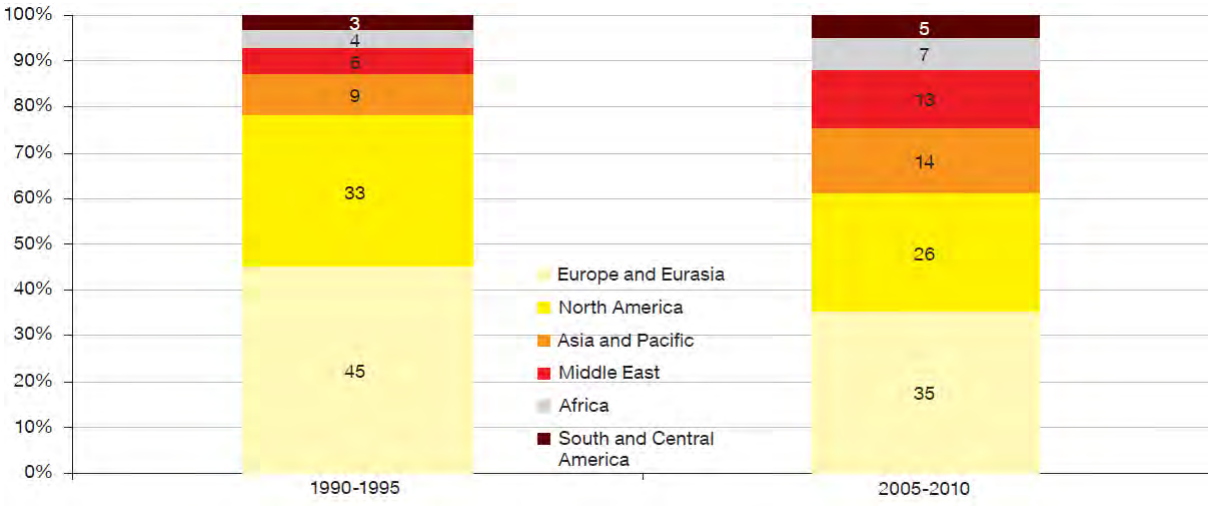
Figure 28. Historical evolution of world natural gas production and consumption, 1970-2010 (billion cubic meters)




Source: BP, *Statistical Review of World Energy*, June 2011

**Note: The difference between these world consumption figures and the world production statistics is due to variations in stocks at storage facilities and liquefaction plants, together with unavoidable disparities in the definition, measurement or conversion of gas supply and demand data.**

Figure 29. Regional breakdown of natural gas production, 1990-1995, 2005-2010 averages (as a share of total world production)

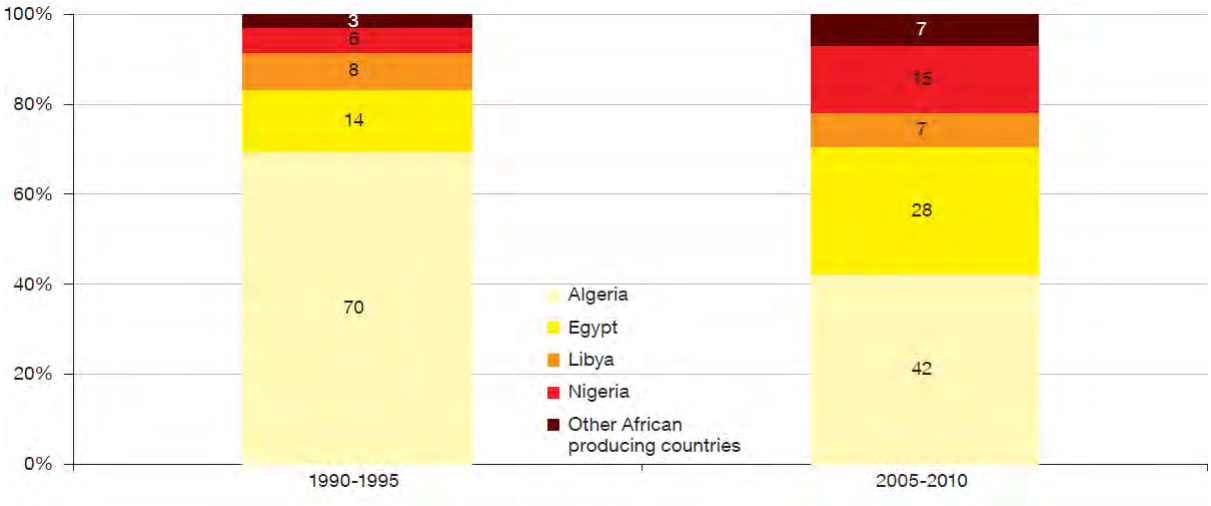



Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in billion cubic meters.

**The recent rapid growth in shale gas production (unconventional gas) in the United States has resulted in a surplus of natural gas in the market, and allowed the country to record the world's largest increase in production for a third consecutive year. The most important decline in natural gas production was in Europe and Eurasia which was driven by declining consumption in 2008-2009.**

Figure 30. African natural gas production, 1990-1995, 2005-2010 averages (as a share of total African production)

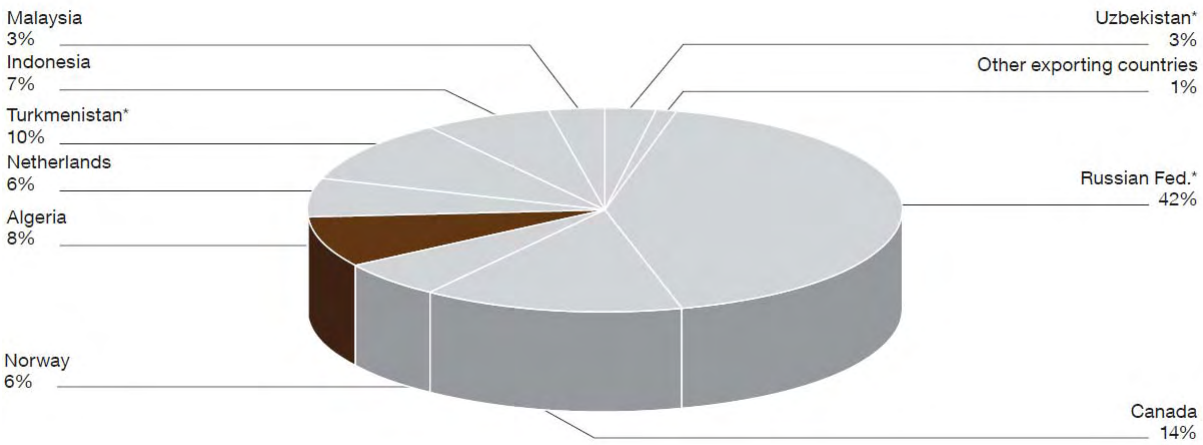



Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in billion cubic meters.

**Despite stable gas production in Algeria, since the early 1990s its share of African production has declined sharply. This was due to the loss of major export markets (e.g. the United States - due to the development of non-conventional gas production). In contrast, the doubling of exploitable Egyptian gas reserves has contributed to the expansion of its production, compensating for a decline in oil production.**

## Figure 31a. World dry natural gas exports and leading exporting countries, 1990-1995 average (as a share of total world exports)

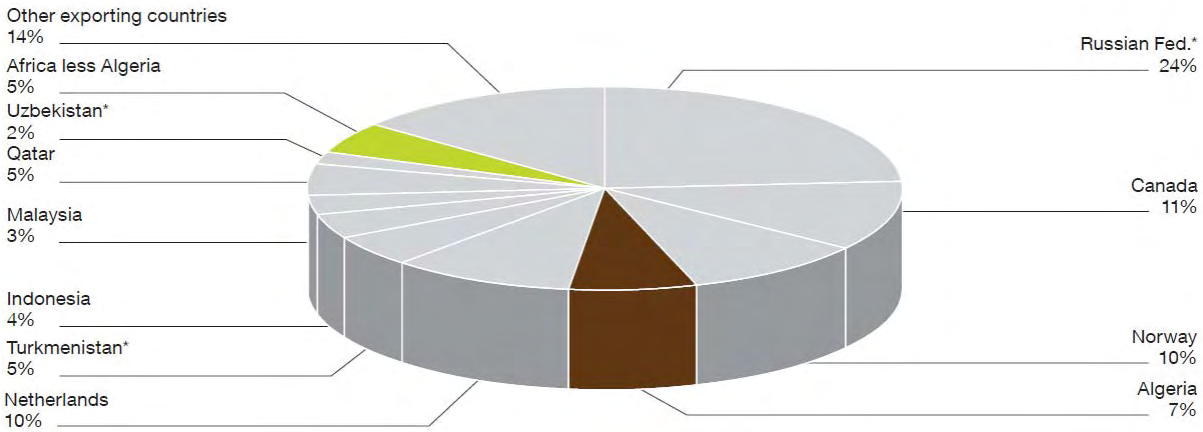



Source: US Energy Information Administration

Notes: The figures are computed from data expressed in billion cubic feet converted to billion cubic meters using IEA, conversion rate: 1ft³ = 0.0283m³. As the exports from "Africa less Algeria" were negligible in 1990-1995, this grouping was aggregated with "other exporting countries" for this period.

* For the Russian Federation, Turkmenistan and Uzbekistan, the first year available is 1992, as these countries were part of the "former USSR" total before this date. As a consequence, the average for these 3 countries has been computed on the 1992-1995 period.

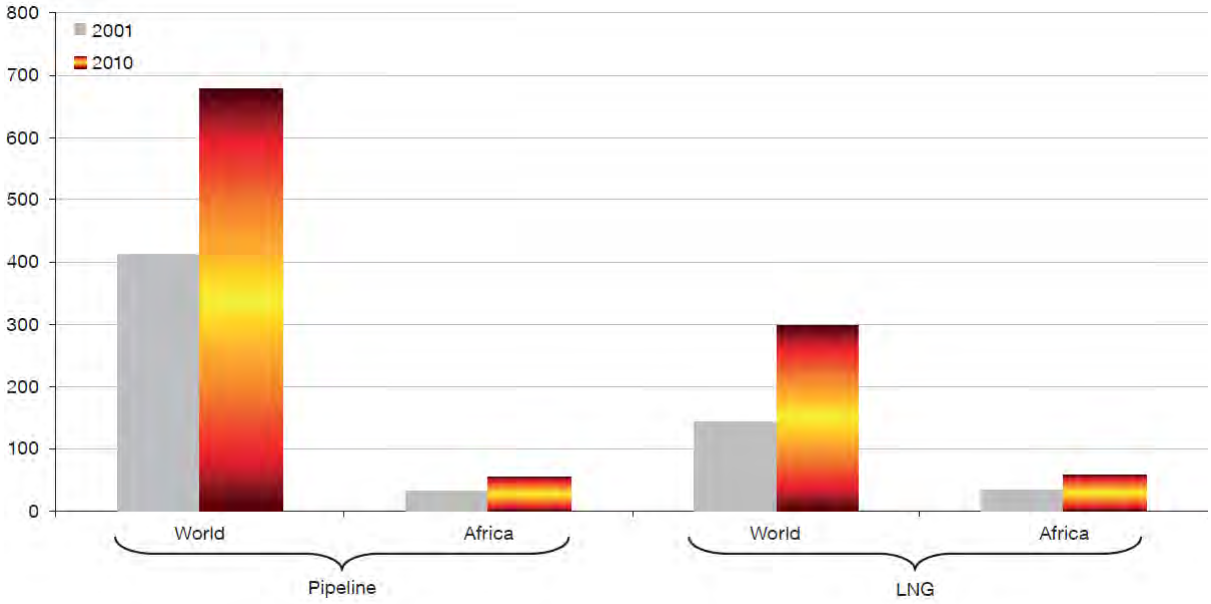
## Figure 31b. World dry natural gas exports and leading exporting countries, 2005-2009 average (as a share of total world exports)




Source: US Energy Information Administration

Note: See above.

Figure 32. Breakdown of World and African natural gas exports by pipeline and LNG, 2001, 2010 (billion cubic meters)



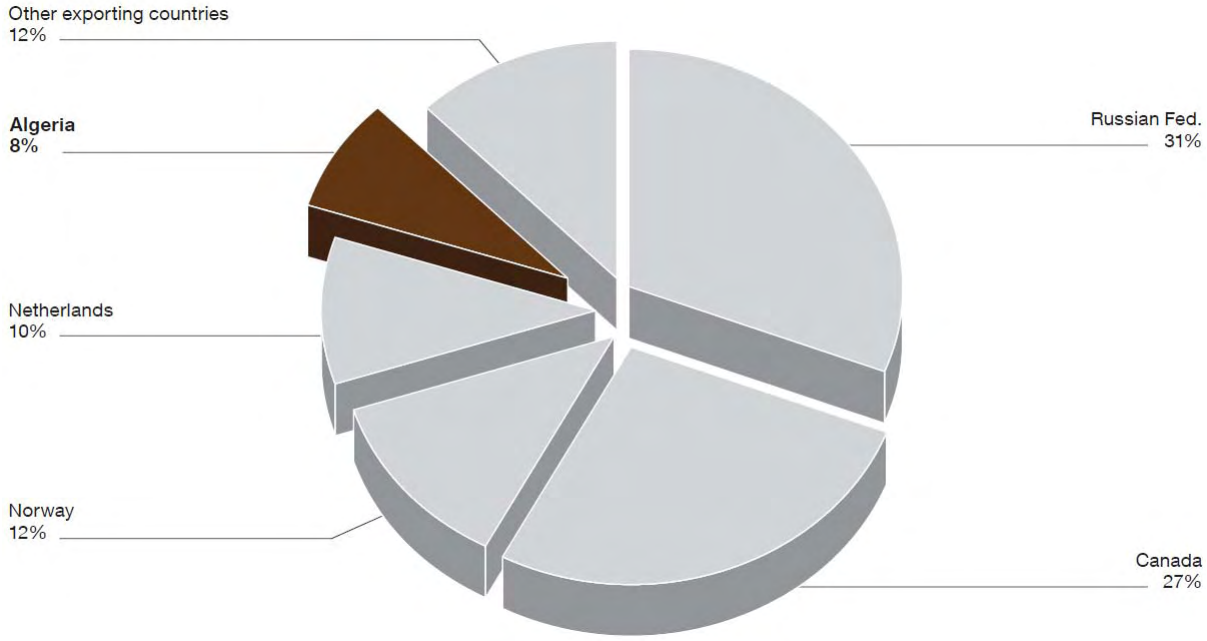

Source: BP, *Statistical Review of World Energy*, June 2011

**Qatar is the world largest LNG exporting country, accounting for more than a quarter of world LNG trade in 2010.**

**The share of African pipeline exports compared with the rest of the world was largely unchanged between 2001 and 2010 while that of African LNG exports declined over the same period (from 24 per cent in 2001 to 19 per cent in 2010). About half of Africa's natural gas production is converted into LNG for international trade.**

**However, local consumption remains low and few pipelines connect producers to consumers on the continent. Current LNG plants on-stream are in Algeria, Equatorial Guinea, Libya and Egypt. There is also one plant under construction in Angola and two planned in Nigeria.**

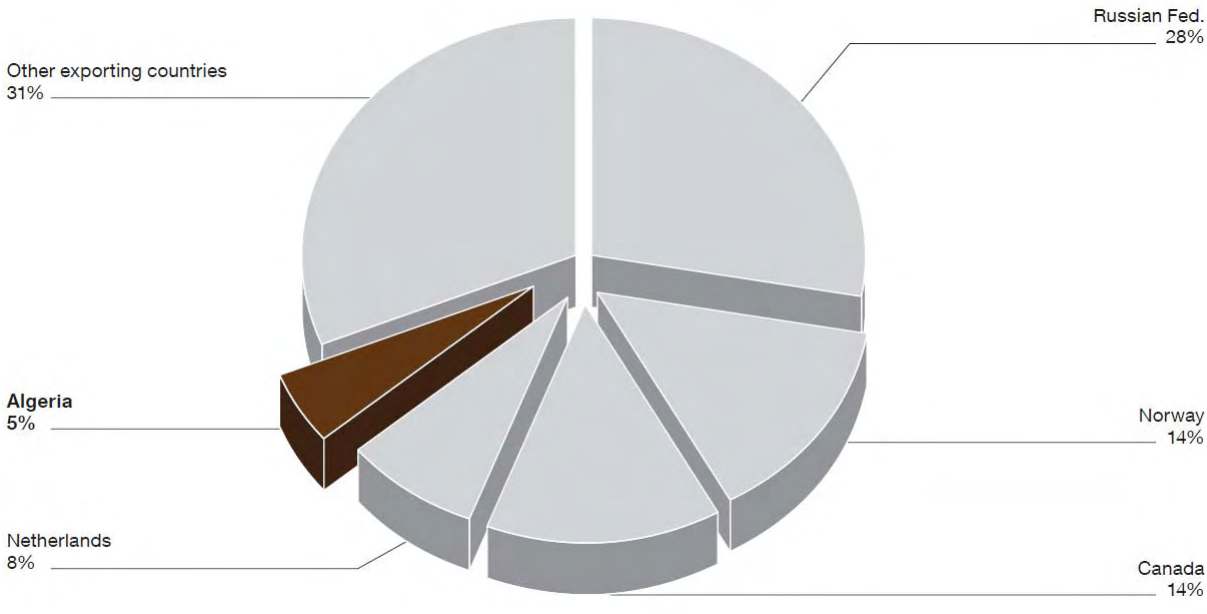
## Figure 33a. Leading countries in world pipeline exports, 2001




Source: BP, *Statistical Review of World Energy*, June 2011

Note: only countries accounting for more than 5 per cent of world pipeline exports are considered as individual exporters in these charts.

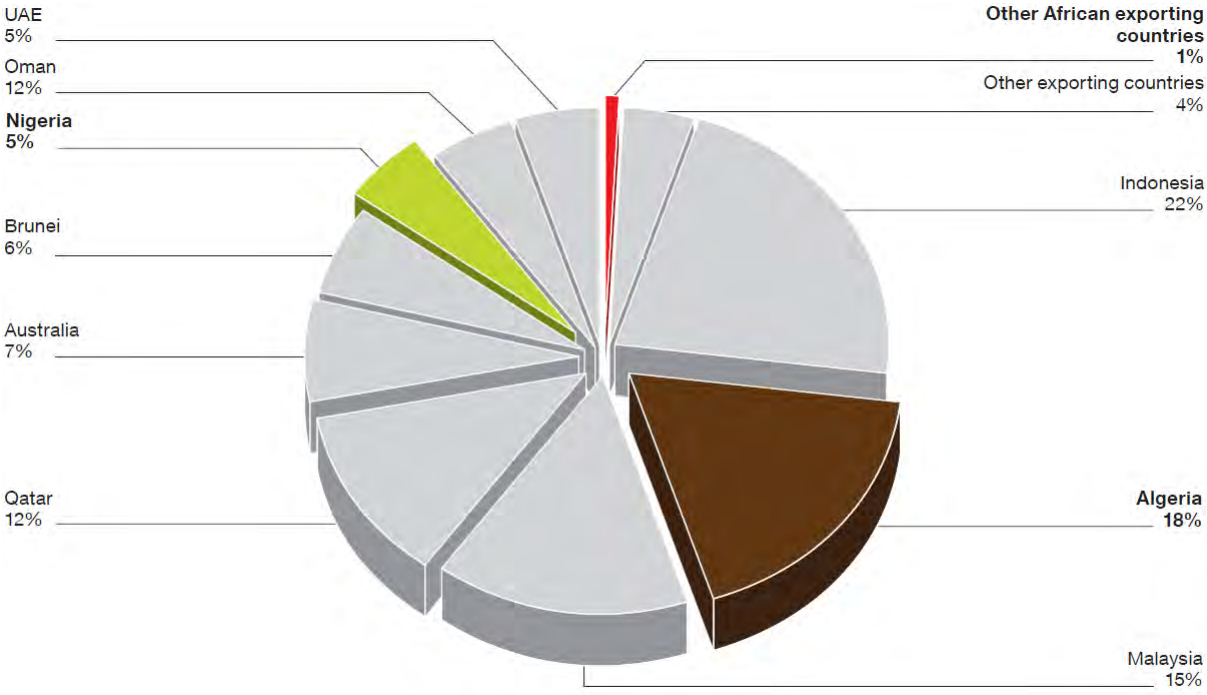
## Figure 33b. Leading countries in world pipeline exports, 2010




Source: BP, *Statistical Review of World Energy*, June 2011

Note: Only countries accounting for more than 5 per cent of world pipeline exports are considered as individual exporters in these charts.

## Figure 34a. Leading countries in world LNG exports, 2001

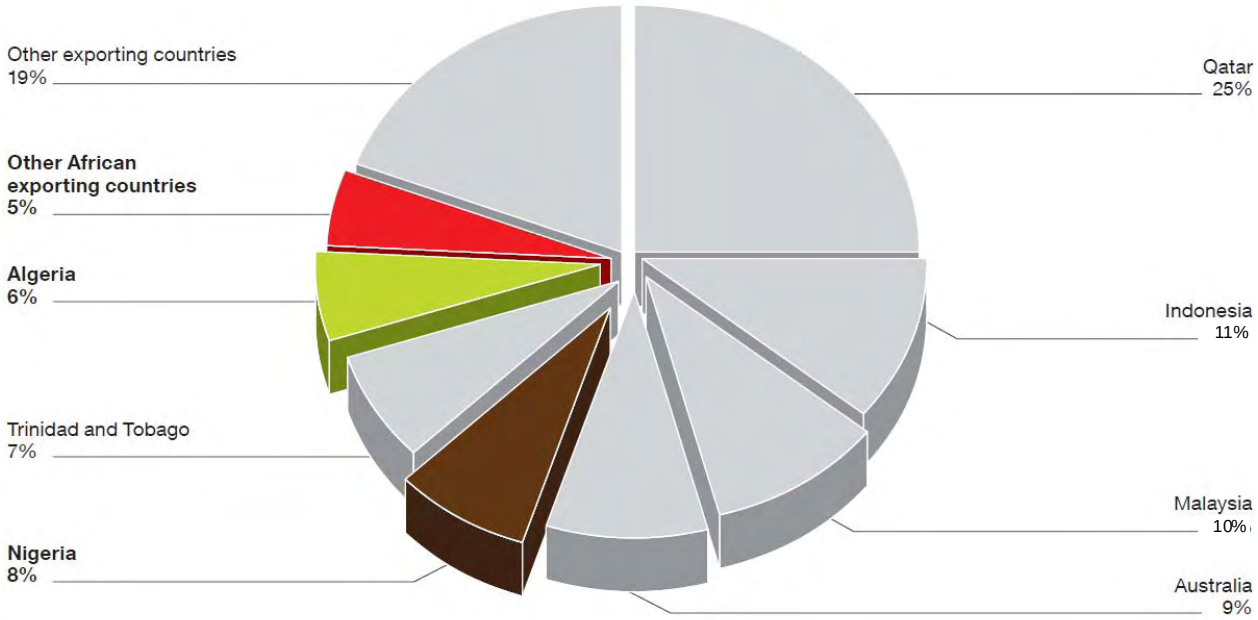



Source: BP, *Statistical Review of World Energy*, June 2011

Note: Only countries accounting for more than 5 per cent of world LNG exports are considered as individual exporters in these charts.

UAE stands for United Arab Emirates.

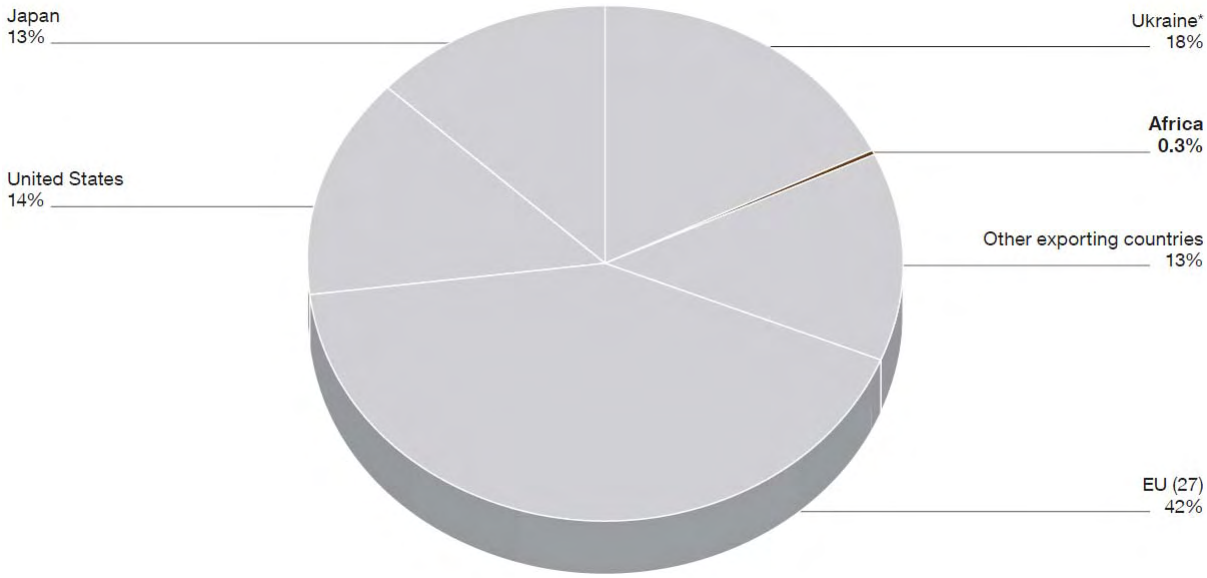
## Figure 34b. Leading countries in world LNG exports, 2010




Source: BP, *Statistical Review of World Energy*, June 2011

Note: Only countries accounting for more than 5 per cent of world LNG exports are considered as individual exporters in these charts.

Figure 35a. Leading dry natural gas importing countries, 1990-1995 average (as a share of total world imports)

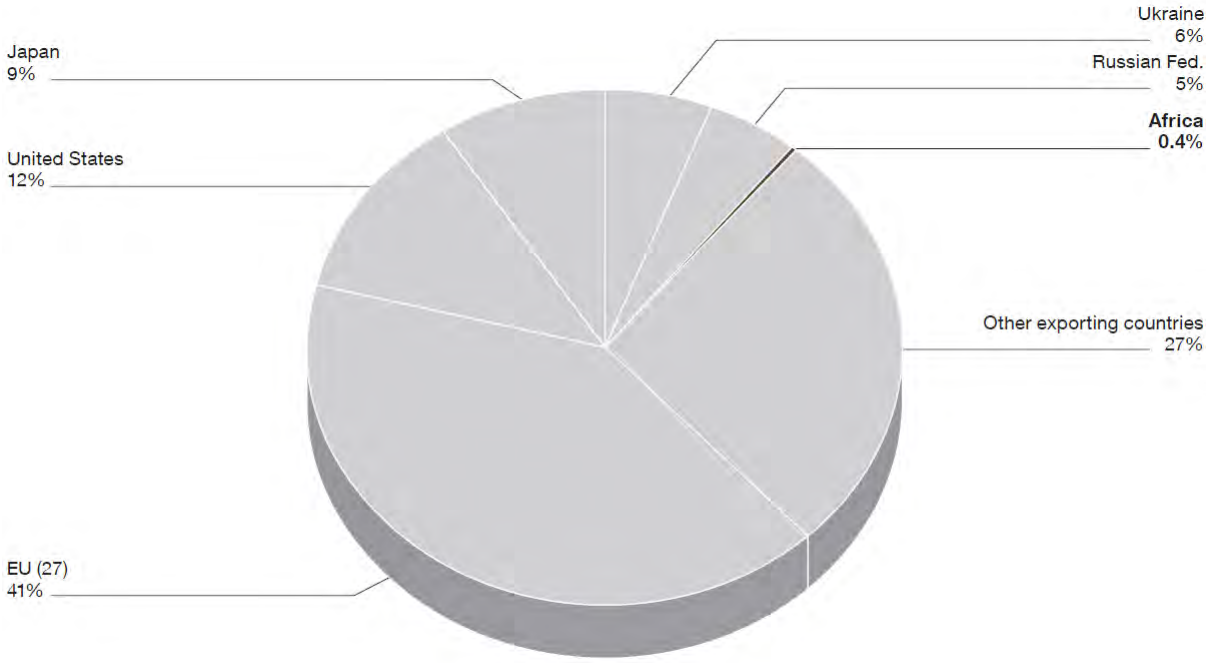



Source: US Energy Information Administration

Notes: These figures are computed from data expressed in billion cubic feet converted to billion cubic meters using IEA, conversion rate: $1ft^3 = 0.0283m^3$.

* For Ukraine, the first year available is 1992, as this country was part of the "former USSR" total before this date. As a consequence, the average for this country has been computed on the 1992-1995 period.

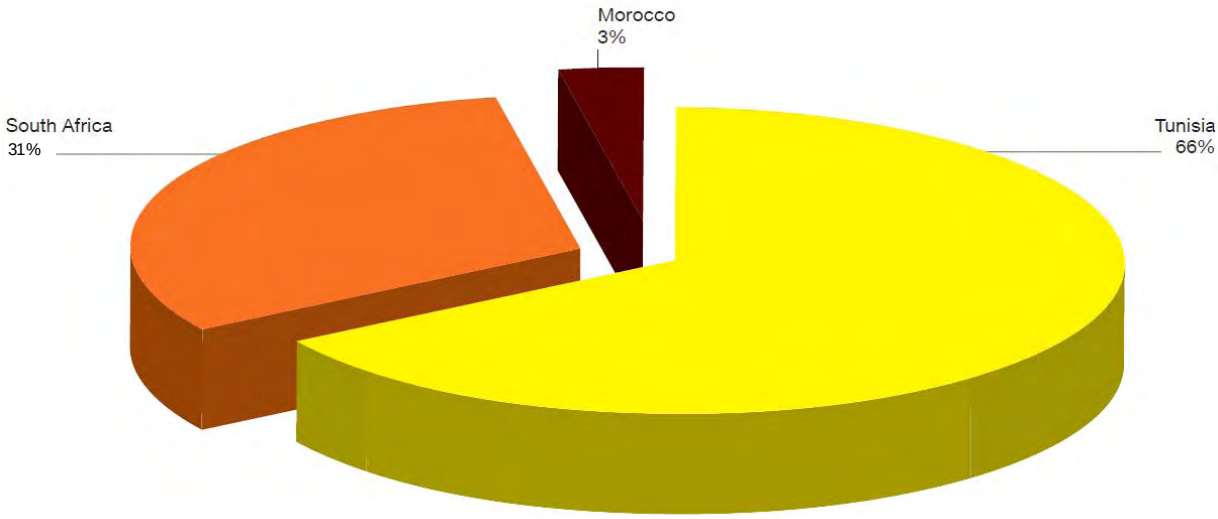
Figure 35b. Leading dry natural gas importing countries, 2005-2009 average (as a share of total world imports)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in billion cubic feet converted to billion cubic meters using IEA, conversion rate: $1ft^3 = 0.0283m^3$.

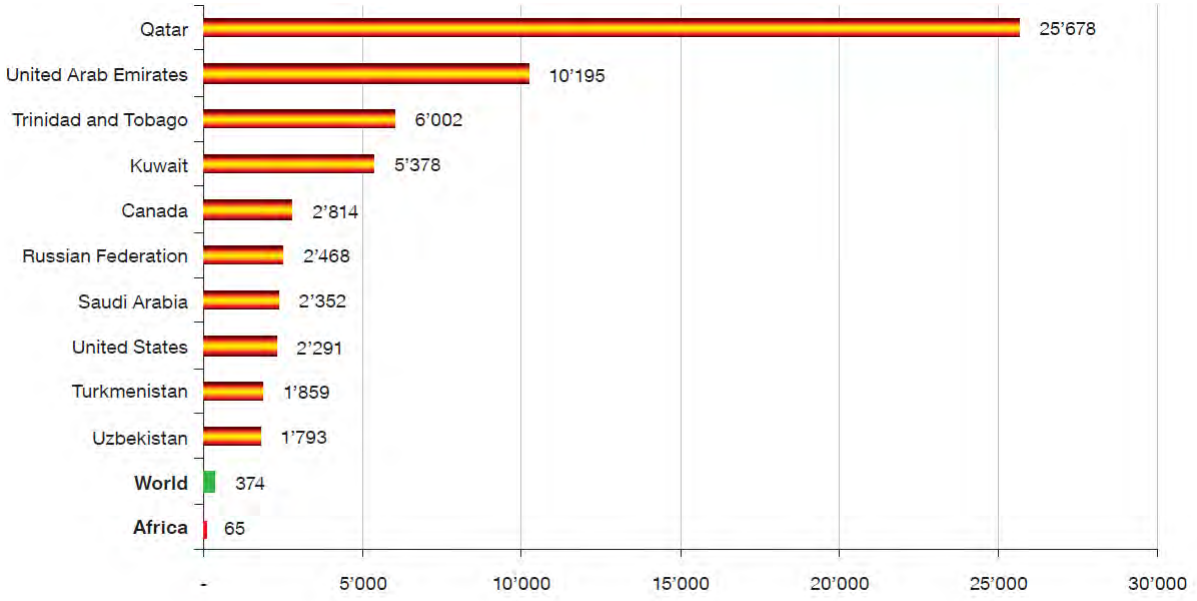
Figure 36. African dry natural gas imports by leading African importing countries, 1992-2009 average (as a share of total African imports)




Source: US Energy Information Administration

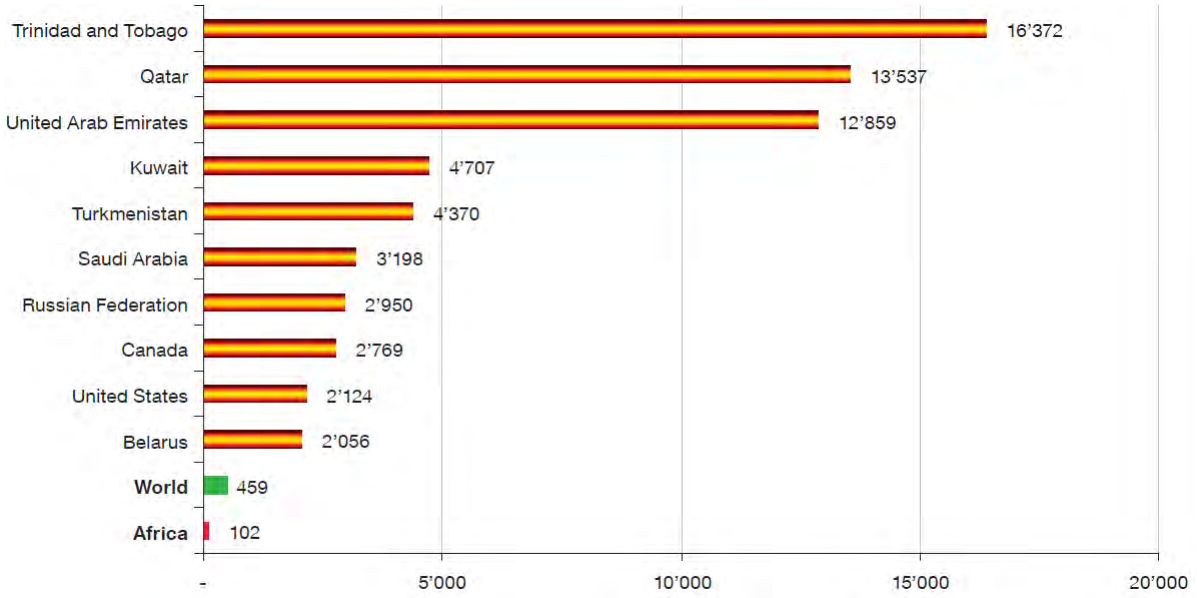
Note: These figures are computed from data expressed in billion cubic meters.

Figure 37a. Leading natural gas consuming countries per capita, 1995 (cubic meters per capita)




Source: BP, *Statistical Review of World Energy*, June 2011 (consumption data statistics), UNCTAD, *UNCTADstat* (for population data).

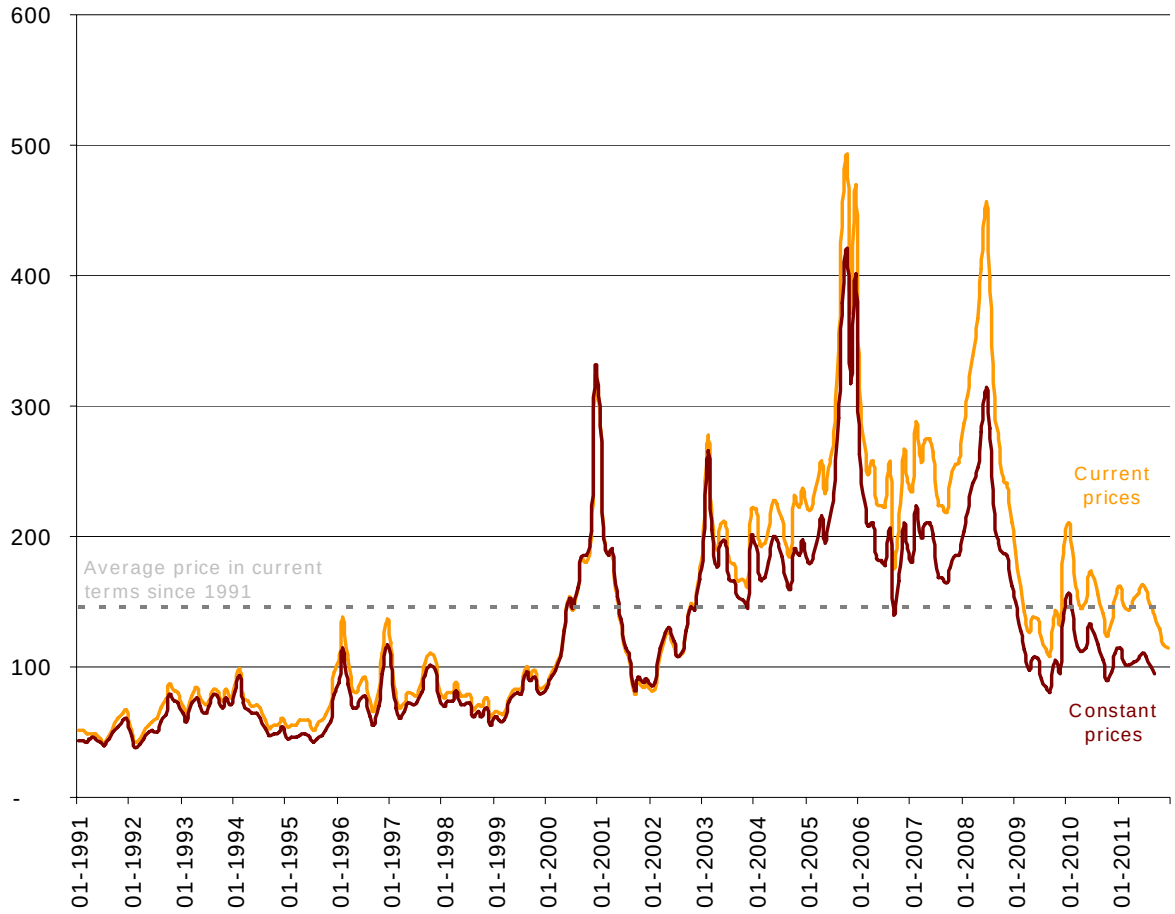
Figure 37b. Leading natural gas consuming countries per capita, 2010 (cubic meters per capita)




Source: BP, *Statistical Review of World Energy*, June 2011 (consumption data statistics), UNCTAD, *UNCTADstat* (for population data).

**Although gas consumption per capita increased in Africa by over 50 per cent between 1995 and 2010, the lack of distribution infrastructure limited its consumption to 102 cubic metres per capita in 2010, which was well below the world average of 459 cubic metres per capita.**

Figure 38. Historical evolution of natural gas prices in current and constant terms, January 1991-December 2011 (US$ per 1'000 cubic meters)




Source: IMF, International Financial Statistics.

Note: For computation, the following deflator has been used: Unit value index of manufactured goods exports by developed market-economy countries (UNSD). At the time of writing, this deflator was available up to the third quarter of 2011.

**A decline in demand for energy following the financial crisis in 2008-2009 and subsequent recession as well as increasing natural gas supplies from a variety of sources have contributed to keeping markets well supplied and prices relatively low over the past few years.**

# Facts and figures: COAL

## Making news this quarter

This section of UNCTAD's Commodities at a Glance on energy, describes world coal trade, price, production and consumption trends, with a particular focus on Africa. In 2007 coal accounted for 28 per cent of global total primary energy supply (see Figure 2) and remains the major fuel for electricity generation. However, coal faces increased competition from natural gas and renewable energies in global energy markets.

The global demand for coal continues to grow due to increased steel and cement production, and energy consumption. During the 2000-2009 period, global coal imports rose by 41 per cent (Figure 43). Coal reserves are estimated at 860.9 billion tonnes, of which the largest share is contributed by Europe and Eurasia (35.4 per cent) followed by Asia Pacific and North America (30.9 per cent and 28.5 per cent respectively). Africa and the Middle East contribute about 33 billion tonnes to world reserves (3.8 per cent of the world total), however discoveries are set to increase as development continues in the Moatize project in Mozambique, one of the largest unexplored coal basins in the world. It is estimated that, at current rates of production, it would take 118 years to exhaust reserves, almost double the length of time it will take to deplete natural gas reserves. [1]

International trade in coal is mainly conducted through seaborne transport but also to a lesser extent by rail across land-locked countries. Two types of coal are destined for international trade - thermal and coking coal. As transportation costs account for a significant share of the delivered price of coal, trade is conducted within two regional markets - the Atlantic market consisting of countries in Western Europe, and the Pacific market consisting of developing and OECD Asian countries [2] (see Map 4). Australia is the leading exporter of both coking and steam coal, accounting for 19 per cent and 59 per cent of total world trade [3] respectively. South Africa is the leading exporter in Africa and has the continent's largest coal export terminal. Most of South Africa's coal exports are classified as thermal coal and destined for Western European, Mediterranean and North African markets but also supplies India in the Asia-Pacific market.

[1] BP, *Statistical Review of World Energy 2010*, June 2011. Estimates based on Mtoe data.
[2] For more information see - http://www.worldcoal.org/coal/market-amp-transportation/
[3] Australian Coal Association, *The Australian Coal Industry - Coal Exports*; http://www.australiancoal.com.au/the-australian-coal-industry_coal-exports.aspx

The Asia-Pacific region has become a world centre for coal production, consumption and trade. Eight of the world's top ten firms by market capitalization involved in the coal sector are from the Asia-Pacific region (see Figure 48). Between 2009 and 2010 global coal consumption grew by 7.6 per cent,[4] which is faster than natural gas (7.4 per cent), oil (3.1 per cent), nuclear (2 per cent) and hydro (5.3 per cent). South Africa, China and India are among the top ten coal producing and consuming countries in the world.[5] China is the world's leading coal producer. Australia is the world's main exporter of coal, and Japan and the EU continue to be the world's largest coal importers.

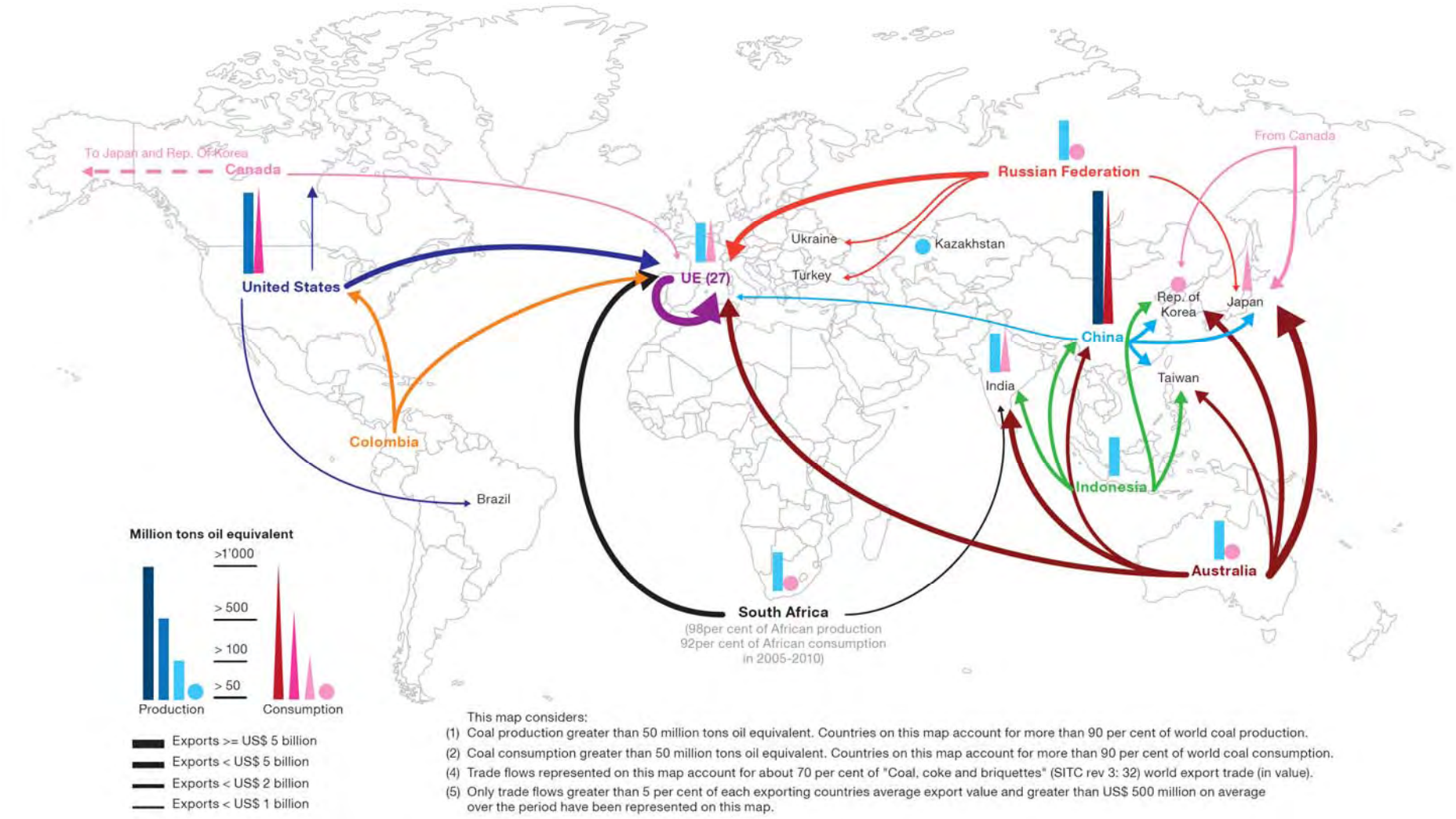
Global coal consumption more than doubled from 1,499.6 million tonnes of oil equivalent (Mtoe) in 1970 to 3,555.8 Mtoe in 2010.[6] To meet the growing demand for coal, production was also boosted in the major producing countries, particularly in China where a 9 per cent increase accounted for two thirds of global growth. Africa accounts for 4 per cent of world coal production, 98 per cent of which is generated by South Africa (see Figure 40). African coal production and trade is dominated by South Africa, which during the 2005-2009 period accounted for 8 per cent of world coal exports. In global terms, African coal imports are minor, only accounting for 1 per cent of world coal imports during the 2005-2009 period (See Figure 44b). Morocco is the continent's major coal importer, accounting for 47 per cent of all African coal imports during the 2005-2009 period (see Figure 45).

As shown in Figure 47, during the 2002-2008 commodity boom, the monthly prices for coal peaked in July 2008, with US$ 193 per metric ton, before falling to US$ 65 per metric ton in March 2009, due to the global economic recession. Supported by strong demand from China, the price of coal has increased since April 2009. Despite short-term volatility, the price continued its upward trend to reach a cyclical peak in January 2011. In 2010 and during the first quarter of 2011, coal prices averaged respectively US$106 and US$ 138 (see Figure 47).

Global demand for coal remains buoyant because it is critical to electricity generation, steel, cement and aluminium production. Given increasing concerns about climate change, developing countries will need to invest in innovative technologies which support its sustainable use. As global efforts to combat climate change intensify, the future prospects for coal in the world market will increasingly depend on carbon emission reduction agreements, policies and the development of CO2 capture and storage technologies.

[4] BP, *Statistical Review of World Energy 2010*, June 2011. Estimates based on Mtoe data.
[5] BP, *Statistical Review of World Energy 2010*, June 2011. Estimates based on Mtoe data.
[6] BP, *Statistical Review of World Energy 2010*, June 2011. Estimates based on Mtoe data.

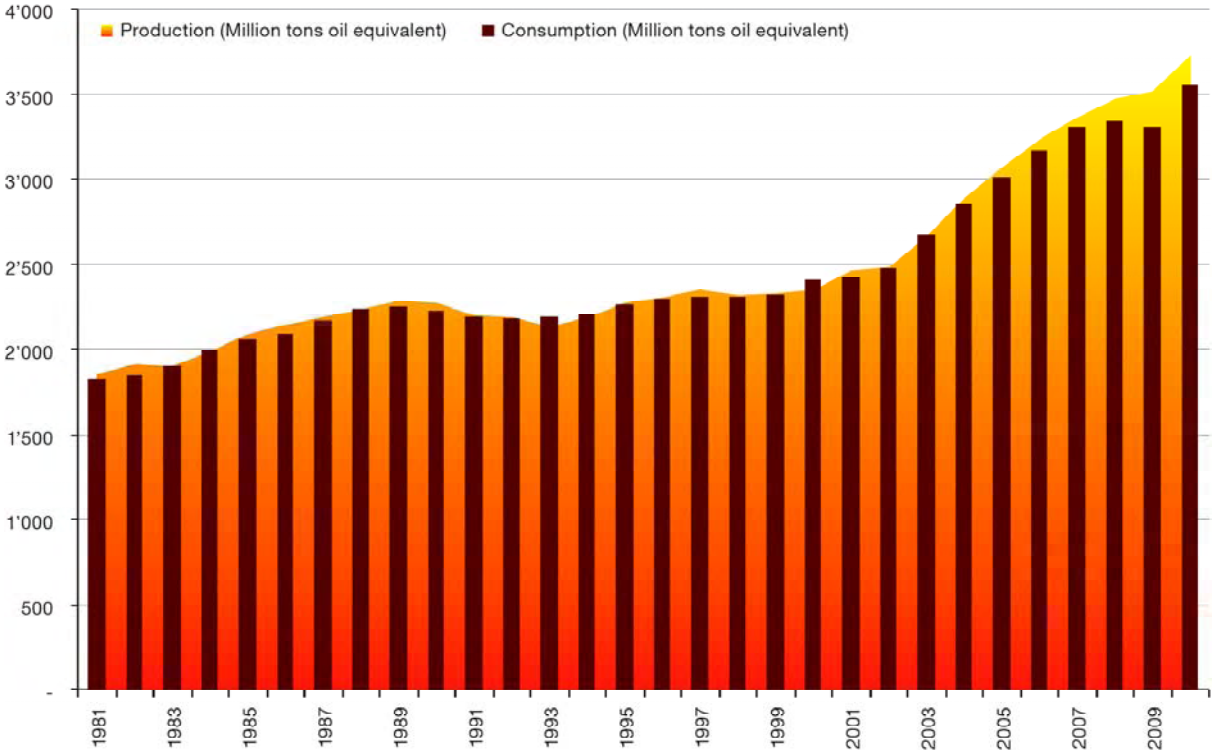
Map 4. Coal: World production, consumption and main trade flows, 2005-2010 average




Source: BP, *Statistical Review of World Energy*, June 2011 and UNCTAD, *UNCTADstat* in regard to trade value data statistics

Note: UE (27) = European Union (27); Taiwan = Taiwan (Province of China).

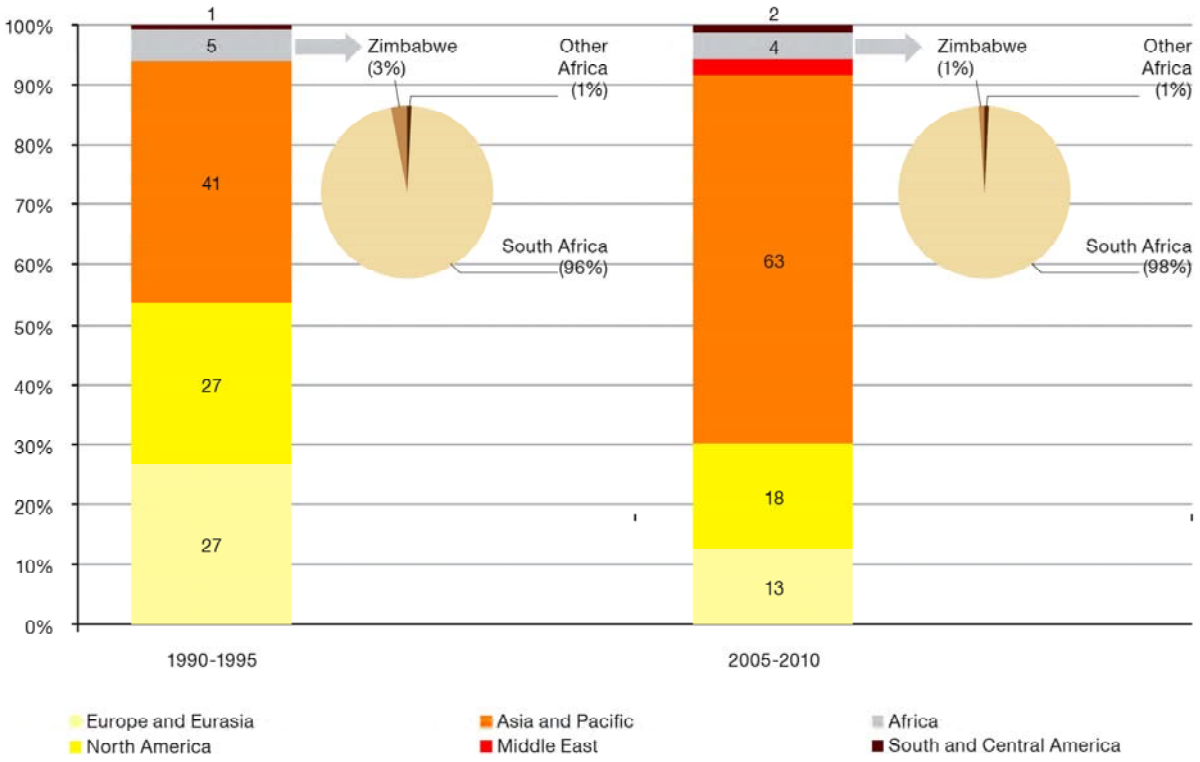
Figure 39. Historical evolution of world coal production and consumption, 1981-2010 (million tons oil equivalent)




Source: BP, *Statistical Review of World Energy*, June 2011

**World coal production has consistently exceeded consumption since 1981. Between 2009 and 2010 global coal production and consumption grew by 6.3 per cent and 7.6 per cent respectively, which is faster than natural gas (7.4 per cent), oil (3.1 per cent), nuclear (2 per cent) and hydro (5.3 per cent).**

Figure 40. Regional breakdown of coal production, 1990-1995 and 2005-2010 averages (as a share of total world coal production)



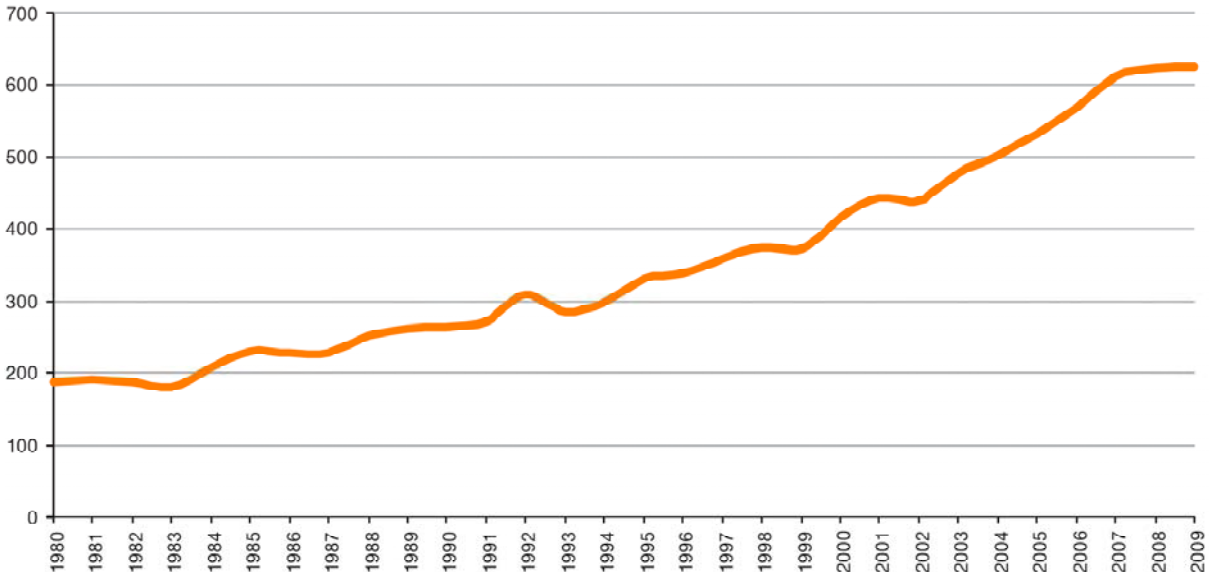

Source: BP, *Statistical Review of World Energy*, June 2011

Note: These figures are computed from data expressed in million tons oil equivalent.

**The Asia-Pacific region has experienced the greatest increase in coal production over the past 20 years, as the region's GDP has grown strongly with economic expansion in China. The Asia-Pacific region currently accounts for 63 per cent of global coal production.**

**South Africa accounts for 4 per cent of world production and 98 per cent of Africa's output.**

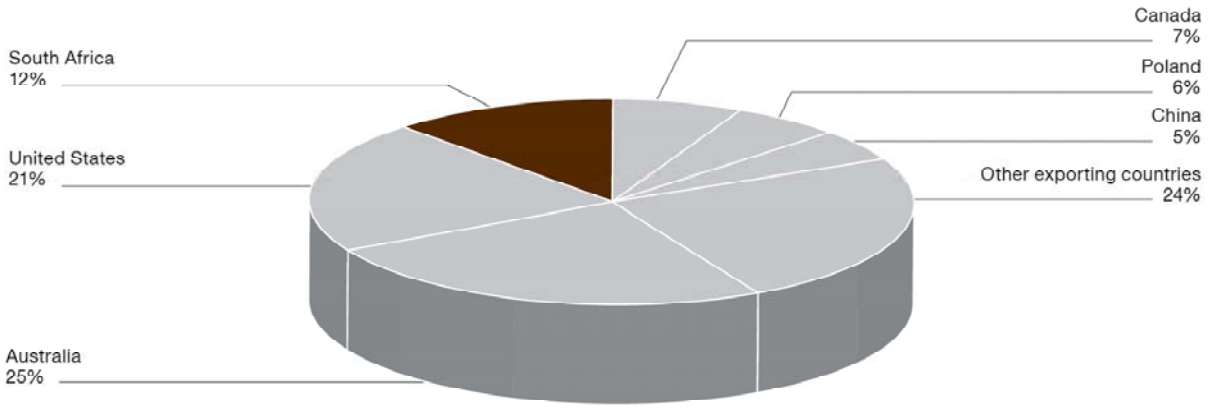
Figure 41. Historical evolution of world coal exports, 1980-2009 (million tons oil equivalent)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

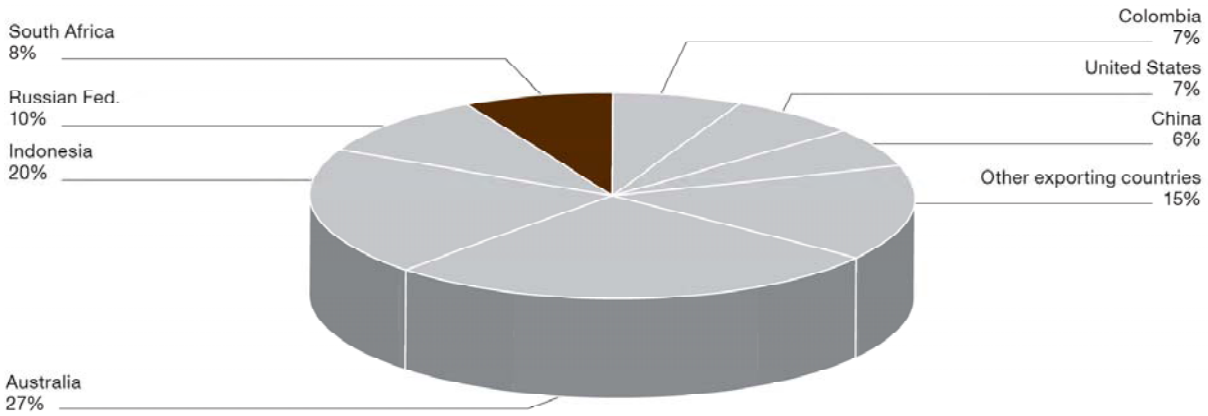
Figure 42a. Breakdown of world coal exports by leading exporting countries, 1990-1995 average (as a share of total world exports)




Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

Figure 42b. Breakdown of world coal exports by leading exporting countries, 2005-2009 average (as a share of total world exports)

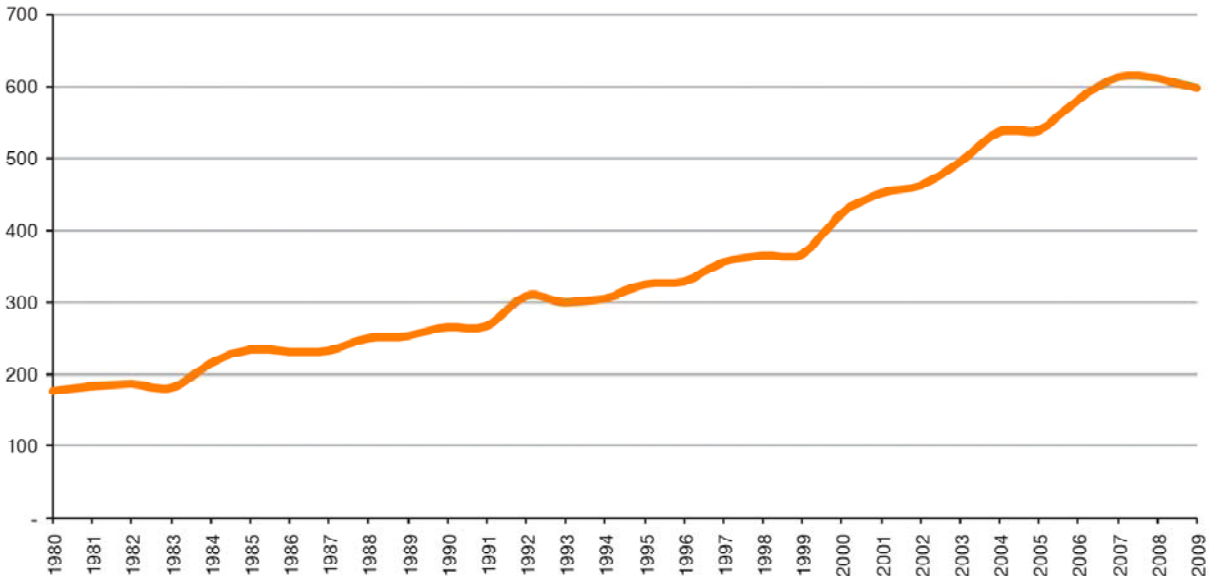



Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

**South Africa is the major African exporting country, accounting for 8 per cent of world exports. Australia remains the world's leading coal exporter; however, since 1990-1995, Indonesia and the Russian Federation have significantly improved their export market shares.**

Figure 43. Historical evolution of world coal imports, 1980-2009 (million tons oil equivalent)

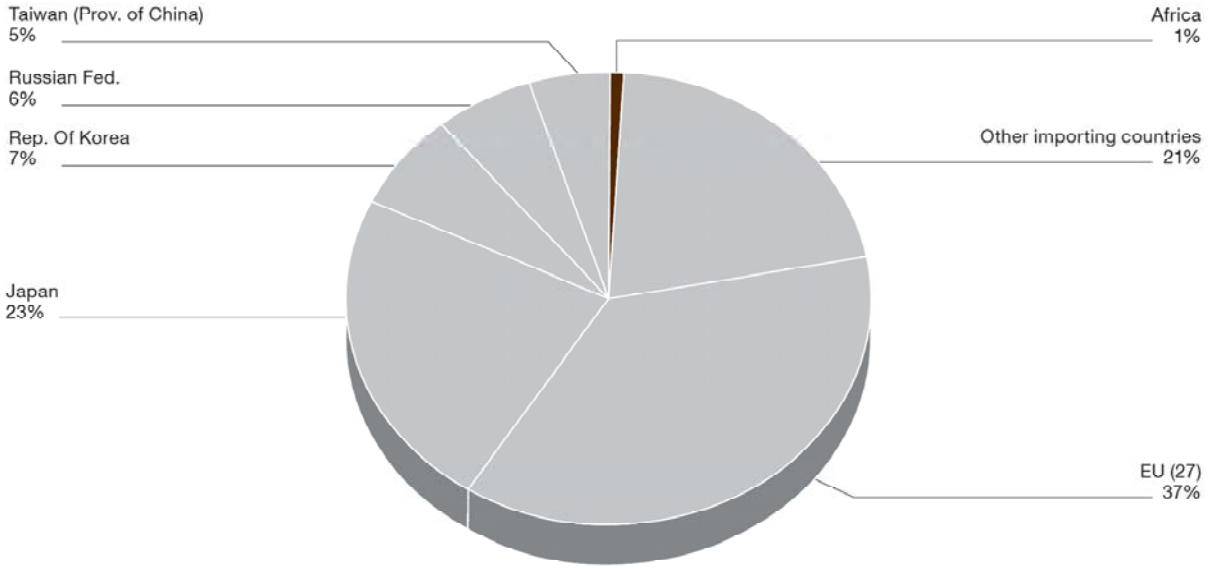



Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

**World coal imports have risen steadily over the past 30 years, particularly in the Asia-Pacific region, which currently accounts for 56 per cent of global coal consumption; due largely to demand in China and India. Also, Japan, Taiwan (Province of China), and Korea (Republic of), import significant quantities of coal for electricity generation and steel production.**

Figure 44a. Breakdown of world coal imports by leading importing countries, 1990-1995 average (as a share of total world imports)

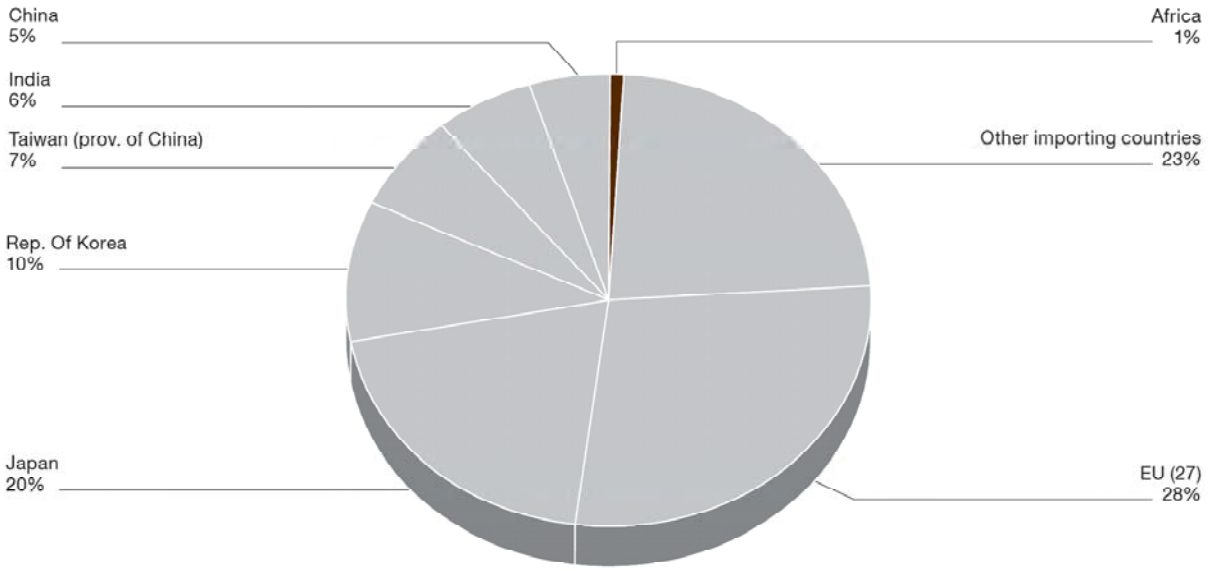



Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

* For Russian Federation, the first year available is 1992, as this country was part of the "former USSR" total before this date. As a consequence, the average for this country has been computed on the 1992-1995 period.

Figure 44b. Breakdown of world coal imports by leading importing countries, 2005-2009 average (as a share of total world imports)

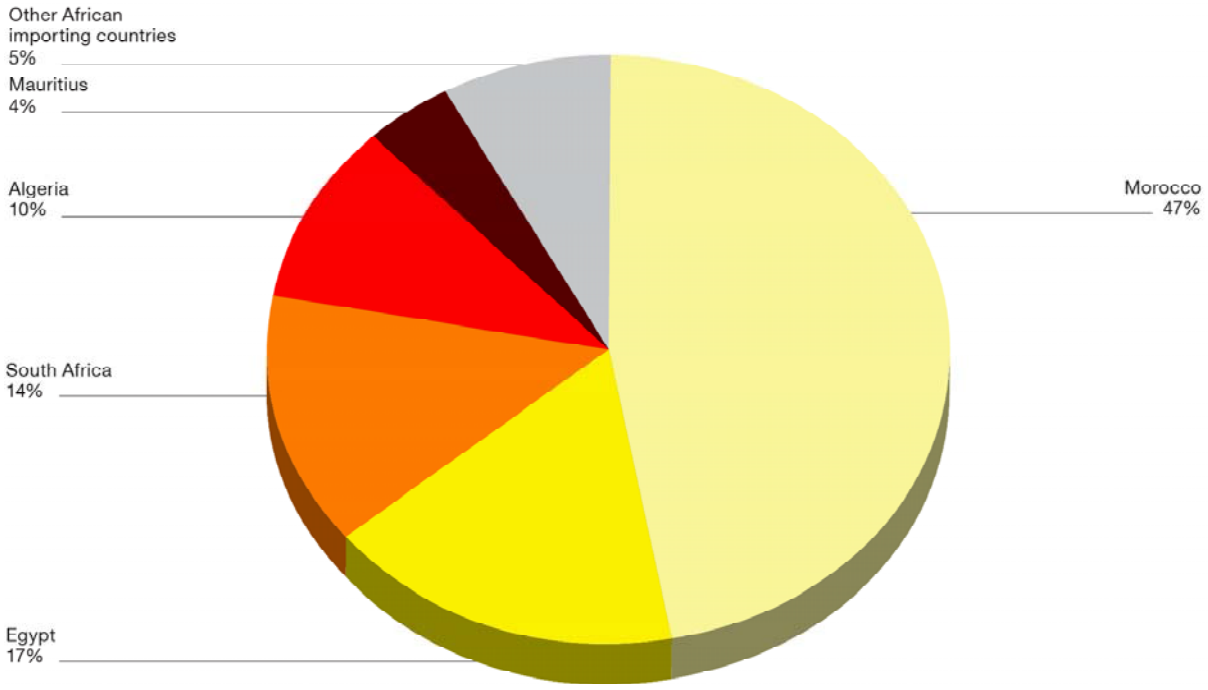



Source: US Energy Information Administration

Note: These figures are computed from data expressed in quadrillion Btu and converted to Mtoe using IEA, formula of 1 MBtu = 2.52*10-8 Mtoe.

**In global terms, African coal imports are minor accounting for only 1 per cent of world imports over the past 20 years. Japan and the EU (27) have been the main coal importing regions over the past 20 years.**

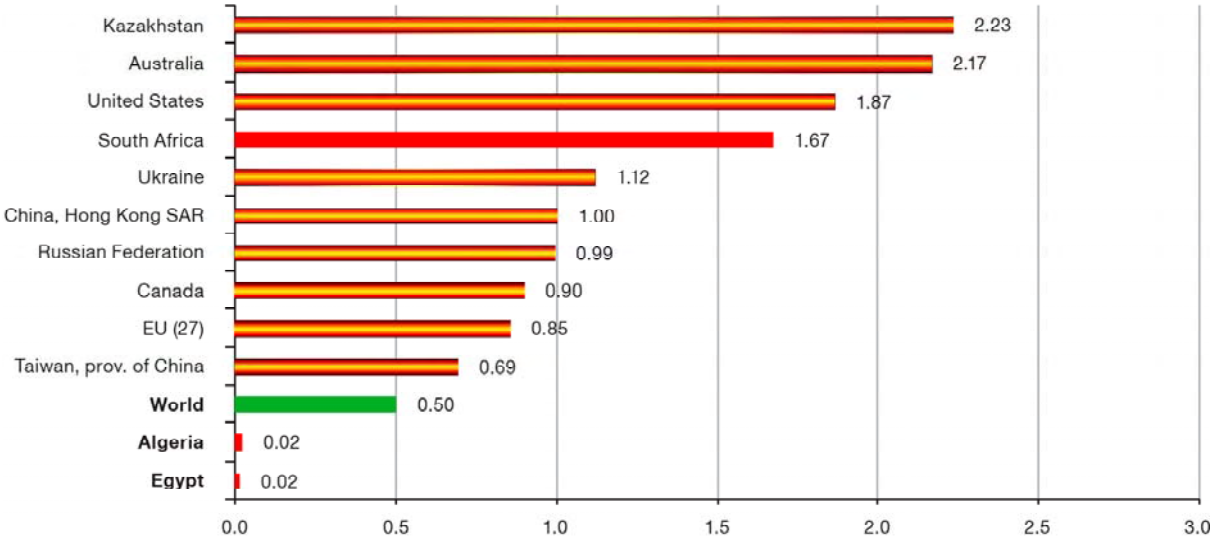
Figure 45. Leading African coal importing countries, 2005-2009 average (as a share of total African imports)




Source: US Energy Information Administration

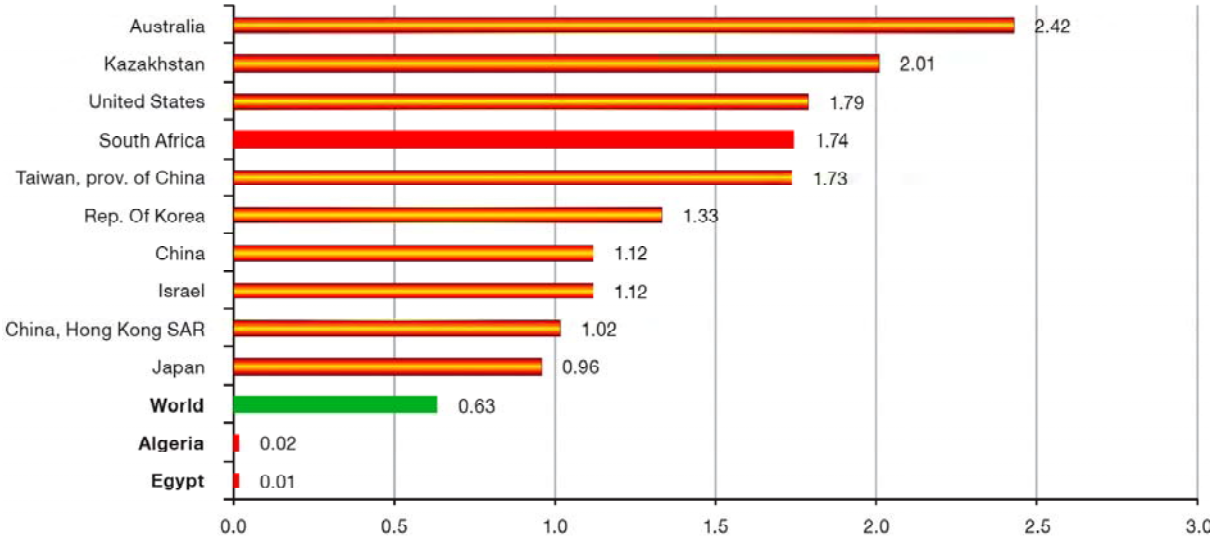
**Electricity generation accounts for 94 per cent of coal use in South Africa.**

Figure 46a. Leading coal consuming countries per capita, 1990-1995 average (ton oil equivalent per capita)




Source: BP, *Statistical Review of World Energy*, June 2011

Figure 46b. Leading coal consuming countries per capita, 2005-2010 average (ton oil equivalent per capita)



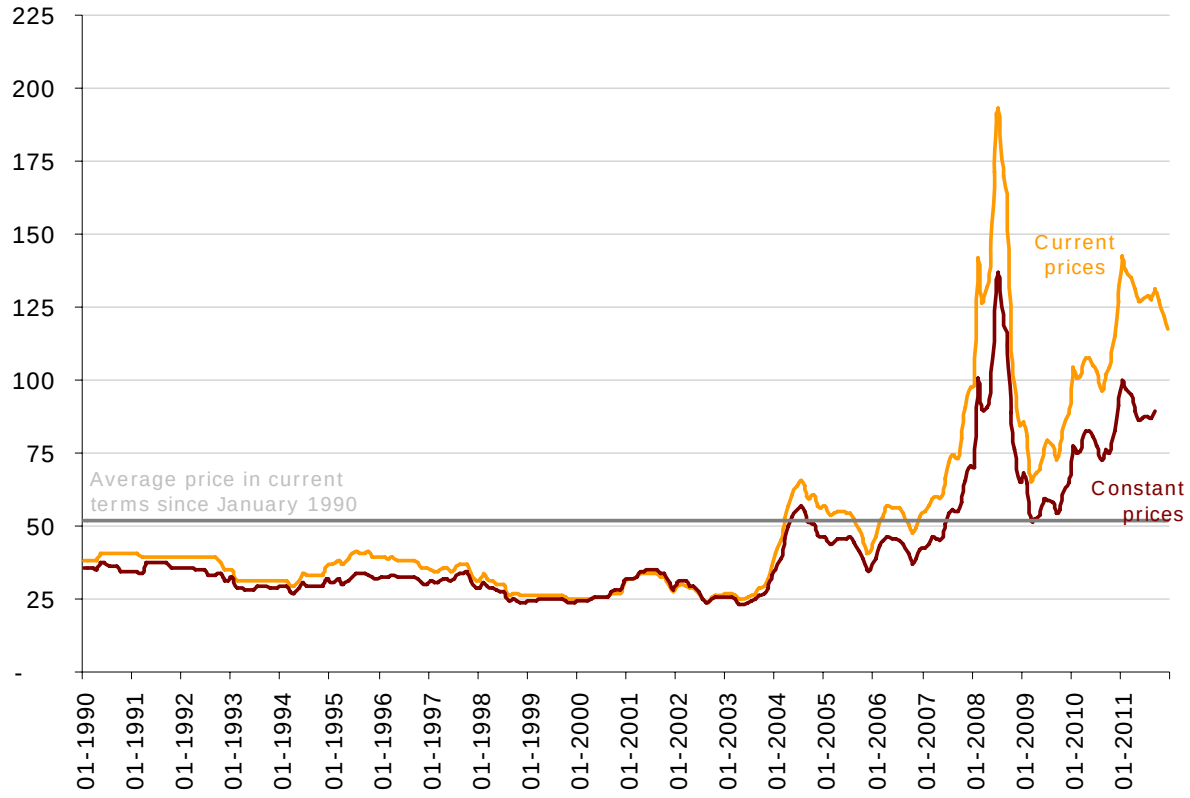

Source: BP, *Statistical Review of World Energy*, June 2011

**China, USA, India, Japan and the Russian Federation - account for around 72 per cent of total global coal use.**

**African countries fall well below the world average per capita consumption of coal.**

**The top 4 consuming countries on a per capita basis remains unchanged over the past 20 years.**

Figure 47. Historical evolution of coal prices in current and constant terms, January 1990-December 2011 (US$ per 1'000 metric ton)

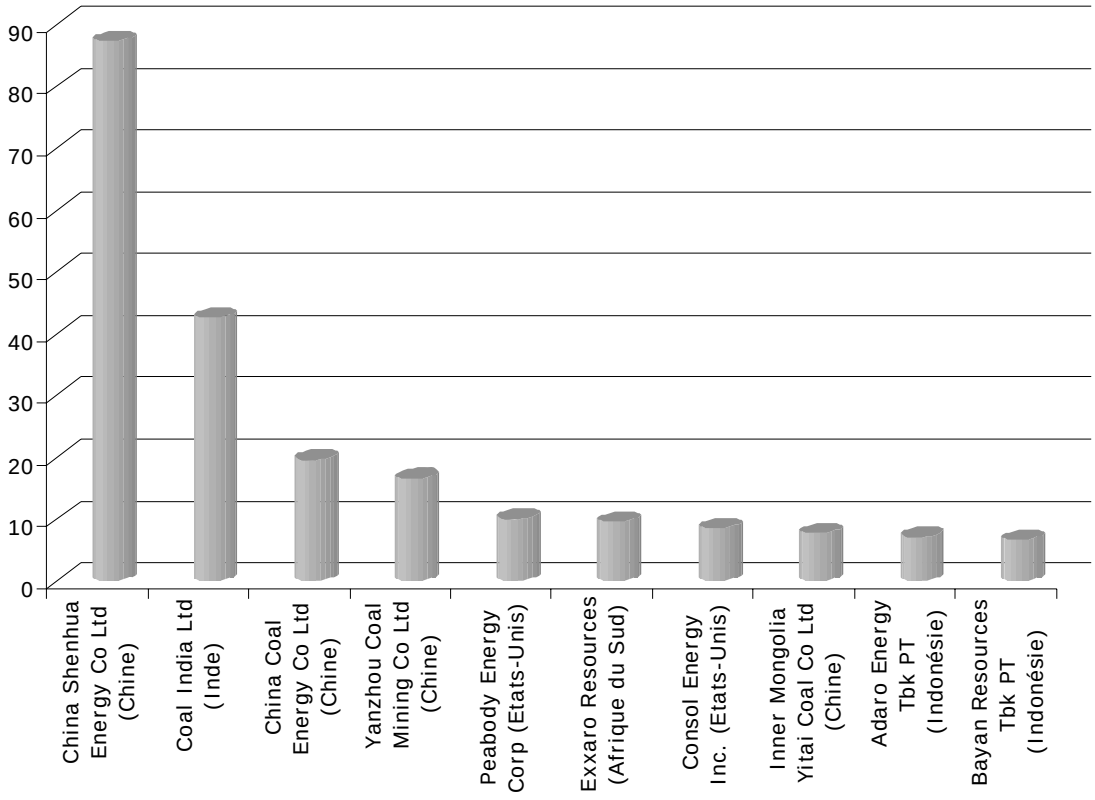



Source: IMF, *International Financial Statistics*.

Note: For computation, the deflator used was the unit value index of manufactured goods exports by developed market-economy countries (UNSD). At the time of writing, this deflator was available up to the third quarter of 2011.

**During the 2002-2008 commodity boom, the monthly prices for coal peaked in July 2008 (US$ 193 per metric ton) before falling to US$ 65 per metric ton in March 2009, due to the global economic recession. Despite short-term volatility, the price continued its upward trend to reach a cyclical peak in January 2011. In 2010 and during the first quarter of 2011, coal prices averaged respectively US$106 and US$ 135.**

Figure 48. Leading companies by market capitalization in the coal sector, as of 2 February 2012 (US$ billion)




Source: Thomson Reuters

**Seven of the world's top ten firms by market capitalization involved in the coal sector, are from the Asia-Pacific region.**

# Facts and figures:
# RENEWABLE ENERGIES

## Making news this quarter

This section of UNCTAD's Commodities at a Glance on energy, describes world renewable energies, [1] production and consumption trends, with a particular focus on Africa. As energy use, primarily sourced from fossil fuels accounts for 66 per cent of total greenhouse gas emissions, [2] a major challenge for developing countries will be that of transiting towards more sustainable and secure energy sources while maintaining and expanding access to affordable energy for industrial and household use. Two-thirds of developing country parties to the United Nations Framework Convention on Climate Change have reported energy supply measures as key priorities for investment and financial flows, notably switching from fossil fuels to renewable energy. [3] Energy remains a critical link between development and climate change mitigation as global access to energy services remains as unequally distributed as income. It is estimated that four out of five people without electricity live in rural areas in developing countries, mainly in South Asia and sub-Saharan Africa. [4]

Although there remain significant obstacles to Africa's expansion of energy services to their population, access to sustainable energy sources is crucial for helping them meet their socioeconomic development objectives. Energy poverty affecting approximately 75 per cent of Africa's population will generate greater environmental pressures due to increased demand for the energy deficit to be addressed. Stimulating the development and consumption of non-fossil fuel energy sources in Africa may require a shift in the balance of existing subsidy arrangements and greater public and private investment in the renewables sector. Currently, six of the world's top ten firms by market capitalization involved in the renewable energy sector, are from the EU (see Figure 54)

[1] Renewable energy is derived from natural processes such as wind, sun, geothermal heat and plant growth that are replenished constantly.
[2] UN-DESA (2009). *World Economic and Social Survey 2009: Promoting Development, Saving the Planet*. United Nations publication, sales no. E.09.II.C.1. New York, United Nations.
[3] UNFCCC (2007). *Investment and financial flows to address climate change*. Bonn, United Nations Framework Convention on Climate Change Secretariat.
[4] UN-DESA (2009). *World Economic and Social Survey 2009: Promoting Development, Saving the Planet*. United Nations publication, sales no. E.09.II.C.1. New York, United Nations.

Africa is endowed with substantial renewable energy resources (e.g. an estimated 12 per cent of the global hydropower potential). [5] Yet in 2008, Africa accounted for only 3 per cent of global net generation of renewable electricity (see Figure 50). The biggest African producers of renewable electricity are the Democratic Republic of the Congo, Mozambique and Zambia. [6] Greater decentralized power generation through small-scale renewable energy projects for countries without access to modern energy could also boost "green" employment and development prospects in many developing countries.

There is tremendous scope and potential for growth in developing countries' renewable energy technology and power generation sectors. The renewable energy sector could make a significant contribution to the development of technological and productive capacities based on research, development and innovation in developing countries. This would reduce the reliance of some countries on energy imports, and promote the sustainable development of industry through investment in "green" technologies (e.g. wind, geothermal, hydro and solar power). Figure 49 shows that during the 1980-2008 period, global renewable electricity generation from non-hydro sources grew from 1.8 per cent to 14.6 per cent of global net generation of renewable electricity; for Africa it rose from 0.2 per cent to 3.1 per cent of Africa's net generation of renewable electricity (see Figure 50). Non-hydroelectric renewable electricity generation in Africa is mainly supplied through biomass and waste, geothermal and wind power.

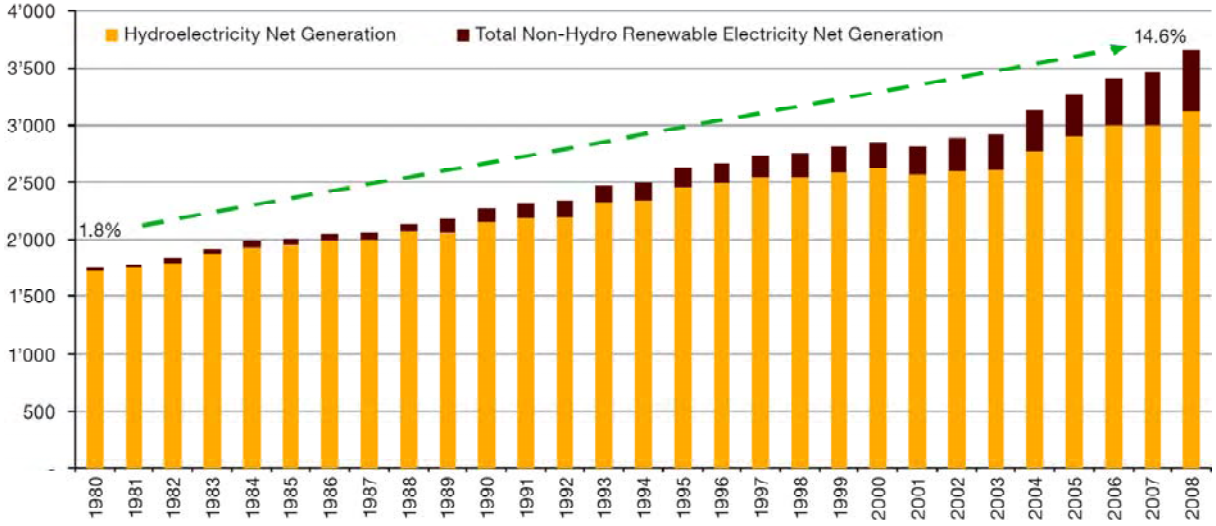
Similarly, the development of bio-energy provides the potential both for reducing Greenhouse Gases (GHGs) and the substitution of fossil fuels. Since 2001, ethanol production has been growing rapidly from an average 323,000 barrels a day in 2001 to 1,327,000 barrels a day in 2009 (see Figure 53). Brazil and the US dominate world ethanol production, together accounting for 88 per cent of ethanol production in 2009. Despite its sharp growth between 2001 and 2009, biodiesel production remains relatively marginal in comparison to Ethanol (see Figure 53).

Climate change concerns, together with high oil prices and peak oil, have encouraged governments to initiate public-private investment and incentive programmes to promote the development of the renewable energy sector.

[5] Water for Agriculture and Energy in Africa (2008). Hydropower resource assessment of Africa. Ministerial Conference on Water for Agriculture and Energy in Africa: the Challenges of Climate Change, held in Sirte, Libyan Arab Jamahiriya, 15–17 December 2008. Available at: *http://www.sirtewaterandenergy.org/docs/2009/Sirte_2008_BAK_3.pdf*.

[6] UNCTAD secretariat calculations, based on Total Renewable Electricity Net Generation data from the US Energy Information Administration (EIA), *International Energy Statistics* (*http://tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=6&pid=29&aid=12*).

Figure 49. World: breakdown of renewable electricity net generation between hydro and non-hydro sources, 1980-2008 (billion kilowatthours)

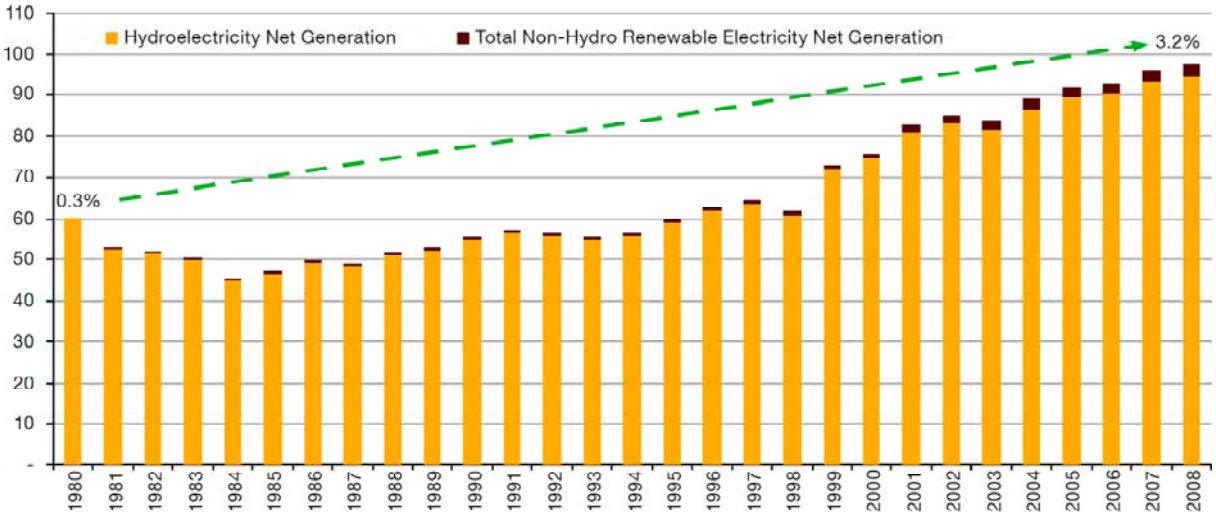



Source: US Energy Information Administration

Note: percentages indicated on the graph (for 1980 and 2008) are the share of the non-hydro renewable electricity net generation in the total renewable electricity net generation.

**Climate change concerns, together with high prices and peak oil, have encouraged governments to begin public-private investment and incentive programmes to promote the development of the renewable energy sector. During the 1980-2008 period, global renewable electricity generation from non-hydro sources grew from 1.8 per cent to 14.6 per cent of global net generation of renewable electricity.**

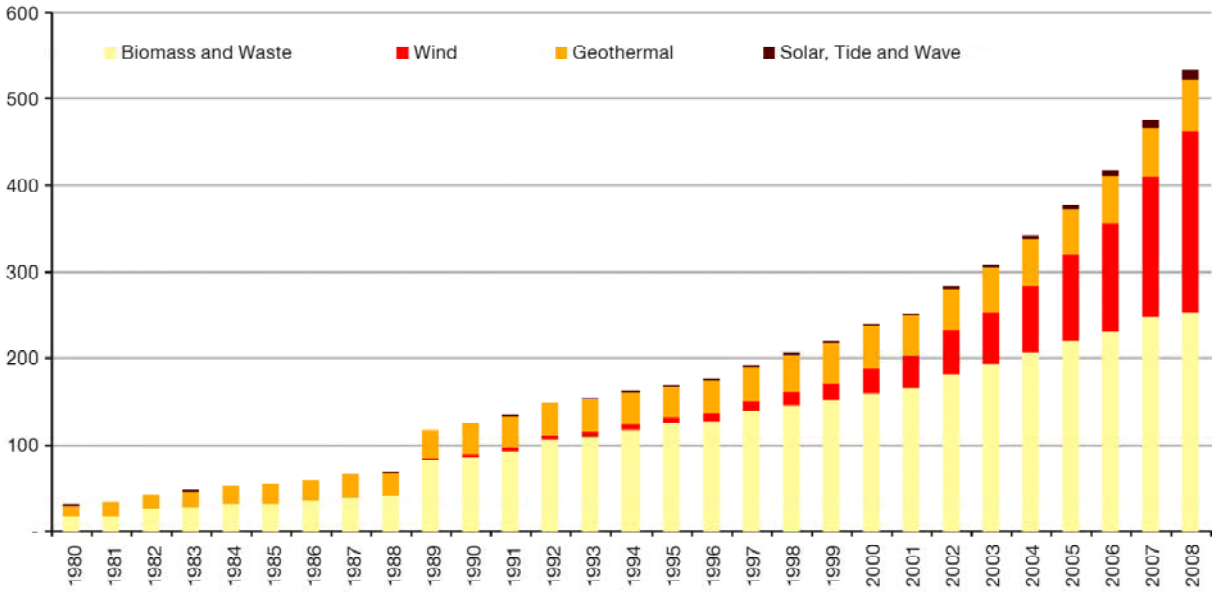
Figure 50. Africa: breakdown of renewable electricity net generation between hydro and non-hydro sources, 1980-2008 (billion kilowatthours)




Source: US Energy Information Administration

**In 2008, non-hydro renewable electricity (i.e. wind, solar, biomass) in Africa accounted for only 3 per cent of global net generation of renewable electricity**

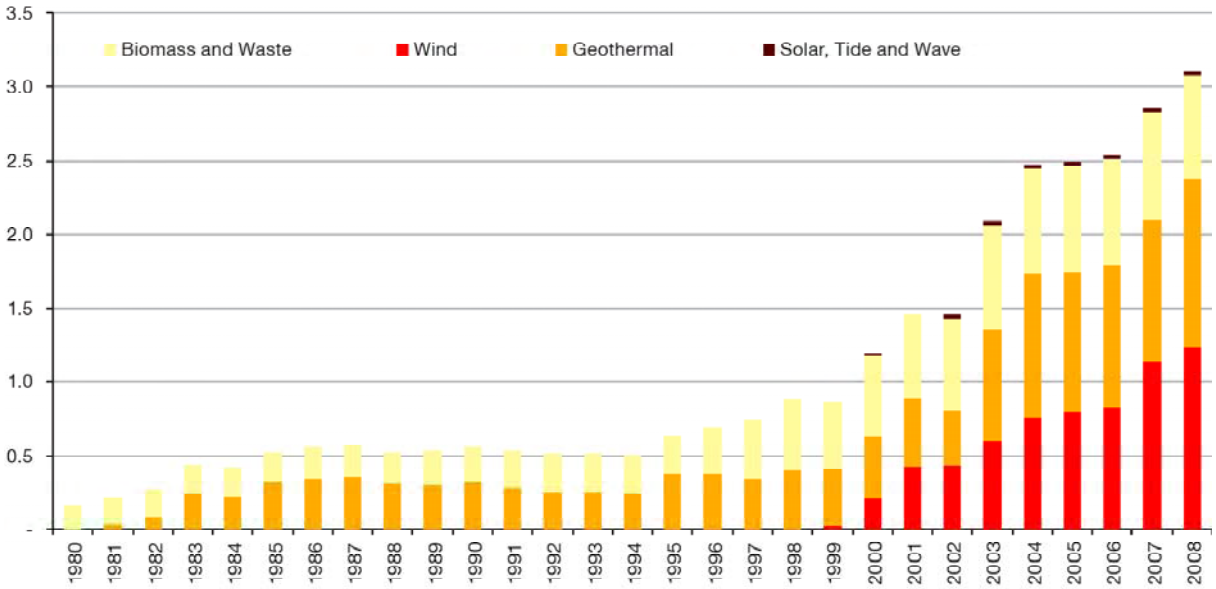
Figure 51. World: breakdown of non-hydroelectric renewable electricity net generation by energy sources, 1980-2008 (billion kilowatthours)




Source: US Energy Information Administration

**Global non-hydroelectric renewable electricity generation is mainly supplied through biomass and waste, geothermal and wind power.**

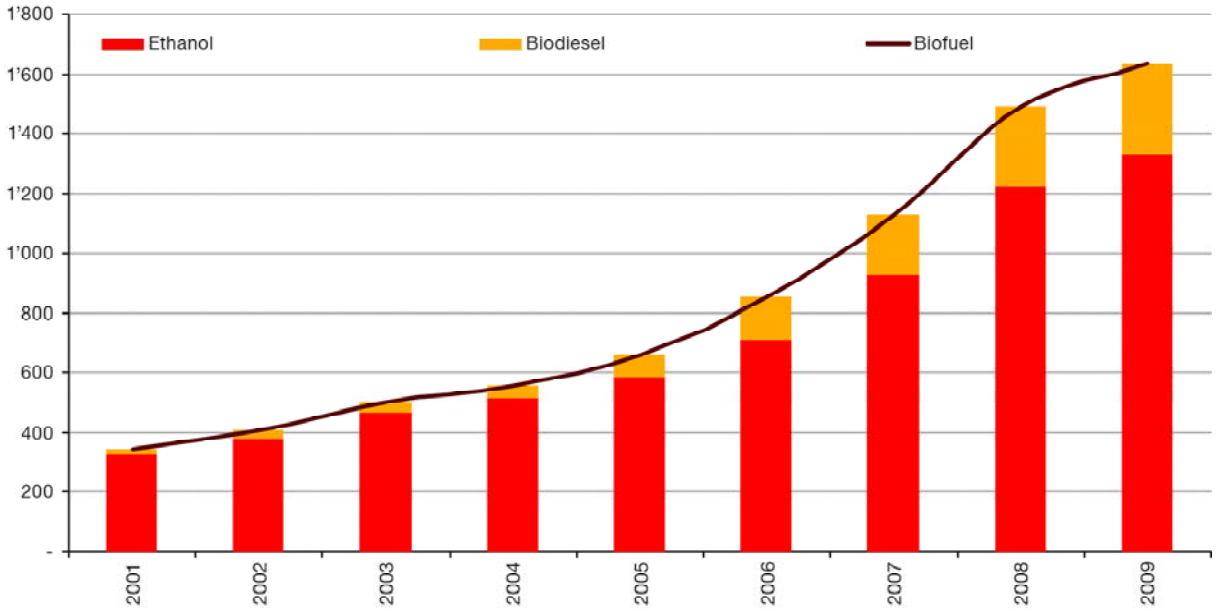
Figure 52. Africa: breakdown of the non-hydroelectric renewable electricity net generation by energy sources, 1980-2008 (billion kilowatthours)




Source: US Energy Information Administration

**Non-hydroelectric renewable electricity generation in Africa is mainly supplied through wind, geothermal, biomass and waste power.**

Figure 53. Evolution of the biofuel production and breakdown between ethanol production and biodiesel, 2001-2009 (1'000 barrels per day)

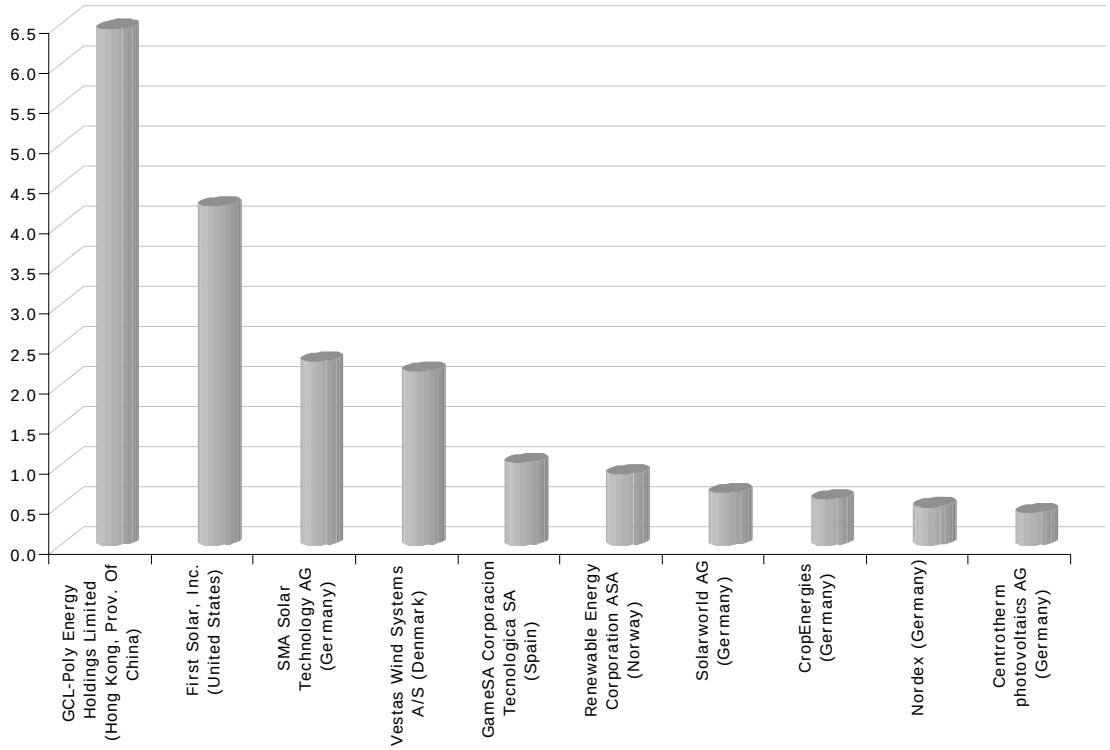



Source: US Energy Information Administration

**Since 2001 ethanol production has been growing rapidly from an average 314'000 barrels a day in 2001 to 1'327'000 barrels a day in 2009.**

**Brazil and the US dominate world ethanol production, together accounting for 88 per cent of ethanol production in 2009. However, biodiesel production is relatively marginal in comparison to ethanol production.**

Figure 54. Leading companies by market capitalization in the renewable energy sector, as of 2 February 2012 (US$ billion)




Source: Thomson Reuters.