



Energy in profile



Number two, 1995

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The world energy scene has undergone many changes since the first oil shock 20 years ago. From the mid-1970s to the mid-1980s, crude oil prices were largely controlled by OPEC. Today, they are negotiated between buyer and seller, reflecting market perceptions of supply and demand and the potential impact of world events. Most internationally traded crude oils are priced with reference to marker crude oils which set the price for selling into a particular market. Oil is now traded as a commodity with futures and forward markets developed as a means of managing risk.

Concern about possible shortages of fossil fuels has been replaced by concern about their environmental impact. Environmental considerations are a driving force in many countries, leading to increasing, and in some cases contradictory, environmental regulations. By minimising the environmental impact of their businesses through continuous improvement in their operations, energy companies contribute to the process of striking the right balance between economic growth and environmental protection.

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Abbreviations/definitions

bbf	barrel
b/d	barrels a day
bdoe	barrels a day of oil equivalent
CPE*	centrally planned economy
dwt	deadweight tonnes
EU	European Union
FSU	Former Soviet Union
GDP	Gross domestic product
IEA	International Energy Agency
kcal	kilocalorie
LNG	Liquefied natural gas
LPG	Liquefied petroleum gas
milliard	equals billion (10 ⁹)
NGL	Natural gas liquids
OECD†	Organisation for Economic Cooperation and Development
OPEC	Organisation of Petroleum Exporting Countries (Saudi Arabia, Iran, Iraq, Qatar, United Arab Emirates, Kuwait, Venezuela, Nigeria, Libya, Algeria, Indonesia and Gabon).
UAE	United Arab Emirates

* The term 'CPEs' is used only for convenience in the compilation of statistical data, and unless otherwise stated, applies to: Albania, Bulgaria, China, the former Czechoslovakia, Hungary, Mongolia, North Korea, Poland, Romania, the former Soviet Union (FSU) and Vietnam. It is recognised that most of these countries have moved away from centrally planned systems.

† OECD countries have included Mexico since April 1994. However for the purposes of this publication OECD statistics have been calculated excluding Mexico unless otherwise stated.

Primary energy demand

In 1994, world demand for primary energy was around 178 million bdoe, a rise of four per cent on 1993. Of this total, conventional fossil fuels – oil, natural gas and coal – accounted for nearly 150 million bdoe or 84% (Figure 1).

In 1994, some 37% of primary energy demand was met by oil, 26% by coal and 21% by gas. Over the past 25 years, oil's share has declined with non-fossil fuels taking an increasing, albeit still relatively small, share of total energy demand.

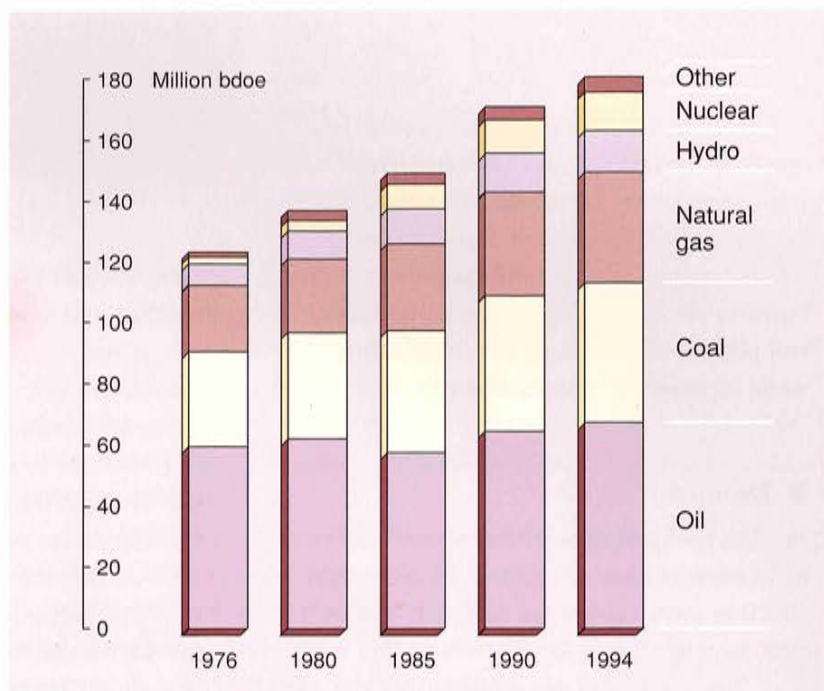
Since 1976, demand for oil has risen by 14%, coal by 47% and gas by 65%. Non-fossil fuels demand has risen most of all, by 145%, and today accounts for nearly 15% of total demand. However, oil is expected to remain the major source of energy for at least the next 25 years.

OECD countries account for more than half of the world's primary energy demand. Within the OECD, North America accounts for about half of total demand. On average, each person in the industrialised world consumes about 10 times the amount of commercial energy as one in the developing world. In the

last decade, however, per capita energy consumption in OECD countries has risen only slowly or remained constant, partly as a result of improved energy efficiency, while relatively modest economic growth has continued. There has also been a shift towards more service-based economies, with energy-intensive industries moving to non-OECD countries.

In non-OECD countries, energy consumption is increasing more rapidly than in the OECD. The FSU and China account for more than half of non-OECD primary energy demand.

Figure 1
World primary energy demand



Oil

Reserves

Estimated world reserves have grown from 625 billion barrels since 1973, as a result of technical advances, continued exploration and greater knowledge of the world's oil resources. Today, world proved reserves of oil and NGLs (as at 1 January 1995) are estimated at 1005 billion barrels, essentially unchanged from 1994. Future replacement or growth in these reserves is expected to come from an estimated 500 to 1000 billion barrels of oil yet to be

discovered, plus a further 400 to 500 billion barrels which are expected to be recoverable from known fields through the wider application of current and new technologies, but are not yet sufficiently firm to be considered proved reserves.

More than three-quarters of the world's proved oil reserves are in OPEC countries and more than half lie in just four Middle Eastern countries – Saudi Arabia, Iraq, Kuwait and Iran (Figure 2, page 2). Saudi Arabia alone accounts for more than one quarter of world reserves and one-third of OPEC reserves. At current rates of production, OPEC reserves are equivalent to some 85 years of supply, almost double the world's average reserves to production ratio of some 45 years. Some OPEC members have even higher reserves/production

ratios, for example, Abu Dhabi 135 years and Kuwait 140 years.

Reserves in the FSU and eastern Europe are estimated at 59 billion barrels, or six per cent of the world total, although these could increase considerably given access to advanced technology.

Proved reserves in OECD countries, which account for more than half of the world's oil consumption, amount to just five per cent of the world total and have declined by 25% in volume terms in the last decade.

The global trend towards privatisation has had a significant impact in the oil industry, and western companies continue to gain access to opportunities in countries previously closed to them, such as the FSU and China. Of particular significance is the return to countries such as Venezuela and Iran, where novel contractual arrangements provide foreign investment opportunities without compromising the principle of national resource ownership. These new partnerships will play an important role in maintaining world oil reserves in the decades to come.

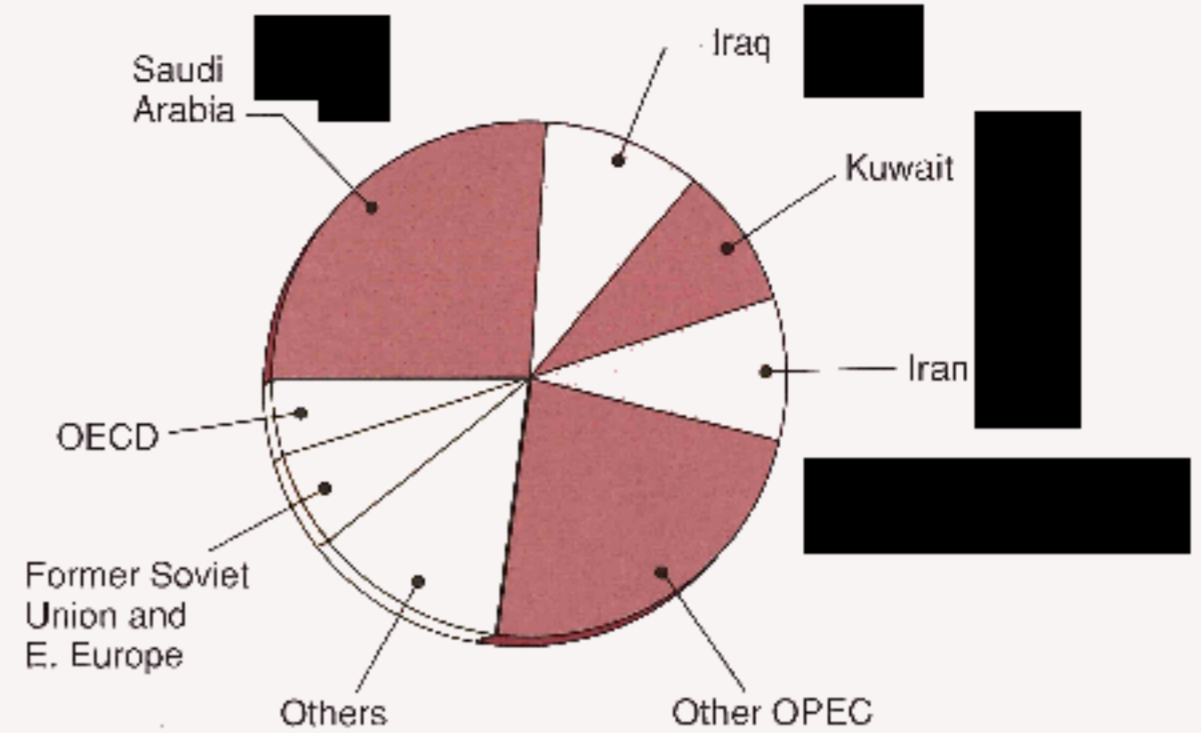
■ Demand

In 1994, world oil demand was 67 million b/d, an increase of some one million b/d over 1993. OECD countries accounted for nearly 57% of total demand (Figure 3).

The increase in demand was due mainly to recovery from recession in OECD countries coupled with the continued strong economic growth in many non-OECD areas, especially in the Asia-Pacific region. Demand began to increase in eastern Europe following economic recovery, but continued to decline in the FSU, albeit more slowly than in previous years.

Demand continues to 'whiten', ie demand is growing faster for products such as gasoline, naphtha and kerosine, the lighter products of the distillation process. The largest end-use sector for oil is transportation, which accounts for about half of total demand. Motor gasoline consumption increased by some 200 000 b/d to 17.9 million b/d.

Demand for oil products differs between OECD and non-OECD countries. In OECD countries, demand is dominated by motor gasoline which in 1994 accounted for some 12.4 million b/d – 33% of total OECD demand –



Total: 1005 billion barrels, at 1 January 1995

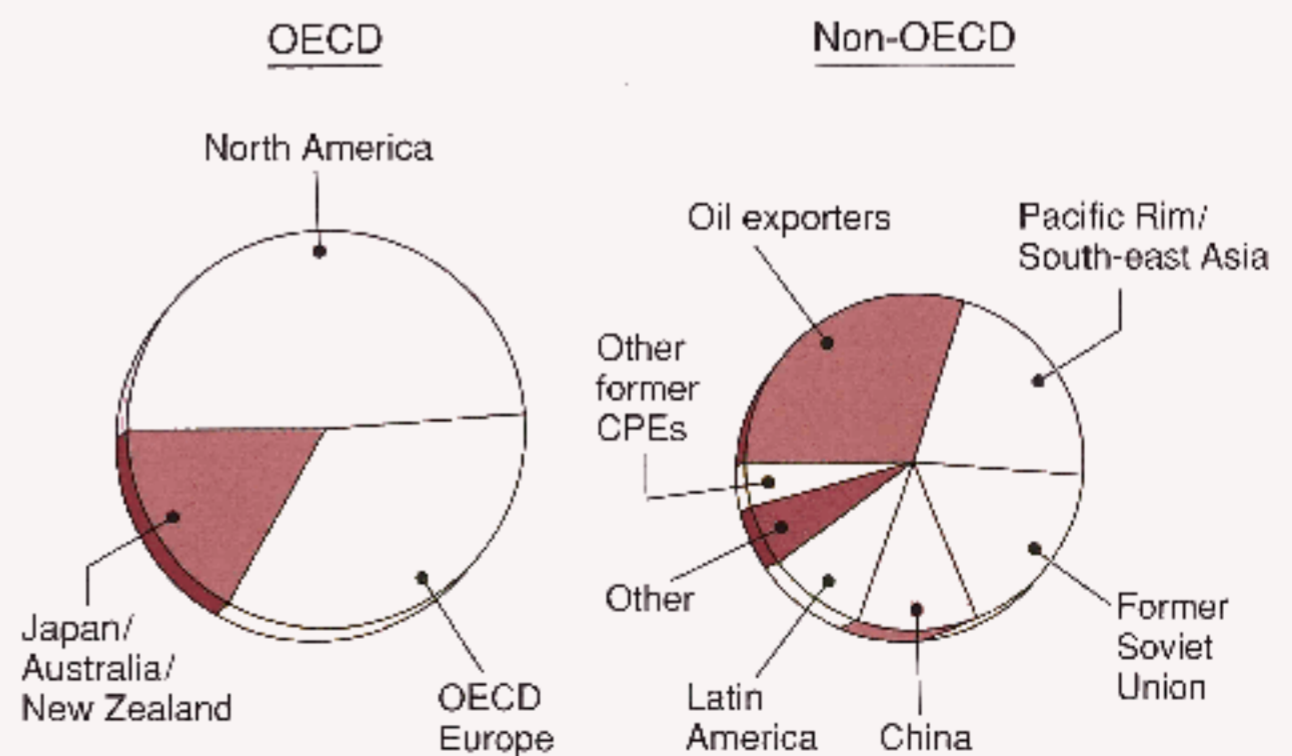
Based on Oil and Gas Journal data.

Figure 2
Proven oil reserves

up by around one per cent over 1993. In non-OECD countries (including the former CPEs), by contrast, gasoil and fuel oil together account for more than half of total demand. Demand for motor gasoline – at around 5.5 million b/d or 20% of the total – is lower than in the OECD countries, although it is increasing steadily and grew by around four per cent in 1994 outside the former CPEs.

Similarly, demand for gasoil rose by 1.8% in OECD countries and nearly three per cent in non-OECD areas. In contrast, fuel oil

Figure 3
World oil demand, 1994



Total: 67 million b/d

demand remained steady in the OECD but rose by 1.5% in the non-OECD.

■ Production

World oil production (crude oil, NGLs and synthetics) in 1994, at just under 67.5 million b/d showed an increase of around two per cent over 1993. Of this, OPEC countries' supply was some 27.2 million b/d or around 40% of the total (Figure 4), while the remaining 40 million b/d were produced in non-OPEC countries (Figure 5). The world's three largest producers, Saudi Arabia, the USA and the FSU, together account for 36% of world production. Globally there was a small build-up of stocks as demand in 1994 was slightly below production.

Non-OPEC production – particularly the UK's North Sea sector – supplied 60% of the increase in 1994. UK North Sea production rose by 26% to just over 2.5 million b/d and Norway's by 13% to 2.7 million b/d. The increase in North Sea production was due both to new fields coming on-stream and to extensions to the life of older fields by the application of new technology and reduced production costs. Other non-OPEC countries significantly increasing production included Argentina, India and Yemen. In some countries, notably Argentina, privatisation has been encouraged, which stimulated increased production.

In the FSU, despite increased foreign investment, production continued to fall. FSU production in 1994 was 7.3 million b/d, a decline of nearly seven per cent.

In the USA, production has declined since the mid-1980s apart from a short boost during the Gulf war. In 1994, it fell to 8.6 million b/d, down just over two per cent.

The rise in oil production from OPEC countries was just under two per cent. This was lower than the rise in non-OPEC countries' production. OPEC countries maintained their production quotas from the end of 1993 throughout 1994. Despite this, production increases were recorded in Kuwait which was still rebuilding after the Gulf war, and in Venezuela. Nigeria's production fell as a result of strikes by oil industry workers during the third quarter of 1994.

Saudi Arabia remains by far and away the largest single producing country in OPEC at some 8.6 million b/d (including NGLs and half of the neutral zone) in 1994. This represents 32% of OPEC production and 13% of the

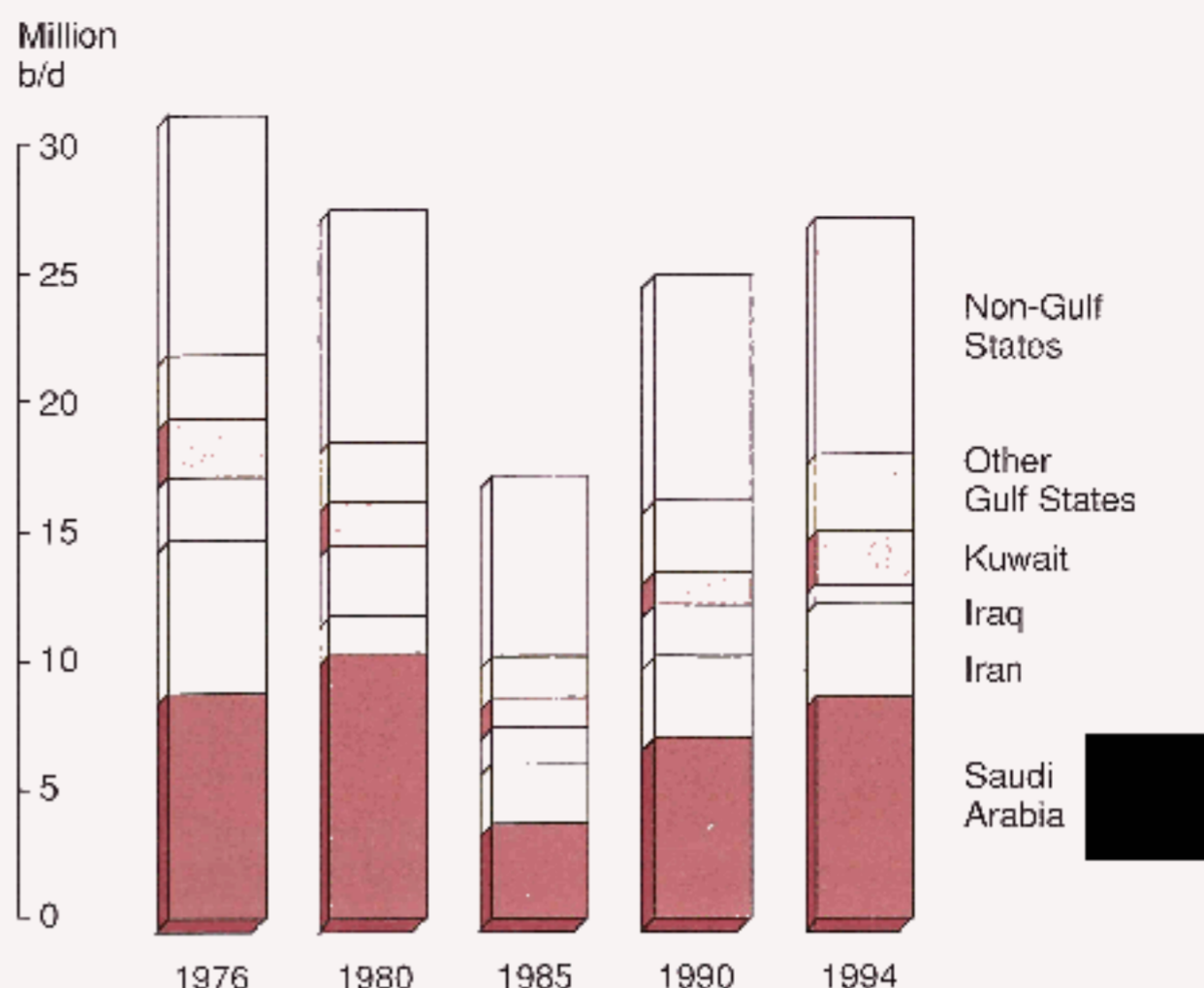
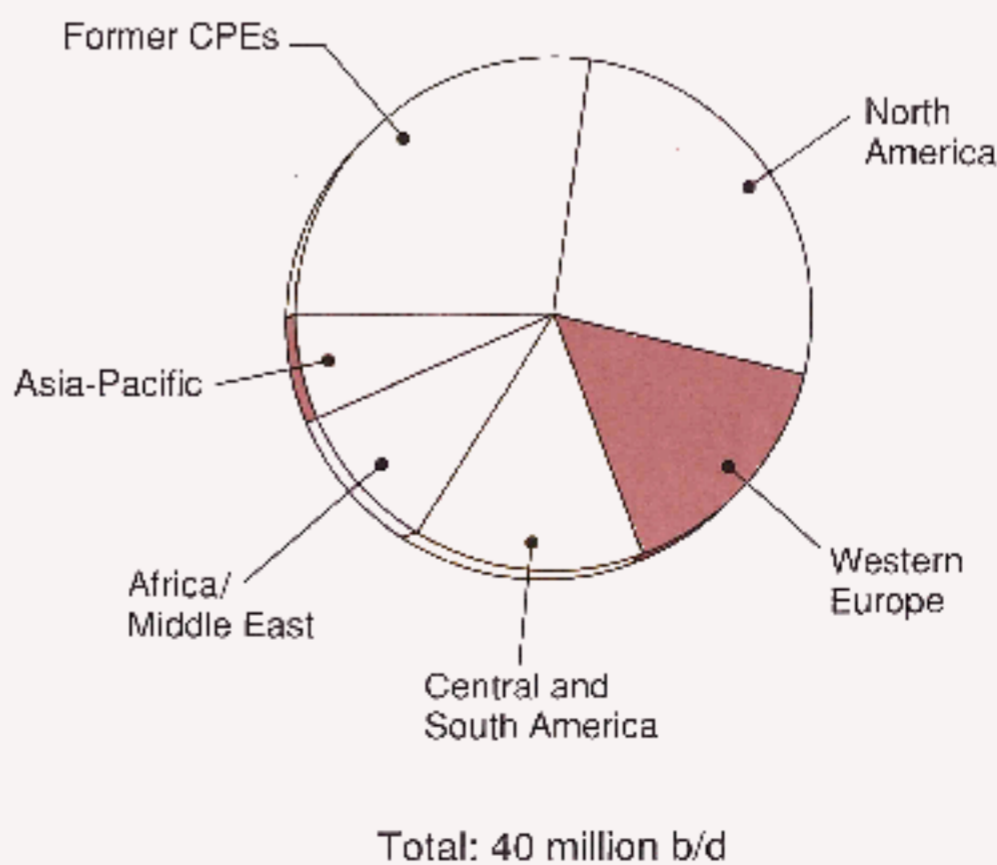


Figure 4
OPEC crude/NGL production

world total. In 1994, Saudi Arabia changed the mix of grades while maintaining the total overall production level, by producing more lighter grades. This, together with increased production of light grades from the North Sea, was a major factor in squeezing refiners' complex margins.

Oil prices remained weak during the first quarter of 1994, the spot price of Brent Blend (one of the main marker crudes) averaging only \$14 a barrel. However, a partial recovery occurred in April that year, and during the

Figure 5
Non-OPEC production, 1994



remainder of 1994 prices fluctuated in the range \$15 to \$17.5/bbl. The recovery reflected market perceptions of an improved balance between oil supply and demand following OPEC's decision at the end of March to extend its production agreement until the end of the year. Prices were also supported for a time by market concerns about production disruptions in Yemen and Nigeria. However, for the year as a whole, spot Brent averaged approximately \$15.80/bbl, a reduction of some \$1.20/bbl compared with 1993. In comparison a typical Gulf crude (Dubai), averaged \$14.75/bbl in 1994, down slightly from \$14.90 in 1993 (Figure 6).

■ Transportation

Since many oil resources are located far from the oil markets they serve, transportation is a vital aspect of the oil business. Today, some 60% of the world's crude oil is carried by sea in around 3000 ocean-going tankers with a total tonnage of more than 270 million dwt. Very Large Crude Carriers (VLCCs) account for around half of this tonnage. These were introduced in the late 1960s to offer economies of scale, especially on long-haul routes. Between 1970 and 1974, freight costs fell from almost 60% to just five per cent of the total cost of acquiring crude and shipping it from the Arabian Gulf to north-west Europe. However, falling oil demand and a shift of emphasis to short-haul routes from non-OPEC areas of production such as the North Sea and Alaska, led to a surplus of tonnage. The slump continued until the end of the 1980s (Figure 7) when the call on OPEC production – and hence long-haul routes – increased, leading to orders for new tankers.

In 1994, the supply of VLCC tonnage was more than adequate to meet demand, partly as a result of the mini-boom of 1991 which resulted in several new orders. (A VLCC takes an average of 18 months to build.) However, accelerated scrapping is likely, since refurbishment is often not cost-effective due to low freight rates, and as much of the fleet is ageing, there is only limited remaining trading life in the older tonnage. Notwithstanding the anticipated increase in demand for VLCC tonnage, large increases in freight rates are unlikely as significant improvements in freight rates are expected to trigger orders for new tonnage.

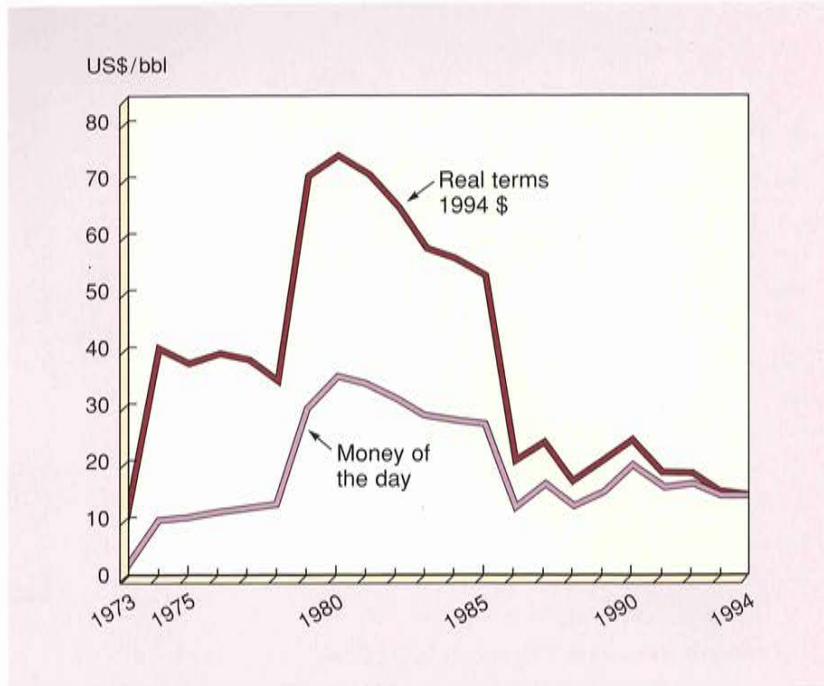


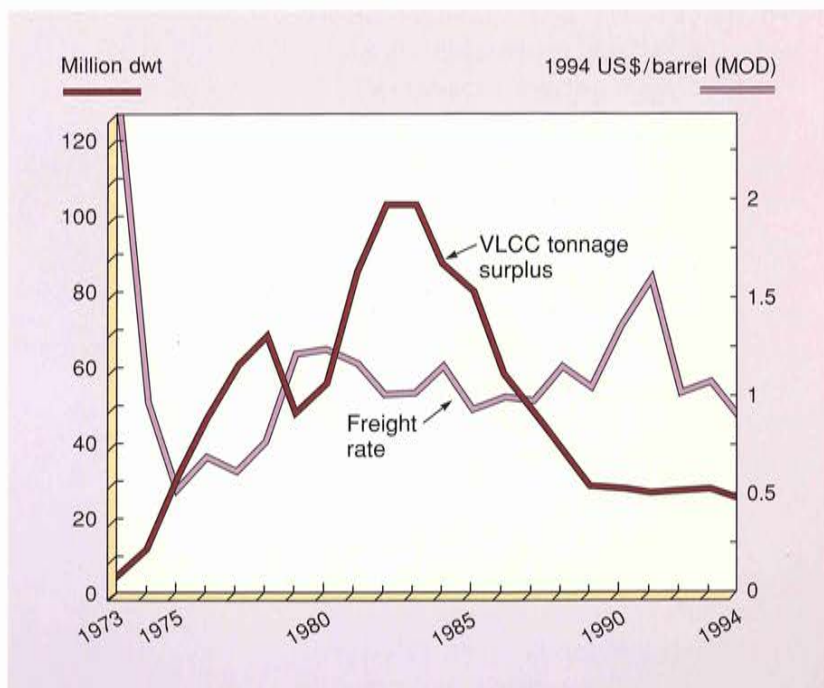
Figure 6
Crude oil prices

■ Refining

World primary distillation capacity (excluding 'mothballed' capacity) was estimated at some 3.8 billion tonnes a year in 1994, an increase of one per cent compared to 1993. Conversion capacity increased more than 3.5% – from 1.47 billion tonnes a year in 1993 to 1.53 billion tonnes a year in 1994.

Figure 8 gives a regional breakdown of distillation and conversion capacities. North America has the world's largest and most

Figure 7
Tankers and freight rates



sophisticated refining industry, with primary distillation and conversion capacities of 970 and 680 million tonnes a year respectively.

Following a period of rationalisation in the early 1980s, total primary distillation capacity is now at the same level as at the end of the 1970s, though with a different regional spread. Primary distillation capacity in the Middle East, the Asia-Pacific region and the former CPEs has increased significantly, mainly at the expense of western Europe. Conversion capacity has grown steadily by more than 50% over the past 15 years. This trend is set to continue as refineries increase conversion of residual oil fractions to meet market demands for higher-value products such as automotive fuels, lubricants and chemical feedstocks. Processes such as residue catalytic cracking and residue hydroconversion will help to meet these demands.

Environmental concerns will continue to have a significant effect on refineries as a result of the need to improve environmental performance in refining and meet the demand for products which conform to increasingly stringent environmental legislation. In many parts of the world, significant investment is being made in refinery upgrade facilities to meet a growing demand for cleaner products such as oxygenated gasoline and low sulphur diesels. Such investment represents a heavy financial burden, especially to smaller refineries.

Trade

World oil trade (including NGLs) amounted to some 35 million b/d in 1994, a three per cent increase compared to 1993. Almost two-thirds of this was exported from OPEC countries.

Since the early 1970s, exports from OPEC countries have varied considerably, ranging from more than 29 million b/d, or almost 85% of total trade in 1979, to less than 14 million b/d, just over 60% of total trade in 1985 (Figure 9). Since the mid-1980s, OPEC exports have gradually increased, reaching over 22 million b/d in 1994. More than two-thirds of the 1994 total were from the Gulf States with 7.6 million b/d coming from the main OPEC exporter, Saudi Arabia. Exports from Iraq remained minimal in 1994 as a result of continuing UN sanctions.

Some four-fifths of OPEC production is exported, and it thus represents a key source

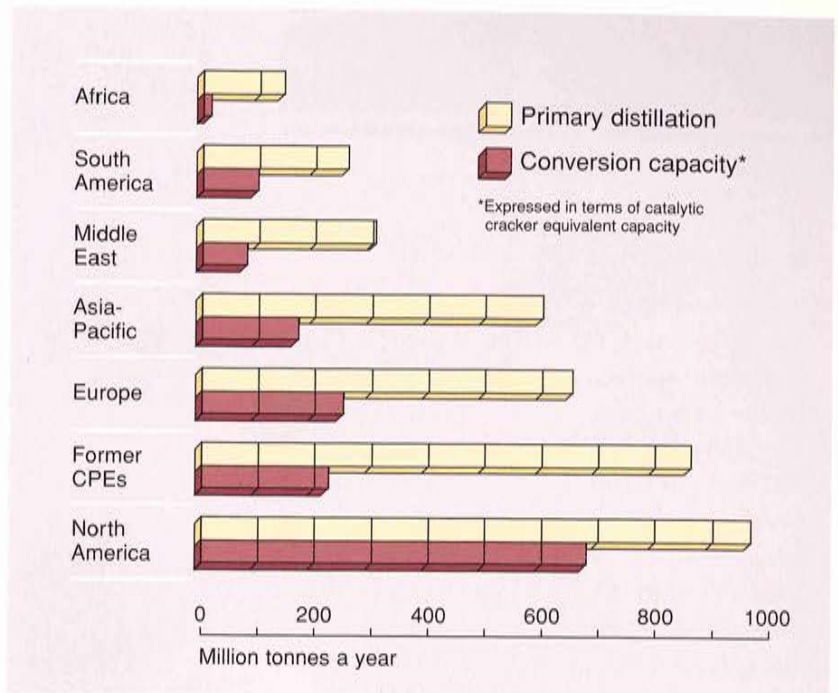


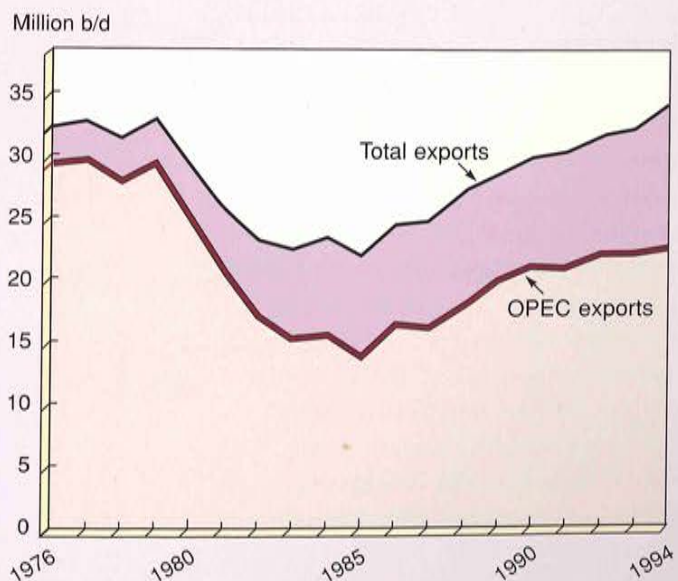
Figure 8
World refinery capacity, 1994

of revenue for OPEC countries.

Exports from non-OPEC countries have increased steadily since the 1970s and exceeded 13 million b/d in 1994. Around half of these came from just three sources, the FSU, Norway and Mexico. Other important exporters are the UK, Angola, Oman and Egypt, all of which export some 0.5 million b/d.

The world's main oil importers are the USA, Japan, Germany, France, Italy and South Korea, which together account for some two-thirds of total imports.

Figure 9
Oil exports



Natural gas

■ Reserves

World proved gas reserves are estimated at 135 000 mrd m³ (Figure 10). At current production levels, reserves are adequate for a further 66 years.

More than 70% are concentrated in the FSU and the Middle East. The FSU has the world's largest natural gas reserves – estimated at around 54 000 milliard m³ or some 40% of the total – followed by Iran with some 20 000 milliard m³ or 15% of the total. The USA, the world's second largest natural gas consumer after the FSU, has just three per cent of total reserves.

A significant proportion of gas reserves is to be found in giant fields. Out of the top 11 fields, six are in the FSU and the remainder in Qatar, Iran, Algeria, the Netherlands and Norway.

Natural gas reserves are abundant: as a result of increased exploration, estimates have almost doubled every 10 years since the 1960s. This upward trend is likely to continue, since current estimates of proved reserves do not take into account discoveries (especially in the FSU and Iran) which have not yet been fully appraised and so are not yet classified as proved. The number of countries with known gas reserves is also increasing: from about 40 in 1960 to around 90 today.

■ Production

The world's largest natural gas producers are the FSU and the USA which together account for around 60% of world production. In 1994, world natural gas production increased slightly to 2034 milliard m³ (Figure 11), as continued growth in western Europe and North America was offset by lower output in the FSU. In Europe, indigenous production rose by two per cent to 210 mrd m³ as new offshore fields in Norway, the UK and Italy started up in 1994. Production increased by four per cent in North America to more than 650 mrd m³. Production in the FSU, which in the 1980s was a driving

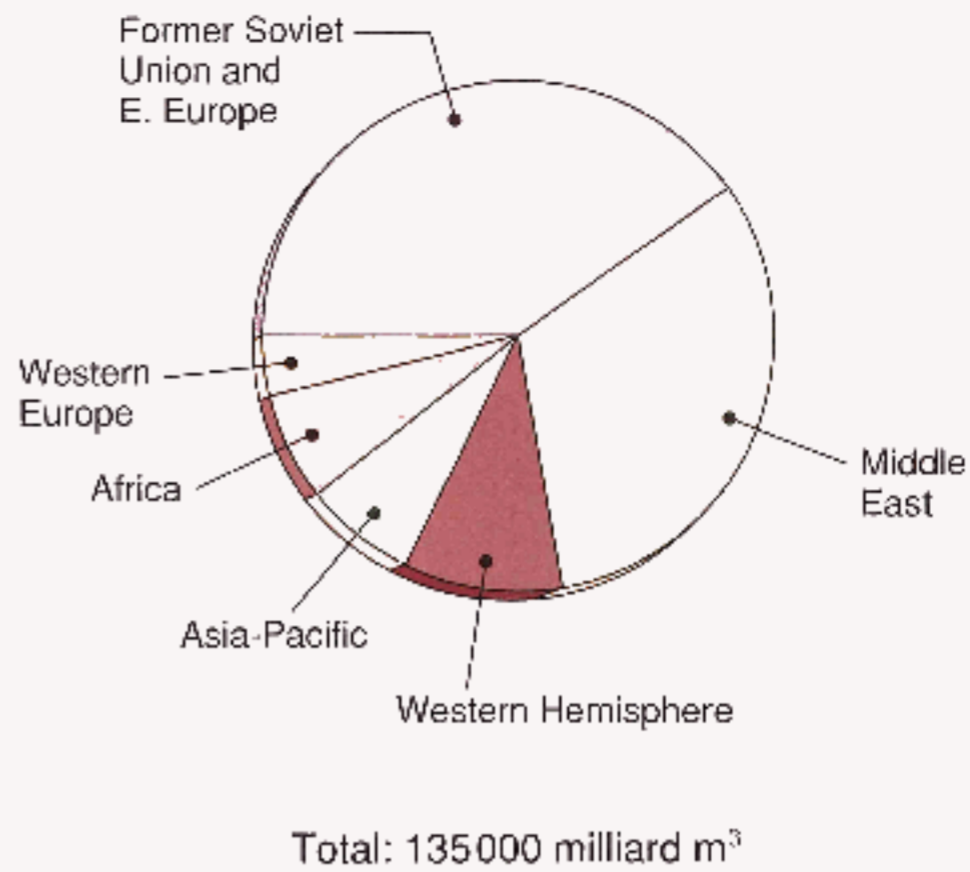


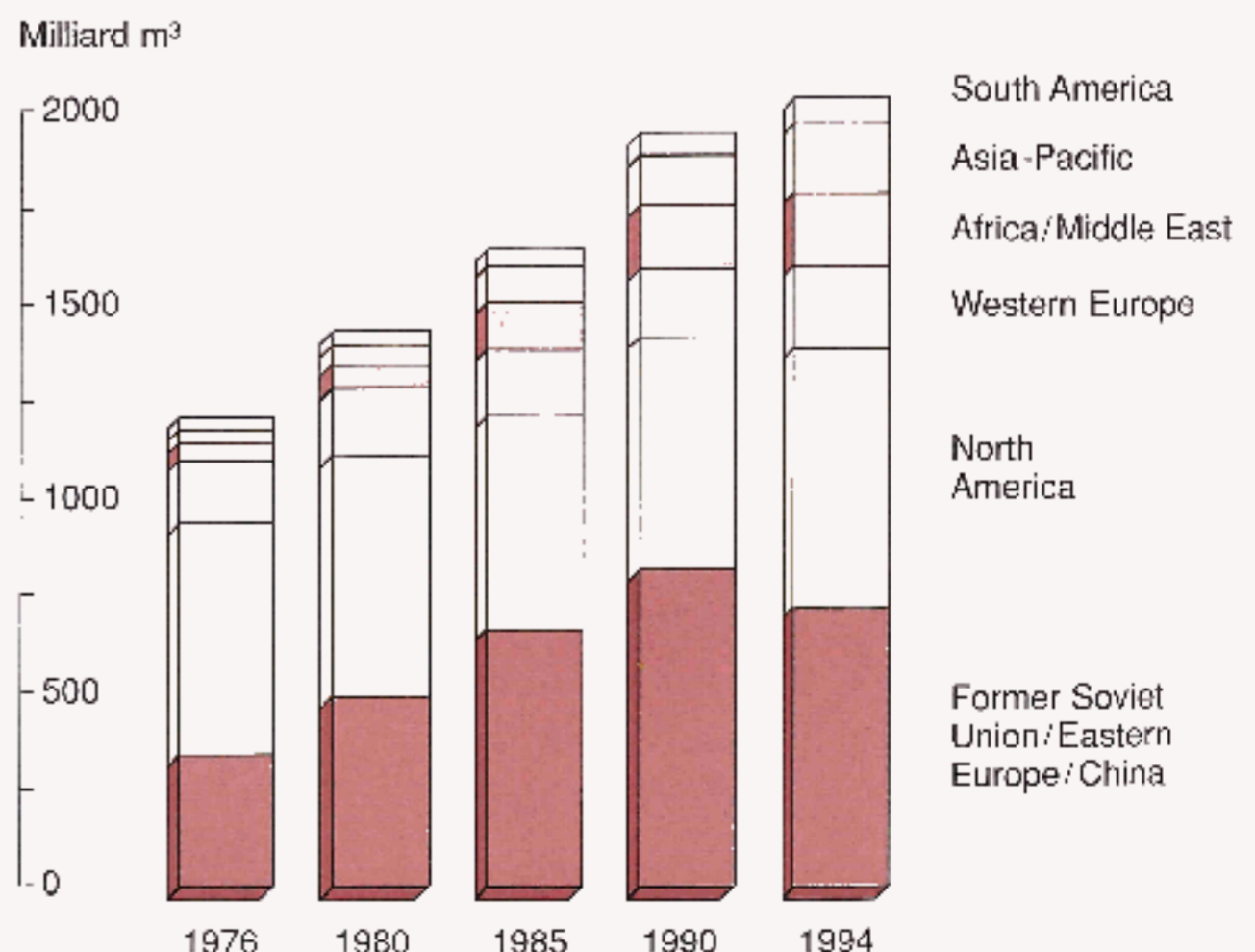
Figure 10
Proved natural gas reserves, 1994

force for the steady increase in total world production, declined for a fourth consecutive year to some 670 milliard m³ – more than five per cent below the level in 1993.

■ Consumption

Most natural gas is consumed locally since the high costs of transportation (compared to those of transporting oil) limit international trade. In 1994, indigenous sources supplied some 83% of demand. Most natural gas is sold under long-term contracts, of 20 years or

Figure 11
Natural gas net production¹



¹ Excludes re-injected/flared gas and shrinkage due to the extraction of NGL

² All gas volumes quoted in this section, including figures 10-13, are adjusted @ 9500 kcal/m³.

more, except in the USA where about 40% of the volume traded is on 'spot market' terms.

Consumption patterns generally follow those of production, except in the case of Japan, which relies almost entirely on imported LNG, mainly for power generation. In 1994, consumption in Japan rose principally due to higher use of air conditioning in the hot dry summer. Economic restructuring in the FSU continues to reduce gas consumption, which declined to 570 mrd m³ in 1994, eight per cent below 1993. In central and eastern Europe, gas consumption remained constant at some 68 milliard m³. In the USA, the market for gas rose two per cent to 576 milliard m³ due to continued strong industrial and commercial growth. In western Europe, overall demand increased by two per cent over 1993 as economies recovered. The milder weather in the second half of 1994 reduced demand in the Netherlands and Italy. However, in the UK, gas use for power generation increased, and in Germany additional connections raised gas consumption for public distribution.

Weather variations can affect consumption, especially in the temperature-sensitive residential and commercial sectors. Gas storage is becoming an increasingly important factor in load balancing for seasonal demand. In the USA, for instance, theoretical storage capacity is believed to be almost half of total annual production.

Trade

International trade in natural gas (Figures 12 and 13) rose five per cent to 344 milliard m³ in 1994. Both pipeline gas and liquefied natural gas (LNG) trade continued to rise in 1994 and together account for some 17% of total world consumption. Of this, three-quarters is pipeline gas and the remainder LNG. The FSU is still the world's biggest gas exporter, accounting for some 30% of total exports, followed by Canada with 20%. The main importer is the USA, with some 20% of total trade followed by Germany and Japan. In 1994 pipeline exports to western Europe from the FSU and Norway increased and Canadian pipeline exports to the USA continued to rise.

LNG trade is centred mainly in the Asia-Pacific region with about two-thirds of exports destined for Japan, principally from Indonesia, Brunei, Malaysia and Australia, but also from Abu Dhabi and the USA. Some 40% of LNG exports are from just one country, Indonesia.

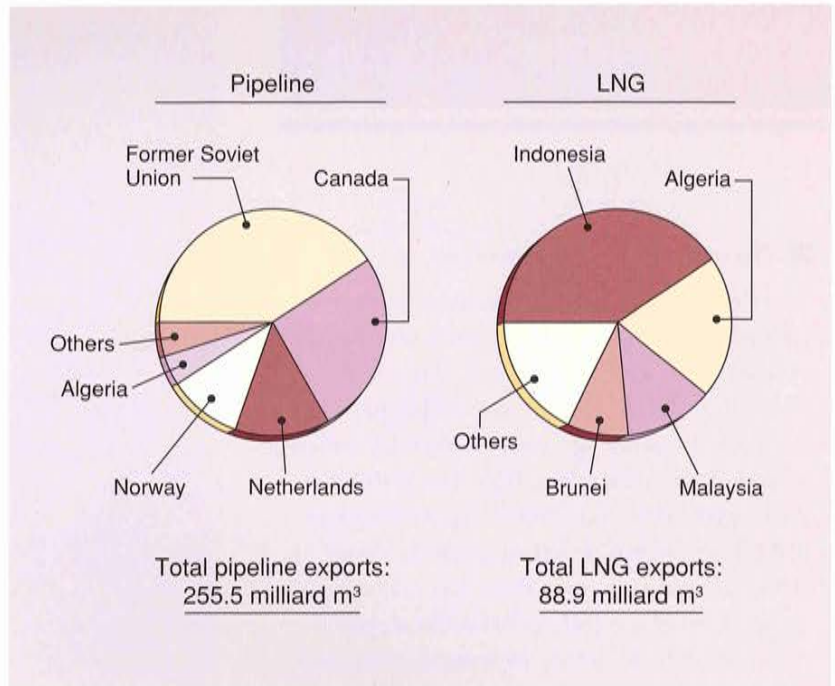
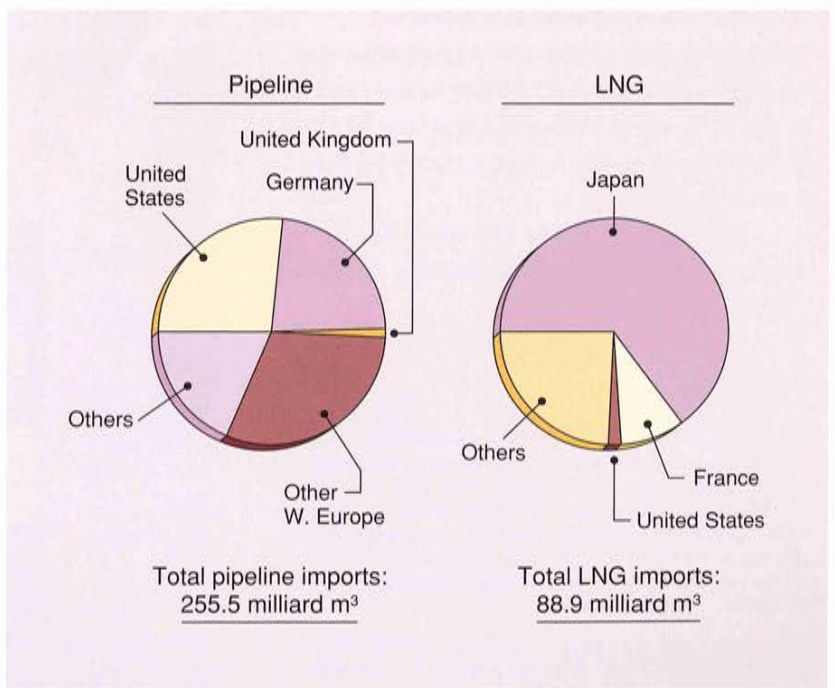


Figure 12
Natural gas exports, 1994

LNG trade as a proportion of world natural gas trade has more than doubled since the mid-1970s. In 1994, it rose to some 89 milliard m³, 26% of total trade. This rise of over five per cent from 1993, is explained by a recovery in Japanese imports and increased imports to South Korea and Taiwan. Lower LNG exports from Algeria, due to plant refurbishment, combined with surplus LNG capacity among exporters traditionally supplying Japan, contributed to the growth in spot and short-term LNG transactions.

Figure 13
Natural gas imports, 1994



Coal

Resources and reserves

Proved world reserves of economically recoverable hard coal* are currently estimated at 528 billion tonnes coal equivalent** (Figure 14). In addition, economically recoverable proved reserves of lignite* are estimated at 136 billion tonnes of coal equivalent. The total for economically recoverable reserves of coal is therefore 664 billion tonnes of coal equivalent. These reserves represent more than 200 years of use at current production rates. Total coal resources, which include estimated additional reserves and coal that is not considered recoverable under current or anticipated local economic conditions, are estimated at more than 6700 billion tonnes of coal equivalent.

Production

World hard coal production was estimated at 3565 million tonnes in 1994, an increase of 109 million tonnes from 1993 production (Figure 15). There were further declines in Europe, specifically the UK (down 20 million tonnes) and Germany (down six million tonnes) as high-cost production was closed, and in the FSU (down 30 million tonnes) as a result of changing economic conditions and equipment deterioration. All other major producing countries remained steady or increased production, as in China where production rose 71 million tonnes to 1.21 billion tonnes, and in the USA where production also rose by 71 million tonnes as the industry recovered from a strike in 1993.

Production in China and the USA accounts for 58% of world production. In 1995,

*Hard coal includes bituminous coal and anthracite. It covers the geologically more mature denser coals having moist, ash-free gross calorific values above 5700 kcal/kg in the International Classification system. Brown coal (lignite) is low rank coal, having a gross calorific value below 4600 kcal/kg. Sub-bituminous coal is intermediate between brown coal and hard coal, but is generally classified with the latter.

**A tonne of coal equivalent is an energy unit which has a coal calorific value of 7000 kcal/kg net as received and equals 0.7 tonnes of oil equivalent.

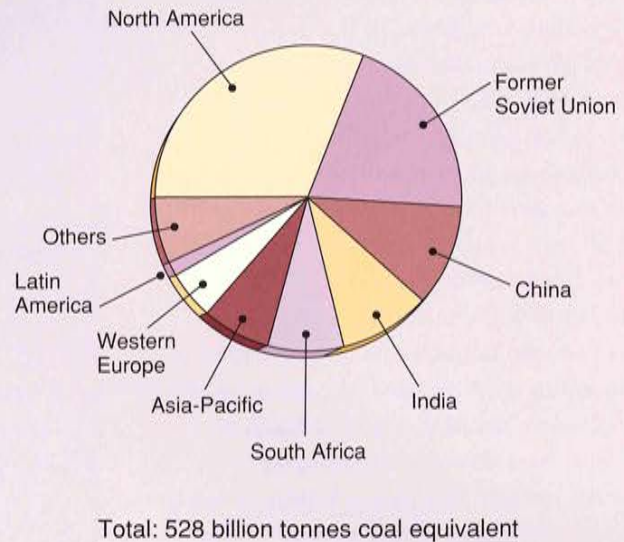
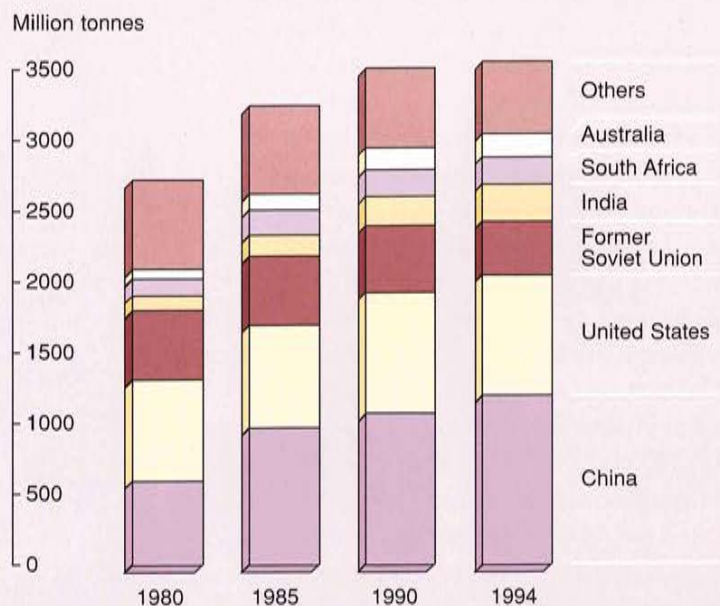


Figure 14
Hard coal reserves, 1994

production trends in the EU and USA will stabilise while FSU output will continue to decline. In China, where the energy economy is coal based, production will continue to grow in response to the dynamic growth that is occurring and the consequential ever-increasing demand for energy and electricity.

World brown coal production in 1994 is estimated at 1091 million tonnes, marginally lower than the 1993 production of 1101 million tonnes.

Figure 15
Hard coal production



■ Consumption

Total hard coal consumption in 1994 was estimated at 3546 million tonnes, a rise over the 1993 figure of 3480 million tonnes (Figure 16). In 1994, consumption declined again in the EU and the FSU, rose in the USA, South Africa and China and remained virtually unchanged elsewhere. The increases in the USA, South Africa and China accounted for 93 million tonnes of the total rise in consumption.

In 1995, consumption in the Asian region is expected to continue to grow both in the domestic use of hard coal – as in China – and in the use of imported coal in expanding coal-fired utility capacity in the Asia-Pacific region. Further declines will occur in the FSU, while EU consumption will stabilise.

■ Trade

In 1994, international trade in anthracite, thermal and metallurgical coals[†] rose from 1993 levels by 19 million tonnes to reach 407 million tonnes (Figure 17). This represents some 11% of total world production in tonnage terms.

Demand for imported seaborne thermal coal in the EU rose in 1994 following a sharp decline in 1993. Demand elsewhere in the Atlantic Basin edged up. The on-going increase in Pacific Basin demand continued as newly constructed power plants were put into operation. Slight declines in exports from the USA and FSU coupled with near-static exports from Australia and Colombia kept the market reasonably tight on supply and allowed South Africa to expand exports into the Atlantic Basin, and Indonesia and China into the Pacific Basin. Overall demand rose by 10 million tonnes in 1994 to 208 million tonnes with the increase evenly split between the Atlantic and Pacific Basins. The tightening of the demand/supply balance resulted in prices rising throughout the year.

[†] The term thermal coal (or steam coal) is used to distinguish coals considered particularly suitable for under-boiler use from those suitable for the iron and steel industry. Coal used to manufacture iron and steel is termed metallurgical coal. Most metallurgical coals have coking properties and these are termed coking coals. Anthracite, used primarily in the thermal coal industry, is the coal of highest 'rank'. Rank indicates maturity in terms of general chemical and physical properties.

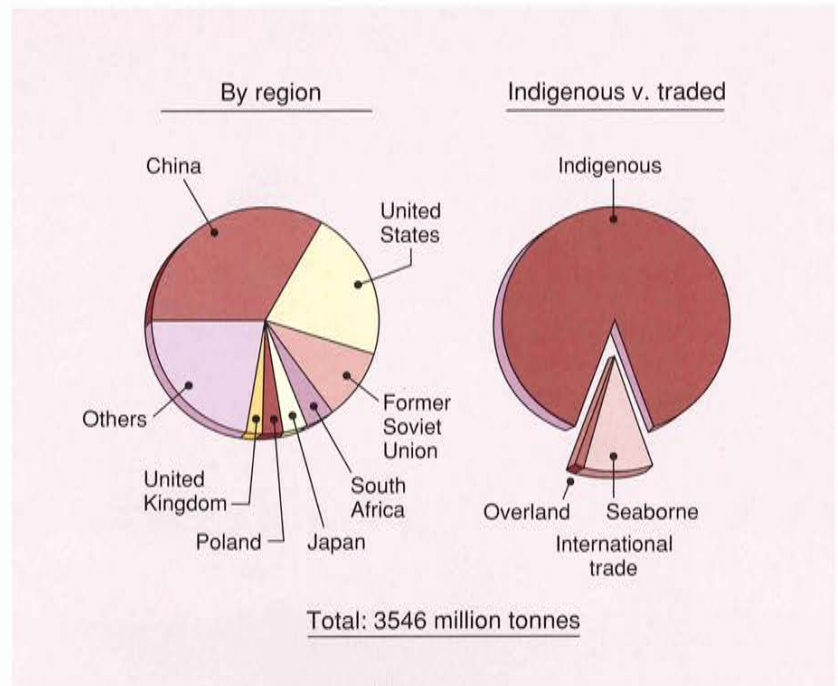
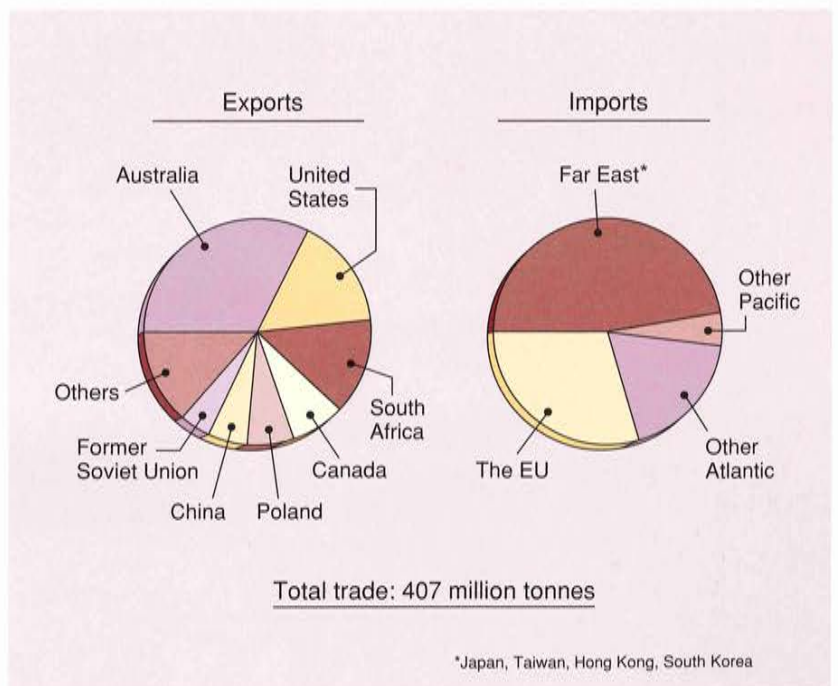


Figure 16
Hard coal
consumption, 1994

The trade in seaborne metallurgical coal was weak at the beginning of 1994 but strengthened through the year as improving economic conditions gave rise to increasing steel production. Total trade in 1994 was similar to that of 1993 at 159 million tonnes.

The outlook for seaborne coal in 1995 is of strengthening demand both for thermal coal in the Atlantic and Pacific Basins and for metallurgical coal in the Pacific. Seaborne coal trade is projected to increase by seven per cent over 1994.

Figure 17
Coal trade,
1994





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