

Figure 2.1  
Classification of fossil fuel reserves.

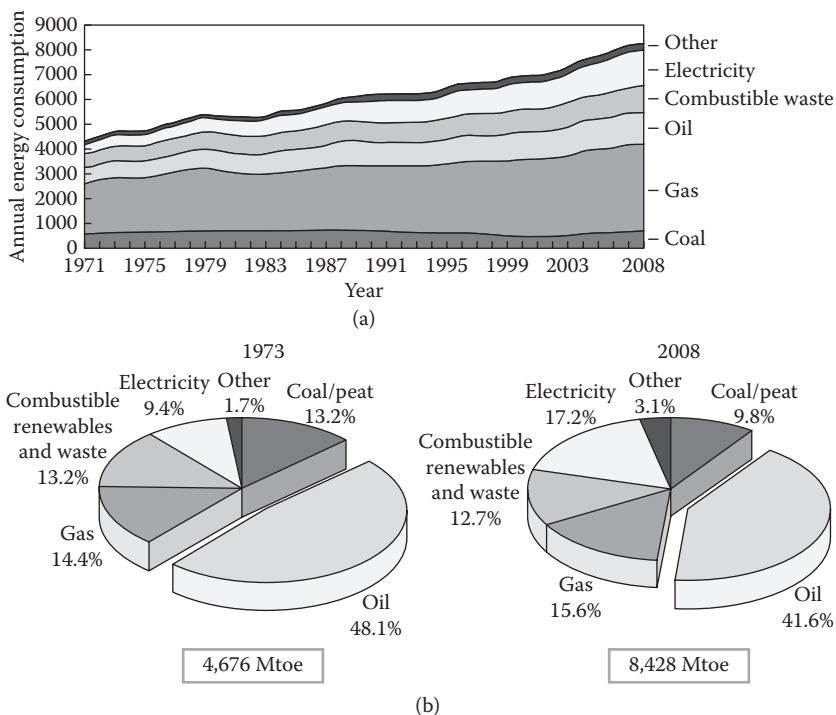


Figure 2.3

(See color insert.) Changes in the world annual consumption of coal, oil, natural gas, and electricity measured in 103 ton oil equivalent over the period 1977–2008. (a) World annual energy consumption over the period of 1977 through 2008, in million tons of oil equivalents (Mtoe), showing the increased contributions of coal, oil, natural gas, electricity, and other sources of minor forms of energy (b) Comparison of the annual total world energy consumption for the years 1973 and 2008 showing the corresponding changes in the fractional contributions of the different forms of energy. (From International Energy Agency, *Key World Energy Statistics*, 2011, [www.iea.org/books](http://www.iea.org/books), Paris, France.)

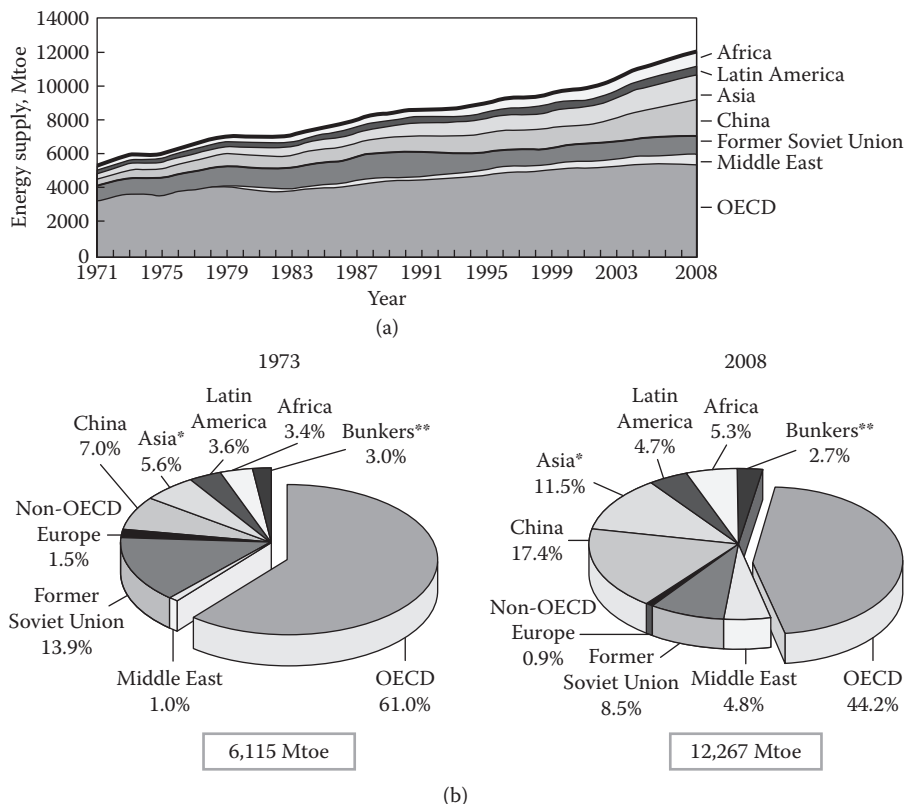


Figure 2.4

(See color insert.) Comparison of changes in energy supply by regions between 1973 and 2008 showing, for example, China's share increasing by around a factor of five. (a) Annual total energy supply over the period 1977 through 2008, in Mtoe, by the different major regions of the world. It shows for example P.R. China's share increasing over the period by around a factor of 5 (b) Comparison of annual total world energy consumption between the years 1973 and 2008 showing corresponding changes in the fractional contributions of the consumption of different major world regions. (From International Energy Agency, *Key World Energy Statistics*, 2011, [www.iea.org/books](http://www.iea.org/books), Paris, France.)

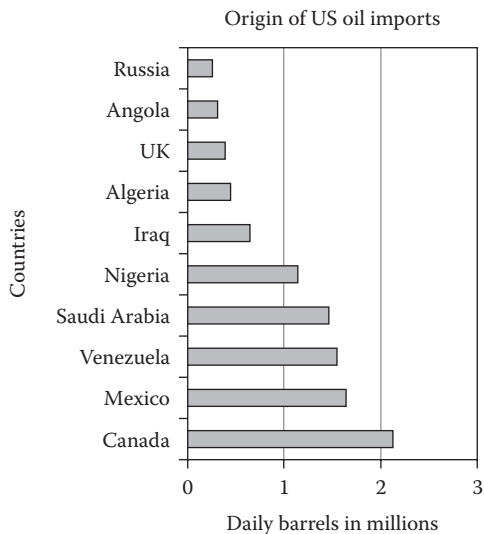


Figure 2.5

The origin and size of oil imports of the United States in millions of barrels per day in recent years: Canada is shown as the top supplier. (From Information U.S. Government Administration.)

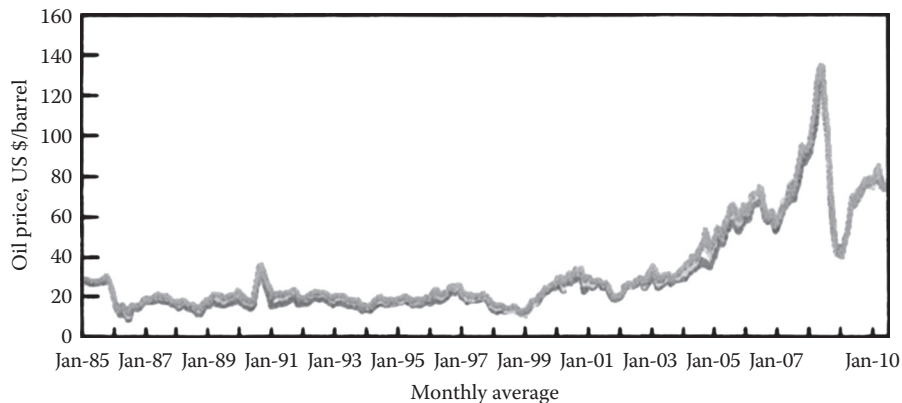


Figure 2.6

The wide fluctuation in the price of oil in recent years. (Adapted from U.S. Department of Energy, National Petroleum Council, *Hard Truths about Energy*, 2007, Washington DC, USA, [Elect. Edition].)

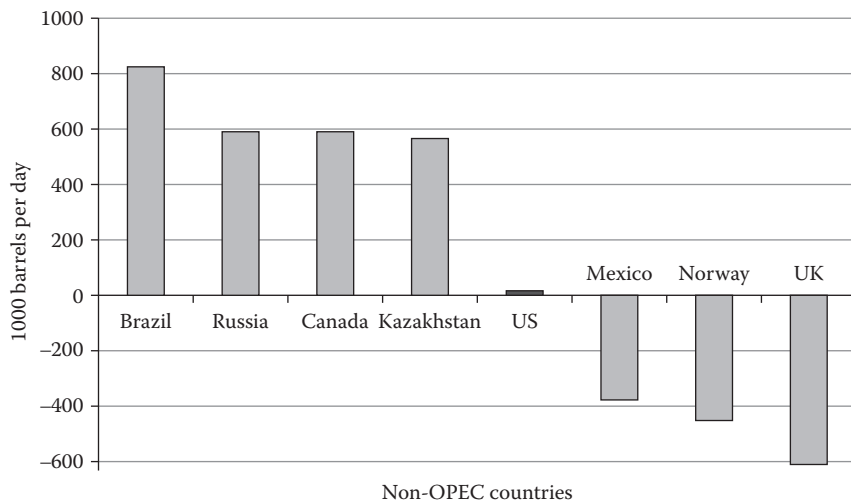


Figure 2.7

An estimate of the likely projected changes in the oil production capacity of some nonOPEC countries in the next few years. (From International Energy Agency, *Key World Energy Statistics*, 2011, [www.iea.org/books](http://www.iea.org/books), Paris, France.)

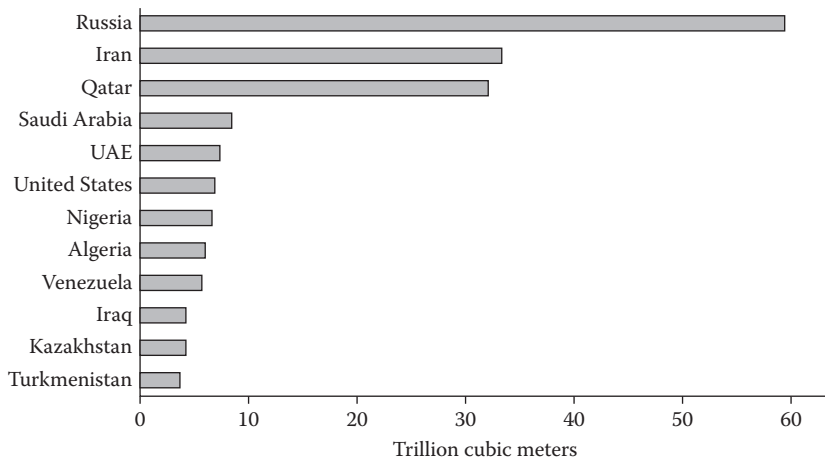


Figure 2.8

Estimated major conventional natural gas reserves by country. (From *BP Statistical Review of World Energy*, [yearly to 2012], [bp.com/statisticalreview](http://bp.com/statisticalreview). International Energy Agency, *Key World Energy Statistics*, 2011, [www.iea.org/books](http://www.iea.org/books), Paris, France.)

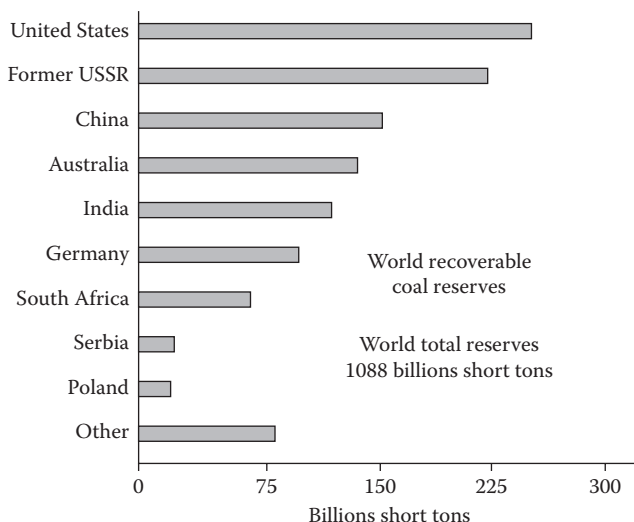


Figure 2.9

Estimated world reserves of coal. (From *BP Statistical Review of World Energy*, [yearly to 2012], [bp.com/statisticalreview](http://bp.com/statisticalreview). International Energy Agency, *Key World Energy Statistics*, 2011, [www.iea.org/books](http://www.iea.org/books), Paris, France.)



**“PROVED RESERVES”** – This term defines the estimated quantity of crude oil, natural gas, natural gas liquids or sulphur which analysis of geological and engineering data demonstrates with reasonable certainty to be recoverable from known oil or gas fields under existing economic and operating conditions.

**“PROBABLE RESERVES”** – Probable reserves are a realistic assessment of the reserves that will be recovered from known oil or gas fields based on the estimated ultimate size and reservoir characteristics of such fields. Probable reserves include those reserves shown in the proved category.

**“ORIGINAL IN-PLACE RESERVES”** – Original in-place reserves are defined as the total quantity of crude oil or raw gas initially in place within the estimated area of an oil or gas field from which production has been obtained or for which reserves have been credited. This term represents the sum of (1) the anticipated ultimate crude oil or raw gas production and (2) the crude oil or raw gas estimated to be non-recoverable under existing economic and operating conditions.

**“ULTIMATE RECOVERABLE RESERVES”** – Ultimate recoverable reserves are defined as the total quantity of crude oil, natural gas, natural gas liquids or sulphur estimated to be ultimately producible from an oil or gas field as determined by an analysis of current geological and engineering data. This includes any quantities already produced up to the respective date of the estimate.

**“REMAINING RESERVES”** – Remaining reserves are those quantities of crude oil, natural gas, natural gas liquids and sulphur as estimated under proved or probable reserves after deducting those quantities produced up to the respective date of the estimate.

**“RAW GAS”** – Raw gas is defined as natural gas, in its natural state, existing in or produced from a field.

**“MARKETABLE NATURAL GAS”** – Marketable natural gas is defined as raw gas from which certain hydrocarbon and non-hydrocarbon compounds have been removed or partially removed by processing. Marketable natural gas is often referred to as pipeline gas, residue gas or sales gas.

**“NATURAL GAS LIQUIDS”** – Natural gas liquids are defined as the hydrocarbon components: propane, butane and pentanes plus (also referred to as condensate), or a combination of them that are subject to recovery from raw gas liquids by processing in field separators, scrubbers, gas processing and reprocessing plants, or cycling plants. The propane and butane components are often referred to as liquefied petroleum gases or LPG.

**“NON-CONVENTIONAL RESERVES”** – At the present time only those reserves attributable to the operational Athabasca oil sands project are included in the Canadian Petroleum Association (CPA) estimates of non-conventional reserves. Normally those quantities of synthetic crude oil and sulphur would be included which the Committee estimates could be recovered by established production projects within an economic radius of the project from deposits having equivalent or better characteristics than the deposit under development.

Figure 2.2

Definitions of different terms used in describing oil and gas reserves. (Adapted from *Bulletins of the Energy Resources Conservation Board*, Government of the Province of Alberta, Edmonton, Alberta, Canada.