Key drivers and uncertainties

Key factors influencing a global shift of economic power from the advanced economies to the emerging economies are, first of all, the rates of productivity and income growth in emerging economies, which are outpacing those in advanced economies. Other important drivers are similar to those underlying continued economic growth: population growth, continuing technological innovation and diffusion of technologies, favourable economic policies and integration at regional and global level (Maddison, 2001).

Major uncertainties include the ability of emerging economies to secure access to key resources under changing scarcity patterns and to maintain or gain an additional competitive edge vis-à-vis the advanced economies. As with the issue of economic growth more broadly, there are also uncertainties over whether technological innovation will proceed fast enough to sustain economic growth despite increasing resource prices.

Socio-political developments (for example democratic processes, growing income disparities, and potential ethnic conflicts) are a particular uncertainty, as is the effect of adapting to reduced availability of skilled labour due to possible mass migration in the short term and ageing in the longer-term future. A specific uncertainty is the ability of emerging countries to develop economic cooperation mechanisms and further economic integration, which will reinforce their position on the global stage. The last and perhaps most important uncertainty concerns geopolitical stability and the absence of military conflicts.

7 Intensified global competition for resources

How will Europe survive in the intensifying scramble for scarce resources? The answer may lie in more efficient production and resource use, new technologies, innovation and increasing cooperation with foreign partners.

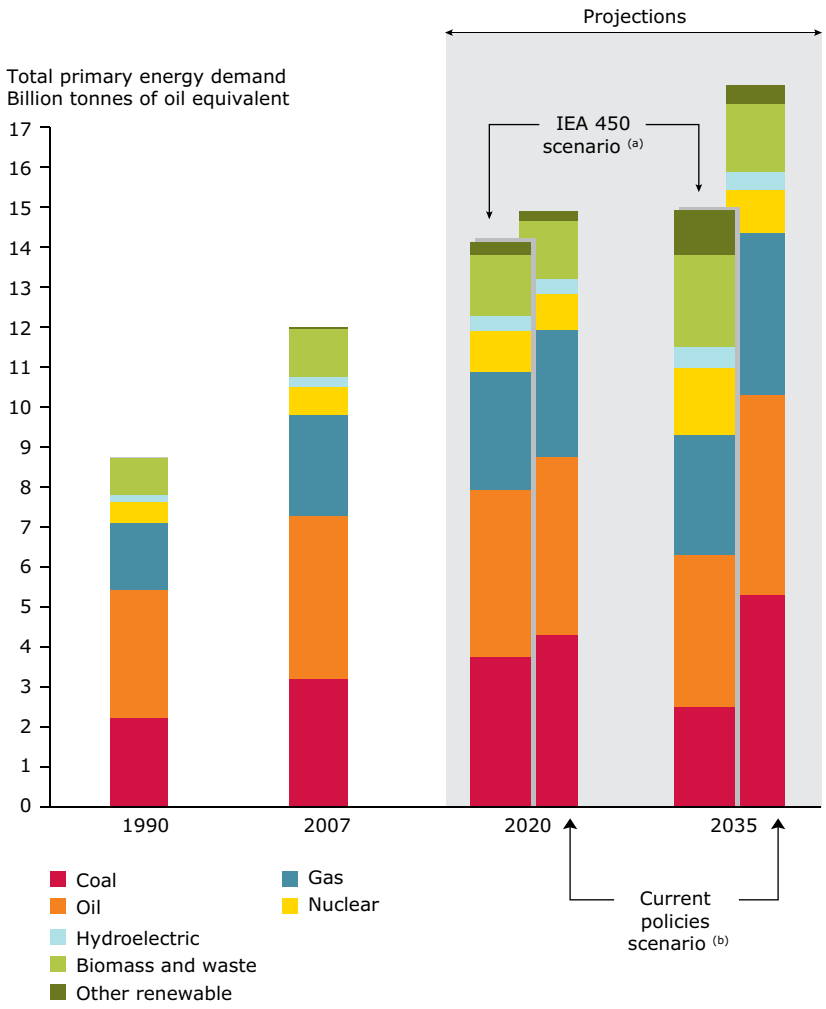
Economic growth is continuing globally and is accelerating in BRIC countries and other newly emerging economies. Demand for fossil fuels and other subsoil and natural resources is likely to grow in absolute terms despite continuing and partly successful efforts to increase the resource- and energy-efficiency of economic activities.

Fossil fuels will remain the most important energy source, at least until 2030, and the use of oil, gas and coal is expected to grow in volume (IEA, 2009) over this period. Coal is not scarce but is problematic for pollution and climate change reasons. The production costs of oil continue to rise with the expanding share of deepwater exploitation in total supply (IEA, 2008) (see Figure 7.2). Although coal and gas are abundantly available, environmental and logistical reasons prevent a substantial shift away from oil to these energy sources.

Fossil fuel reserves are concentrated in a small number of countries. Some 80 % of the coal reserves are located in just six countries and the EU has just 4 % of the global total. The EU share of the world's gas reserves decreased from 4.6 % in 1980 to 1.3 % in 2009 and these reserves are expected to be exhausted before 2030. More than half of the global stock is found in only three countries: Iran, Qatar and Russia, which accounted for (24 % of the total in 2009 and is a major gas supplier for the EU.

Ten countries (of which eight are OPEC members) have 80 % of the world's oil reserves. Some of these countries may exercise their power to restrict supply or influence the price (NIC, 2008). EU dependence on imported fossil fuels — currently accounting for over 50 % of fuels consumed — is slowly rising. Some EU Member States (for instance

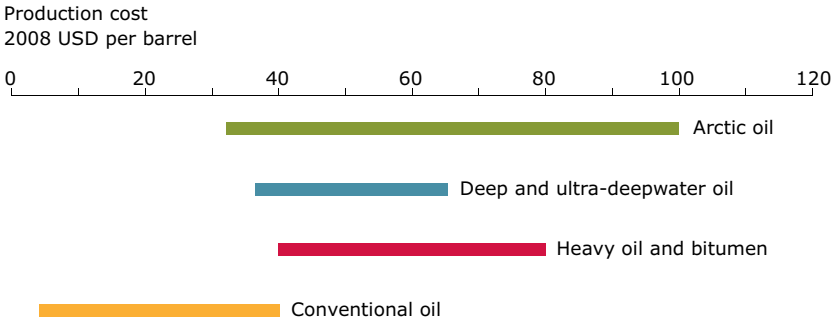
Figure 7.1 World energy demand



Note: (a) The 450 scenario is based on greenhouse-gas emission-reductions and other commitments associated with the Copenhagen Accord; on other policies currently under discussion or announced but not yet implemented; and on the extension or strengthening of some policies already in force and included under current policies scenario.
(b) The current policies scenario includes all policies in place and supported through enhanced measures as mid-2010.

Source: IEA, 2008.

Figure 7.2 Cost of oil production



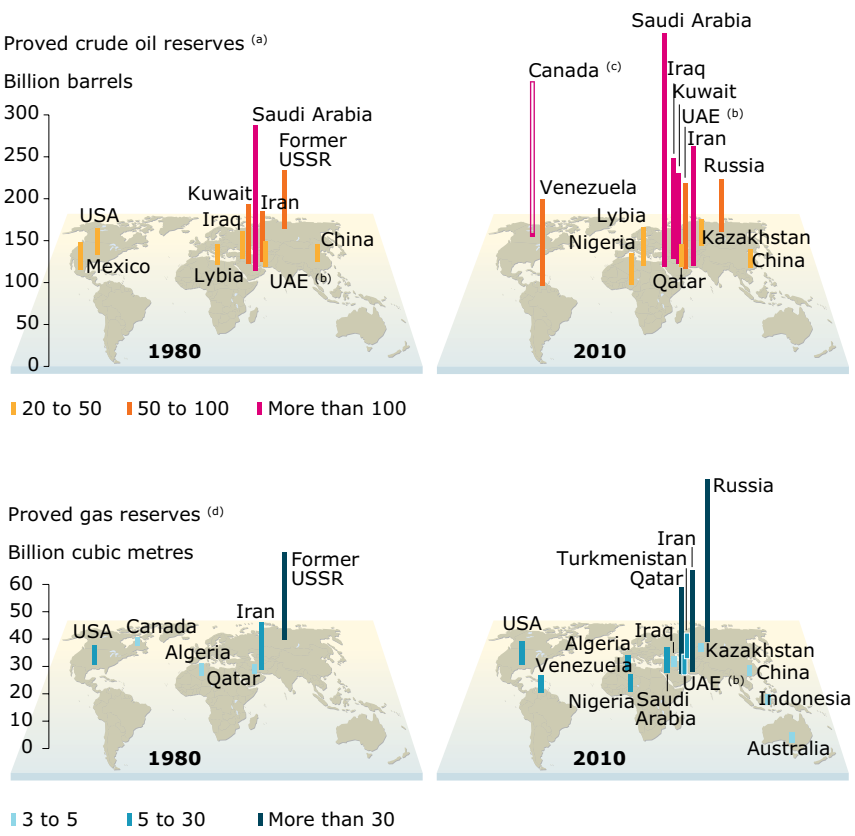
Source: IEA, 2008.

Estonia, France, Italy and Sweden) have sizeable oil shale stocks and reduced foreign supply may encourage them to exploit these sources. The Arctic region is expected to contain a substantial amount of oil, probably up to 90 billion barrels, which is 7.5 times the estimated EU reserves of about 12 billion barrels.

Stocks of 14 groups of raw materials are considered 'critical' due to their high economic importance and high supply risk within the next 10 years. The EU has very few reserves of some, such as gallium (used in photovoltaics and microchips), tantalum (used in microelectronic capacitors), germanium (used in fibreglass cables) and neodymium (used in high performance magnets), which are essential for high-tech applications (Fraunhofer and IZT, 2009; EC, 2010).

The demand for phosphorus, most of which is used as agricultural fertiliser, is predicted to increase by 50–100 % by 2050 with increased global demand for food and changing diets. The remaining potential reserves are of lower quality or more costly to extract. Phosphate rock reserves are in the control of only a few countries, mainly Morocco (with nearly 40 % of global reserves), China and the USA, and are thus subject to international political influence. There is no substitute for phosphorus and, with very small EU stocks, imports will be essential for Europe's development.

Figure 7.3 Selected oil and gas reserves



Note: The countries represented here hold stocks of 80 % of global proved reserves in oil and gas
(a) Only countries with more than 20 billion barrels are shown.
(b) United Arab Emirates.
(c) Including 172.3 billion barrels of oil sands and 5.2 billion barrels of conventional oil and condensate.
(d) Only countries with more than 3 billion cubic metres are shown.

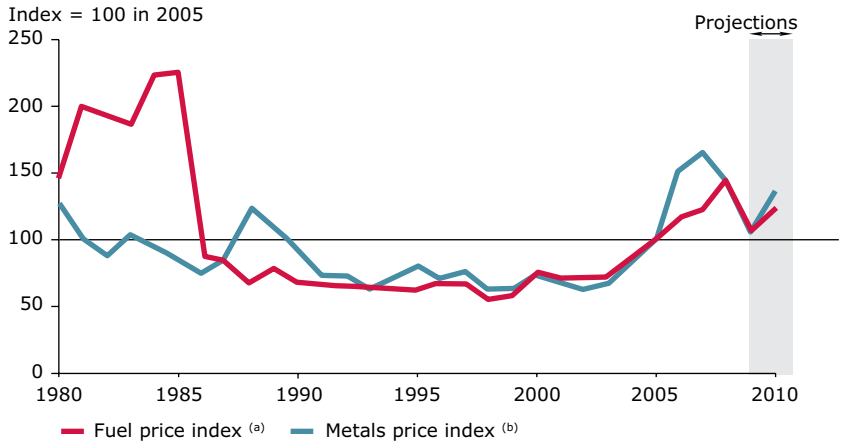
Source: EIA, 2010.

Increased demand for subsoil resources will stimulate exploration and exploitation of new sources (Maddison, 2001). Supply is expected to meet rising demand, both for 'bulk' resources like fossil fuels and minerals, and for metals that are essential for environmental technologies.

Prices of bulk resources (fossil fuels and a selection of metals such as copper, aluminium, iron, tin, nickel, zinc, lead and uranium) may be seen as reflecting their scarcity. Data show a fairly constant price level throughout the 1990s and an increase in the 2000s disturbed by the 2008–2009 economic crisis (Figure 7.4). This may indicate a continuing availability of these resources at the global level with shocks inducing short-term price increases (IMF, 2010; World Bank, 2009).

The increased need for strategic resources may stimulate political monopolisation of access (for example China's moves to secure resources in parts of Africa in recent years), which may complicate access for other purchasers, including the EU.

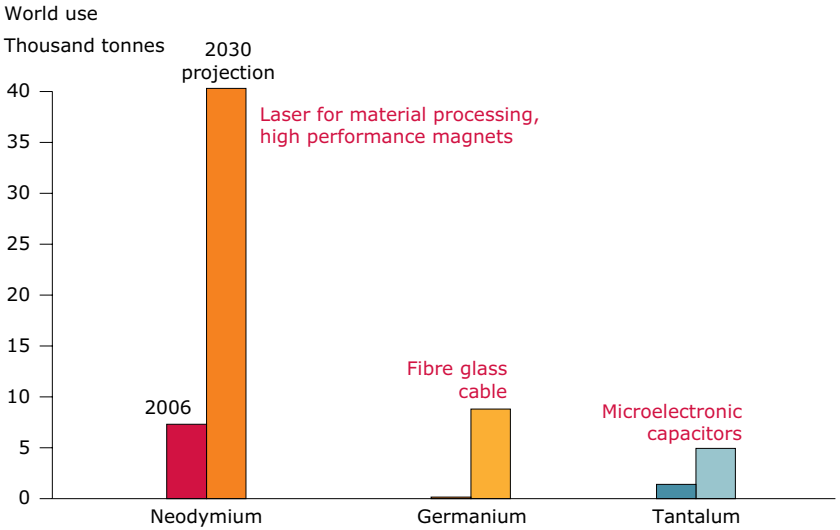
Figure 7.4 Price of fossil fuels and metals



Note: (a) Including crude oil (petroleum), natural gas and coal.
(b) Including copper, aluminum, iron ore, tin, nickel, zinc, lead and uranium.

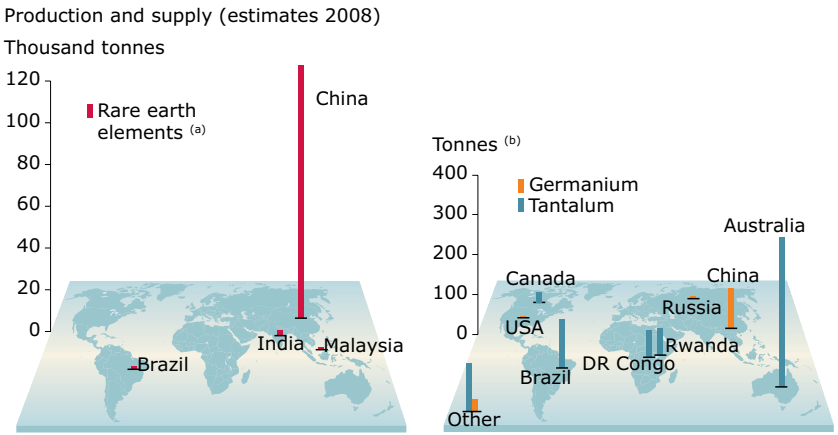
Source: IMF, 2010.

Figure 7.5 Use and supply of selected raw materials



Note: In red: selected technologies responsible for the growth in use of these minerals by 2030.

Sources: Fraunhofer, 2009; USGS, 2004.



Note: (a) Rare earth elements are a collection of 17 chemical elements, including Neodymium.
(b) Please note variations in the vertical scale.

Source: Angerer et al., 2009; USGS, 2010b.

Box 7.1 Why is intensified global resource competition important for Europe?

Secure access to resources is crucial for European production. Europe is relatively resource poor and needs to import much of the resources it requires. This is especially true assuming continuing growth in demand for energy and the resources needed for advanced environmental technology solutions. Europe may, under the pressure of increased competition from the emerging economies, find market niches that would reduce its overall need for minerals and metals.

To meet its growing energy needs Europe relies on foreign resources. The environmental effects of expanding exploitation fall largely outside Europe, implying a growing global footprint. Increasing scarcity of fossil fuels may stimulate greater efforts to shift to other energy sources that can be found domestically. This may have various effects on Europe's environment, including increased land use for biofuels, disruption of ecosystems from developing hydropower capacity, noise and visual pollution from wind turbines, and the impacts of expanding oil shale exploitation. Expanding nuclear energy capacity will trigger public debate about waste storage and safety risks.

Similarly, growing long-term scarcity of minerals and metals may induce Europe to turn to sources previously deemed uneconomic. Expanding mining has environmental effects, including altering landscapes, polluting water and generating waste. Exploiting poorer reserves, with lower extraction rates, may lead to reduced energy efficiency.

Key drivers and uncertainties

The key drivers of intensifying competition for resources are continuing economic growth and related growth in numbers of middle-income consumers. Depleting resources and changing geographical patterns of demand and supply influence access to key resources. Technological innovation will boost demand for certain minerals and metals not widely used before (such as lithium and rare earths metals). Efforts to expand the membership of trade agreements and other forms of economic integration may be important to alleviate competition over resources.

Major uncertainties include the continuation and global pattern of economic growth, the future direction and application of technological innovations such as the NBIC technology cluster and changing demand for certain resources. On the supply side, new reserves may be found. Some reserves may be too costly to exploit, however, because of environmental considerations (e.g. in the Arctic). Global progress in environmental agreements (e.g. on strict preservation of the Arctic environment) could exclude or reduce the availability of such resources. Geopolitical instability may hamper new trade agreements and other pacts that smooth international trade and reduce resource competition.

8 Decreasing stocks of natural resources

A larger and richer global population with expanding consumption needs will place growing demands on natural systems for food, water and energy. European resource stocks may likewise face increasing pressures.

Growing human demand for natural resources, driven by continuous population growth and increasing individual consumption, has resulted in large-scale land conversion (deforestation, cultivation and urbanisation) and loss of biodiversity (MA, 2005). While biodiversity loss could be regarded as a megatrend in its own right, it is included here because land conversion and loss of natural ecosystems are central to changes in biodiversity. Humans have converted about a quarter of the Earth's potential net primary production ([5]), either through direct cropping (53 %), land-use-induced productivity changes (40 %) or human-induced fires (7 %). As shown in Map 8.l, the combined impact on natural ecosystems is biggest in North America, Europe and south-east Asia (Haberl et al., 2007).

Deforestation is occurring on an alarming scale, particularly in the tropics. The net area lost annually has decreased substantially, however, from approximately 83 000 km^2 per year in the 1990s to just over 50 000 km^2 per year from 2000–2010. The historical large-scale forest loss in temperate regions has come halted and forest cover there is slowly increasing again with a net gain of 30 000 km^2 in the period 1990–2005. Projections of forest cover by 2050 vary considerably depending on the underlying assumptions, but most studies indicate further overall decline (FAO, 2010; Leadley et al., 2010).

The significant growth of the world's population in coming decades and the shift in diets from cereals to meat as wealth increases may cause demand for agricultural production to rise steeply. According

([5]) Primary production is the production of organic compounds from atmospheric or aquatic carbon dioxide, mainly through photosynthesis.