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Article

The art of managing energy security risks

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ABSTRACT

Countries thus far realise their energy security predominantly with energy policies (e.g., diversifying the energy mix and suppliers) and their energy security risk instruments mostly address the risk of short-term supply disruptions. Lack of commercially viable sustainable energies and a renewed concentration of oil and gas supply in the future will reduce the effectiveness of traditional energy policies. Before sustainable energies become widely available, consumer countries are likely to experience increased competition for diversified oil and gas supplies. At the same time, geopolitical enmity shows that energy security will become firmly integrated in the foreign and security policies of a nation. In fact, the current risk landscape is determined by geopolitical rivalry over control of and access to energy-rich regions and by regional risks arising from politico-economic instabilities.

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The art of managing energy security risks

1. Introduction

Energy risks have fundamentally changed in the period after the demise of the Soviet Union, the rapid rise of India and China, and the start of the 'war on terror'. Following two decades of a largely market-based system of energy supplies, a re-politicisation of energy is taking place, with far reaching effects at the global system level, for countries, and for energy companies. Deep uncertainties about the structure of the emerging oil and gas market and the rise of resource nationalism in producing countries are forcing member countries of the Organisation for Economic Cooperation and Development (OECD) to rethink their energy policies in light of increased levels of political uncertainty. For member states of the European Union (EU), the high degree of asymmetric risks in oil and gas security is a challenge to the integration agenda. Risks are shifting at the national level, and growing in the global system.

Many of the risk assessment and management tools used by most western consuming countries, and by (international) oil companies, were developed after the 1973-74 oil crisis. These tools were adapted to the market-oriented approach prevailing in the 1980s and 1990s. This toolset is unlikely to be anywhere nearly as effective in the emerging risk environment, even though it worked well for decades when market forces largely determined supply and demand. The problems that arise in the new environment have been at the heart of economic policy in recent years.

The wide ranging effects of this transformation need to be understood in a framework that distinguishes the three different levels of the international system. There are sub-national actors such as large energy companies, whether private or state-owned. Next, there are countries, whether energy suppliers or consumers. Finally, there is the global system itself, including supranational groups like OPEC, the UN, the EU, and other international organisations that bear on energy matters. To appraise the energy security risks at the global level and the responses of governments and other actors to the new environment, an analysis of the evolving international system and the divergent government strategies is presented in the form of scenarios. Although the scenarios touch on many different problems, they are necessarily truncated. In this context, they are a tool that illustrates the new energy security risks that arise from competing energy security strategies and force us to make assumptions about the rationality of policy makers and market actors. As it turns out, the bounded rationality of policy makers distorts the ability of states to create coherent and economically robust energy strategies – that is, strategies that would allow policy makers to anticipate a shortfall in supply and to apply appropriate energy risk management instruments. At the same time, the concentration of supplies on a limited number of energy-producing countries shows that the required diversification of risk decreasingly applies to oil and gas.

The basic insight of this paper is that the performance of the old toolset is declining at all levels of this system because of the re-politicisation of energy. Risk spreading through financial markets (e.g., forward and derivative markets); environmental risk management (e.g., double hulling tankers); and diversification of both energy supply and sources of supply (e.g., renewables), remain important. These risk management tools will continue to be used, as they must be. But alone they are not able to handle the newly added political risks of a world where supply is increasingly concentrated in the Middle East, the Caspian Sea region, and Russia – where investment options serve national interests rather than the international market – and where new players, such as Brazil, India, China, and others, are increasingly important actors. The success of the old security of supply mechanisms



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rested with the availability of sufficient oil supplies outside OPEC in the period 1980-2000 that stripped all supplies of its national interests in the international markets. In the current setting, oil and gas supplies are becoming more concentrated, demand from new high-growth economies is growing, and climate change policies limit the fossil options. The fear of losing easy access to energy and markets and inadequate institutions to deal with the social and political risk arising from resource competition has exacerbated the emphasis on national interests in producing and consuming countries and has thus elevated energy to a geopolitical issue. Current efforts to deal with conflicts arising from resource competition are difficult to reconcile, as the existing rules shaping the game are the result of an unequal development pattern that is exacerbated by market imperfections and inadequate existing institutions. Thus, this paper will focus on the two highest levels of aggregation: nations and the global system itself and it will show that international markets have been too insensitive for too long to national political and social interests. While the national response was predictable, a new set of international rules is needed to account for the changed circumstances of the global system in order to prevent geopolitical clashes over energy security and climate change.

The remainder of this paper is structured as follows. In the following section we develop a framework for understanding the changes in the international system and their impact on international energy relations. In Section 3, we document some key oil and gas facts and explore some future expectations. In Section 4, energy policy and energy risk management instruments are explained. In Section 5, the risk landscape in a changing world will be explored, focusing on the relations among consumer and producer countries in the framework of a new international order. In Section 6, risk management options will be explored. Section 7 concludes.

2. Paradigm change

In the early 1990s, the view was that globalisation would be followed by a shift to more effective legal, institutional and political structures.

To better understand the changed environment in international energy supply, it is useful to contrast it with the expectations of the early 1990s. At that time, changes in the international political and economic system were heralded as an important breakthrough for the proponents of globalisation. Both the United States and Western Europe expected a rapid integration of the global economy. There was a surprisingly optimistic view that globalisation of the economy would be followed by a positive shift to more effective legal, institutional and political structures that would contribute to equity and growth (see, for instance, CIEP 2004, Van der Linde 2005, and Hoogeveen and Perlot 2005). Oil- and gas-producing countries were themselves expected to make the transition to globalisation. Membership of the World Trade Organization (WTO) and foreign direct investments (FDI) were an important tool in facilitating this integration.

It is important to understand that this globalisation scenario contained implicit and explicit risk management strategies. It greatly limited political risks by forcing nations to operate as if market forces were the primary ones determining supply and demand. It further envisioned a major shift in global values. Environmentalism, democratic movements, and a stigma of illegitimacy attached to the use of force were seen as more or less inevitable outcomes of economic globalisation (Giddens 1990).

But this scenario failed to materialise, despite the high hopes that it would. Rather, what happened can be called 'weak' globalisation, as distinct from the 'strong' globalisation envisioned in the early 1990s. It is important to understand that global anarchy did not occur or anything close to it. But neither did a strong form of globalisation. It was 'weak' because it was mainly accepted at the conceptual level, although the self-interest of (nearly) all states in macroeconomic stability was also a major factor in its acceptance. The evidence indicates that it did not go deeper than this into the

underlying institutions of the nations that make up the international system. For example, despite the recycling of oil dollars through the private banking system, some Middle East OPEC nations actually reduced their level of integration within the financial system. For this group of countries, the growing population and low oil prices since the mid-1980s undoubtedly increased pressure on the state to facilitate economic growth and social development. On the spending side, economic and social pressures from below crowded out the governments' ability to invest in new oil production capacities. The expectation in the early 1990s was that these countries would gradually open up for foreign direct investments to finance the replacement of mature production capacities at home and abroad. But this did not happen either.

The Asian crisis of 1997 exposed the risks of rapid integration in the international economy without providing for proper political and institutional reforms to accompany it. The interaction between weak institutions and the crisis, which led to large financial losses, reinforced the lesson that integration in the world economy required deep institutional and political reforms in the domestic economy. Precisely because the costs of reform are high and the shift to stronger regulatory and supervisory structures are politically difficult to implement, many governments and political elites shied away from these policies to avoid creating even larger social and economic instability, and in the process losing their power base. In many oil-producing countries, the oil riches had not brought about a lasting increase in economic welfare, but rather created a boom-bust type of economy entirely dependent on natural resources. Furthermore, the distribution of oil wealth was extremely skewed. The Asian crisis was accompanied by a steep drop in oil prices and resulted in an economic crisis in most of the oil-producing countries (among them the OPEC countries), limiting their appetite for further reforms. Only some smaller countries with mature oil industries were able to restructure the economy. In contrast to the globalisation scenario of the early 1990s, oil-producing governments re-centralised power over political and economic life. Liberalisation of the economy, let alone the oil sector, was no longer appealing.

In the event, most governments of oil-producing countries re-centralised power over political and economic life and liberalisation of the economy, let alone the oil sector, was no longer appealing.

At the turn of the 21st century, the optimism of realising fast-track integration in the world economy became further subdued with the 9/11 terrorist attacks on New York and Washington and the subsequent strategic reorientation and economic downturn in the West. Taken together, all of these factors radically altered the energy risk landscape. The view that the integration into the world economy would automatically bring about more political and social progress, adherence to international norms of law and order, and would reduce the risk of failed states and violent internal conflicts, was rudely proven misguided. Despite the success of some countries to make a rapid transition into open and democratic societies that are fully integrated in the world system, many countries – among them the largest oil and gas producers – are not on such a development path at all, but remain rather stuck in their non-integrated ways.¹ Their integration was at best only partial and did not include the legal, institutional, and political changes required for full integration.

'Weak' globalisation poses challenges for some large oil- and gas-producing countries. In the period from the mid-1980s to the late 1990s – after OPEC countries had experienced a substantial loss in market share as a result of their earlier price policies – they kept the global economy supplied with sufficient oil and were sensitive to keep the price at a level acceptable to the consumer countries. The role of swing producer was performed by Saudi Arabia and the United Arab Emirates (UAE). Kuwait could no longer perform this role after 1990. The world economy relied heavily on the ability of these two major producers to provide the market with buffer capacity.

¹ The central European countries are notable examples. Perhaps because they integrated in the EU rather than into a more anonymous world, they were able to make such a rapid transition. Yet, three years into EU membership, domestic political stability is waning and the disappointment among the population is growing.

Still, the integration of China and India into the world economy assumes the availability of energy, in particular oil and gas, which is abundantly available in the Persian Gulf region and Central Asia, but also in some other countries such as Venezuela and Russia. With the oil production in non-OPEC countries maturing and the continued increase of consumption, in particular in the big emerging market economies, the confidence that the required capacities will be developed using a market system can no longer be counted on. In other words, for two decades the oil market transformed political uncertainty into price risk. This was a major structural achievement. Price risk was managed by market-based solutions, including forward markets and derivatives. But the market system now is not performing this role nearly as well, not because of financial inefficiencies but because of a geopolitical restructuring in the strategic environment of energy.

New alliances and major constraints on energy development fundamentally alter the existing risk landscape of energy.

With the expansion of Liquefied Natural Gas (LNG), a similar development was expected to emerge on the natural gas market, increasingly linking regional gas markets and making take-or-pay long-term contracts ever more obsolete with the deepening of gas market integration. Thus, the enthusiasm with which gas-consuming countries wished to apply market-based principles on their gas markets was not shared by producer countries that were at the onset of huge investments to realise the new export capacities. They perceived the market-oriented approach of consumer countries as a means to shift the investment risk to them and their national companies without the security of demand that such investments warranted (Van der Linde *et al.* 2006). Increased distrust in the ability of the international market economy to produce the energy requirements according to market rules can create a substantial crisis at the global system level that will ripple through to nations and companies. Consequently, oil consumers who believe they can no longer rely on the international market system to provide them with sufficient oil will 'explore' more politically oriented strategies to satisfy their needs. Whilst not predicting energy wars, they cannot be ruled out *prima facie*. Rather, new alliances – as exemplified by deals between Iran and India and China – and major constraints on energy development – as in Russia – fundamentally alter the risk landscape of energy and may lead to more struggles.

This development, in turn, changes the risk map for the United States, the European Union, and Japan. The change of the international system away from the economically integrated and multilateral cooperative world renders some of the energy security approaches and risk management policy tools much less effective.

For a discussion of the current and future energy security risks, it is important to review the development of supply and demand. The current oil and gas markets have invoked the current energy security fears and will prompt new policy directions.

3. Some basic energy facts and expectations (1980-2020)

3.1 Reserves

Since 1984, world proven oil reserves have continued to grow, but there continues to be an uneven distribution of reserves, with countries in the Middle East – in particular the countries around the Persian Gulf – dominating oil reserves (see Figure A1 in the Annex). This uneven distribution is even more pertinent in the case of natural gas, with a mere 3 countries (Iran, Qatar, and Russia) representing 57 percent of world proven reserves.

The share of North America and Europe, traditionally large consumers of oil, in proven conventional oil reserves is declining, while the share of reserves of Asia, with its fast increasing share of world oil

consumption, remains low. The outlook for the main consuming countries is that they will increasingly rely on imported oil and gas. For the North American market, the outlook is somewhat different if unconventional oil is included because the distribution of these reserves differs significantly from the distribution of conventional oil. The share of both American continents in this type of reserve is substantial. The International Energy Agency expects that increasingly unconventional oil will find its way to the market (IEA 2006). The major constraint on developing unconventional oil resources is the production and environmental cost, particularly in terms of CO₂ emissions. A continued tight oil market with high prices could trigger investments and technological breakthroughs that accelerate the unlocking of this potential for the market.

Based on the calculations of the BP Statistical Review of World Energy 2006, the world proven (conventional) reserves would suffice to satisfy current demand for another 40 years (the reserve-to-production ratio). However, demand is predicted to grow, which implies that new reserves are required to prevent the ratio from dropping.

Investments in the past resulted in new additions to reserves, although super mega-fields, like those in the Persian Gulf, have not been discovered since the 1970s, and more recent additions come from smaller fields. It is important to note that the cost of finding oil is increasing and that important non-OPEC oil provinces are maturing.

The natural gas reserves of the Middle East – which amount to about 38 percent of world proven reserves – were until the recent developments in LNG-captive reserves unable to commercially reach a market (see Figure A2 in the Annex). The natural gas markets are still predominantly regional markets, with the North American and European markets mainly supplied by pipelines and the Asian market by LNG. The European market is largely supplied by Norway, Algeria, and Russia. Domestic EU supply is declining, against the background of growing demand from the power sector. Natural gas is relatively clean compared to oil and coal, and the current environmental policy stance is expected to translate into a larger demand for imported gas in the coming decades.

3.2 Production

Oil produced outside the OPEC has steadily increased, with OPEC becoming a swing producer in world oil markets after 1973 (see Figure A3 in the Annex). OPEC production varied from a high of around 31 million barrels per day (mbd) in 1979 to a low of 16½ mbd in 1985 (BP 2005) and increasing thereafter to a high of 34 mbd in June 2005.² The combination of demand growth and the slowing growth of non-OPEC oil production implies an increasing call on OPEC oil in the future. Due to the long lead-time, the combination of underinvestment in the 1990s and demand growth has created the current tight oil market – a topic explored in greater detail by Fattouh (this volume). This was expressed in both relatively high oil prices and a dramatic decline in buffer capacity of OPEC after 2003.

In the 1980s, the buffer capacity came into existence because the market preferred to consume non-OPEC oil that was priced competitively against the OPEC marker crudes. OPEC prices were at that time determined by the OPEC conference. In the period 1980-1985, the OPEC price level was above the market price and OPEC subsequently lost a large market share to competing non-OPEC crudes despite the lower production costs of OPEC oil. Perhaps more significantly, future projections show that non-OPEC supplies, which include producing regions such as Africa, the Caspian Sea region and

The combination of demand growth and the slowing growth of non-OPEC oil production implies an increasing call on OPEC oil in the future.

² www.eia.doe.gov/emeu/steo/pub/3atab.html

Russia, will be losing market share incrementally beyond the year 2010. This process is expected to accelerate over time. Indeed, non-OPEC supply is expected to peak around 2010 at 48 mbd, or 54 percent of world supply at that time, and will decline slowly but surely thereafter (IEA 2002, p 95).

The buffer or spare capacity in the international oil market in the 1980s and 1990s fulfilled an important role in stabilising the market. OPEC's role as a swing producer depends on sufficient levels of spare capacity that can be introduced to the market when other sources are at capacity or when certain producers can temporarily not supply the market.

The current tight market and the lack of spare capacity are among the main drivers of the debate about future oil supply and demand.

The distribution of spare capacity in OPEC is uneven, however. Only Saudi Arabia, Kuwait, and the United Arab Emirates have spare capacity in their system, other OPEC producers nearly always produced close to capacity. In recent years, spare capacity levels declined to the extent that only Saudi Arabia is able to increase production slightly when there is a shortfall elsewhere. The current tight market and the lack of spare capacity are among the main drivers of the debate about future supply and demand.

The supply side of the oil market is thus very asymmetrically concentrated. The Persian Gulf countries possess 90 percent of the Middle East oil reserves while they are simultaneously key members of OPEC. Because the cheapest and most plentiful oil is located in the Persian Gulf, OPEC will continue to influence oil prices with its production policy – as argued by Noreng (2002), for instance. It is important to note, however, that when the oil market is unable to restore its required level of spare capacity that can compensate for incidental shortfalls or demand spurs, all producing countries potentially gain the power to drive prices up.

All projections of future consumption statistics show an increasing call on OPEC oil, juxtaposed by the fact that by 2030, Persian Gulf production is expected to form the bulk of OPEC supply increases. Indeed, as the International Energy Agency has pointed out, “of the projected 31 mb/d rise in world oil demand between 2010 and 2030, 29 mb/d will come from OPEC Middle East” (IEA 2004, p.110).

Hence, the Middle East – the Persian Gulf in particular – is a geopolitical focal point. Moreover, the Persian Gulf is also increasingly important in the international gas market, now that LNG developments can unlock the previously stranded reserves.

3.3 Consumption

World primary energy demand will continue to grow over the next decades, reflecting the continued importance of fossil fuels in world energy demand (see Figure A4 in the Annex). More specifically, oil demand in the next two to three decades will predominantly grow in the developing countries, and to a lesser extent in developed economies, while growth of natural gas demand is more prominent in OECD countries. In particular, oil demand in countries such as China and India is projected to grow substantially. According to the Energy Information Agency of the US Department of Energy, China is projected to consume 12.8 mbd in 2025 of which 9.4 mbd must be imported.³ In 2002, OECD countries consumed 52 percent of world primary energy demand compared to 38 percent for developing countries. By 2030, the OECD share is projected to decline to 43 percent and the developing country share is expected to increase to 48 percent (IEA 2004). In terms of CO₂ emissions, China will soon surpass the United States in absolute emissions levels, although per capita emissions remain far below those of the United States.

³ www.eia.doe.gov

Shifts in the demand for and supply of oil and gas will also shift trade flows. The Persian Gulf is already a major supplier for Asian economies. Naturally, the maturity and decline of non-OPEC supplies in the coming decade will also increase demand for Gulf oil in the United States and Europe (see Figure A5 in the Annex). This could lead to intense competition for oil flows among the major consumer nations.

Diversification of supply and local pollution is expected to stimulate demand for natural gas in the coastal urban areas in China. At present, the Chinese natural gas market is still relatively small and localised. However, in the coming decades the pull on LNG supplies and possibly on Russian and Caspian supplies will become stronger.

The growing import dependence and the expectation that oil and natural gas supplies will become more concentrated on a few net exporting countries – such as Russia, the Caspian Sea region, and the Persian Gulf – have led to growing security of supply concerns among the consumer countries.

3.4 The role of OPEC and the Persian Gulf producers

Much of the new demand must be satisfied by increased Persian Gulf oil and gas production. The Iraqi production potential is large enough to become a game changer but the uncertain political future could imply, like in the past, that the potential largely remains untapped. Both the internal situation in Iran and the troubled US-Iranian relations have stunted the development of its oil and gas sector. As a result, Saudi Arabia's role as a large and reliable supplier to world markets gained importance. The call on Gulf oil as projected by the IEA relies mainly on increased Saudi supplies. Saudi Arabia has indicated that it was confident it could produce 15 mbd by 2020, but said it was doubtful that it could produce more (*Financial Times* 2005). The projected IEA call on Saudi oil could then, according to Saudi officials, be 4.5 mbd higher than Saudi Arabia would actually be able to supply. The fact that Saudi Arabia voiced doubts about any increase of its production capacity above 15 mbd is significant for future international oil market developments.

The discussion of Saudi production potential, which flared up again in 2005, is important against the background of uncertainties surrounding the other producers in the Gulf. Experts like Campbell and Simmons have repeatedly questioned the future Saudi production capacities and reserve data and the debate on a nearing decline in world oil production continues until today.⁴ Both point out that earlier reserves additions of OPEC members cannot be verified and most of these additions took place in 1985-90, when OPEC quotas were determined on the basis of each member's share in OPEC reserves. The fact that the international oil market currently lacks the transparency to verify reserve data can be a continued source of uncertainty in the future. The debate is important for strategic reasons: if world conventional oil production is peaking soon, the upward pressure on oil prices will increase to the point that alternative energy resources must be introduced in the energy mix much sooner than anticipated. Competition for scarce resources among consuming countries will increase during that transition. For some developing countries, the outlook of persistent higher oil prices might thwart their economic take-off and frustrate the international Johannesburg agenda to make commercial energy available to more people in the world.

It is important to note that OPEC's performance in coordinating market activities whilst accommodating the economic needs of its members has not always been optimal. That is to say, internally, the cartel's members have been in situations of imperfect cooperation over the last three decades. Essentially, the basis for bargaining over oil prices within OPEC can be observed in the correlation between withholding capacity and idle capacity, which determines the strength

⁴ Campbell and Laherrère (1998) and Simmons (2005).

of those who want higher prices and those that want lower ones (Noreng 2002). When oil is withheld from the market, it enlarges the spare capacity but simultaneously requires higher levels of investments. Not all OPEC members are able to bear these costs to an equal extent. Hence, by nature of its constitution, OPEC is subject to a conflict-ridden decision-making process because members have differing objectives. In the past, Saudi Arabia, the United Arab Emirates, and Kuwait – until 1990 – carried the bulk of the costs of maintaining spare capacity. The ability to continue with this policy indefinitely is decreasing with the increasing societal costs. The asymmetries within the cartel are hereby deemed to sharpen, accompanied by increasingly acute economic and financial difficulties in many OPEC countries. Despite recent market conditions, the long-run developments point to increasing difficulties for the cartel's members to cooperate, given the disparity between the economic compositions of the member states, the ability to share the cost of maintaining and exerting market power, and the sharpened geopolitical tensions in the region.

Hence, two opposing trends are taking shape at the dawn of the 21st century. On the one hand, the cartel has internally been facing imperfect cooperation.⁵ On the other hand, long-run supply projections show that the cartel's core, the Gulf producers, will regain extensive market power as non-OPEC producers lose market share over time. After all, the vast majority of incremental world oil demand can only be met over time by those countries with the largest reserves (Bahgat 2003). As for natural gas, similar concerns about producer cooperation are surfacing.

3.5 Natural gas

The international market for natural gas was regional in nature until the recent LNG developments.

The international market for natural gas was regional in nature until the recent LNG developments. In North America and Europe, markets were supplied through pipelines, while the Asian market relied on LNG from the start. The North American market was largely self-sufficient. The Asian market was mainly supplied with LNG from Brunei and Indonesia. The West European market was supplied by the Netherlands, the United Kingdom, and Norway. In addition, substantial imports were necessary from Algeria (to supply southern European markets) and the Soviet Union. Natural gas from the Soviet Union was mainly supplied through the Ukrainian corridor to eastern and western Europe on long-term take-or-pay contracts. After the demise of the Soviet Union, Russia continued to supply gas to the European markets despite the radical change in the ownership structure of the pipelines and the inability of some transit countries to pay for their gas imports in hard-currency prices. Particularly the countries of the Commonwealth of Independent States (CIS) initially paid substantially lower prices than European countries, in part to cover the transit fee. Early in 2006, the Russia-Ukraine gas crisis was a conflict over the terms and price of gas sold to the Ukraine, the transit fee to Europe, and control over the corridor (Stern 2006). In 2007, renegotiation also took place with Belarus – both on oil and gas sales and transit fees. Russia has in recent years actively contracted gas from the Caspian Sea region, in part to satisfy increasing domestic demand and to free up Russian gas for export to Europe. At the same time, the EU saw the energy resources of the Caspian Sea region as a possibility to diversify suppliers (Stern 2005). The often referred to 'great game' about oil supply routes could easily also refer to gas supply routes, except that in gas, new routes will have to compete with existing routes through Russia.

Also in North America, natural gas gained prominence in the energy mix and despite substantial domestic supplies, LNG imports were expected to play a growing part in supply (Yergin 2006). Robust US natural gas prices were expected to attract new gas into the market from South America, Africa, and the Gulf (Thorn 2006).

⁵ The recent changes in Iraq and the resulting regional and national instability could potentially further compound this problem in the medium to long term.

With the growing pressure to reduce CO₂ emissions and the favourable economics of gas-fired power stations, the natural gas market was until recently predicted to grow substantially in all major consumer markets. However, security of supply concerns have dampened these expectations somewhat and other options are being studied.

3.6 Concluding remarks

Two-thirds of the world's oil and gas potential (including Iraq) falls within the realm of developments controlled by governments or state-owned companies, while foreign direct investments can develop a little over a third of current reserves (IEA 2004). It is clear that any decision of a legitimate government in Iraq to allow foreign direct investments would have a huge impact on investment possibilities for foreign oil companies, immediately increasing their access to (cheap onshore) oil by 10 percent.

Two-thirds of the world's oil and gas potential falls within the realm of developments controlled by governments or state-owned companies.

Suffice it to say that increasing reliance on OPEC and large gas producers such as Russia has profound geopolitical and economic implications for the world's oil-importing blocs. Resource nationalism is presently on the rise in countries like Russia and is still a current factor in many Gulf countries (*The Economist* 2005a). Accompanied by the political and economic instability in many of the world's non-OPEC producers, these ramifications will have a major impact on the behaviour of the world producers and consumers of oil. The pressure of the international market system to induce economic and institutional reforms conducive to mobilising sufficient investment capital has been building up. However, the resistance to such reform is still very large. A way to avoid these reforms seems to be to accept the investment offers from countries such as China and India. These countries are prepared to invest public funds in oil and gas projects in return for oil and gas supplies. They do not have, at least not initially, any further demands on the political and economic structure of producing countries. Of course, this could change when producing countries cannot deliver on their promises, and further integration into the world system also becomes an issue for these new oil consumers.

Despite soaring oil prices over the past years, demand has proven to be remarkably price inelastic (*The Economist* 2005b). Economic stability and growth can only be achieved through a steady flow of energy and – to an ever-present extent – the flow of oil. Due to ever-rising future demand, oil-importing countries are striving to diversify their sources of oil imports. Against the background of increasing oil and gas imports of major consumer countries and the inevitable politicisation of energy relations that accompanies this structural dependence, energy security risk management is gaining prominence on governments' agendas (CIEP 2004). Most instruments to manage energy risks were developed after the 1973-74 oil crisis and geared mostly at the energy sector. The instruments were not designed for disruptions or situations of undersupply with a longer duration nor were they really tested in a crisis situation. The issue that must be raised here is whether the energy risk management instruments are capable of dealing with near-term and future risks in the oil and gas market.

4. Energy risk management instruments

4.1 Priorities of energy policy

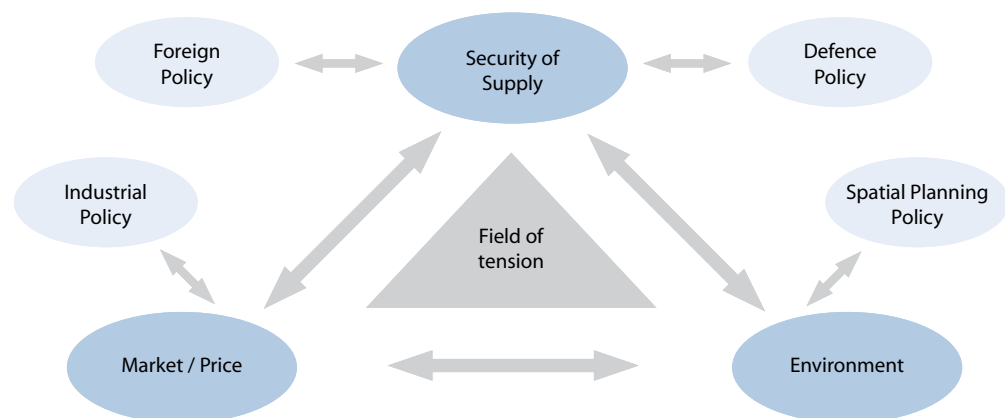
Security of supply is one of the key policy goals in energy policy making, together with the objectives of ensuring reasonable prices and environment protection. Each government of consumer countries must find a balance in pursuing these policy goals because there is a certain amount of tension

among them. In general, security of supply policies and environmental goals increase the cost of energy, which could be at loggerheads with reasonable prices and short-term market efficiency. Most governments are fairly successful in pursuing two out of these three policy goals.

The importance attached to various energy policy objectives varies among consumer countries and across time.

The importance attached to each goal (and the price society is willing to pay to achieve it) varies among consumer countries and across time. Moreover, the use of, or emphasis on, certain policy instruments varies among the consumer countries and in time. In part, this is due to the influence of other policy objectives on energy policy-making priorities – as sketched in Figure 1. As such, energy policy is an expression of the value that society attaches to a certain component of its energy policy and the efficiency of its instruments. For one consumer country, an import dependency ratio above 50 percent of domestic demand sets off alarm bells in policy circles, while in other countries they have learned to live with much higher levels of dependency.

Figure 1. Context of energy policy making



Source: Hoogeveen and Perlot (2005).

4.2 Energy risk management instruments

The energy security risk management instruments can be subdivided into four groups (CIEP 2004). Two of them aim at external energy relations (prevention and deterrence) while two other groups aim at managing the domestic energy economy (containment and crisis management). The intensity and style of the policy instrument used depend on the type and level of risk. The schematic presentation in Figure 2 shows the variety of energy risk management instruments employed by consumer countries to manage the divergent levels of risk in producer countries. The last category of risk management tools is the response to increasing risk levels and the use of far-reaching sanctions or force. These can be employed unilaterally or in a coalition.

On the face of it, there is a number of risk instruments that consumer countries can choose when implementing their energy policies (see Figure A6 in the Annex). They evolve dynamically as the risk profile changes. Moreover, each country has its own assessment of the risks and legal and regulatory constraints on the optimal mix of risk management tools. When a country does not have to be concerned about its security of supply, the risk management instruments focus on maintaining good political and trade relations with the exporting countries and perhaps close cooperation among certain like-minded consumer countries. Examples are: multilateral cooperation, foreign policy, trade policy and economic cooperation, allowing horizontal and vertical integration of companies across borders, and diversification of resources. These instruments fit in with an efficient international oil and gas market.

When a country becomes increasingly uncertain about its security of supply, a combination of external and internal risk management tools will be favoured. The preferred strategy is geographical diversification, thereby reducing dependency on the country or region being the source of insecurity. Another type of diversification is to switch to other fuels, such as gas, coal, and increasingly renewables and nuclear. Often, consumer countries hold strategic stocks that they can draw on in the event of a sudden disruption. Since 1974, OECD countries have pursued a cooperative approach within the framework of the International Energy Agency (IEA) in maintaining strategic oil stocks (equal to 90 days of consumption), sharing oil, and coordinating emergency and demand management policies. For gas, there are no formal agreements to cooperate in case of a supply shock.⁶ Strategic gas stocks are not widely held because of high storage cost (compared to oil), but to some extent oil stocks can double as a crisis mechanism for gas-fired power stations with dual-firing possibilities. Other dual-firing capabilities also provide short-term solutions for gas shortages. It is important to note that China and India, but also countries such as Brazil, are not part of any cooperative agreement to enhance energy security.

Figure 2. Key energy risk management instruments and risk situations

Risk situation	Risk management instrument
Energy-supplying country/region is stable	Prevention
Stability in energy-supplying country/region is uncertain	Prevention Containment Deterrence
Turmoil in energy-supplying country/region	Containment Crisis management Response

Sources: Based on CIEP (2004).

Notes: See Figure A6 in the Annex for a more comprehensive illustration of energy risk management tools.

When there are great uncertainties about security of supply – because the producing country or region has (nearly) crossed the threshold into political and/or economic turmoil – a consumer country that is a follower rather than a rule setter can only attempt to reduce the effects of a crisis on its economy with containment and crisis management instruments. For such a country, the external risk management tools will be insufficient to avert a crisis or disruption of supplies. By contrast, a geopolitical and geo-economic power (a rule setter) could contemplate intervening in the affairs of exporting countries to remove the obstacles to export, even though the result is uncertain.

The effectiveness of these risk management instruments depends on the size and the political importance of a particular consumer country and/or the alliance in which it participates. In case of the EU, the use of deterrence or response instruments is fairly limited because the EU has neither a common defence nor a common foreign policy and, to exert pressure, it can only operate in alliances. As a matter of fact, the EU does not have a common energy policy. It is the limitations of one set of risk instruments that very often explains the emphasis on other risk instruments.

The asymmetric exposure of consumer countries to energy supply risks also explains why they use different risk management instruments and energy security strategies. Furthermore, energy security risk management must be consistent with other policies, such as foreign and security policies

The effectiveness of risk management instruments depends on the size and the political importance of a particular consumer country and/or the alliance in which it participates.

⁶ Gas is different from oil because its transportation is more rigid (pipelines, LNG terminals, and ships) and more bilateral by tradition. The IEA is formally only concerned with oil market emergencies, although the organisation follows gas market developments closely.

– which link to the function of a country and its stakeholders within the international system. The power of a country to shape these policies can also affect the choice of risk instruments. Therefore, the asymmetric risk landscape can affect the efficiency of an alliance of consumer countries to avert a crisis (Van der Linde 2003).

The evolving asymmetric risk landscape determines the scope and effectiveness of the currently available risk management instruments.

The evolving asymmetric risk landscape determines the scope and effectiveness of the currently available risk management instruments. We have already argued that the opportunities to diversify oil and gas supply – the best security instrument so far – are declining in the coming decades. Moreover, diversification away from oil has reached a point where oil dependency is traded for gas import dependency, which relies on the same politically and economically unstable regions. Coal and heavy oil consumption are facing environmental constraints, which new technologies could eventually release. The anticipated transition to domestically produced non-fossil fuels (renewables and nuclear), which can reduce both import dependency and environmental problems, is still far away. The wider use of nuclear energy suffers from concerns about safety of the fuel cycle and safe waste management. Between the currently available short-term oriented energy risk management instruments and the transition to a less carbon-intensive economy remains, however, a substantial time gap and new energy security risks.

5. Risks in a changing world: present and future trends

Given the present patterns of demand and supply, their long-run projections, and the inadequacies to fully manage the energy security risks, it is possible to develop a risk landscape for the international oil and gas market and the actors involved. As for future risks, key questions are: How will geopolitical rivalry influence the global risk (macro) landscape of the world oil market in years to come? How will political, social, and economic instabilities in producer countries influence foreign and security policies of the world's major powers as they pursue their energy security? And then, how and why is energy security becoming a political and strategic problem?

5.1 Global risks

To begin with, it is obvious that there are four major power blocs in the aftermath of the Cold War and at the beginning of the 21st century: The United States, the EU, China and Russia. The former three (group of) nations are bound to become the leading oil-consuming countries, while the latter has the obvious advantage of being an energy-rich country. Today's question is how the emergence of China (and India) as an economic and political power challenges the hegemonic position of the United States as a centre of innovation and growth. As part of the process of uneven growth and structural change, new powers challenge old ones, creating and destroying trade at the same time. As long as the hegemonic power or dominant economies can move on to new economic activities that create growth, the hegemon remains the engine of growth. However, the faster the change and the faster newcomers gain in world markets, the greater the challenge for the dominant states to remain the centre of economic growth. This is particularly important because periods of structural change usually are periods of intense nationalistic competition (Gilpin 1987). This could have a crucial bearing on the way the risk landscape evolves in the future, given that access to (energy) resources is a centrepiece of modern geopolitics.

The control over geopolitical pivots in or close to energy-rich areas can have a fundamental impact on the extent to which a region can be controlled and denied to geopolitical rivals. Brzezinski (1997, p.41) claimed that attaining geo-strategic pivots "in some cases gives them a special role either in defining access to important areas or denying resources to a significant [geo-strategic] player."

Great powers seek to prevent rival great powers from dominating the wealth-generating areas of the world and will attempt to occupy those regions themselves (Mearsheimer 2001). In this respect, geopolitical pivots will play an increasingly important role in competition for and access to oil and gas. As far as the Persian Gulf is concerned, should the consolidation of Iraq by the United States as a geopolitical pivot be successful, it would be an ideal pivot for strategic control of the Middle East and the Persian Gulf whilst providing the oil market with a valuable source of oil supply in the long-run.

Great powers seek to prevent rival great powers from dominating the wealth-generating areas of the world and will attempt to occupy those regions themselves.

Given the overall changing structure of oil and gas supply in the medium- to long term and the inherent instability in many producing countries, access to and control of energy-rich regions via geopolitical pivots will prove to be vital for the world's major powers. Not only is political and economic volatility a reason for exercising control over strategically located countries; shrinking diversity (i.e., increasing concentration) of supply is another compelling trend and reinforces the necessity for strategic leverage. Increasing market power in the hands of few producer countries gives undue influence over the price of oil and gas, from the perspective of consumer countries. This broad trend has a significant bearing on the competition between oil-importing countries and, therefore, on the risk landscape of energy security.

At the heart of today's international risk landscape, then, lays the fate of Iraq and the other Persian Gulf countries as the world's true long-run excess-capacity oil and gas producers. The inability of the United States to eliminate the insurgency in Iraq is in itself a real problem in that it undermines the security and stability of the entire Persian Gulf region because it increases the danger of an eruption of the underlying conflict between Shiia and Sunni Muslims in and among neighbouring countries. This not only negatively impacts the energy security of the United States but also the security of the EU and China. The Caspian Sea region, West Africa, and South America will all become correspondingly more important due to the wish for diversification away from the Persian Gulf suppliers and the strong possibility of a lack of spare capacity in the international oil market.

5.2 Controlling supply lines and transportation bottlenecks

Supply disruptions can take place not only due to internal trouble in an oil-producing state, but also due to actions on the part of rival powers. In practical terms, great powers place a high premium on having a powerful and dynamic economy while preferably the economies of its rivals grow slowly or hardly at all (Mearsheimer 2001).

Even if a certain country does not directly possess resources, it can still act as a pivot if it is located on a transit route or close to supply route choke points. Turkey, for instance, is a country strategically located between the Middle East, the Caspian Sea region, and the Eurasian plateau. Hence, Turkey forms a vital link between oil-rich countries such as Iran and Azerbaijan and oil-consuming blocs such as the EU and the United States (by sea transport). Moreover, Turkey controls the Dardanelles Strait, a major choke point for Russian oil exports to the international market.

Currently, the control over the Strait of Hormuz and the Strait of Malacca are vital oil and LNG supply choke points. In 2002, 44 percent of interregional oil trade passed through the Strait of Hormuz and in 2030 this is expected to grow to 66 percent of oil trade (IEA 2004). In addition, the expansion of gas production in the Persian Gulf region and the subsequent growth of international gas trade, in particular the sea bound trade in LNG, implies that the share of interregional gas trade will increase from 18 percent in 2002 to 34 percent in 2030. The share of interregional oil trade in the Strait of Malacca will increase from 32 percent in 2002 to 37 percent in 2030, while interregional gas trade will

Access to various geopolitically sensitive countries, particularly in Central Asia, is of paramount importance since this region of the world is largely landlocked.

decline from 27 percent in 2002 to 14 percent in 2030. The declining share in interregional gas trade in the Strait of Malacca is a result of the much faster expanding LNG trade flows to the EU and the United States. The absolute flows of LNG through the Strait of Malacca are expected to continue to grow in that period (IEA 2004). The importance of the Strait of Hormuz is shared among all importing countries of oil and gas, while the Strait of Malacca is particularly important to China, Japan, and Korea. The fact that the US navy patrols both straits gives the United States a strategic advantage.

Especially with respect to Central Asia, access to various geopolitically sensitive countries is of paramount importance since this region of the world is largely landlocked. It is for this reason that the struggle over the designation of pipeline routes plays such an important role in Central Asia. While Russia would like to retain control of oil and gas flows from the Caspian Sea region to markets in the West, the United States, the EU and China look for alternative ways of transporting resources from the Caspian Sea region to consuming countries.

5.3 A different geopolitical landscape

While security of supply has been an issue for all major oil-consuming nations since the first oil crisis of 1973-74, the parameters of supply security have changed since the collapse of the Soviet Union. A new period of uncertainty and asymmetry in power politics was heralded in, changing the geopolitical map of the world. The collapse of the Soviet Union was initially seen as a victory for the international market system. The original expectation was that globalisation would become the major driving force in international political and economic relations. In such a globalised international system, it was thought that the role of the nation state would diminish, while multilateral relations would flourish and other stakeholders would be important players (CIEP 2004). It was assumed that the previously centrally-planned economies would become integrated in the global economy and that the economic integration would automatically integrate them in the social and political rule set that belonged to the international market system as promoted by the West.

On the whole, geopolitical developments underpin the developments in the world oil market. Though no organised and politically motivated export restrictions or disruption of supply have taken place since the 1973-74 oil crisis, other than the OPEC production policy, a number of other fundamental discontinuities of oil supply have occurred (e.g., the Iranian revolution of 1979, the Iran-Iraq War of 1980-88, the Gulf War of 1991, the strike in Venezuela 2002-03, and so on).⁷ To a greater or lesser extent, these fundamental discontinuities have led to sharp oil price spikes. The resulting economic side effects on consumer countries have been well documented (CIEP 2004).

5.4 Towards a single world order?

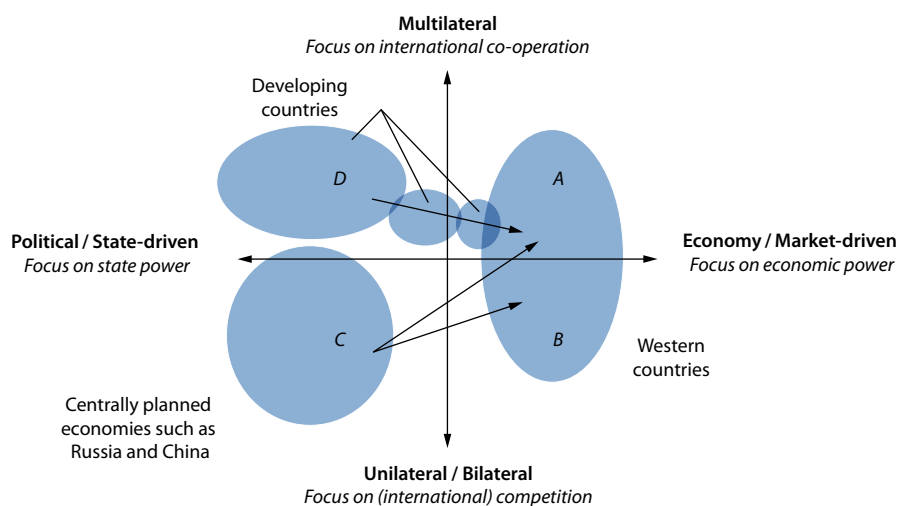
In the early 1990s, in the United States and Europe, it was commonly thought that a single world order would develop before too long, in which all countries would be subject to the same political, economic, legal and social mores. The mores of this system are based of two key elements. First, the expected decrease in national political power over economic actions – because economic decision-making would become decentralised. Second, the role of the government would be limited to facilitating and regulating markets, and in its role as a political authority it was assumed that the government could prevent and solve conflicts in the system. Thus, it was assumed that companies would increasingly operate in an open international environment, competing for capital, labour and markets. The hegemon was assumed to manage the regulation of international political, economic,

⁷ Such discontinuities can occur in the form of *force majeure* disruptions (internal or external conditions in producing countries, such as civil unrest), export restriction disruptions (deliberate restriction of exports) and embargo disruptions (deliberate restraint imposed by consuming countries on certain producer countries); see CIEP (2004).

legal and social pre-requisites and impose them if necessary. This role fell upon the United States in the absence of other contenders, but it seemed initially wary of setting the mores too openly and mainly stressed its domestic economic successes. The result was that mainly the legal-economic component of the system was portrayed as an ideological idea.

Globalisation offered the prospect of political and economic barriers to, for instance, international investment, being rapidly abolished. After all, even in China, the process of creating openings towards the international market-oriented system had started in the 1980s and the transition of the former Soviet Union and Eastern Europe was partly shaped by western institutional funding. The developing countries were also encouraged, often after a monetary or financial crisis, to liberalise their economies and adapt to the demands of the international market. In Figure 3, this movement towards one market-based system is graphically illustrated.

Figure 3. Expected post-1989 development



Source: Van der Linde (2005, p. 237)

The United States, the only remaining hegemon and the most dynamic economic power at that time, also set the trend for Europe. The EU, in the role of ‘assistant hegemon’, hurriedly opted for rapidly incorporating 10-12 Central and Eastern European countries as well as for deeper integration by adopting Economic and Monetary Union. An added advantage of this double stroke, which had been prompted by the new geopolitical relationships, might be a more important role for Europe at the regional level, but possibly also at the world stage.

So Europe explicitly backed the formation of a single world system, but had the ambition to claim its own role in the system, next to the United States. For that reason, not only would total economic integration have to be pursued, but also Europe’s political and strategic role would have to be strengthened.

As far as the energy market was concerned, globalisation would thus remove political barriers that limited access to raw materials, oil and gas resources, and attractive new markets. In the West, foreign direct investments were seen as the best tool to denationalise oil and gas. In practice, an important role was foreseen for the existing multinational oil companies as procurers of capital and expertise and as outposts of the system in the ‘learner’ market economies. Thus seen, globalisation would reduce and remove political differences and national interests, marking the end of history as described by Fukuyama (1992).

The United States, the only remaining hegemon and the most dynamic economic power by the end of the 1980s, also set the trend for Europe.

Certainly this might explain the motivation of the EU, in line with its own programme for the future and as a prerequisite for closer political and economic relations, to coerce Russia into adopting the EU gas-market proposal. Moreover, in the light of the imminent, more dominant, market position of Russian gas in the European market, it would be difficult for an internal market to develop with monopolistic suppliers at the external borders. The rapid decline of the Russian economy and the weak political development in the 1990s were all the more reason why the EU approached Russia on the basis of an unequal power relationship. It was believed that the energy *acquis* could be exported to a major energy supplier of Europe.

The recovery of the Russian economy and the growing internal political stability around the year 2000 caused the Russian energy interests to quickly become a national priority.

The recovery of the Russian economy and the growing internal political stability around the year 2000 caused the Russian energy interests to quickly become a national priority. Brussels struggled with getting accustomed to the new balance of power, whereas the leaders of several EU member states, in particular Germany, rapidly adjusted their policies in line with the new position of Russia.

During the dot-com boom in the 1990s, the West largely neglected further defining the mores of the international market system, whereas other countries were busy developing all sorts of ideas on the details of their preferred mores. Russia, but also, for instance, Iran, seriously considered various aspects of post-modernism and international relations. According to these countries, globalisation could accommodate various national identities and alternative directions of progress. They thus formulated their own set of references for globalisation. Thus, the United States, being the only hegemon left, made a capital mistake in the early 1990s at first by not defining the 'new international order', as announced by Bush senior, with a coherent vision on the necessary mores, but, instead, relied by default on market forces to bring about full integration. After 9/11, the United States changed track and began, for the sake of US national security, to impose the mores top-down. Thus it chose to brush aside other ongoing processes in favour of its own mores and interests. Consequently, this blocked any potential for convergence.

So while, at first, globalisation seemed an option of attractive simplicity, the mores of the system eventually threatened to destroy the diversity and self-determination of nations and societies for the sake of the hegemon's national security. In the post-2001 approach, globalisation could offer the ruling elites in the emerging countries much less than their own interpretations could. The transition from being supposed partners in the globalisation process to followers of the hegemon did not proceed smoothly and evoked intense, adverse reactions.

Since then, clearly successful autocratic regimes have emerged, for instance in Russia, Venezuela, China, and other Asian countries. These countries participate in the international economy, but on their own terms, and give priority to their own national interests. Instead of being the intended 'mores followers', these regimes are increasingly becoming 'mores setters'. In the geopolitical situation after the 2003 invasion of Iraq, these regimes felt even more justified to follow their own course. National interests, according to countries like China, can no longer be entrusted solely to the hegemon of the international market system. They found the answer in what we can now call 'weak' globalisation: participating in the international economy, but on condition that the state's long-term political, strategic, and economic national interests are served. Since 2001, and even more so since 2003, this attitude has increasingly started to clash with the US approach to globalisation.

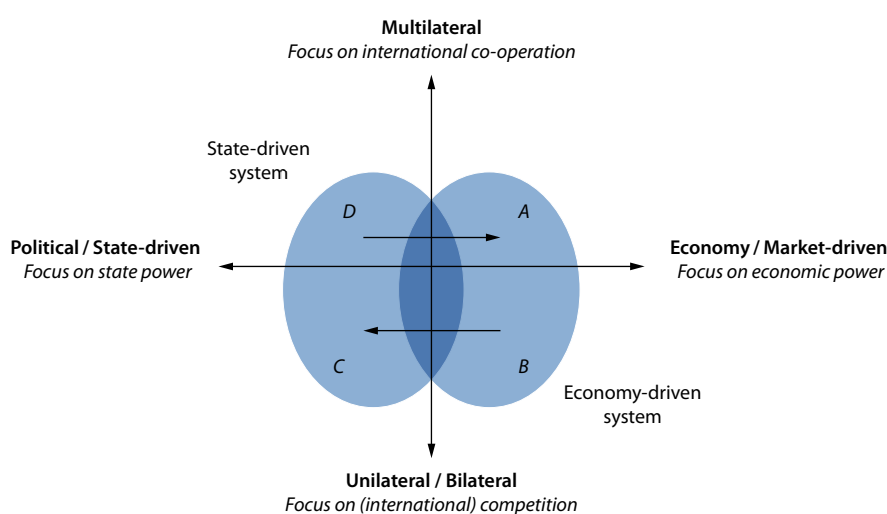
The rise of China and India in recent years has created sufficient momentum for these countries to set their own conditions for access to the market, investment, and competition – without running the risk of being shut out from raw materials, capital, and markets. Moreover, they offer a perspective to

other autocratic regimes that are still searching for the proper balance between economic growth and preserving their political power.

The perspective of free access to oil and gas resources and the role of Western energy companies and banks in accessing these resources, which is the basis of the American and European energy policies, will change drastically if the oil-and-gas-producing countries in particular would embrace weak globalisation and adopt China's, India's and Russia's attitude to international relations. Weak globalisation makes national interests the yardstick of international conduct, instead of a hegemon's interests. There is sufficient reason to assume that oil-and-gas-producing countries are more likely to opt for weak globalisation in combination with strong state control than to enter into the political and social experiments that go with full globalisation.

The perspective of free access to oil and gas resources will change drastically if the oil-and-gas-producing countries adopt China's, India's or Russia's attitude to globalisation and international relations.

Figure 4. Two competing systems?



Source: Van der Linde (2005, p. 241).

Assuming that the United States, Europe, and some countries in the Asia-Pacific region continue to promote market-based solutions for their own economies, albeit with a sometimes political-strategic dressing, and that the successful emerging economies and the energy-producing countries opt to remain in a national-interest driven system, two competing systems will emerge (see Figure 4). In such a situation, a serious confrontation, particularly about energy, between the main players of the two competing systems seems more likely to occur than in a single-system solution of either a state-driven or economy-driven type. The strength of the market-based system will also depend on its ability to attract and secure sufficient oil and gas flows, and, at the same time, its ability to reduce its import-dependency from countries belonging to the 'other system'. In this context, the new EU energy policy (European Commission 2007) is a decisive move in this direction and attempts to bundle security of supply and environmental objectives into a single approach.

5.5 Concluding remarks

Foreign policy and military dimensions now accompany the economic aspect of a smooth flow of oil from producer to consumer countries. In essence, access to energy has become securitised, with extensive military implications. This implies that oil-importing power blocs possibly need to move from assuring energy supply through international markets (realising sufficient imports) to actively managing the rising spectre of geopolitical risks to energy supply in energy-rich areas of the world.

No other energy market than the oil market manifests such an acute need for increasingly active policy making in both the foreign policy and defence dimensions. The risk profile of gas is different, but with its growing internationalisation (and call on Persian Gulf reserves) it is possible that at some point the security of gas supplies develops into a situation akin to oil (CIEP 2004).

The development of sustainable and renewable fuels also forms part of such a strategy for managing the risk associated with geopolitical shifts and instability. It is this route that the EU has recently decided to pursue. Besides benefits for the environment and the climate, such fuels partly offer a way out of the dependency dilemma for oil-importing countries. The drive to create sustainable and renewable fuels, particularly those that can be produced domestically, reflects the awareness of various governments and countries that oil and gas import dependency is strategically undesirable. Hence managing risk with respect to energy security can become a strategic problem, coloured not only by political considerations but also economic and military ones.

6. Managing risk in a changing world

6.1 Bounded rationality

The dimensions of risk discussed above combine to form the risk landscape that policy makers face today when dealing with energy security. New global and regional risks together with new forms of energy, technological innovations, industrial developments, and so on all redefine the issue of security of supply and subsequently determine the (in)efficiency of existing energy security risk management instruments. In theory, it is easy to observe that energy security needs to be addressed proactively.

Bounded rationality relates to the problem of how countries differ in terms of culture, for many of them tend to act rationally only to a certain extent.

In practice though, it would be difficult, particularly since policy makers tend to be faced with bounded rationality: the limited foresight, imprecise language, the costs of calculating solutions, and the fact that policy makers cannot solve complex problems arbitrarily, exactly or instantaneously (Milgrom and Roberts 1992). Herbert Simon, one of the pioneers on bounded rationality, points out that most people are only partly rational, and are in fact emotional/irrational in the remaining part of their actions (Simon 1957). Moreover Williamson, a student of Simon, contends that “boundedly rational agents experience limits in formulating and solving complex problems and in processing information” (Williamson 1981, p. 553). In essence, bounded rationality relates to the problem of how countries differ in terms of culture, for many of them tend to act rationally only to a certain extent. This is particularly important for the assessment of how the international system will develop in the coming years. Will the international system become more cooperative and will economic integration be an acceptable approach to political leaders in the United States, Europe, China, and so on – or will the international system develop more nationalistic competition?

Insofar as cultural differences amongst relevant players are concerned, bounded rationality goes a long way in explaining how the characters of both consumer and producer countries change. Since countries often act in a way bound to their cultural identities, they are boundedly rational by definition. What matters in that respect is what organ or groups of organs (in any given countries) do to help shape foreign and security policies. Rational ignorance (Downs 1957) is another term to describe behaviour in a country, meaning that “rational ignorance on the part of constituents [in a country] is going to increase the role, in many situations, of incomplete subjective perceptions playing an important part in choices” (North 1991, p. 51). Though this concept pertains to

institutional economics, its basic meaning relates directly to transactions and economic behaviour in the oil and gas markets.

Of particular concern here is the economic behaviour both of producer as well as consumer blocs and the differences between them in terms of rational ignorance. Relevant players make choices based on information, which is necessarily incomplete, and differences in culture and national priorities further compound the problem of making rational choices. Each country's rational ignorance and to a great extent its rational choices are influenced by national considerations and cultural conscience. Producer and consumer countries are asymmetric in this respect; so bounded rationality is essentially skewed when observed against the backdrop of cultural differences between players.

Rationality may play a great role in one country and less in another due to the inclination of the presiding government in question. The combination of imperfect information, rational ignorance, and cultural asymmetries could contribute to instability in oil and gas markets, further shaping the risk landscape of the future. The way in which the recent relationship between the EU and Russia is developing is explainable both as geopolitical rivalry and as an expression of bounded rationality. Bounded rationality limits the rational, purely wealth-maximising behaviour of countries to a great extent. A sound energy policy will involve not only the close interaction of foreign and security dimensions, but also economic and environmental policies with respect to alternative fuels and fuel diversification. Diversification of supply, buttressed by military and geopolitical activity, is, on its own, no longer satisfactory as an energy strategy. Energy security is realised both at home, with demand management and policies to optimise domestic production capacities, and abroad with foreign trade and foreign investment policies in the knowledge that most existing energy risk management instruments do not guarantee security of supply in case of a prolonged supply shock. New decisions and strategies with respect to mixing fossil and alternative fuel types have to be made in order to enhance energy security. In this sense, sustainable energies become an important part of future energy security strategies.

The way in which the recent relationship between the EU and Russia is developing is explainable both as geopolitical rivalry and as an expression of bounded rationality.

Information is not perfect from the outset; hence, combining different fields into one single coherent energy approach will enhance the bounded rationality of top strategists. When it comes to managing energy security risks, policy makers will have to integrate policy fields that hitherto have been quite separate from one another. A greater number of contingencies need to be accounted for, but not all of them can be, so that policy makers tend to act in an intentionally rational manner given their limitations (Milgrom and Roberts 1992).

6.2 Policy options in a changing world

Countries will inevitably have to import more energy and accept that in the coming years a large share of the energy mix will remain fossil fuel-based. Yet, the energy mix and the composition of imports can be altered by optimising the use of cleaner fuels, such as renewables, natural gas, clean coal and eventually hydrogen-based energy. Despite earlier efforts to move away from oil, the dependency of the transport sector has remained very large. Nevertheless, energy demand can be made more efficient than today. Still, it must be concluded that most of the traditional risk management instruments for energy supply security largely offer short-term solutions for a long-term problem. Rapid diversification away from oil could limit some of the risks attached to future oil consumption but without a ready-to-go alternative it might create other transition related risks. There is no obvious alternative fuel available yet, which implies that the gap can only be closed by a transition period in which multiple energy sources are used, such as synthetic fuels, biofuels, renewables, hydrogen, and nuclear.

The ability of market-driven economies to pre-emptively move away from oil without coercive regulation is small.

But how can such an energy mix be realised within a competitive and by nature short-term rewards-oriented market system? The oil price does not yet reflect the costs of the long-term political and economic risks. The option to diversify away from oil in a competitive environment is not easily pursued unless the main competitors move along the same path. The ability of market-driven economies to pre-emptively move away from oil without coercive regulation is small. Countries that experienced a structural change of path usually realised such a shift with substantial fiscal and regulatory backing. A number of industrialised consumer countries successfully moved away from oil for electricity generation in the 1980s and replaced oil with nuclear (France and Belgium), coal, and natural gas. In these economies, oil is predominantly used as a transportation fuel. Although new fuels and car technologies are entering the market, the replacement of oil as the preferred fuel in transportation is still not imminent. In the absence of a prevailing option, the gap might have to be closed by developing multiple fuel options that need to be prioritised and fully assessed, considering their viability and cost effectiveness (Jacometti 2005). The capacity to redistribute assets in the economy through government spending and inhibiting consumption of certain fuels in order to achieve long-term energy security can have a detrimental effect on the short-term competitive position of the country. Moreover, it requires a strong government that can enter into long-term agreements with stakeholders in various sectors of the economy and preferably cooperation among various consumer governments to create such a new market place. Cooperation would help to reduce the costs of creating this market and governments can opt to collectively use the 'infant-industry' principle to jump-start the new market. Naturally, such a strategy is counter-intuitive to proponents of the market-based economy that worked so hard to remove barriers to trade and competition in the past. Thus, governments would have to enact this paradigm shift in order to move away from initially conventional oil and perhaps later to some extent from natural gas, if similar security risks were to develop.

That said, the dilemma is: how to weigh the short-term risks of a serious disruption or undersupply against the longer-term security of more domestically produced (cleaner) energies as long as prices do not reflect all the risks?⁸ Pursuing an aggressive strategy to structurally move away from oil and, to some extent gas, could easily create a self-fulfilling prophecy with regard to the position of the oil- and gas-producing countries in the world system. The prospect for producing countries, under this strategy, could be very uncertain with regard to investment in future production capacities. They may prefer to intensify cooperation with countries that do not pursue such a strategy and tailor investment levels to a certain demand profile of the preferred markets. Depending on the speed of transition in the economies moving away from oil, the oil market could become less tight, thus creating additional short- and medium-term competitive advantages for those countries that stuck to oil.⁹ In terms of the international system and competition among rule setters, this dilemma is clear. For the United States, the EU and Japan, such a long-term strategy might further stimulate competition in world goods markets with China (and others) if China would not opt for shifting away from oil. China might be able to generate more economic and political power unless trade barriers prevent unwanted oil-generated goods from China (and others) from entering these markets. However, such a strategy would substantially raise the threshold for China (and others) to integrate into the market-driven system, effectively creating two systems.

8 Prices should reflect: (i) the real long-run economic and social costs of proceeding with the use of oil combined with the higher expected discount rates required to reflect rising political risk in countries whose overall instability is deemed to rise over time; and (ii) the benefit from using clean fuels both in terms of energy independence from risky oil-rich countries as well as the environmental gains, which translate directly into less long-run economic and social costs and thus a higher payoff.

9 Brazil attempted to introduce alcohol from sugar cane in the 1970s and 1980s but the programme collapsed when oil prices declined substantially in the mid-1980s and consumers switched back to petrol.

The uncertainty about the viability of the new energy technologies and the time needed for the transition might create a large upfront risk to the power position of Western countries in the world. It is therefore more likely that such a strategy will in the end not be pursued and that the risk of a major oil crisis and the accompanying international system risks remains the preferred option. Competing for oil with China and thus increasing the energy costs of the country could be an effective short-term instrument of the market-driven economies to attempt to set the rules for China's (and others') integration. If a structural shift away from oil is not feasible in the short- and medium term, the best strategy may be to continue to attempt to firmly integrate the producing countries into the market-based system. To achieve such an integration it is likely that a fuller array of foreign, security and trade policy tools, in addition to smarter employment of prevention, containment and deterrence instruments, will be required than in the past because Western countries were unsuccessful in gaining the confidence of the producers in the early 1990s. Larger short- and long-term benefits for producing countries – for instance, by helping them to face the social and economic problems of oil-rich economies and creating security of demand – should be offered in order to win their confidence in the market system. Signals that Western countries might opt – both for security and environmental reasons – for a less oil (and perhaps later gas) dependent economy, have for now raised the distrust of producing countries. In that sense, China's (and others') proposition to offer their markets is more appealing.

7. Conclusion

The market structure of oil supply is bound to change over time, with increasing reliance on the OPEC and the Persian Gulf. Meanwhile, as present trends indicate, geopolitical enmity shows that a new form of realism will shape geo-strategic behaviour in the future. This means energy security should become firmly integrated in the foreign and security policies of a nation, regardless of whether or not clean fuels can eventually be used to a greater extent. The risk landscape is determined by geopolitical rivalry to control and access energy-rich regions and by regional risks arising from politico-economic instabilities.

The effects of oil supply disruptions or undersupply can be harmful to any major economy. In the mean time, the active management of risk requires an entirely new approach to security of supply: energy security. In this new paradigm, there is no more room for an energy strategy that is geared merely towards a majority of oil in its energy portfolio. Increasing the share of gas in the energy mix only temporarily reduces the energy security problem. The failure of countries to acknowledge this problem can be observed as an underlying failure to cooperate.

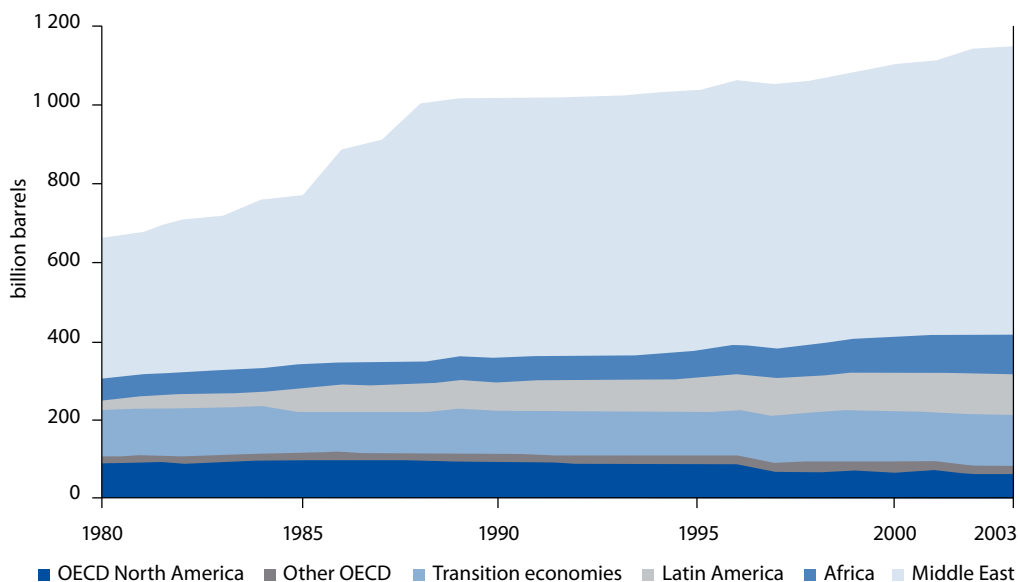
The active management of risk requires an entirely new approach to security of supply.

In the short- and medium term when dependencies on imported oil are still growing, energy security is going to be difficult to obtain. Traditional energy risk management instruments will not suffice in an environment of competing nations and where the playing field is in flux. Moreover, they were never meant to provide security for a longer period of time. Current energy risk management instruments in OECD countries were designed for short interruptions of supply, while the longer-term security of supply was guaranteed by foreign direct investments, the frail integration of producer countries in the international market, and US foreign and security policy. Current energy policies also cannot alleviate the impact of sustained higher oil prices on the economy. Energy security in the past three decades relied on the hegemonic powers of the United States and its willingness to share its energy security with its most important allies. China does not seem to be convinced that it will be allowed to share in the energy security of the market economies, particularly in an energy market that is expected to be tight in the coming decades. Distrust among major consumers could then easily translate in competing systems of rule setting.

The new post-Cold War era offers ample room for the world's dominant powers to compete for control of and access to oil and gas. Unless a new energy strategy approach is initiated that can help rival powers to escape the prisoner's dilemma of oil and gas consumption, this geopolitical rivalry will continue.

Annex

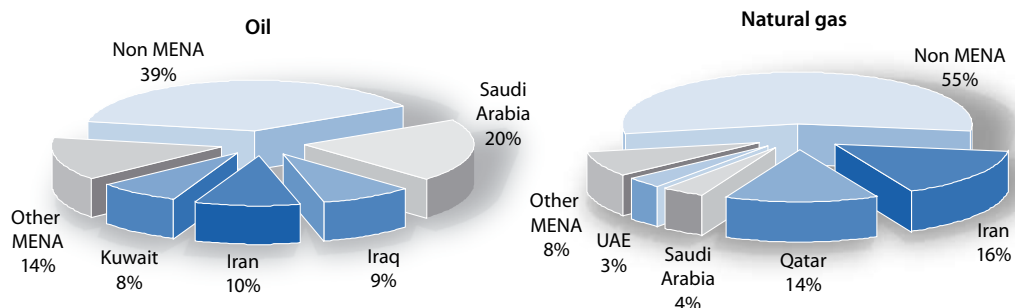
Figure A1. Development and distribution of world oil reserves



Source: International Energy Agency (2004)

Notes: There is some difference in the data shown here and those reported by BP, United States Geological Survey (USGS), OPEC, and the Oil and Gas Journal. This difference results from definitions of proven reserves and the method of data collection.

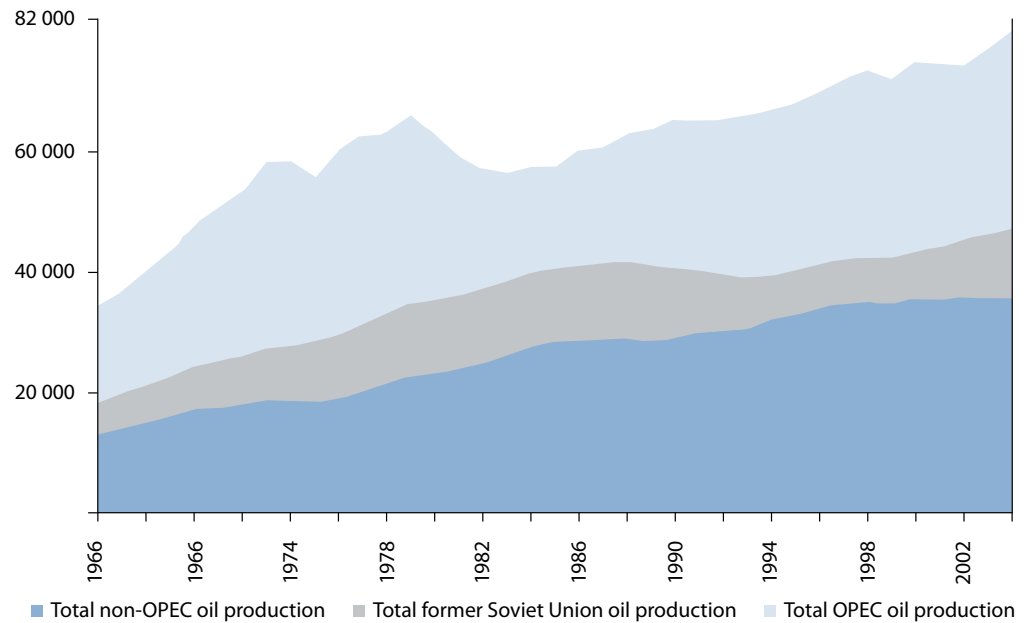
Figure A2. World proven oil and gas reserves



Source: International Energy Agency (2005)

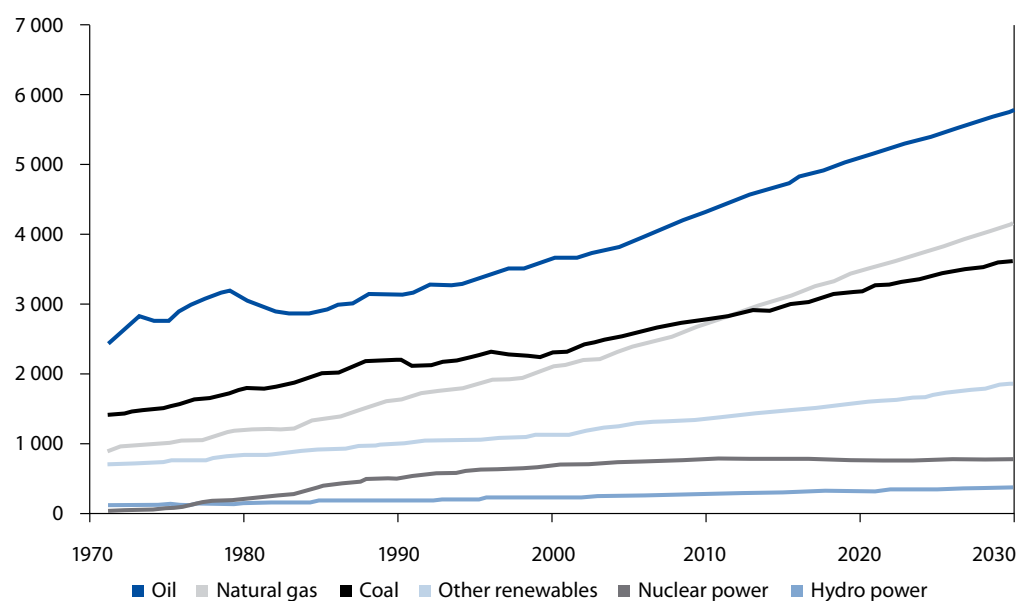
Notes: MENA ≡ Middle East North Africa

Figure A3. World crude oil production (in thousands of barrels per day), 1965-2004



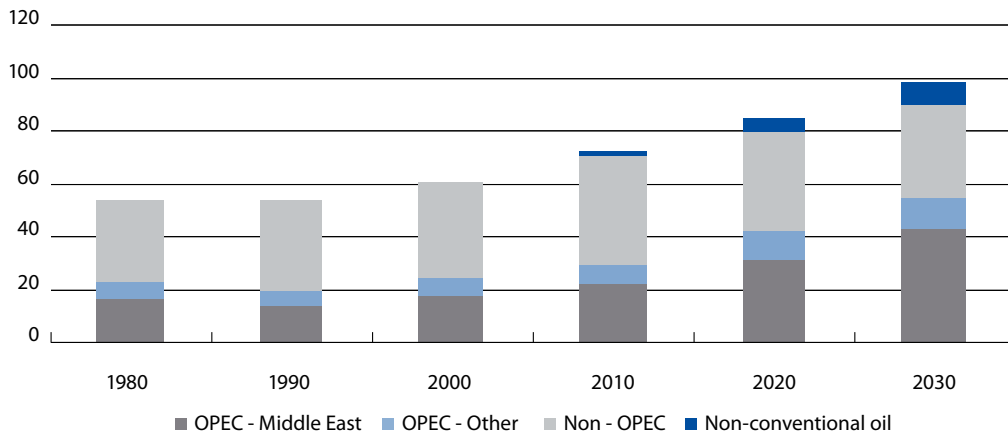
Source: BP (2005)

Figure A4. World primary energy demand (in million tonnes of oil equivalent)



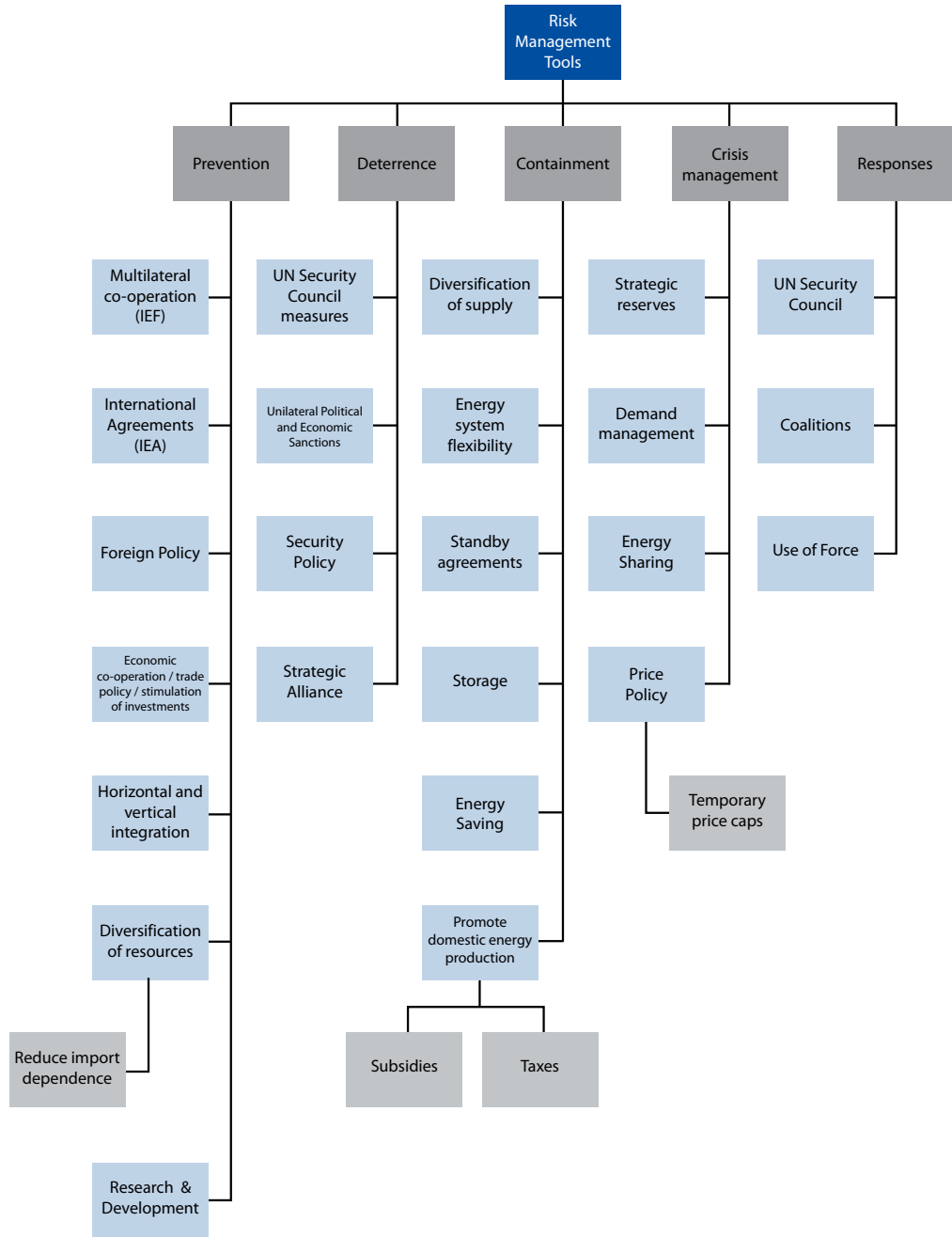
Source: International Energy Agency (2004)

Figure A5. World oil production (in million barrels per day) – past, present, and future



Source: International Energy Agency (2003)

Figure A6. Energy risk management tools



Source: Based on CIEP 2004

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