ENERGY RESOURCES AND ENERGY POLICY

ADDRESSING GLOBAL ENERGY AND SECURITY CHALLENGES

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The geographical distribution of current energy resources is quite uneven which makes some countries and regions major suppliers of energy products, oil and gas in particular. Key-suppliers of energy products are located in the Middle East, the CIS, Africa and Latin America whereas North America, Europe, and South and East Asia are major consumers.

Recent events show that energy prices can change rapidly, reacting to economic, social and political events in oil exporting countries. Energy policies and strategies may trigger tensions between countries. Moreover, there are growing concerns about the safety of energy transportation routes and security in transit countries. In addition, extraction, transportation, storage, processing and final uses of energy resources do impact on the environment in many negative ways.

These basic facts and the development of energy security concepts and strategies in some countries underline the importance of energy se-

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curity issues and the need to assess linkages between energy and security systematically.

In that context, international and regional cooperation, organizations and treaties are key-components of energy security and, subsequently, a strengthening and better use of existing institutional frameworks should be advocated.

I. Key-Energy Issues and Security Implications

More than any other market, the energy market seems to be characterized by very specific features such as geographical concentration and related geopolitical implications, linkages with economic development and growth, the quality of governance and democracy, and the environmental impacts. Given its critical overall importance, the energy sector is also an ideal target for terrorism. These issues raise numerous security concerns that require strategies and policies to contain, reduce or eliminate the risks associated with energy dependency, price instability, economic development strategies, poor governance and corruption, and the environment.

I.1. Basic Energy Figures and Tendencies

Energy consumption

Despite gains in terms of energy efficiency, as shown in Table 1, world energy consumption increased by about 16% between 1990 and 2001, to reach 403.9 quadrillion (10^{15}) btu (British Thermal Unit) in the last year.

Table 1

World Energy Consumption (*quadrillion btu*)

	1990	2001	2010	2025
Industrialized Nations	**182.8**	**211.5 [+16%]* (53%)****	**236.3 [+12%]**	**81.4 [+19%] (45%)**
Eastern Europe/FSU	**76.3**	**53.3 [–30%] (13%)**	**59.0 [+11%]**	**75.6 [+28%] (12%)**
Developing Nations	**89.3**	**139.2 [+56%] (34%)**	**175.5 [+26%]**	**265.9 [+50%] (43%)**
Of which Asia	**52.5**	**85.0 [+62%] (21%)**	**110.6 [+30%]**	**173.4 [+57%] (28%)**
Total World	**348.4**	**403.9 [+16%] (100%)**	**470.8 [+17%]**	**622.9 [+32%]**

* Between […], percentage changes with respect to the previous reported year.

** Between (…), share in total world.

Source: Energy Information Administration (EIA), *International Energy Outlook 2004* [http://www.eia.doe.gov/oiaf/ieo/download.html].

In absolute terms (for the reference period) consumption increased much more in developing countries than in industrialized ones. This is a reflection of the economic development and fast growth in some newly industrialized countries and emerging market economies. However, energy consumption decreased in transition countries, mainly because of the collapse of output that accompanied the disintegration of the Soviet economic area, liberalization and the adoption of market-based institutions.[1]

Considering Table 1, in 2001, industrialized countries consumed more than half of the world's energy. However, energy consumption is growing much faster in developing countries than in industrialized ones. As a result, developing and developed countries should consume about the same quantities of energy by 2025. Within the group of developing countries, about two thirds of energy consumption shall then take place in Asia, notably in China and India.

Energy supply sources

Oil accounts for 40% of the world energy supply in recent years (see Table 2); it is followed by coal and gas (about 22-23% for each). These are all non-renewable sources of energy. Both nuclear energy, that is also non-renewable, and hydro-electricity, that is renewable, represent about 7% of world supply. Other sources of energy are *de facto* very negligible. However, the share of wind power is growing fast. The use of solar panels is increasing in developed and developing countries. Biomass energy, mainly from wood, is a major supply source in many developing countries.

Table 2

Main Sources of Energy Production
(*recent years*)

Sources	Share in total (%)
Oil	40
Natural gas	23
Coal	22
Nuclear	7
Hydroelectric	7
Biomass and others*	1
Total World	100

* Geothermal, solar, and wind.

Source: EIA.

The high price of fuel

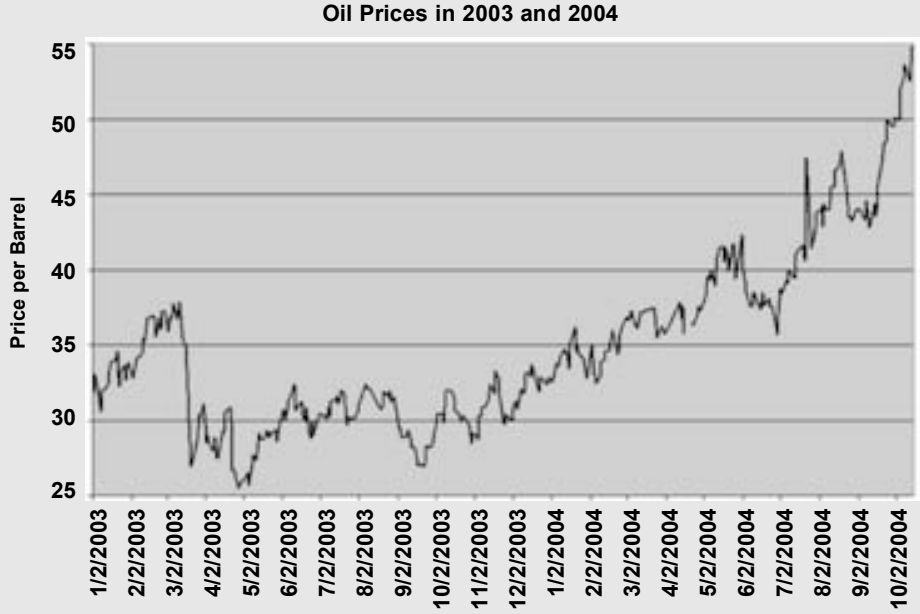
According to experts, high oil prices should become the rule and determine the price of gas and coal (see Fig. 1).[2] At the same time, oil price volatility seems to have also increased recently. These

[1] Former command economies were also characterized by a high energy intensity of output, mainly because of the lack of economic incentives to save resources and a development strategy based on energy-intensive heavy industry.

[2] According to Paul Maidment, "many of the factors behind the recent surge in prices are likely to persist" ("The High Price of Oil," *Energy Brief*, FORBES, 8 September, 2004.)

price features partly reflect news about political, economic and social events (e.g. mass demonstrations and strikes) in major oil exporting countries such as Russia, Venezuela and Nigeria. It may also relate to fundamental factors such as more accurate (and rather pessimistic) information about oil reserves and their speed of depletion. Higher and/or more volatile prices should negatively impact on economic growth, employment and incomes in many countries, in particular poor ones.[3]

Figure 1



Source: [http://en.wikipedia.org/wiki/Hubbert_peak].

Geographical concentration of oil and gas resources

A distinction has to be made between proven, identified and economically recoverable oil reserves. As indicated by Table 3, figures may somehow differ between data sources. New data and information may change reference figures. For instance, the adoption of new technologies should improve recovery rates.

The distinction between proven and recoverable oil reserves is quite essential because proven reserves are not a measure of future supply and, according to some experts, relying on proven reserves figures only can lead to wrong perceptions and decisions. What matters for the future is economically recoverable oil, for which the Middle East, Saudi Arabia and Iraq in particular, does not appear as a dominant region.

Table 4 shows that more than two thirds of proven world oil reserves are concentrated in Middle-East countries. Considering recoverable oil, with less than 40% of world reserves, the dominant position of the Middle East deteriorates whereas the combined reserves of North America, Europe and the CIS represent 36% of world reserves.

[3] See: Kofi A. Annan, "Where the High Oil Price Really Hurts," *The International Herald Tribune*, Tuesday, 3 October, 2000.

Table 3

World Oil Reserves
(*estimates*)

Estimates/Sources	Quantities*	Level
Proven		
DOE / OGJ**	**1,016.8**	**103.6**
DOE / GULF***	**981.4**	**100**
Identified		
USGS****	**1,103.2**	**112.4**
Recoverable		
USGS	**2,272.5**	**231.5**

* Billions of 42 gallon barrels.
** Department of Energy / *Oil and Gas Journal.*
*** DOE / Gulf Publishing Co.
**** U.S. Geological Survey.

Source: Bill Kovarik Ph.D., 2003 [http://www.radford.edu/~wkovarik/oil/].

Table 4

Geographical Distribution of
Oil Reserves (%)

Region/Country	Proven	Recoverable
Iran	**8.8**	**5.7**
Iraq	**11.1**	**6.5**
Kuwait	**9.5**	**5.8**
Saudi Arabia	**25.9**	**16.5**
Total Middle East	***66.4***	***39.6***
Europe and former SU	**7.6**	**18.6**
North America	**5.4**	**17.5**
World	**100**	**100**

Source: See Table 3.

More than half of the world reserves of natural gas are located in three countries only: Russia, Iran and Qatar (see Table 5). Russia alone controls almost 30% of world gas reserves, a share that

could still increase with expected discoveries of large fields in Arctic regions, where extraction will be facilitated by the global warming process and the melting of the ice cap.[4]

Table 5

Proven Gas Reserves
(1 January, 2002)

Rank	Country	Billion cu m	Share (%)
1	Russia	47,860	29.7
2	Iran	24,800	15.4
3	Qatar	17,930	11.1
4	Saudi Arabia	6,339	3.93
5	UAE	5,892	3.65
World			

Source: [www.cia.gov].

Oil and gas companies

Table 6 proposes a ranking of major oil and gas companies. These companies belong to both public and private sectors. For example, Exxon/Mobil is a private entity whereas Saudi Arabian Oil Co. is listed as a public one. From the perspective of political economy, the distinction between public and private ownership may not matter. Large private oil companies represent powerful lobbies that can have considerable leverages on politicians in parliaments and governments. Furthermore, in some countries, the absence of democratic controls implies that public companies are serving the interests of those who control them and thus engage in rent-seeking activities, which may not be welfare enhancing to society at large.

Considering current production, the largest oil companies are located in the U.S., U.K., Saudi Arabia, Mexico and Venezuela, representing a mixture of public and private interests. Ailing Yukos was the Russian largest oil company in terms of production. The ranking of companies by reserves show that Russian companies are ranked above Western ones.

Russian Gazprom, which already controls slightly less than 20% of world gas reserves (see Table 7), could strengthen its position in the energy sector, which is not well perceived by Western experts and politicians, especially when the State remains the main shareholder.

OPEC

Besides oil companies, the Organization of Petroleum Exporting Countries is a major player on the oil market. It is a permanent intergovernmental organization created at the Baghdad Conference in 1960, by five founding members: Iran, Iraq, Kuwait, Saudi Arabia and Venezuela. They were later joined by other Members: Qatar (1961), Indonesia (1962), Libya (1962), United Arab Emirates (1967),

[4] "The Arctic region, particularly offshore, has huge oil and gas reserves, mostly in Russia, Canada, Alaska, Greenland and Norway. Warmer temperatures would make it easier to drill and ship oil (and gas) from the Arctic" (Tom Doggett, "Global Warming Exposes Artic to Oil, Gas Drilling," *Reuters,* 8 November, 2004).

Table 6

Ranking of Major Oil Companies

Rank	By production		By reserves*
	# 1*	# 2**	
1	Exxon/Mobil (U.S.)	Saudi Arabian Oil Co.	LUKoil (RF)
2	Royal Dutch Shell (U.K./Neth)	Petroleos Mexicano	Yukos (RF)
3	Chevron Texaco (U.S.)	Petroleos de Venezuela	Gazprom (RF)
4	BP Amoco (U.K.)	China National Petroleum	Exxon/Mobil (U.S.)
5	Yukos (RF)	BP Amoco + Arco	Royal Dutch Shell (U.K./Neth)
6	Total Fina Elf (F)	Exxon/Mobil	Chevron Texaco (U.S.)
7	LUKoil (RF)	Nigerian National Oil Co.	BP Amoco (U.K.)
8	Conoco Phillips (U.S.)	Iraq National Oil Co.	Tyumen (RF)

Remark: Other rankings could refer to assets, investments, profit, political leverage (?), etc.

Source: * Forbes (2003) [http://www.scaruffi.com/politics/oil.html].
** Late 1990s [http://www.gravmag.com/oil2.html].

Table 7

OAO Gazprom in Figures (2002)

■ Gas reserves	28,800 billion cu m
■ Share of world gas reserves	17.9%
■ Gas production	540 billion cu m
■ Pipeline system	about 150,000 km
■ Exports	
— Europe	134 billion cu m
— CIS + Baltic states	45 billion cu m
■ E.ON Ruhrgas interest	6.4%
■ Market value	USD 40-60 bn

Source: E.ON Ruhrgas.

Algeria (1969), Nigeria (1971), Ecuador (1973- left in 1992) and Gabon (1975-1994). Saudi Arabia is seen as the dominant country in the organization.

The total production of OPEC countries represents about 40% of the world's crude oil. The OPEC Member countries coordinate their oil production policies in order to help stabilize the oil market and to help oil producers achieve a reasonable rate of return on their investments. OPEC decisions regarding oil export quotas of members influence the price of oil. However, quotas agreements are not always strictly followed by members. In that respect, it is worth observing that countries like Nigeria and Venezuela are confronted with high external debts for which regular payments are requested.

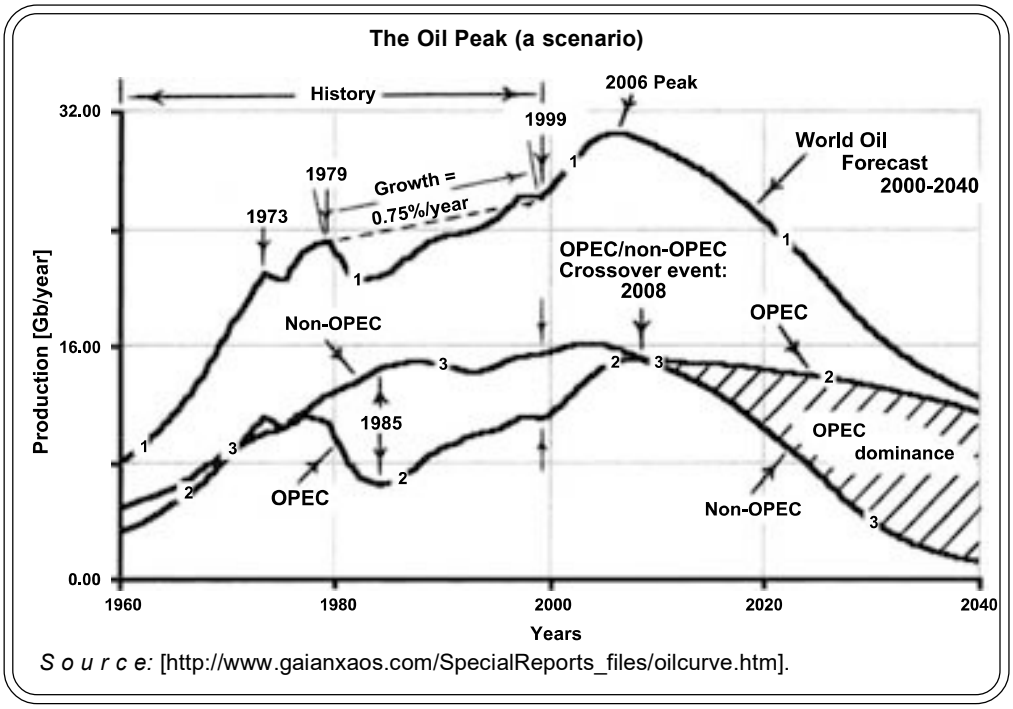
Considering gas, a collusive behavior between Russia and other major gas producers, creating a gas OPEC, must not be excluded, which should have an impact on the long-term price of gas, favoring exporting counties.

Future tendencies

There seems to be contradicting views about the future of oil. According to the *World Energy Outlook 2004* published by the International Energy Agency, world reliance on oil should increase sharply as the energy demand will increase by 60% over the next 25 to 30 years. Thus, oil shall remain the single largest fuel even if the role of natural gas shall continue to grow. According to the *Outlook*, the so-called "oil peak" should be observed in 2030.[5] Overall, fossil oil will continue to dominate global energy use accounting for some 85% of the increase in world primary demand.

For the sake of illustrating the oil peak idea, the scenario depicted in Fig. 2 is very pessimistic as the world oil production should start declining before the end of the current decade. Somehow

Figure 2



Source: [http://www.gaianxaos.com/SpecialReports_files/oilcurve.htm].

[5] Oil experts depict the world production of oil by an "inverted U-curve," called the "Hubbert's Curve." The U.S. geophysicist M. King Hubbert proposed a mathematical model to predict the rate of oil production and subsequent depletion of oil fields (see: M. King Hubbert, "Energy from Fossil Fuels," *Science*, Vol. 109, 4 February, 1949, pp. 103-109).

less pessimistic analysts assume that the world production of oil could reach a peak by 2015 the latest as the Middle East may not be able to compensate for the declining production of oil in other regions.[6]

Whatever the exact date of the oil peak, drastic adjustments will be required to cope with the new situation. Higher prices for oil should stimulate sector-specific investments, possibly leading to the discovery of new fields and a more efficient use of old ones, raising recovery rates; it shall also reduce the demand for oil, promote energy efficiency and the use of substitutes, mainly gas. Renewable sources of energy should gain in importance as well as hydrogen that is already used to propel rockets and has a limited impact on the environment.

Security dimensions

The key-features of energy markets, especially for oil and gas, have security implications:

- Considering the growing demand for energy, competition and rivalry among nations for accessing and controlling energy resources should be expected to increase significantly, especially when access to new energy resources takes time and requires investments.
- The high price of energy products already reflects the growing competition among energy consumers and the fact that oil reserves are limited.
- Oil price fluctuations indicate the need for a more stable or, at least, a more predictable environment in terms of price levels.
- Tensions on energy markets are exacerbated by the geographical concentration of oil and gas reserves on countries and regions seen as risky, potentially unstable or unfriendly.
- In such a context, it is worth monitoring the behavior of major (Eastern and Western, Northern and Southern) companies involved in the energy sector, particularly lobbying activities, and assessing their leverage on political decisions, including those that eventually lead to direct interventions in foreign countries and the funding of terrorism.
- The activities and decisions of OPEC have also security dimensions as they influence the supply and the price of oil.
- In addition, it should be noted that conflicts in the Middle East could stimulate energy producers to better secure their territories to raise the cost of foreign military intervention, which may lead to additional defense expenditures, making the world more insecure.

I.2. Energy and Economic Development

The energy sector as the engine of growth and development

Considering history, dramatic economic changes were often associated with the introduction of new technologies to use and produce energy (see steam engine, dynamo, explosion engine, etc.). Energy is essential for economic growth and development, for both consumers and producers, which explains the increase of the share of developing countries in total energy consumption. This is particularly true for China and India that are significant developing countries in terms of population, economic weight and needs to satisfy. The demand for energy and related policies of these two major countries shall

[6] "Conservative (for which read pessimistic) analysts say global oil production from all possible sources, including shale, bitumen and deep-water wells, will peak at around 2015 at about 90 million bpd, allowing a fairly modest increase in consumption" (A. Kirby, "When the Last Oil Well Runs Dry," BBC website, 19 April, 2004).

have important implications on international relations, peaceful competition, tensions among nations and eventually conflict.

Huge needs unsatisfied

Poverty, low income and the lack of infrastructure imply that access to energy products is difficult for large segments of the population living in developing countries. In 2002, about 1.6 billion people, i.e. one fourth of the world population, were without electricity. That figure should decline by only 0.2 billion by 2030 according to experts. The number of people relying exclusively on biomass energy is also expected to increase, from 2.4 billion in 2002 to 2.6 billion in 2030, overreaching sustainable levels.[7]

"Dutch disease"

For some transition and developing countries, excessive exports of energy products (mainly oil and gas) may lead to so-called "Dutch diseases." High exports of energy products may lead to large trade and current account surpluses that can cause a real appreciation of the domestic currency and, as a result, decrease the competitiveness of non-energy sectors (e.g. manufacturing and services). Thus, the "Dutch disease" corresponds to the decline of manufacturing (or dis-industrialization), which often contributes to higher unemployment and lower incomes. Scholars perceive Russia and Kazakhstan as Dutch disease cases.[8]

Terms-of-trade risks

A high concentration of exports or imports on energy products may also increase the adverse impact of significant terms-of-trade (= price of exports/price of imports) changes on the domestic economy and the external balance for both energy exporters and importers.

In the short term, terms-of-trade may change significantly and unpredictably, particularly when exports and imports are concentrated on a few products, including energy ones. According to the evidence, within a year, fluctuations can easily reach 15 percent. In the long run, energy prices shall rise, creating additional adjustment pressures on countries that are energy importers whereas the position of energy exporting countries should improve.

The debt problems of major oil exporters such as Mexico, Nigeria and Venezuela are largely attributed to oil price changes and terms-of-trade fluctuations, macroeconomic and exchange rates mismanagement, poor governance, corrupted practices and capital flights.[9] In addition, oil related terms-of-trade deteriorations created significant current account deficits and debts for energy importing countries like, for instance, Brazil.

Energy rents, wealth and income distribution

Oil and gas production may lead to very high rents and an excessive concentration of wealth and power in a few hands and, subsequently, correspond to opaque institutions, corrupted behaviors and large inequalities. High-ranked civil servants and political leaders may take control over energy resources and capture significant shares of export revenues. This can lead to huge amounts of capital flight, which reduces re-investment in the domestic economy. This can also delay political reforms

[7] For more detail, see: International Energy Agency, *World Energy Outlook 2004*.

[8] See: M. Bernstam, A. Rabushka, "The Dutch Disease: Peter the Great's Real Legacy," Hoover Institutions, Public Policy Inquiry, 20 June, 2001; A. Cohen, "Confronting Kazakhstan Dutch Disease," *Central Asia-Caucasus Analyst*, Johns Hopkins University, Central Asia Caucasus Institute, Wednesday/26 March, 2003.

[9] Most often, an improvement of the terms-of-trade caused by higher oil prices first led to impressive surpluses, followed by large borrowings and growing indebtednesses, which became unbearable burdens when the oil price started declining, leading to so-called "debt traps," namely situations where new borrowings are needed to repay old ones.

aiming at more democracy, transparency, rule-of-law and human rights. Vested interests, in particular powerful oil companies, based in high-income energy consumer/importer countries may contribute to these negative features.

Achieving sustainable development

One of the major challenges for both developed and developing countries is achieving sustainable development. Economic growth should not have detrimental impacts on the natural environment, undermining the prospects of a better life for the future generations. As indicated by the World Summit on Sustainable Development (Johannesburg, 2002), the U.N. *Agenda 21* and apparent (often irreversible) environmental degradation, mainstream supplies of energy are not sustainable given current levels of energy consumption.

I.3. Environmental Aspects of Energy

Impacts of energy on the environment

The direct and indirect impacts of energy on the environment may correspond to: a degradation of the ecological balance and the loss of biodiversity, a deterioration of health conditions for human beings, a lowering of the quantity and quality of water, undermining economic activities and lowering living standards, etc. These impacts can be local, transboundary, regional and global. They can trigger tensions and even conflicts within and between countries.

Energy and pollution

CO_2 emissions caused by the use of carbon fuels (oil, gas and coal) are the main factor contributing to global warming and climate changes. Climate change in turn affects ecological systems and may contribute to increased land degradation, water stress and desertification as well as an increase in dramatic weather changes and related natural disasters. Industrial countries are responsible for most emissions, however developing giants like China and India are rapidly reaching comparable emission levels.

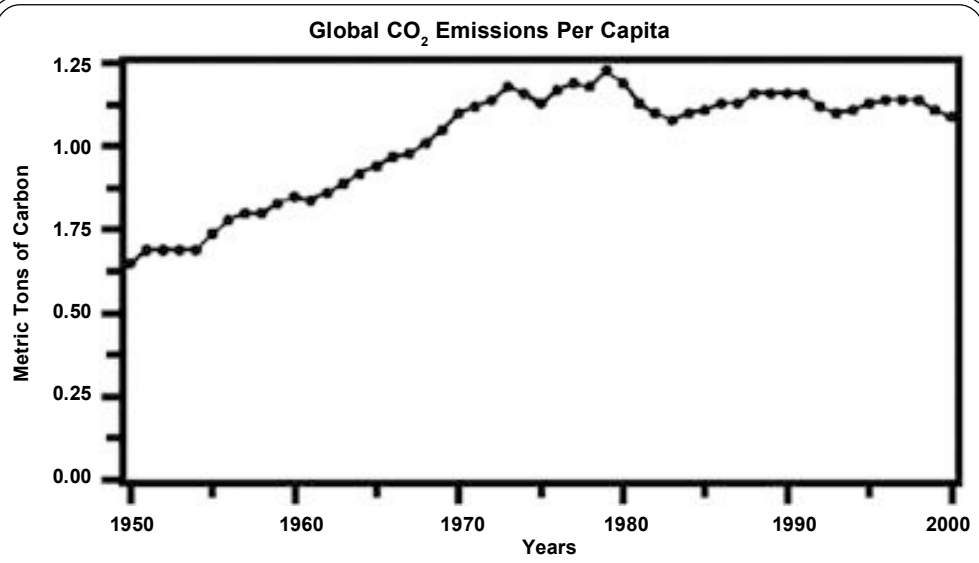
Despite the seeming stabilization of CO_2 emission per capita (see Fig. 3), all the projections from different sources reported in Fig. 4 indicate that CO_2 concentration in the atmosphere shall continue to increase over the next decades, with a predicted 60% rise in climate destabilizing emissions, most of it from cars, trucks and power stations. Two thirds of the increase will come from developing countries. Besides CO_2 emissions and other types of energy and economic activity-related pollutions, the transportation and the storage of energy products are potential sources of environmental hazards.

In some countries and regions, the production of hydro-electricity may compete with the use of water for agricultural production, including food crops, creating tensions between up-stream and down-stream users. Moreover, unsustainable use of biomass energy may lead to deforestation and, as result, contribute to water stress, erosion and desertification in some countries.

The case of nuclear energy

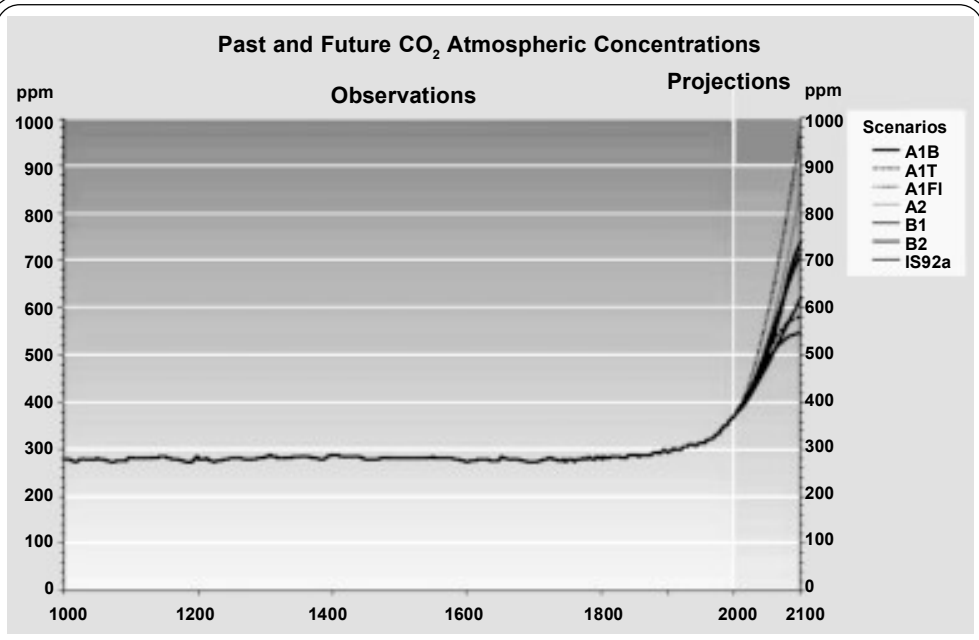
Nuclear energy does not significantly contribute to CO_2 emissions. However, in the case of nuclear power, there is a risk of radiation and contamination. Technical failures and human mistakes may cause disasters like the Chernobyl one. Also, nuclear wastes are a source of concerns. The closure of nuclear power stations leaves a legacy of environmental inconvenience for which mainly future generations shall be responsible. Besides, nuclear technologies can serve both civilian and military uses, which may increase so-called "proliferation risks" ("dirty" and "clean" bombs), stimulate costly arms races and increase material damages and direct and indirect losses of human lives in case of war.

Figure 3



Source: Carbon Dioxide Information Analysis Center [http://cdiac.esd.ornl.gov/trends/emis/glo.htm].

Figure 4



Source: IPCC Third Assessment Report—Synthesis Report [http://carto.eu.org/article2546.html].

I.4. The Threat of Terrorism

Terrorism is seen as one of the major threats to security and stability. As indicated by "9/11" the costs of terrorism can be tremendous. Recent analyses indicate that these costs can still increase with the use of so-called "weapons of mass destruction" and the damaging of vital installations and infrastructures.

Considering energy, terrorism is already impeding a full recovery of oil production in the Middle East. Worse can be expected as Osama bin Laden and his followers are calling on fighters to disrupt oil supplies.[10] Some maritime and land routes for energy transportation are also considered as insecure because of terrorism. Terrorists could target nuclear power stations and related facilities.

Another possible linkage between terrorism and energy is the funding of terrorist activities with incomes from oil exports. The media reported that relatives of high ranked Saudi officials provided financial support to some of the terrorists involved in "9/11", a sensitive issue indeed.[11] The role of Islamic charities (and the rather opaque banking system) funded by the Saudis was also mentioned.

II. Addressing Energy and Security-Related Threats and Challenges

Strategies have been developed to address energy and security-related threats and challenges. They correspond to national responses that combine public and private initiatives for which market-based incentives are essential.

International cooperation, including the role of international organizations and financial institutions, and legal instruments are also important to address energy and security issues, promote scientific research and support investments, mitigate risks of tensions and prevent possible conflicts between countries.

II.1. Components of Energy Security Policies

Scope of energy security

From a pragmatic perspective, we shall assume that energy security is a multifaceted concept that relates to many issues, including access to resources, the safety of transportation routes, the availability of storage facilities and strategic reserves, the stability and the predictability of prices, the reduction and prevention of environmental damages, etc.[12]

Addressing the various aspects of energy security requires considerable investments in research, equipment and infrastructures. New economically profitable technologies must be developed, as

[10] See: M. Fahmi, "Saudi Al Qaeda Urges Attacks on Oil Facilities," *Reuters*, 19 December, 2004.

[11] See: J. Risen, "Report Traces Ties of Saudi Ambassador's Wife to Hijackers," *International Herald Tribune*, 28 July, 2003.

[12] A formal definition of energy security is provided by B. Barton *et al.*: "We define energy security as a condition in which a nation and all, or most, of its citizens and businesses have access to sufficient energy resources at reasonable prices for the foreseeable future free from serious risk of major disruption of service" ("Introduction" to *Energy Security—Managing Risk in a Dynamic Legal and Regulatory Environment*, Oxford University Press, 2004, p. 5). This definition precludes environmental aspects which are seen as important by other scholars and policy makers.

well as adequate regulations and efficient markets. Political will and some lobbying are also essential, for which civil society (NGOs), the private sector and public bodies have key-roles to play. International agreements, organizations and cooperation must also be perceived as key-elements of energy security.

Reducing external dependency

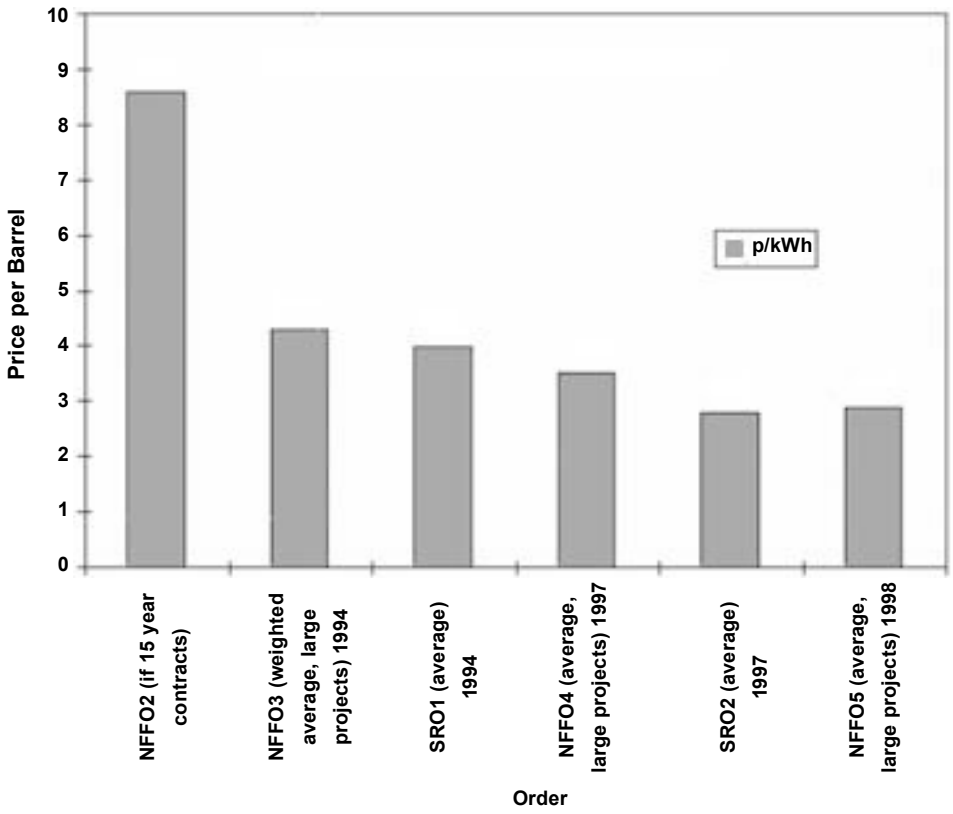
For any country or region, one important step to improve energy security is to reduce dependency on external/foreign supply of energy and diversify both nonrenewable and renewable energy sources.

The geographical diversification of imports of energy products helps diminish excessive reliance on a few suppliers located in specific/sensitive regions. The diversification of energy sources also supports the reduction of dependency on a few energy products such as oil and gas.

Adopting new energy technologies/techniques

New technologies can help the identification of new oil and gas fields and increase recovery rates of known fields that are already exploited. New technologies also matters for the better use of coal.

Figure 5



Source: British Wind Energy Association [http://www.bwea.com/ref/econ.html].

The adoption of new technologies also reduces the energy intensity of productive processes and outputs, and helps improve the environment.

Renewable energy

Another component of energy security is the more extensive use of renewable sources of energy. Hydro-electricity produced along rivers and sea coasts (using tide-power) is one source of renewable energy.

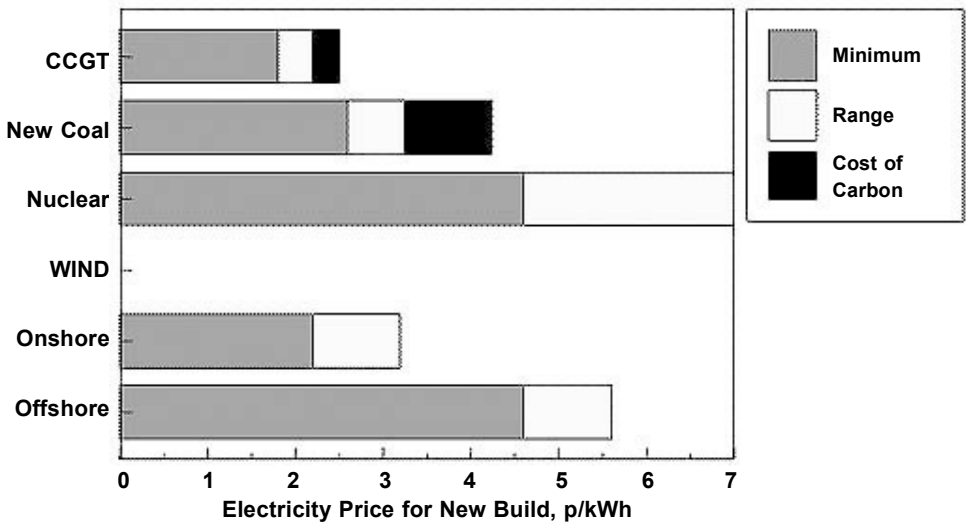
The evidence provided for the U.K. shows that wind electricity is also being generated at declining marginal and average costs because of the adoption of new technologies, making it economically more profitable and competitive (see Figs. 5 and 6). In other words, there should be growing incentives for adopting more environmental friendly technologies. In terms of potential, renewable energies could eventually provide most of the world's energy. However, cost-efficient capture and storage are still problematic.

Economic incentives

Development and access to the newest and most efficient technologies is a critical matter which requires adequate policies to promote R&D activities, stimulate investments and, for some countries, attract FDIs. For that reason, economic incentives are essential to involve private investors in new energy-related activities and projects. The pricing of energy must reflect scarcities and market conditions. Adequate prices can help contain the demand and stimulate economically rational behaviors.

In some countries, privatization should be seen as a key-policy measure to improve energy efficiency and achieve adequate levels of investments. In the case of privatization in the energy sector, social aspects have to be taken into account. The adoption of adequate legislation, specific regulations

Figure 6



Source: British Wind Energy Association [http://www.bwea.com/ref/econ.html].

and the use of economic incentives are important to improve the state of environment. The negative influence of specific lobbies in the energy sector should also be reduced.

Improving the environment

The development and the adoption of new technologies must take into account the need to improve the state of the environment and better preserve the ecological balance. Considering fossil fuels, CO_2 emissions must be further reduced and more steps should be taken to prepare for a shift to a lower carbon intensive energy future. Renewable sources of energy should also be favored as some of them have limited impacts on the environment. Measures should be adopted to reduce the use of wood in developing countries and develop sustainable forestry practices. Energy efficiency must be enhanced across all sectors, especially in carbon intensive ones.

Poverty reduction

Some new energy production technologies must also satisfy the needs of the most vulnerable segments of the population, particularly in low-income countries. In that respect, possible market failures may require an active role for public bodies with the support of the international community.

Trading economic development for emissions?

Many countries use environmental regulations and economic tools such as carbon taxes and tradable permits to take environmental externalities into account when designing national development strategies. According to some governments in both developing and developed countries, this harms competitiveness and hampers economic growth. However, innovation and technological breakthroughs can enhance energy efficiency and, thereby, lower costs. Increased productivity, backed by training and education could also create more jobs in the long run. Given the uncertainties surrounding global warming it might be prudent to take steps, i.e. so-called 'no regret' measures, which have environmental benefits at limited economic costs, and actually may have economic benefits.

Long-term contracts and investment guarantees

In some cases, long-term contracts with energy suppliers can raise energy security, assuming their full enforcement and penalties in case of violation. Investment guarantees should also be provided to companies that invest in the energy sector to limit the risks of expropriation and nationalization.

Averting the "Dutch disease" and terms-of-trade risks

In countries that are energy exporters, measures should be taken to reduce the risk of a Dutch disease. This may require some degree of interventionism with adequate fiscal instruments to avoid an excessive expansion of and reliance on the energy sector. There should also be incentives to invest the surpluses of the energy sector in other economic activities to support the diversification of the economic base and exports, taking into account WTO rules. The diversification of the economy and exports should reduce terms-of-trade risks.

Adopting energy security concepts, policies and strategies

Many countries have adopted energy security concepts that incorporate some of the elements mentioned above. The European Union, the U.S. and Japan designed such concepts and visions that allow for improving long-term energy strategies and policies.

Energy, democracy and good governance

In countries dominated by the energy sector, the diversification of domestic economic activities and the reduction of inequalities may require political changes aimed at providing more democracy.

This should improve the rule-of-law and allow for more transparency and good governance regarding the conduct of economic policy in all sectors, including energy. In that context, it is worth mentioning the initiative of U.K. Prime Minister Tony Blair to make the oil sector more transparent. Governments in developing and transition countries, oil companies and NGOs support the initiative.[13]

Addressing lobbying

Lobbying is a feature of modern societies. Elites, big companies and business associations are involved in activities that aim at influencing political circles with the adoption of special-interest legislation and the implementation of specific policies that, most often, should increase their incomes and wealth, strengthen their power and, as a possible outcome, limit the functioning and the scope of democratic rules.

In that context, oil lobbies are not exceptions. In specific cases, lobbying contradicts so-called "public and general interests." Thus, lobbying may delay the adoption of measures aiming at saving energy and improving the state of the environment; lobbying may lead to the adoption of foreign policies that could prove counterproductive in the long run.

Nevertheless, not all lobbying must be seen as negative. Considering the strategic importance of energy, tax cuts and other advantages could be justified when oil companies are investing in large prospection projects, for instance, in deep seas. The use of (renewable) wind energy is also promoted by associations in the U.S. and Europe and has been met with beneficial tax cuts and other incentives.

Fighting terrorism

The misuse of oil rents for funding terrorism and other illicit activities is addressed by various organizations, including the IMF and the U.N. Money laundering and the funding of terrorism is the special focus of the Financial Action Task Force hosted by the OECD. The FATF proposes recommendations that can help better identify and suppress banking and financial operations linked to terrorist activities.[14]

II.2. Energy, Security and International Cooperation

From tensions to cooperation

Energy can be a source of severe tensions between countries that can be mitigated through international cooperation. In addition, the negative impacts on the environment of energy-related activities have to be lessened, which requires international legal instruments. So-called "energy dialogs" between countries and regions can also be useful for reducing risks and stimulate FDIs in the energy sector, etc. In others words, challenges and threats related to energy create unique opportunities for strengthening positive linkages between countries and stimulate far-reaching initiatives.

International agreements and the environment

Several international treaties address energy-related issues. Most of these legal instruments aim at improving the state of the environment, including air and water quality. They aim at promoting sustainable development and improving the ecological balance.

One of the major documents is the *Kyoto Protocol* to the *U.N. Framework Convention on Climate Change* that has implications for CO_2 emissions and the well-being of future generations. The Russian Federation ratified the Protocol recently, making it effective as of 16 February, 2005.

[13] Information is provided on the website of DFID, the U.K. Department for International Development.
[14] See: [http://www1.oecd.org/fatf/].

Nevertheless, as indicated by the growing CO_2 concentration in the atmosphere, more is needed to address more effectively the causes and the consequences of climate change. Given their status in the Kyoto Protocol, more stringent conditions should be imposed on fast growing developing countries like China and India, and trade protectionism could be justified for environmental reasons when the exporting country does not meet specific environmental standards.

Energy Charter and MIGA

The "*Energy Charter*" process, that gained momentum in the early 1990s with the end of the Cold War, provides the broadest multilateral framework of rules in existence under international law governing energy cooperation. One key aspect of the EC is the provision of specific rules and guarantees for FDIs and strong commitments regarding the facilitation of energy transit. To date the Treaty has been signed or acceded to by fifty-one states plus the European Communities. It is a major pillar of East-West cooperation in the field of energy. However, Russia has not yet ratified the Treaty.[15]

Another interesting instrument for investment protection is provided by the Multilateral Investment Guarantee Agency (MIGA, of the World Bank) that offers insurance schemes to private companies willing to invest in developing countries, taking into account the impact on the economy, social conditions and the environment.

Energy dialogs and regional cooperation

Russian diplomats seem to favor the notion of so-called "energy dialogs." The Energy Charter Treaty is seen as a key-element and step in the energy dialog between Russia and the EU. Thus, before the creation of a common economic space between the two partners Russia should be first linked to the EU through the energy sector.[16] Some countries, like Japan, also support regional cooperation on energy issues.[17]

International organizations

Several international organizations are involved in energy matters. The shared goal of the 26 member countries of the *International Energy Agency* is to create the conditions for a better use of energy within the context of sustainable economic development. For that purpose, open markets, energy efficiency and environmental protection are seen as essential.

The U.N. based *International Atomic Energy Agency* is the world's center of nuclear cooperation and works for the safe, secure and peaceful use of nuclear technologies. Other U.N. bodies, such as for instance UNECE and UNEP, are involved in environmental, energy and sustainable development matters.

International financial institutions

Major financial institutions are working on energy issues. For instance, in December 2004, the IMF posted on its website the preliminary version of a *Guide on Resource Revenue Transparency* that "underscores that institutional strengthening and improved transparency can provide significant benefits to governments and taxpayers."

[15] For more detail, see the Energy Charter website [www.encharter.org]. Andrei Konoplyanik, who is Deputy Secretary-General of the Energy Charter, is former Deputy Minister of Fuel and Energy of Russia, which may indicate that his country may at some stage ratify the Treaty.

[16] The common economic space may possibly refer to the creation of a common market, with free trade for goods and services and the free movement of capital and labor (see: V.I. Voloshin, "EU-Russia Energy Dialogue," Russian-European Center for Economic Policy (RECEP), 12 October, 2004 [www.recep.ru]).

[17] See, for instance: K. Koyema, "Energy Security and Regional Cooperation in Asia," *IEEJ/KEEI/OPEC Secretariat Joint Meeting,* 27 November, 2003 [http://eneken.ieej.or.jp/en/data/pdf/228.pdf].

On its side, the *World Bank Energy Program* concentrates on issues that are important for economic and social development such as the delivery of modern energy services to the poor, private and public sector roles in the delivery of electricity services, power sector infrastructures with particular focus on networks, renewable energy. The *European Bank* (EBRD) operations for the energy sector cover conservation, transportation and consumption. It also includes power generation, transmission, and distribution.

International NGOs

The *World Energy Council* and the *World Council for Renewable Energy* are also relevant non-governmental institutions in the field of energy. WEC is 80-year-old and has member committees in 90 countries. It provides services to members, makes forecasts and publishes authoritative studies on energy issues, taking into account economic, social, environmental, R&D and technology dimensions. The WCRE was created in 2001 in Berlin to promote environmentally friendly energy.[18]

Associations

National and international associations have been created to study and promote specific energy aspects. The U.S. based *International Association for Energy Economics* supports research and academic activities. It publishes the *Energy Journal*. The *Association for the Study of Peak Oil and Gas* concentrates on the issue of depletion, which matters for economic stability and security.

In Conclusion

- Linkages between energy and security are manifold and complex. Market features (supply, demand, reserve, geography, trends) are *de facto* sources of international tensions and conflict prone.
- In terms of economic development, huge energy needs will remain unsatisfied for decades, contributing to poverty conditions. Developing and transition countries that benefit from generous energy resource endowments are also exhibiting distorted economic structures (Dutch disease) and high levels of corruption.
- The energy sector is a source of environmental concerns such as CO_2 concentration which shall continue to increase significantly and severely impact on global warming, contributing to water stress in some regions and flooding in others. Reliance on nuclear energy is also seen as risky and leaves a legacy of burdens to future generations. The threat of terrorism is darkening the already bleak picture.
- Synergies may emerge when reacting to energy challenges and threats. For instance, relying on renewable sources of energy (e.g. wind and hydro-power) reduces external dependency, does not contribute to climate change and may possibly reduce energy costs in the long run.
- The interests of energy exporters and importers do not necessarily conflict. Reducing reliance on energy should help save energy resources in all countries, postponing the date of both oil and gas peaks. Thus, for some countries, lower energy exports could allow to rebalance and diversify economic structures while, at the same time, stimulate the adoption of renewable energy in importing countries.

[18] The foundation document underlines "the fact that the global energy demand is increasing faster than the introduction of renewable energy; (moreover) the comprehensive impacts, climate hazards, burdens to the environment, risk of accidents, conflicts around exhausting resources have caused an urgent need to replace nuclear and fossil energy by renewable ones and focus new investments on renewable energy and energy efficiency" (see: [http://www.world-council-for-renewable-energy.org/index.html]).

- There seems to be common interests between Russian (and other CIS) oligarchs, Saudi leaders and Western oil companies. For these groups, reliance on traditional non-renewable energy sources provides incomes (rents, royalties and profits), wealth and influence. These groups shall continue to impact on energy policies.
- Energy security concepts and strategies have been developed to address related threats and challenges. Efficiency and sustainable development are key-components of these strategies. However, taking for instance into account expected climate changes, much more might be needed to avoid environmental disasters. In addition, the energy sector should be made more transparent by addressing convincingly related corruption and negative aspects of lobbying.
- Considering the existence of major legal instruments and the work of international bodies, organizations and financial institutions, the international community is not ill-equipped to address energy issues, diffuse tensions and improve the situation in countries, regions and globally, East and West, North and South. However, here also, the picture is rather complex and there might be coherence and coordination problems for which there could be a case for genuine "global governance," relying on the U.N. system and cooperation with regional security organizations.
- Taking into account international financial institutions, the IMF has certainly a key-role to play to improve the taxation of the energy sector, making it more transparent, which supports PM T. Blair's oil sector initiative. The World Bank must continue to help developing countries to improve their energy sector, taking into account specific social needs. The EBRD provides loans to enhance the energy sector in CIS countries. Other regional financial institutions do the same in other countries.
- Giving more importance to international organizations in the field of energy and related issues such as *inter alia* development, good governance, the environment and the safety of transportation and transit routes could require the mobilization of additional financial, material and human resources that would be seen as long-term investments for the sake of energy security and peace.