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GLOBAL ASPECTS AND A POSSIBLE CONTENT OF A COMMON EUROPEAN ENERGY POLICY

Many people say that the European Union needs to create a common energy policy. However, only a few of them gives details about its content. In this paper, we examine the global, long term aspects of the European energy situation. We base our proposals for the content of the common energy policy of the EU on the conclusions drawn from this analysis. According to our findings a common energy policy should incorporate foreign policy (including climate change diplomacy), educational policy, R&D policy and setting strict rules for building related energy consumption.
JEL: Q48

Introduction

Many politicians say that the European Union needs a common energy policy. However, only a few of them is aware of its necessary contents and its global linkages and background. Having experienced some natural gas supply troubles and disputes between the Russian gas monopoly, Gazprom and Ukraine or Belarus, one most recently, at the beginning of 2009 between Russia and Ukraine, they argue that Europe needs to reduce its energy (most importantly natural gas) dependency from Russia through building gas pipelines to be filled with non-Russian gas or pipelines bypassing recent transit countries like Ukraine or Belarus. Another argument for creating a common energy policy is the need for a strong bargaining position of the EU against big energy suppliers, mostly Russia.

In this paper we try to give a picture about the necessary linkages, possibilities and background which should inevitably be taken into account when considering the creation of a common energy policy for the European Union.

As energy sector is a very stable and slowly changing sector, with a need of huge investments and long return on investment we are examining changes and possibilities emerging on the long term, mostly in the next 20-50 years.

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Firstly, we examine the global demand and supply situation for the most important fossil fuels, crude oil and natural gas. Secondly, we deal with its implications for Europe. Next, we give some suggestions for the possible content of a European energy policy. Fourthly, we deal with the global linkages of the climate change efforts made by the European Union. The final section concludes.

Long term demand and supply of the main energy resources

To be able to judge the conditions for the European energy policy, first of all we need to know the global and the European demand and supply prospects. We need to know this as these are the circumstances under which the European energy sector has to operate, these data show whether Europe will need more crude oil or natural gas in 20-50 years time and whether there will be resources available at that time. This analysis may indicate how fierce the competition for these resources will be and to what extent we may be forced to switch to the use of other energy sources like renewable ones. We don't need an exact projection of supply and demand, and this is not the goal of the current paper, we only need to know to which direction global demand and supply is going to move and whether it is expected to result in an increase of the European energy dependence.

Demand

Global demand for energy has increased for several centuries. There might have been some slight valleys in the demand curve, especially during global economic repressions, but on the average demand for crude oil and natural gas has been steadily increasing. In the last 2-3 decades one tendency has strengthened, namely the catch-up of developing countries in terms of energy consumption. Developing countries, especially China and India, keep increasing their share in the global energy demand. In Figure I below there are two important changes deserving attention. First, the increase in the total global demand amounts to 73% between 1973 and 2006. Second, the share of OECD countries dropped from 60.6% in 1973 to 47.3% in 2006. Asia, China, Latin America, Africa and the Middle East together almost doubled their share (from 22.8% to 41.5%), which is an increase of energy consumption of 215% during 33 years (on average 3.5% yearly). A huge increase, especially in comparison to the relevant data for OECD countries: an increase of 35% over 33 years (on average 0.9% yearly).

Obviously, past tendencies don't determine future developments. To project future developments let us have a look on the factors determining energy demand:

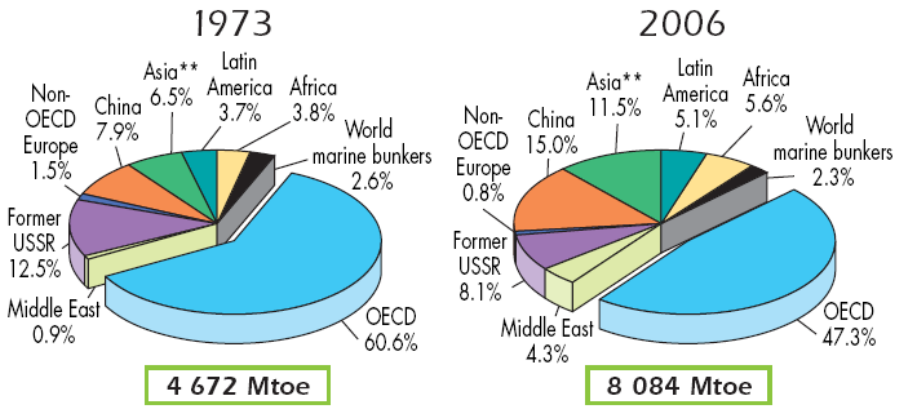
- World population: high growth rates especially in developing countries like China, India, Middle Eastern, African and Latin American countries. Developed world: rather stagnating or slightly shrinking population.

- Growth of per capita income: moderate rates for developed countries, higher rates for China, India, Russia and some other developing countries.

- Transport sector: characterized by the number of automobiles per 1000 people (transport sector accounts for 60.5% of the total oil consumption[2]), see fig. 2.

Figure 1

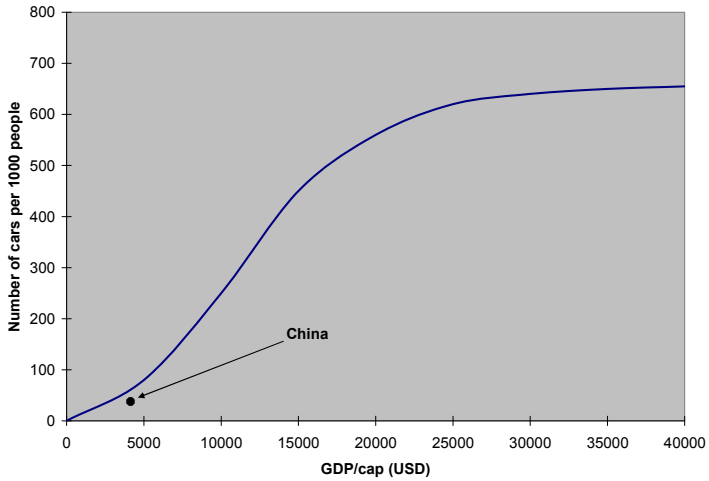
1973 and 2006 regional shares of total final energy consumption



** Asia excludes China
Source: graph taken from IEA: Key World Energy Statistics 2008, p. 30.

Figure 2

Number of automobiles per 1000 people



Source: presentation of László Varró, Strategic director of the Hungarian oil and gas company MOL Zrt., given on 2nd December 2008 in Budapest. This figure is only an approximate copy of the figure projected by László Varró, exact data of the original figure aren't available for the author of this paper.

[2] Source: IEA: Key World Energy Statistics 2008, p. 33

This figure refers to the crude oil consumed only in the transport sector. According to this we can expect a strong increase in the number of automobiles sold in the developing world, including China and India, therefore we can expect a strong growth in crude oil consumption in these countries.

- Industry: several industrial sectors are exposed to a global competition therefore adoption of energy saving technologies is crucial for these sectors. The increase of industrial energy consumption is expected to stay moderate.

- Households (space heating in buildings): through the increase of the world population and the ongoing individualization tendencies (fewer and fewer big families living together in one household and building) further increase is expected.

Figure 3

Energy consumption in the industry sector, in Mtoe

	World			**OECD**			**Non-OECD**		
	1973	2006	Change (1973 = 100)	1973	2006	Change (1973 = 100)	1973	2006	Change (1973 = 100)
Industry sector	1545	2180	141.10	955	866	90.68	590	1314	222.71

Source: IEA: Key World Energy Statistics 2008, p. 36-39, own calculations

Implications from the demand side

Most probably, all these tendencies continue to increase global energy consumption on the long run.

Population and per capita income developments (high growth rates in the developing world) and transport sector developments aren't expected to change their directions which implies that developing countries are expected to keep increasing their shares in the global energy consumption.

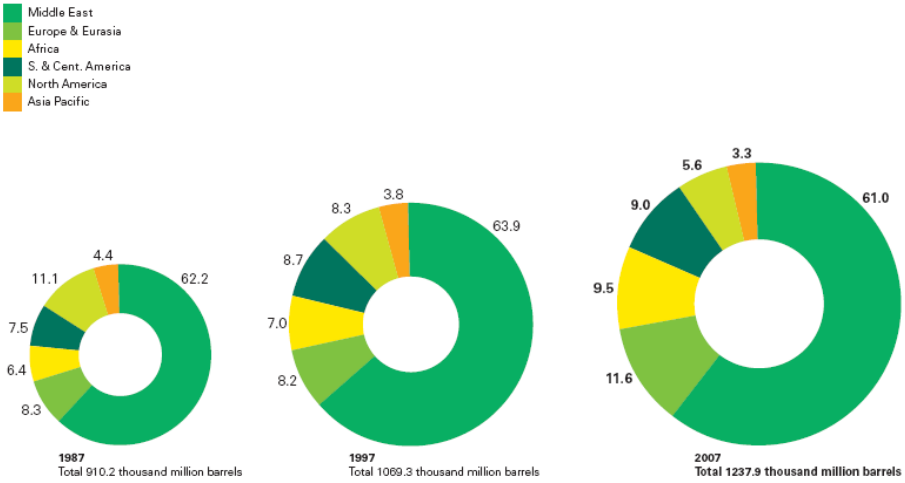
Supply

When considering the long term supply side conditions for Europe we need to know where we may expect to get the most important energy sources from in the future, namely crude oil, natural gas and coal. To know this, we need to have a look at the proved reserves of these resources.

Regarding crude oil reserves, the European Union is expected to rely on crude oil mostly from countries outside its borders, most probably from the Middle East and/or South and Central America. Current extraction data justify this assumption as North Sea oil fields supply less and less each year.

Figure 4

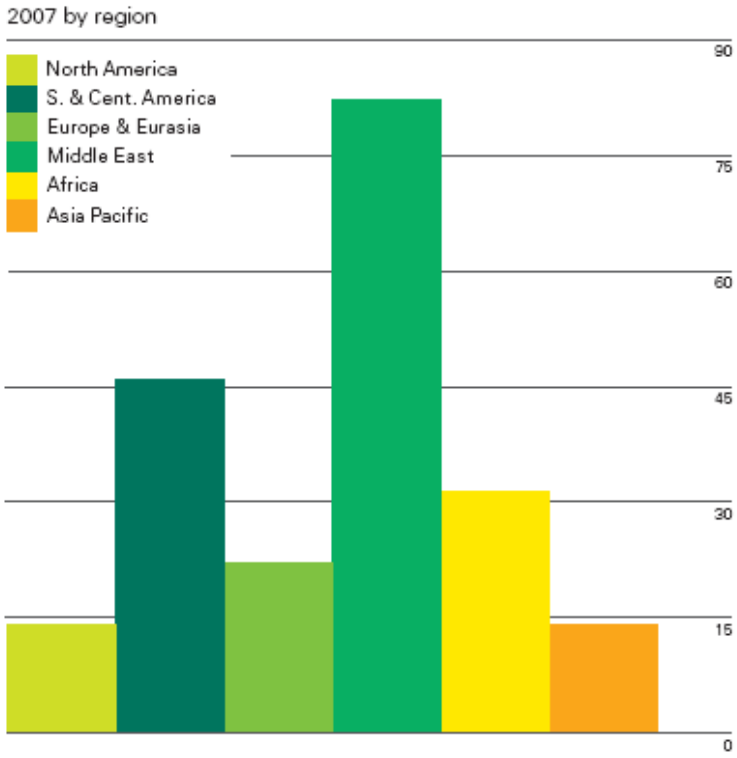
Distribution of proved oil reserves in 1987, 1997 and at the end of 2007, %



Source: BP Statistical Review of World Energy, June 2008, p. 7

Figure 5

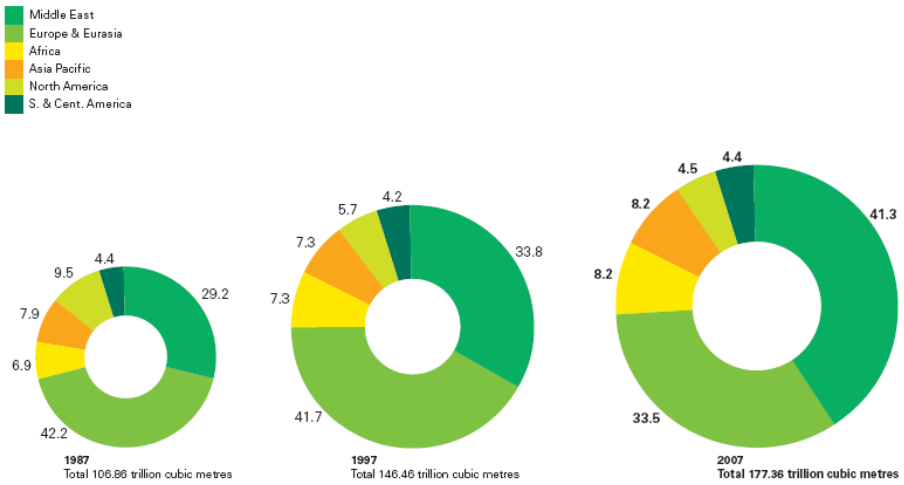
Reserves-to-production ratios by region in 2007, crude oil, years



Source: BP Statistical Review of World Energy, June 2008, p. 10

Figure 6

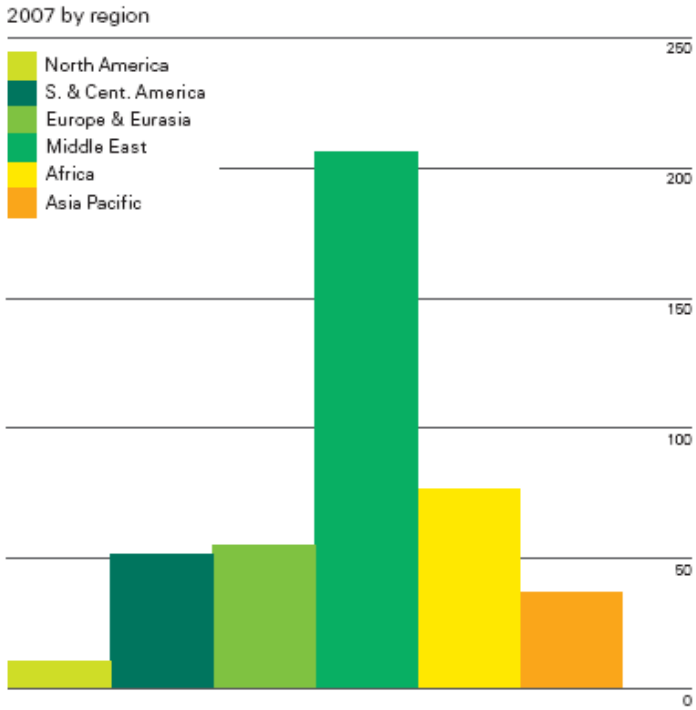
Distribution of proved natural gas reserves in 1987, 1997 and at the end of 2007, %



Source: BP Statistical Review of World Energy, June 2008, p. 23

Figure 7

Reserves-to-production ratios by region in 2007, natural gas, years



Source: BP Statistical Review of World Energy, June 2008, p. 26

Regarding natural gas, the European Union will be forced to fulfill its natural gas needs to an increasing extent from abroad as its gas fields' yields are expected to decline in the upcoming years. As "European and Eurasian" sources mean mostly Russian sources, the EU itself can't avoid doing business with its most important natural gas supplier, Russia. Moreover, as natural gas is preferably transported via pipelines, to only a smaller extent via ships as LNG, and EU production is declining while EU demand is steadily increasing, pipelines are crucial for satisfying the EU needs for natural gas. According to the figures above, these pipelines must transport natural gas either from Russia/former Soviet Union countries or from the Middle East. However, if the conditions/tendencies mentioned before happen to change, new pipelines may happen to be unnecessary.

Figure 8

Distribution of proved coal reserves in 1987, 1997 and at the end of 2007, %

Proved reserves at end 2007 Million tonnes		Anthracite and bituminous	Sub-bituminous and lignite	Total	Share of total, %	Reserves / production ratio (years)
US		112261	130460	**242721**	28.6	234
Total North America		**116592**	**133918**	**250510**	**29.6**	**224**
Total South & Central America		**7229**	**9047**	**16276**	**1.9**	**188**
Kazakhstan		28170	3130	**31300**	3.7	332
Russian Federation		49088	107922	**157010**	18.5	500
Ukraine		15351	18522	**33873**	4.0	444
Total Europe & Eurasia		**102042**	**170204**	**272246**	**32.1**	**224**
South Africa		48000	–	**48000**	5.7	178
Middle East		1386	–	**1386**	0.2	*
Total Middle East & Africa		**50817**	**174**	**50991**	**6.0**	**186**
Australia		37100	39500	**76600**	9.0	194
China		62200	52300	**114500**	13.5	45
India		52240	4258	**56498**	6.7	118
Total Asia Pacific		**154216**	**103249**	**257465**	**30.4**	**70**
TOTAL WORLD		**430896**	**416592**	**847488**	**100.0**	**133**
of which:	European Union	8427	21143	**29570**	3.5	50
	OECD	162490	194420	**356910**	42.1	168
	Former Soviet Union	93609	132386	**225995**	26.7	463
	Other EMEs	174797	89786	**264583**	31.2	70

Source: BP Statistical Review of World Energy, June 2008, p. 32; EMEs = emerging economies.

As this table makes it clear, proved coal reserves are far more equally distributed on Earth than either crude oil or natural gas. In spite of this fact, the EU is not even with this energy source very well supplied. If production is kept unchanged, reserves will last 50 more years.

Implications for the European energy situation

During the next decades competition for energy sources is going to strengthen. It is explained by not only the new global players, such as China and India, but by a decline of the available traditional energy resources, as well. Extraction of fossil fuels will become more expansive, it will require more developed technologies for getting these resources out of the ground. Increased demand is going to face a declining or at much higher costs extractable supply which is going to lead to higher energy prices, and to the spread of higher inflation rates induced by higher production/transportation costs. For monetary authorities this kind of inflation, namely cost side inflation is difficult to handle with, interest rate increases keep back demand and investments, therefore economic growth unnecessarily.

Clash of different countries for the same energy resources is going to increase tension between different regions/countries of the world. An early form of appearance of this is already currently observable in Africa and South and Central America. China cultivates fruitful relationships with countries which suffer from the embargo of the Western countries (e.g. Sudan) or aren't considered as members of the friendly states such as Venezuela, Cuba or Iran. In exchange for loans and other financial aids Western countries often require efforts from the African countries, such as building hospitals, cutting back government expenditure, spending more on the health and educational system, efforts to strengthen democratic values and protect human rights etc. China, however, turns a blind eye to the oppression by dictators or human right infringements and supplies these countries with cheap loans or other financial help in exchange of only natural resources[3]. With this activity China undermines the development policy of the European Union and the USA which may lead to conflicts between the Far-Eastern giant and the Western world. This may lead to a need of rethinking of Western development policies towards the third world.

Another region important for energy supplies is the Middle East. As the figures about the distribution of proved oil and natural gas reserves make it clear, on the long run we must rely on Middle Eastern countries as energy suppliers. Currently, few would say that diversifying our energy supplies to Iran or Iraq would increase the supply security of energy resources for Europe. Instability in Iraq, war between Israel and Hamas in the Gasa Strip started on 27th December 2008 and the supposed nuclear program of Iran make the whole area instable and insecure as suppliers. Going to the North, to Middle Asia we face an unresolved legal status of the Caspian Sea, a forward pushing Russia buying up all the oil and natural gas resources possible in the former Soviet Union countries. Further, we see an unsolved conflict between Russia and Georgia.

[3] See: Hugyecz, A. Kína: nyersanyag- és energiapiacok, Együttműködési és konfliktusmezők hazánk számára. [China: commodity and energy markets, Potential cooperation and conflict fields for Hungary] Budapest, Institute for World Economics, Hungarian Academy of Sciences – Prime Minister's Office, 2008.

In this respect, the possible common energy policy of the EU is far more foreign policy. First, we should solve the problems of the Middle East and come to an understanding with Russia, which, by the way, has always, even during the cold war, been a stable and reliable supplier of energy resources to Europe. The gas disputes and gas delivery difficulties in 2006, 2007 and most recently at the beginning of 2009 aren't manifestations of an unreliable Russian supplier, but rather consequences of the reluctance (and perhaps ability) of Ukraine to pay market prices for the Russian gas.

Anyway, if things continue to happen the same way, on the long run there won't be other alternatives for Europe than to buy natural gas and crude oil from Russia, the Middle Asian and Middle Eastern region.

As the European demand for these resources increases and other possible suppliers can't fulfill the EU needs, the EU's energy dependence on countries mentioned above is going to increase.

Possible ways to go for the European common energy policy

Demand

Europe can't increase the stock of its fossil energy sources. It therefore has to deal with energy consumption.

First of all, the EU has to force its member states to realize investments which are realizable at negative costs[4]. These include energy efficient technologies for households, using compact fluorescence bulbs, installing efficient furnaces and massive insulation for house walls. The EU has to set very strict rules and standards for energy efficiency of houses as technologies eliminating natural gas based heating systems are already available at reasonable costs. Such systems are geothermal heat pump systems or passive houses.[5]

In some countries of Europe, especially in Germany, Sweden and Austria, geothermal heat pumps are very popular. Currently, almost all new houses in Sweden are equipped with heat pump systems, therefore no natural gas is necessary for space and water heating. In some other countries, however, due to the lack of demand and supply prices for heat pumps are prohibitive. People simply don't know how heat pumps work, others (many) simply don't believe that one can produce 4-5.5 kWh heat energy by consuming only 1 kWh electricity.

[4] For such investments see for example: Novikova, Ürge-Vorsatz. Carbon Dioxide Mitigation Potential in the Hungarian Residential Sector. Budapest, October 2007, p. 3; McKinsey Global Institute. The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth. June 2008, p. 15.

[5] Passive houses are houses which due to the massive insulation of the walls, floors and the roof and thanks to special windows don't need a traditional heating system. Such houses are heated by the people living and electric devices operating in it.

As local governments consider setting so strict rules/standards as politically unfeasible, this must be the task of the European Union. EU subsidies must be available in countries where heat pumps don't appear on the market. A big market has to be established with many customers and more and more suppliers through which prices can drop to real market price levels.

Building standards have to be modified and have to become very strict. Buildings (including houses, commercial, public use and industrial ones), if once built, are going to use energy for at least the next 50 years. It's very cost efficient to include energy efficient solutions during the planning and building stage of a building. You can easily and at reasonable costs build houses using 60-70% less energy for space heating than houses with nationwide (see not only Hungary and other Central and Eastern European countries but Germany for instance, as well) average energy needs[6].

People living in the European Union have to contribute to a stop of increase of building related direct natural gas use (building related natural gas consumption is responsible for a big share of natural gas consumption in several European countries). People have to be explained that other technologies do exist, moreover, as most probably explanation won't have the necessary effect, they have to be forced to build houses with no direct natural gas consumption (heat pumps need electricity whose production to a certain extent is based on natural gas in several EU countries, that's why we say "direct natural gas consumption").

By the way, it's necessary to mention that natural gas consumption is in 17 EU member states more carbon dioxide intensive than electricity consumption. It also means that in 17 EU member states it would decrease the overall carbon dioxide emissions if we switched from natural gas consumption to electricity consumption. Moreover, it has to be mentioned that imposing carbon price on electricity producing power plants (see recently approved EU Climate Change Package) is going to increase electricity prices and therefore it is a disincentive for switching from natural gas use to electricity use in the EU, although such a switch would lead to a decline in the overall carbon dioxide emissions in 17 member states of the EU.[7]

Another area for creating strict standards is the consumption of electric devices used in households, mostly refrigerators. Strict standards for standby modes of such devices are necessary, as well.

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[6] The Hungarian residential sector needs on average 292.5 kWh/m2/year energy for space heating (Source: ÉMI Kht. [Institute for Building Related Quality Control and Innovation]). It can be reduced remarkably and at negative costs by insulating the walls massively. Through installing special windows you can reduce this value even further. Relevant standard for passive houses (with no heating required) is 15 kWh/m2/year (not achievable in case of houses already existing).

[7] See: Ellison, D. L., A. Hugyecz. Why (is there) No Carbon Price on Natural Gas?. Paper prepared for the Workshop on "Energy: A Cross-Cutting Influence on EU Widening and Deepening", CEPS, Brussels, November 12th 2008.

Banning traditional bulbs is the most cost efficient way of increasing energy efficiency in places where you need lightning.

The EU has to set strict standards for the fuel consumption of automobiles, as well. Automobile taxes should be based on carbon dioxide emission per km, these taxes should be high enough to mean a real incentive for buying less polluting cars and using public transport. On the long term, we will have no alternatives but for using electricity driven cars – not only because of depletion of current fuel sources but rather because of a need to mitigate climate change effects. Electric engines are far more efficient than internal combustion engines. The European research and development strategies must focus on the improvement of batteries, on the development of very efficient cars.

R&D investments will result in a developing environmental technology sector which will result in more jobs, increased export of goods and services originating from Europe and a global leading role of the environmental technology sector of the EU (insulation materials, renewable energy systems, energy and material saving technologies etc.)

Educational policy plays a crucial role in the behavior of the next generations regarding energy and material saving. The way of thinking has to be changed, environmental consciousness has to be improved. Reducing energy consumption resulting in a drop of standard of living is a wrong way to go. Only a few, environmentally very conscious people can be convinced that way.

Supply

Another way to reduce the energy dependence of the EU member states is a use of renewable technologies, such as hydro, wind, solar heat energy, solar photovoltaic (PV), geothermal energy and perhaps biomass. The most abundant sources are wind and solar energy (heat and PV). Solar heat energy is mostly used for warm water heating in households, for space heating it's used to a smaller extent.

Electricity generating systems, like wind energy or solar PV are popular and promising technologies. The biggest constraint against their spread is the integration of such power plants into the electricity systems. Electricity system operators often face difficulties in keeping electricity supply and demand balanced. Once great number of wind parks are in operation, whose electricity production keeps changing steadily and to a big extent, other very flexible, easily manageable power plants must be available in order to keep electricity supply and demand balanced. A storage of electricity in batteries is due to the great necessary storage facilities unfeasible but there is a suitable and commonly used technology, namely pumped storage power plants. They are capable of giving a very dynamic response to an excessive demand or supply in the electricity grid caused by either demand side fluctuations or by supply side changes due to wind speed fluctuations for example. Such pumped storage power plants can enable the integration of remarkable electricity producing capacities using renewable sources. Until recently, there has not been used any similar, so flexible, easily manageable, tried and tested technology with so small

environmental effects. Such pumped storage power stations have operated in several countries (e.g. France) with great success for several years.

It could be a task of the EU common energy policy to promote the building of such pumped storage systems therefore to overcome the integration problem of renewable technologies.

Cross-border connection of electricity grids of different EU member states is another urgent task. Small countries have to cooperate in balancing electricity demand and supply but they can manage it only if electricity grids are connected to each other. Smaller countries in Central and Eastern Europe like Austria, Bulgaria, the Czech Republic, Hungary, Romania, Slovakia and Slovenia have to create a really integrated electricity system. Such EU-wide grid developments should be promoted by the common energy policy, as well.

EU initiated building of natural gas storage facilities and the cross-border connection of gas pipelines would increase energy supply security of the individual member states.

As figures about proved energy reserves (oil, gas and coal) imply, the European Union can only rely on coal, as a locally available energy source for a longer time period. As climate change puts constraints on building traditional coal-fired power plants, we will be able to build them only if we develop carbon capture and storage (CCS) facilities for each coal-fired power plant. Such facilities aren't in operation yet, there are 13 demonstration projects being built in several countries of Europe. If this technology turns out to be a success, it can result in some relief regarding energy dependence.

Most importantly, the EU's common energy policy has to promote the creation of an electricity producing system which, first, enables the integration of the abundant renewable sources, second, results in an environmental friendly electricity production.

We are convinced that one can avoid building new nuclear power stations through installing electricity saving lightning systems and the production of electricity from renewable sources.

New nuclear technologies (e.g. fusion energy) are currently not available in industrial scale and won't be used in power stations until 2020. If it turns out to be environmental friendly and flexible, it can solve the electricity production difficulties for many decades. This is another argument for a need of promoting extensive R&D investments in the energy sector.

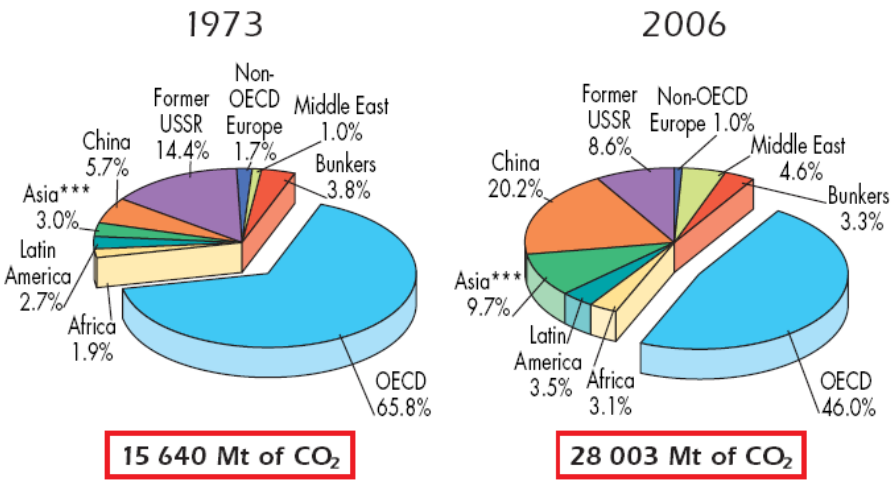
The global need for clean energy

The European Union makes remarkable efforts to (force its member states to) reduce its greenhouse gas (GHG) emissions and its energy consumption. The Climate

Change Package, approved in December 2008, is aimed at reducing the EU's GHG emission by 30% if other big GHG emitter countries commit themselves to a remarkable reduction of their GHG emission. As the EU-27 countries account for only a quite small share of global GHG emission, other countries with big GHG emissions should be convinced of sharing such efforts. Most urgently, the USA, China, India, Russia and Japan have to become members of a global climate change mitigation regime as in 2006 this 5 countries alone accounted for 55% of the total global CO2 emissions.[8]

Figure 9

1973 and 2006 regional shares of CO2 emissions**



** Calculated using the IEA's energy balances and the Revised 1996 IPCC guidelines. CO2 emissions are from fuel combustions only.
*** Asia excludes China.
Source: IEA: Key World Energy Statistics 2008, p. 45.

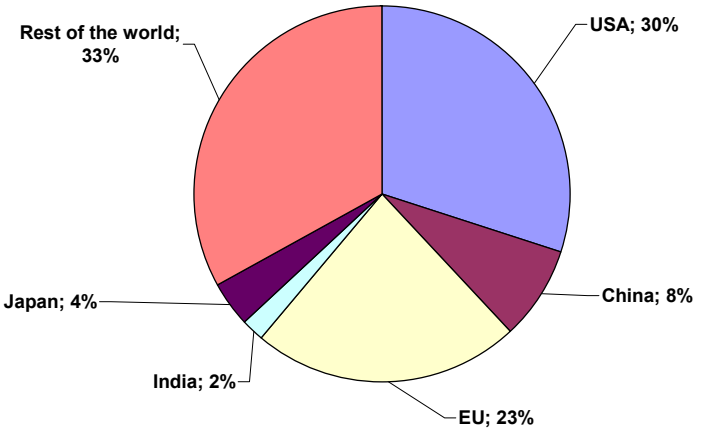
Developing countries are reluctant to commit themselves to a remarkable reduction of GHG emissions as they are convinced that this is not them who are responsible for the climate change but the developed world. If you add up the energy related CO2 emissions between 1900 and 2005 you'll see that their opinion is well-founded. China, for instance, accounts for only 8% of the total emissions.

Unfortunately, even if this argument is strong, big emerging economies can't avoid sharing climate change mitigation efforts as they are affected by climate related catastrophes and health diseases, as well. They might be right in their argumentation but it doesn't help to mitigate climate change effects.

[8] Source: IEA: Key World Energy Statistics 2008, p. 48-57, own calculations.

Figure 10

Cumulative, energy related CO2 emissions between 1900 and 2005



Source: International Energy Agency: World Energy Outlook 2007, China and India Insights, Paris, 2007, p. 191.

The recently approved Energy and Climate Change Package of the European Union is a good demonstration of commitment to stop climate change. However, the EU's commitment alone won't be enough to reach this ambitious goal and the EU, through its climate diplomacy, has to be able to convince other big polluter countries to cut back GHG emissions. That's pure foreign policy and, at the same time, a great opportunity for the European environmental sector to sell its products and services globally.

Just some examples: the energy efficiency of the whole Chinese building stock has to be increased very much. An energy efficient reconstruction of only 4-5% of the existing buildings in China requires an investment of 150-200 billion euros. Moreover, 15-20 million people migrate from countryside areas to urban areas. Until 2020 this tendency results in a growth of the Chinese urban population by 165-220 million. These migrants need new houses, schools, hospitals, power plants, manufacturing plants, storage facilities etc. which could be a good market for European companies. Further, until 2020 China aims at fulfilling 16% of its electricity needs by renewable energy and aims at spending 187 billion euros for the investments necessary for achieving this goal.[9]

As seen before, climate change is not only a constraint but at the same time a great opportunity to increase FDI and exports of products, services and technologies originating from EU countries.

[9] See: The German Chamber Network: Marketing für deutsche Standards, Produkte, Technologien mit Schwerpunkt Shanghai und Yangzi-Region, in Building, Energy & Environment, Shanghai, May 2007, p. 1-2.

All in all, climate change diplomacy has to be part of the future European common energy policy.

Conclusion

As we have seen, the European Union will have to rely on its current energy suppliers, moreover, its energy dependence will increase further if current energy demand and supply tendencies don't change.

Several factors contribute to the development of a stronger competition for fossil energy resources. New players on the energy market (on the demand side) are developing countries, like China and India.

If the EU wants to diversify its energy suppliers, on the long run it won't have any other alternatives but to import crude oil and natural gas from the Middle East, from Russia and Middle Asia. The Middle Eastern and Middle Asian region is a politically instable region. We can only ensure energy supplies and increase energy security in Europe if this region is a stable one, filled with friendly states and governments.

The common European energy policy has to incorporate a strong foreign policy towards the Middle East and the former Soviet Union countries. Wars, political instability of the region have to be eliminated.

Another foreign policy task is that the EU has to convince big polluter countries to share efforts for reducing greenhouse gas emissions and mitigating climate change. Not only developing but developed countries have to be part of a new climate change regime.

Within the borders of the EU it has to reduce its energy consumption. It has to make use of investments realizable at negative costs. The energy efficiency of buildings (including houses, industrial, commercial and public use ones) has to be increased by a huge extent and, where possible, natural gas based heating systems have to be replaced by heat pumps. The promotion of such technologies (through correct price incentives) and a creation of big markets for these technologies result in declining costs. Many of the currently available technologies are already available at reasonable costs. These have to be published to as many people as possible. The next generation has to learn in schools how one can be economical with energy without a drop in the standard of living.

R&D investments and a leading role in environmental technologies are going to be a great opportunity to create jobs and increase the European export.

Easily manageable electricity producing power plants have to be built and electricity grids of different EU member states have to be connected to enable the integration of renewable energy technologies into the electricity system. Creating effective financial incentives for it must be part of the common European energy policy.

All in all, the common energy policy has to be a complex policy, including effective foreign policy, climate change diplomacy, R&D policy, educational policy, setting strict rules and policies to improve energy efficiency in the (above all) non-competing sectors of the economy.

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