

Challenging Energy: Global Overview of Actions, Policies and Plans

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"Energy is essential for development, yet two billion people currently go without, condemning them to remain in the poverty trap. We need to make clean energy supplies accessible and affordable. We need to increase the use of renewable energy sources and improve energy efficiency. And we must not flinch from addressing the issue of over consumption - the fact that people in the developed countries use far more energy per capita than those in the developing world."

Kofi Annan, Secretary General of United Nations

"The dimensions of our current resource use are such that the chances of future generations having access to their fair share of scarce resources are endangered. We therefore need to ensure the sustainable use of our natural resources through the creation of a long-term sustainable base and much greater focus throughout the energy value chain."

"Energy Policy Scenarios to 2050, World Energy Council"

1. Preface

What I'm reporting in this paper comes from official policies, official and unofficial documents, statements, companies' reports, surveys, historical data, opinions and critical views by the press, websites with a special focus on energy, and any other sources of information I was able to find.

My purpose was to collect information about and shed light on the today's energy issues, with a particular attention to energy crisis. This purpose turned out to be challenging, but I hope this paper will raise awareness on such an important matter in our century, providing some clearer hint on the topic.

The paper provides a basic background, explores new challenges, then gives an overview of actions, policies and plans of various social actors.

2. Background

2.1. Energy and Human Being

Energy has always been a central matter for human beings, and people have always been seeking for new sources and new technologies in order to have enough energy available for their activities. Thanks to human intellect, people were able to unlock and overcome physical limits imposed on their own muscle power by using tools and harnessing the energies outside their own bodies.

It has been argued that energy is the key "to the advance of civilization", and that the evolution of human societies is dependent on the conversion of energy for human use. Few people have questioned the long-held assumption that standard of living and quality of civilization are proportional to the quantity of energy a society uses. However imprecise it may be, most people still accept the formula:

$$\textit{Energy} = \textit{Progress} = \textit{Civilization}.$$

The first success in controlling and managing natural sources of energy dates at prehistory, when humans became able to set up fires: the energy that it brought changed their lives, because for the first time, they had the power to produce heat and light whenever and wherever needed. Health conditions improved and population growth: since that moment, humans never stopped trying to improve their quality of life.

Besides using wood and their own muscles, people took advantage of the energy that the sun, wind, running water, hot springs, animals and even slaves could provide, but soon it wasn't enough anymore, because of the rising prices of these resources and the growing energy demand. Thus, new technical inventions were needed, and new technical inventions were done: mechanical devices helped people doing their work and also increased productivity, resulting in better living standard again (Smil 1994).

Little by little, the system improved and humans used new energy sources and more efficiently, the turning point being the Industrial Revolutions of 18th and 19th century, with oil usage and massive need of energy. After the Revolution, the only new source of energy discovered and used has been nuclear power, whilst progress have been made in taking advantage of all the energy sources.

In the 20th century, energy consumption has been the highest ever (McNeill 2001), and energy policies have become a huge concern for governments. Since the cost of energy has become a significant factor in the performance of economy of societies, management of energy resources has become very crucial too. The world already faced some energy crisis, and some argue a new one is coming.

2.2. Demand and Supply

Trying to figure out a model to explain energy market in a very simple way is difficult, and the functions below have the only objective to give a first idea of what influence energy consumption and energy supply, thinking at the whole supply chain as a single player. This simplistic view, however, can be useful in comprehending some of the mechanism behind the alarm of an energy crisis.

Energy consumption depends on several dimensions: population, always growing; percentage of urban population, consuming energy four times the rural one; wealth, given that it leads to high energy usage because of the high general consumption of goods. Price affects energy consumption only within the boundaries of a certain wealth level, i.e. consumers are willing to consume less energy while they will be able to maintain their current standard of living. We could write, in a very general way:

$$EC = f(Y, P, u, p)$$

where EC is Energy Consumption, Y is the national income, P is the population, u is the percentage of urban population, p is price.

Energy production and supply relies on: sources' reserves; technology and prices; political and geopolitical interests, managing resources as a strategic tool. We could write, in a very general way:

$$ES = f(R, T, \tau, p, X)$$

where ES is Energy Supply, R are the reserves (known reserves, comprehending exploited ones and strategic ones, and new reserves expected to be discovered), T is existing and used technology, τ is the technology development rate, p is price, X is every event affecting the supply chain, such as wars or strategic political statements.

Energy is a commodity, so producers compete on prices and consumers will always choose the cheapest alternative. Therefore, if a energy company wants to develop new technologies to offer more energy in

future or at present, it has to be careful in order to keep competitive and not to increase price to sustain the investment.

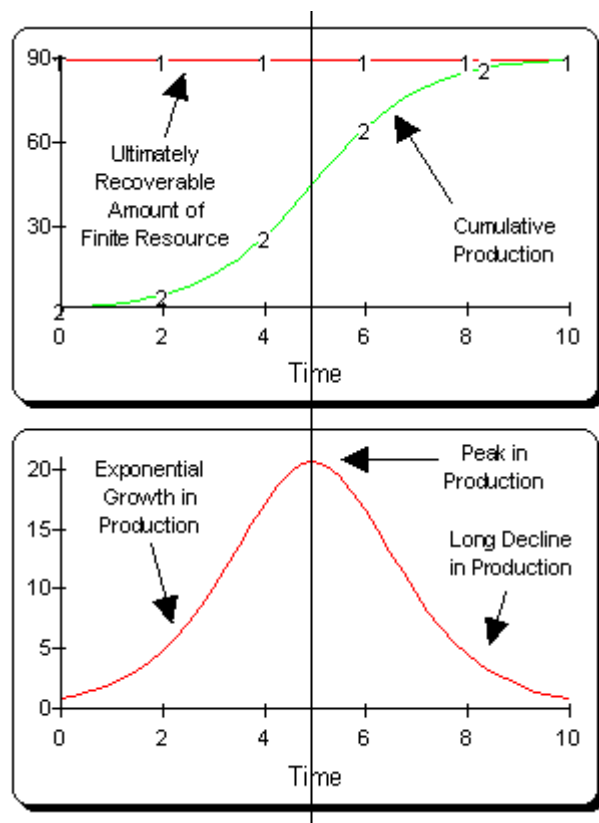
2.3. The Peak

In 2005, the US Department of Energy, in a report titled "Peaking of World Oil Production: Impacts, Mitigation, & Risk Management", also known as the *Hirsch report*, stated:

"The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial

Graph 1

Peak oil is the point in which the global petroleum extraction reaches its maximum, and then it declines. This theory, called *Hubbert peak theory*, date back in 1956, when M. King Hubbert created and first used his model (see Graph #1 by <http://www.hubbertpeak.com/>) to accurately predict that United States oil production would peak between 1965 and 1970. Since that year, other oil reserves have been discovered, questioning the reasonableness of the theory; however, demand and production have increased, and the peak oil fear still has momentum, various modified versions of the original model are used, forecasting oil, gas, and any other non-renewable source end, with more complex functions to allow for real world factors.



Critics raised the doubt of the happening of such a peak for different reasons, like technology development and reserves' spontaneous regeneration, besides the presence of some strategic reserves and the past fails of this kind of models (in 19th century, substituting coal with oil was said almost impossible); anyway, critics to these criticisms are of course presenting their reasons. The debate is open, time will show who is wrong, but in the meantime, some decisions have to be taken: non-renewable resources will not last forever (this is a quite accredited point of view). Nuclear power could be a reliable substitute of oil for a while, but it is non-renewable too, and it also raises the problem of the radioactive waste.

The eventuality of a peak in non-renewable energies production could seriously affect economy and people's life. Running the risk of taking late actions, if the predictions turn out to be true, will be disastrous, whilst some alternatives to fossil fuels can be implemented, new technologies developed, investments done, in order to avoid a crisis and start a more sustainable pattern.

Some documents and plans have been published, some researches have been done; those arguing a new crisis is coming presented their findings, those rejecting this hypothesis presented their criticisms, but an agreement on whether there will be a global crisis is still far.

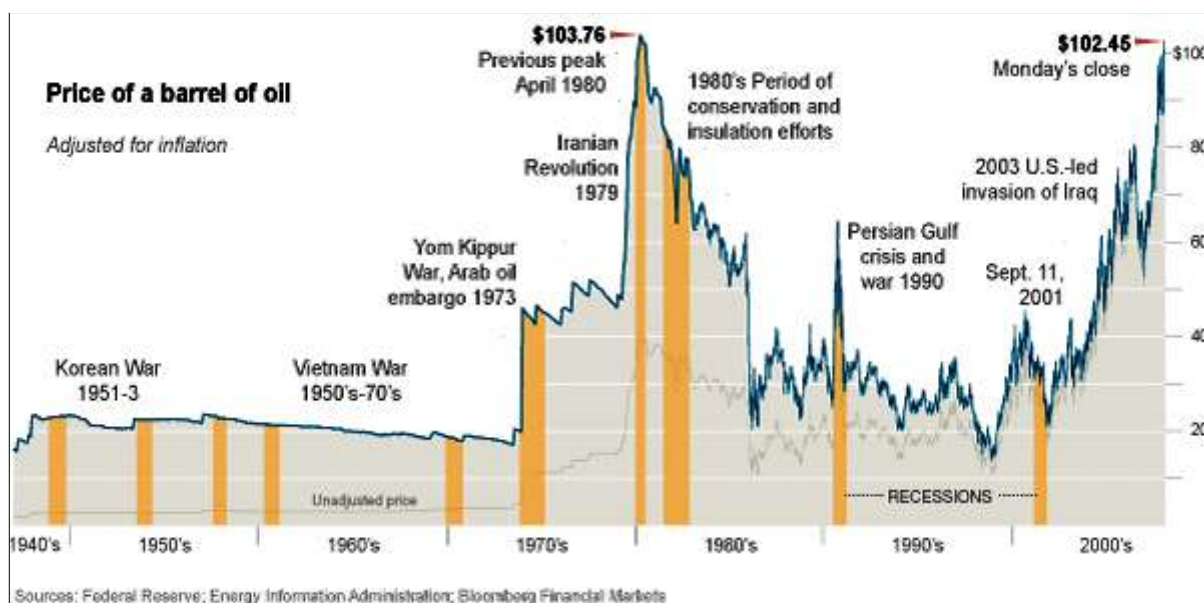
2.4. Recent Oil Crises

"Energy crisis is a situation in which the nation suffers from a disruption of energy supplies, accompanied by rapidly increasing energy prices that threaten economic and national security" (Williams and Alhajji 2003). Energy availability, supply security, relationships with production countries, higher prices, eventual investors speculation, and fear of recession are, among others, matter of concern when facing a crisis.

Recent crises were petrol ones, involving the Western World, and mostly linked with supply and price issues and international politics (see Graph #2). The central role of oil can be read in the relation between the oil price and political actions.

In 1973, the members of Organization of Arab Petroleum Exporting Countries (i.e. the members of OPEC plus Egypt and Syria) announced that they would no longer ship oil to the United States, its allies in Western Europe, and Japan, because of the support given to Israel in the ongoing Yom Kippur War. At the same time, OPEC members use their power to raise world oil prices, after the failure of negotiations with the Seven Sisters. The amount of oil supplied largely decreased, and final consumers were really affected by this lack: the dependence of the industrialized world on crude oil and the predominant role of OPEC as a

Graph #2



global supplier, resulted in inflation and economic slowdown for the targeted countries, which, tried to avert this energy dependence on oil and even on foreigner oil suppliers, responding with a wide range of initiatives and plans (Yergin 1993, Hammes and Douglas 2005). The quest of national energy independence was started. A famous statement regarding national independence is President Nixon's "Project Independence":

"At the end of this decade, in the year 1980, the United States will not be dependent on any other country for the energy we need to provide our jobs, to heat our homes, and to keep our transportation moving."

The following "crises" actually did not depend on real large supply reductions, but they consisted only in price increasing due to the worry of such possible reductions.

In 1979, the Iranian Revolution (the revolution that transformed Iran from a monarchy to an Islamic republic), brought about the second oil crisis. Oil exports had been interrupted and, when the new government was established, resumed oil exports at a lower volume; OPEC increased production to offset the decline, and the overall loss in production was only about 4 percent. However, price increased as a consequence of the widespread fear of a new lack of supply (Yergin 1993, Hammes and Douglas 2005, *Oil Squeeze* 1979).

The energy crises of the 70's led to greater interest in renewable energy, while increased the West's reliance on coal and nuclear power.

In 1990, tensions between Iraq and Kuwait ended in a war. Iraq attacked Kuwait after the latter refused to forgive the Iraqi debt, claiming that Kuwait was pumping oil from a field on the Iraqi-Kuwaiti border and was not sharing the revenue; Iraq also accused Kuwait of producing more oil than allowed under quotas set by the OPEC, thereby depressing the price of oil, Iraq's main export. The conflict culminated in fighting between Iraq and an international coalition of forces led by the United States. By the end of the war, the coalition had driven the Iraqis from Kuwait. During the war, the oil fields of Kuwait were set on fire, causing damage that reduced the oil output until repairs could be performed. OPEC decided that since the oil production in the Kuwait was falling, they would increase their oil supply and stabilize the market. Again, oil price went up because of an eventual supply reduction that did not happen, but this time the crisis lasted only six months.

Everybody knows what happened on 11 September 2001: in a terrorist attack against USA, hijackers crashed two airliners into the Twin Towers in New York City, a third airliner into the Pentagon, and a fourth one into a field in Pennsylvania, after passengers and members of the flight crew attempted to retake control of their plane, which is thought heading toward Washington (CNN.com Specials: Day of Terror). Oil price increased, once again not because of a real lack of supply.

In the last years, oil price increased abruptly. The causes of this increase are still debated, but many people believe it is the signal of a new crisis.

3. A new energy crisis?

Resources are depleting; energy consumption per capita is increasing, mostly in the developing countries; population grows. Is this pattern sustainable?

*"This is the new energy landscape of the 21st century.
It is one in which the world's economic regions are dependent on each other
for ensuring energy security and stable economic conditions,
and for ensuring effective action against climate change."
(European Union 2006)*

Uncertainty about future energy availability depends not only on oil price: oil consumption is decreasing since 2004 because of the high price (Double, double, oil and trouble 2008), but energy consumption is growing. Some argue that the crisis is coming, some assure that energy will be enough to satisfy our needs for a quite long time, anyway, ongoing debates focus on how the crisis could or should be solved, rather than on whether there will be a crisis, demonstrating that concerns about energy have raised.

Those who declare no energy crisis will affect our planet, found their reasons on the fact that renewable energies will, step by step, replace fossil fuels, concluding that the problem of energy scarcity does not actually exist. Those who declare the crisis is coming, claim that renewable energies will not be able to produce all the energy we will need, if the consumption's growth rate does not reverse. Both the alarmist and the non-alarmist agree to the point that a common global path has to be started as soon as possible.

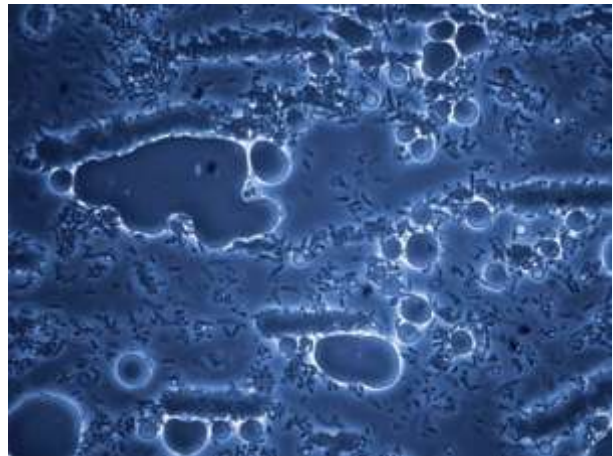
3.1. Technical Frontiers

Scientific world is looking for new sources of energy and developing new technologies in order to increase the amount of energy available for human activities, and to diminish carbon emissions, thought to be the biggest responsible factor of the climate change.

New ways to produce oil are being developed, such as cultivating seaweeds to obtain vegetable oil, or genetically modifying bugs to make them excrete crude oil (see Picture #1), oil being the main energy source in today's economy.

New technologies deal also with renewable energies **Picture #1**

and the capability of obtaining better performances while converting those energies in electricity; improvements in taking advantage of solar, wind, wave, and tidal power, are leading towards a more intensive and spread usage of these energy sources, even though a world 100% relying upon renewable energies is a faraway one. One of the most interesting alternatives to oil in a quite near future, anyway, seems space solar power (at least it is the less criticized one):



the power to be collected in the space is several times greater than the power collected on earth's surface, and then, the power could reach each corner of the world by means of a so called *rectenna*, providing electricity also to those people living in disadvantaged areas (as published by the American National Space Society). The short-term problem is the high development cost.

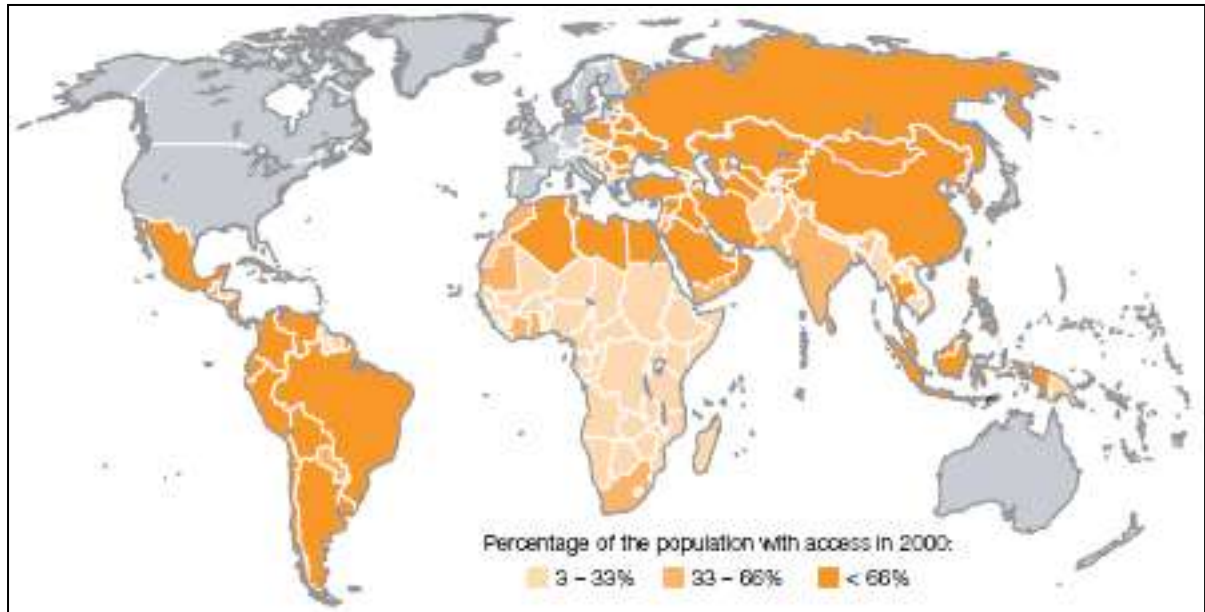
Companies, for their part, are developing more energy efficient products, and automotive industry is slowly introducing into the market some vehicles that make less or no use of fossil fuels, such as hybrid or electric cars.

3.2. Geopolitical Frontiers

Nowadays, the energy issues are no longer only the supply security and stability, or the high prices, or even the national independence or the political choices made; the current situation, besides all these issues, involves also some concerns about the energy sufficiency in the future, when hopefully more and more people will reach the standard of living of western countries.

The supply security seems threatened by the not so stable international politics, while the world's dependence on oil is still too high; if a new oil embargo is stated by the exporting countries, or if they decrease the supply, the consequences will be worse than in the 70's, because the number of countries dependent on oil or on foreign suppliers increased, and because the energy usage per capita increased too, so the people and the nations affected by such an action will be more.

Picture #2



Even if energy security remains a central matter for national energy policies, countries have to think more globally and share energy in order to assure enough energy to (one day it might be possible) all the people of the planet. The European Union is promoting a similar approach within the Community, in order to better react to an eventual national disequilibrium between energy demand and supply.

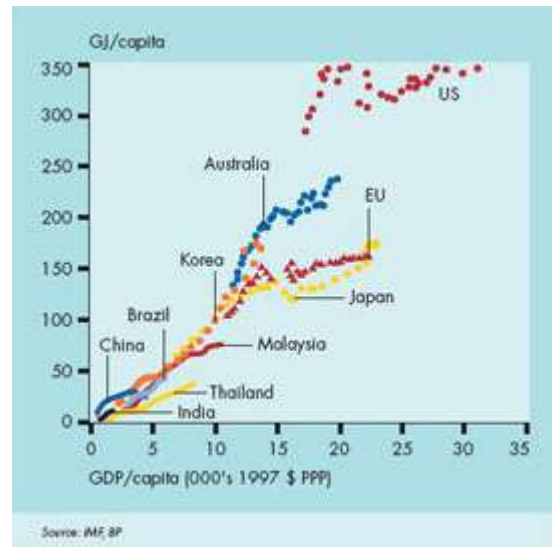
Increasing prices (not only the price of oil but also the price of natural resources in general, and energy in particular) is an important element to take care of, because high prices can seriously affect the quality of life of people, anticipating the crisis that is believed coming with the “peak oil”. High energy prices have direct repercussions on production and transportation, thus driving to inflation and lower wealth (Williams and Alhajji 2003).

National independence from external energy suppliers could have been a good purpose in the past, but the goal was not reached. Present energy concerns are global and not only national energy security is important, but also global energy availability and affordability to improve the quality of life of the world’s population, given that population in the developing countries grows and is consuming more and more energy. When the number of people with electricity access will increase, the need for energy will be huge, given that the present energy accessibility is very low (see Picture #2).

Developed countries, whose citizens have highest **Graph #3**

standard of living, are the ones with the highest energy intensity (see Graph #3), i.e. units of energy per unit of Gross Domestic Product (GDP). Advanced economy, however, can sustain actions towards energy efficiency, and they are doing so; but developing countries cannot afford such actions without damage their people's hope for a healthier and wealthier life.

People in developed countries should help people in developing ones to reach a satisfactory quality of life, and a satisfactory quality of life can be reached only using more energy.



Developing countries, for their part, cannot simply state that investments in energy efficiency or in renewable energies are too expensive, and when they can afford the spending, they should chose this expensive way that, even though is not the cheapest one, in the long term will bring the most positive effects.

4. Avoiding the crisis: Actions, Policies and Plans

Even if energy crisis is still regarded as an eventuality, initiatives have been implemented since last century in order to mitigate some of the possible causes of such crisis.

4.1. Social Pressures

Several social actors, NGOs leading the way, are emphasising the impacts that different energy policies have on climate change, asking for emissions reduction and other measures, and the impacts that the energy distribution is very unequal, thus promoting and financing, sometimes together with multinational or local companies, projects striving to improve social or environmental health. Bringing electricity in rural areas is one example of energy related-projects, but the energy crisis is something that still is not in the agenda of social actors.

Energy concerns are often linked with other priorities, climate change and right to development are their most important ones.

4.2. UN's way

United Nations launched several initiatives related to social pressure concerns, but no action directly seeking for a solution to energy crisis issues has been taken. UN energy concerns are mostly about providing energy to people in disadvantaged areas, and about mitigating climate change.

Initiatives like UN Environmental Program (providing guidance in adopting the best environmental and sustainability performance) can help in being more energy efficient:

UNEP mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

and initiatives like *The Mechanisms under the Kyoto Protocol* are important and can do the difference in crucial aspects such as the right to development:

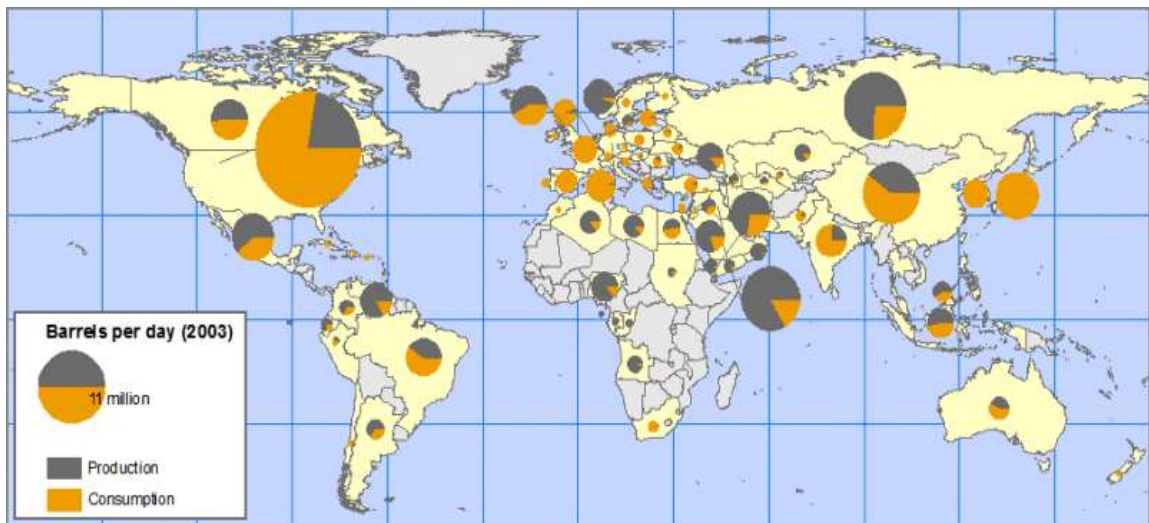
*The Kyoto mechanisms:
Stimulate sustainable development through technology transfer and investment
;
Help countries with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost effective way;
Encourage the private sector and developing countries to contribute to emission reduction efforts.*

These initiatives are example of UN is promoting to the private sector, but an energy crisis involves a lot of issues, hence UN must put more attention on it (ElBaradei 2008).

4.3. Local Actions, Policies and Plans

Trying to summarize energy policies is an hard task. First of all, energy policies are often stated in more than one document; second, an energy policy can pertain to different issues, like climate change, energy security, foreign policy, or right to development; third, unimplemented or unsuccessful policies are quite diffused, perhaps because politicians tend to state priorities and goals with a populist approach, rather than thinking in the long-term and setting consistent policies.

Picture #3



Energy crisis does not seem a so remote possibilities, given the current rate of production and consumption, and given the growth rate of developing countries (see Picture #3 by US Energy Information Agency), but governments seem worried more about the security of their own supply than about the eventuality of a global crisis.

4.3.1. USA

Since the energy crisis of the 70's, United States are looking for energy independence (Barlett and Steele 2003); nevertheless, their policy on energy-related issues, so far, never ended in a success. US approach to global threats appears to be reactive rather than proactive (Johnson 2007), and their policies and statements about energy issues do not make an exception. After the crises of the 70's, the government controlled national oil price for a while in order to protect consumers, thus delaying the path towards energy efficiency, and affecting oil production and oil companies revenues (WTRG).

The federal government published a number of Acts and Policies, none of them being the turning point. State and local bodies (California is the best known example) have been more effective, at least in promoting energy efficiency and "green" energy, or in educating consumers. The last goal set by the Congress is the *Energy Independence and Security Act of 2007*, whose purpose is:

*"to move the United States toward greater energy independence and security
to increase the production of clean renewable fuels, to protect consumers*

to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes."

Opponents among oil industrials contested the Act for the negative effect it will have on oil companies and thus on US economy and dependency on foreign oil; automotive industrials suggested that fuel efficient, hybrid, and electric vehicles are more expensive, and so the Act will affect demand. Anyway, the Act passed, consumers seem to react well, and oil companies are looking at alternatives to oil extraction, be renewable energies or even seaweeds.

Now the electoral campaign shows again a confused information about which actions will be taken by the winner party (Sparring over energy 2008), but renewable energies and energy efficiency are often mentioned in public speeches; the Act of 2007 is not enough to face the energy issues; renewable energies, together with energy efficiency, could be a relief in the short and perhaps in the mid-term but, for the action to be effective, it has to be strong and resolved: the usage of renewable energies must reach an high percentage of the overall consumption in the shortest time possible, and energy efficiency must become a way of life for US citizens.

4.3.2. EU

"The EU has the tools to help. It is the world's second largest energy market, with over 450 million consumers. Acting together, it has the weight to protect and assert its interests. The EU has not just the scale but also the policy range to tackle the new energy landscape. The EU leads the world in demand management, in promoting new and renewable forms of energy, and in the development of low carbon technologies. If the EU backs up a new common policy with a common voice on energy questions, Europe can lead the global search for energy solutions."
(European Union 2006)

Also European Union concerns about energy efficiency and renewable energies. Energy security is a central issue in last actions and directives: the recent born *Energy Community*, extending the energy market to South East Europe and beyond thorough laws and regulations, and giving direction on the energy mix the members should choose, is an important step in creating and promoting an international market for energy, in order to make the supply chain reliable and effective.

Other measures can be found in the directives to the members, addressing green buildings, energy efficiency requirements for home appliances, eco-design requirements for energy-using products, among the others.

EU also shows care about developing and underdeveloped countries right to have access to energy, but at the same time is worried about the possibility of a global energy crisis. However the European purposes are the best formulated ones and, so far, EU is establishing the most serious pattern towards world energy sustainability. The responsibility of acting now lays on the member of the Union, whose well-timed implementation will be crucial for the success of the initiatives.

4.3.3. BRIC

BRIC is the acronym for the emerging giants: Brazil, Russia, India and China. Their demand for energy have been increasing since when they started their economic development path and is going to increase more and more.

These countries are increasing their energy production, but they are unable to satisfy the national demand. Brazil, India and China are more focused on renewable energies than Russia, their policies being less aggressive and more oriented towards a sustainable view.

India has limited fossil reserves: its energy strategy is the encouragement of the development of renewable sources of energy by the use of incentives by the federal and state governments (World Energy Council 2007). The strategy is working and the country is one of the biggest producers of renewable energies, with solar and wind power leading the way. Brazilian government instead, since the 70's, implanted a very large project called "Proálcool", starting to use ethanol from sugar cane as a fuel for vehicles. The project is still ongoing and has reduced the oil importation needs of the country, and also has decreased the price of the gas in the nation (Hammes and Douglas 2005, Yergin 1993).

China is the world's biggest producer of renewable energies (China 'leads the world' in renewable energy 2008) but its policies about energy are the most criticized, partly because the high pollution and emissions level, partly because its impressive growth cannot be sustainable with a so low energy efficiency rate.

Renewable energy in Russia is largely undeveloped although there is considerable potential: the most developed one is geothermal energy, which is used for heating and electricity production in some regions of the Northern Caucasus, and the Far East (World Energy Council 2007). The land is rich in natural energy resources, with the largest known natural gas reserves, the second largest coal reserves, and the eighth largest oil reserves. Russia is the world fourth largest

electricity producer after the USA, China, and Japan and the world's leading net energy exporter, and a major supplier to the European Union (World Energy Council 2007). EU has been trying and still tries to reach an agreement on energy supply, but the targeted partner is a difficult one: it has also been accused in the Western countries of using its natural resources as a policy tool against offending states like Georgia, Ukraine, and other countries it perceives as hindrances to its power.

4.4. Business concerns

Companies are paying more and more attention on energy issues. Graph #4 shows the volume of information (on the web) involving multinationals and energy (the word *energy* has been used as a research key to surf the news, thus including not only the major concerns, but every matter related with energy) and the *Ethical Quote* across all sectors and countries, i.e. the number of positive new minus the number of negative ones (data by Covalence SA). Since 2007, both the volume of information and the EQ increased, meaning that the information sources are reporting more about multinational approach to energy concerns, and that the approach is mostly judged fine.

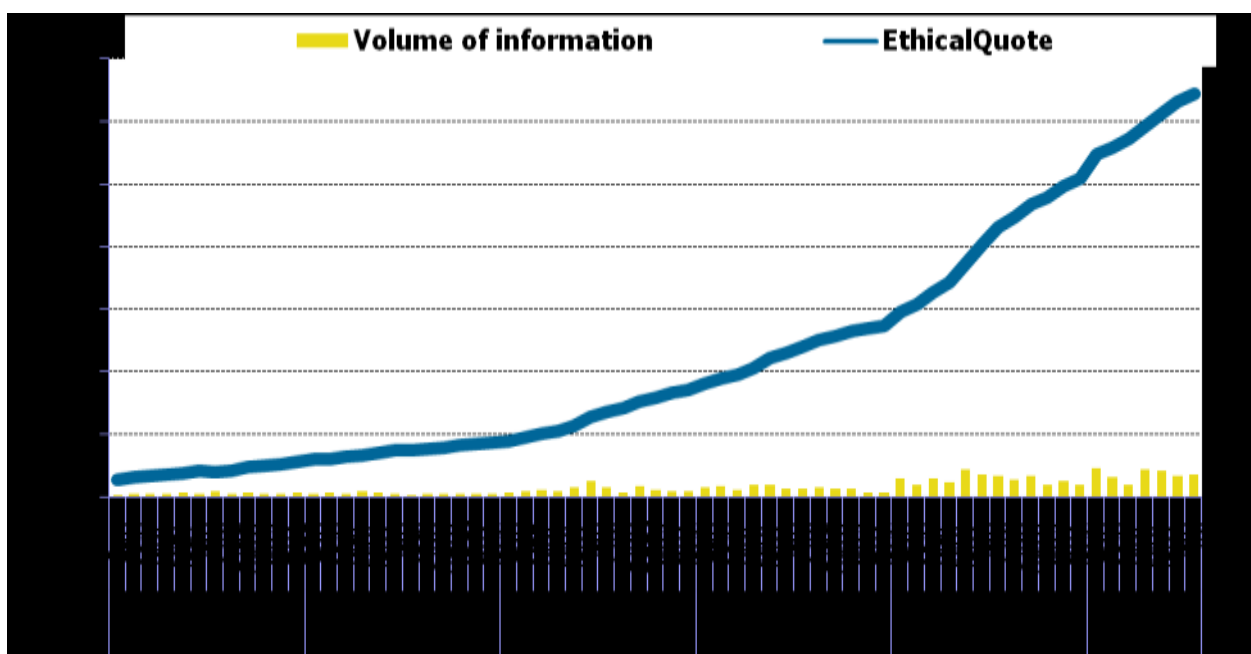
Graph #5 (data by Covalence SA) shows, not surprisingly, that the oil and gas sector is the most

Graph #4

involved one, because of the investments in renewable energies production and related technologies development, whilst other sector involvement mostly relies on renewable energies investments, percentage of renewable energy usage, and energy efficiency policies.

Consumers and governments are asking **Graph #5**

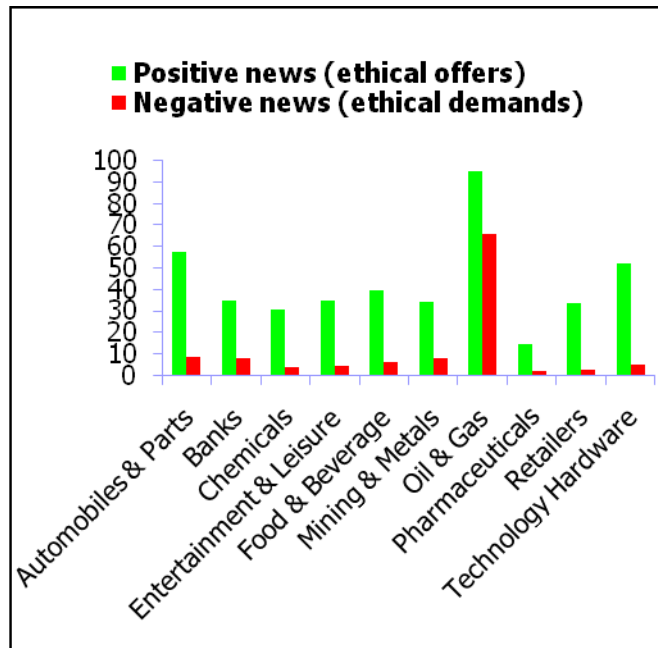
companies to be more responsible and to act sustainably, thereof the "good" behaviour of business is



a consequence of external social pressures, on the wave of the diffusion of Corporate Social Responsibility.

Energy efficiency is driven also by the high prices, and the investments in renewable energies could be also a risk management move. An energy crisis is a threat for business as it is for others: in trying to avoid an eventual crisis companies are just playing into their hands. However, companies are, so far, the most proactive and concrete player in a so uncertain environment.

Private sector is adopting several initiatives, promoted by several organizations, such as independent organizations, groups of companies, UN's agencies, governments, and results are coming.



4.5. Fuzzy Consumers

In developed countries, people are worrying about energy issues either because they want to be “green” and protect the natural environment, or because they want to save money. But these categories are still a minor percentage of the population.

Energy efficient light bulbs (see Picture #4), passive **Picture #4**

houses, hybrid and electric vehicles, are only some example of the variety of products now addressing prudent consumers; being able to discern among all these “opportunities” is very difficult: which light bulb is the most efficient one? Will the investment in a passive house be convenient? What is a passive house?

Consumers lack information. Even worse, consumers lack awareness. If oriented to the short term, in the long term our choices could reveal bad consequence.

A better future or, for the pessimistic, even having a future, is worth of some present give-ups. An energy crisis could seriously affect our lives, but what do we know about this concern? European Union is going to provide people with energy education (Green Paper on Energy Efficiency: Doing more with less 2005), some NGOs are promoting responsible



ways of life, but disorientation is still the main feeling while approaching the issue.

5. Conclusions

Lack of information, or at least difficulties in reaching some reliable and clear information, is the biggest problem I encountered while writing this paper: I have just been able to make an overview and to identify three key issues, or major areas of concern. What comes out, together with these concerns, is the global character of the energy challenge.

5.1. Key Issues

Three key issues emerged: energy security, energy efficiency, and right to development, oil dependence affecting the three. Energy security is a major concern for governments, energy efficiency is a consequence of high prices for companies and consumers, right to development is an issue debated by governments, UN, NGOs, and it seems the most difficult to approach.

UN is focused on promoting environmental friendly behaviours, with effects on energy efficiency and right to development. Local policies and actions set as a main goal energy security, at the same time call for energy efficiency with a series of regulations and standard requirements. Information about policies in other countries could be useful in understanding the global picture of energy concerns, anyway, although the paper analyses only a narrow area of the world, it shows a variety of approaches and no common direction in addressing the problem. Avoiding an energy crisis is a global concern, taking steps together with a common aim is decisive, anyway, even if global action is needed, different approaches in trying to solve the problem could have a positive effect in a first time, in testing policies and reactions before implementing them on a global scale.

NGOs, companies, and consumers can direct their efforts towards one or two priorities, be it energy efficiency, climate change, or energy affordability, and the results of their actions are quickly to come and easier to measure. Governments and UN have a more complex task: their role impose a spread action on the variety of related issues, and they must implement wide spectrum policies. European Union showed the most complete view on the eventuality of an energy crisis, probably because its condition is very uncertain.

5.2. A global challenge

One of the biggest challenges of our century is shifting from oil to other sources of energy, avoiding a new dependence on one particular source. The shift will be difficult and slow: time is needed to develop new infrastructure and in some cases new technologies; the action has to be global because we know when it will be too late to act, so we are waiting as possible before acting, in order to maintain or improve our

living standards, and those who take action now are going to lose competitiveness, because of the higher investments needed; moreover, the political equilibrium will change, with unpredictable consequence.

Besides oil scarcity, energy scarcity is the next challenge: the energy consumption has to be decreased in order to maintain a demand-supply equilibrium, and in order to meet the emerging needs of developing and underdeveloped countries.

Availability, accessibility, and affordability are the global energy challenges of 21st century. The creation of an international market and consumers education and awareness are urgencies, because a more equal and sustainable energy distribution is fundamental to avoid the possible crisis.

Actions have to be taken since now. Some even argue that it is too late to lower the risk of a global energy crisis by 2020, and 2050 seems a more realistic goal. We have to keep in mind that every single present action could contribute in guaranteeing or precluding energy availability and affordability to future generations.

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