

# Oil turbulence in the next decade

An Essay on High Oil Prices in a Supply-constrained World

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Clingendael International Energy Programme



Nederlands Instituut voor Internationale Betrekkingen  
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Clingendael





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Supply-constrained World

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June 2008

## Clingendael International Energy Programme

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## EXECUTIVE SUMMARY

An analysis of the recent development of demand and supply for crude oil indicates that the mismatch in growth could cause tighter markets than we already experience today. In the World Energy Outlook 2007, the International Energy Agency (IEA) warned of a possible 'energy crunch'. But what was anticipated to happen in the first part of the next decade has been fast-forwarded to today, more than 5 years earlier, and could shake the very foundation of our energy systems if no action is undertaken.

### OIL TURBULENCE IN THE NEXT DECADE

- In most scenarios, the Oil Supply-constrained world we are currently experiencing will last much longer than anticipated by policy-makers. Even when taking a conservative view on demand and supply developments, we have to assume that the oil supply constraints will last most of the next decade. Realistically, things will become worse before getting any better.

### OIL PRICE

- The current high oil prices are still primarily driven by structural factors and can be explained without resorting to throwing blame at speculative investors playing the futures market or at the low dollar. Prices are mainly driven by the supply and demand imbalances and the fear that these will further deteriorate in the next decade.
- Until recently, the oil price was largely underpinned by the marginal cost of the last barrel needed to match demand, with some political and economic conjuncture mark-ups or -downs. This currently puts a structural floor of \$110 a barrel under the oil price (WTI).
- The largest part of the \$110 a barrel floor (about 70-75%) is determined by the marginal cost of supply, currently around \$80 (building block 1). The remaining \$30 a barrel (or 25-30%) is determined by supply-demand fundamentals, a short-term risk premium, and long term scarcity and policy (building blocks 2, 3 and 4). Percentage wise this distribution among building blocks has not changed much since 1990, whether the oil price was \$15 a barrel, \$20 or higher.
- Since the 2<sup>nd</sup> quarter of 2008, oil prices have started to deviate from this commodity driven price regime. Recent predictions of Goldman Sachs, OPEC and Gazprom expect that prices could increase to \$200-250 a barrel in 2009.

- If prices are indeed heading towards \$200 a barrel in 12 months' time, or for that matter even to \$150 a barrel, other drivers will gain prominence over marginal costs as the main driver.
- In that case OPEC will have accomplished a long-held wish: oil will then be priced at its real value in the OECD economies, determined in the NYMEX and ICE oil futures markets.
- Such a new price regime, pricing oil at the "User Value", is brought about by the view that the current supply and demand imbalances are structural and that these imbalances could worsen in the next decade.
- In such an environment, pricing at the User Value implies that oil prices will no longer follow the rules of commodity pricing (where prices tend to the marginal cost of supply with some conjuncture mark-ups and – downs), but that prices are determined by the end-consumers in a framework set by governments.
- Pricing at the User Value implies that the oil price will not necessarily invite new supply into the market, since income requirements of producing countries will be easily met through price rather than volume.
- In this Oil Supply-constrained world, oil prices will then oscillate between:
  - a) The cost of the marginal barrel of supply as determined by the most expensive barrel plus a margin for supply/demand fundamentals and geopolitical risks, driven by open markets in an OECD economic framework, and
  - b) The real User Value of oil – determined by increasingly closed markets (for new reserve exploitation; for bilateral oil trade flows; for refined products), as supported by several of the major OPEC countries and Russia.
- The first price system would set the oil price at a floor of around \$110 a barrel for 2008, but it is still rising (as costs are still inflating, although recently at a slower pace). The latter would drive the price up to higher levels, perhaps a super-spike of \$200+ a barrel in 2009 as predicted. Already, we see more resistance to prices driven to such a level: ultimately consumers are going to revolt (the ultimate User Value).
- In any case, prices will show far more volatility – and hence uncertainty, which is detrimental to the global economy and its growth trajectory.

- In the absence of a deep and prolonged recession in major economies, it is reasonable to expect much higher oil prices based on the still worsening supply and demand imbalances. The lack of alternative fuels in sufficient quantities in the transportation sector limits the ability to switch fuels. For this reason, world oil demand will continue to grow even in a low economic growth scenario. Combined with the reluctance of OPEC member countries to accelerate their upstream investments, the oil price will continue to test the upper limits of the price range set by the User Value of oil.

#### **OIL FUTURES MARKET**

- The purpose of oil futures markets is to send important price signals about the future price of oil (and other commodities) determined by market forces.
- Traditionally, higher price signals would be an incentive to develop more expensive oil. Currently, such price signals do not necessarily result in more supply. Instead, they test consumer behavior (the User Value) and thus determine (and destruct) demand.
- It is these latter price signals that are reflected in the current futures market, by many misinterpreted as excessive price speculation and manipulation.
- Analysis of the actual market data from the regulated exchange, which is the best evidence available to date, indicates that prices in the oil futures markets continue to be determined by fundamental market forces.
- All participants in the future market (commercial and non-commercial players – i.e. hedgers and speculators) absorb, act and react on new information and data coming available every day. Their interpretation and actions will lead to higher or lower prices. During this dynamic process prices have to find a new equilibrium.
- Current uncertainties in the global oil market, as well as the depreciation of the dollar, are clearly having an impact on the assessment of market fundamentals, and contribute to the uncertainty or risk premium to the usual analysis of supply and demand data.
- Specifically, uncertainty about the availability of supply due to political and security factors, uncertainty about the continuity of actual levels of demand growth in developing parts of the world, and uncertainty about currency fluctuations (i.e. building block 2 and 3) substantially weigh into the fundamental analysis.



- In times of great uncertainty, like today, prices might temporarily under- or overshoot, quickly (and wrongly) explained as excessive speculation.
- This process is amplified by the fact that prices are now oscillating between two fundamentally different price regimes, one set by the marginal cost of supply with some political and economic conjuncture mark-ups or -downs (i.e. a commodity driven price), the other by the real value for oil products in the OECD-economies (i.e. the User Value).
- Although there may be a possibility that – for shorter periods of time – there may be a stronger link between the positions of non-commercials and prices, they do not appear to be correlated in the long run (IMF studies).
- This is in line with our own analysis as reflected by several of the elements represented by the building blocks 2 and 3 (cyclical factors – causing large swings in oil prices on a daily basis).
- For shorter periods of time, speculators could over-react, but it is important to note that these swings in net speculative positions set the near-time oil price, but do not impact the long-term structural fundamentals, which are the over-arching driver behind today's high oil prices.
- In our view, the structural drivers represented by the marginal barrel of supply (building block 1), and - increasingly more - by scarcity and policy (building block 4) which is the main driver behind the User Value, will continue to play the most important role in the price setting of oil in the foreseeable future, driving oil turbulence in the next decade.

#### **SUPPLY AND DEMAND**

- The recent surge in global oil demand is the result of weak globalization, which has resulted in a doubling of the consumer base to 1.5-2 billion people in a period of less than 15 years. Until the early 1990s, the OECD countries represented the bulk of world demand for oil. Rising demand in the newly industrializing countries is now putting an enormous strain on the oil industry, which is struggling to sustain supply.
- So far, oil demand is much less responsive to higher prices than in the past – due to a diminishing scope for substitution (in the transport sector), a strong rise in demand for middle distillates, the impact of new regulations in e.g. the maritime sector, the unexpected switch back in oil used as feedstock to generate electricity, high excise taxes on transport fuels in the European countries providing a cushion against higher crude

oil prices, and last but not least, the impact of subsidies in many of the non-OECD consumer and producer countries.

- In every likely scenario, oil remains the dominant resource for meeting global demand in the next few decades because there are no real alternative transportation fuels currently available in large enough quantities to replace oil.
- A new supply/demand outlook of around 100-105 million b/d for 2030, most likely to be published by the International Energy Agency (IEA) in their next edition of the WEO in November (versus 116 million b/d in the WEO 2007), will have far-reaching implications.
- It basically means that world oil (and liquids) supply can grow at only half the rate in the next 22 years than earlier anticipated (circa 13-18 million b/d versus 29 million b/d).
- If correct, it implies that the world will have to go through a period of substantial demand destruction – in the order of a half to two thirds of today's oil demand in the US, or up to 100% of the oil projected to be imported by China in 2030.
- A possible quickening of underlying oil field decline rates at the time deepwater oil production (circa 10% of global oil supply) goes off plateau in the first half of the next decade could make this pessimistic supply outlook even worse.
- But even with stable observed decline rates, the industry still has to bring twice as much new oil and liquids onto the market in the next 22 years than what they have done over the past 22 years – around 80 million b/d if supply and demand were to grow to 116 million b/d by 2030 as per WEO 2007, or 70 million b/d in case supply can't grow much further than recently suggested.
- Steeper annual depletion rates in the coming decade will imply that more new oil will have to be developed to offset diminishing supply from existing fields and to meet projected demand.
- This outlook of new scarcity is now exacerbated by the fact that not only available supply will determine what amount of demand can be satisfied; it will also bring about a new allocation of the available oil due to a lack of adequate supply growth compared with demand.
- In practice this means that demand rationing will be required in the OECD countries and particularly in the US, in order to accommodate growth in the newly developing countries, notably China and India.

- Different fuel prices for end-consumers in the different countries will be the dominant factor behind this 'oil redistribution'.
- Through a combination of current OPEC policies and the different price mechanisms in the different consumer regions, the OECD countries pay twice for the burden: once directly at the fuel pump, and secondly indirectly by rationing demand to accommodate the surge in oil demand in the emerging economies, where consumers benefit from subsidized prices but drive up prices in international markets.
- In parallel with the OECD countries accommodating the economic growth of emerging economies, the latter countries have to work away their oil product subsidies without triggering a jump in consumer price inflation, in order to improve energy efficiency and to reduce world oil demand growth.
- The alternative is that new and old oil consumers end up in a fierce competition for scarce oil supplies at much higher price levels, with the risk of triggering a deep and prolonged recession and possible geopolitical tensions.

#### **OPEC'S, RUSSIA'S AND MEXICO'S RESPONSIBILITY**

- Quickly rising oil prices would not be necessary if OPEC and a few other major oil resource holding countries, notably Russia and Mexico, would accept responsibility for balancing the market and take actions accordingly. At the same time, the major oil-consuming countries would have to provide security of demand to the oil producers if they commit to investing in the additional production capacity.
- The fact is that around 8 to 10 million bbl/day of medium-priced oil is available in these countries in addition to what is currently under development, but this oil cannot or will not be developed and produced for political or institutional reasons or due to demand uncertainty.
- Should such oil become available, global oil demand could be met for the entire next decade without rapidly increasing oil prices and without the challenge to global economic growth.
- Oil prices would still (need to) rise, but would do so in a much smoother and more controlled way.
- In return for the OPEC member countries, Russia and Mexico increasing their upstream investments and to unlock the 8 to 10 million b/d medium-cost oil, where needed in cooperation with International Oil Companies to share the investment risks, the consumer countries will

have to arrange for suitable off-take arrangements in order to remedy the security of demand risk with the aim to equally absorb the risks among OECD countries, emerging economies and producing countries. Asking producing countries to take on the full risk of any possible (but unlikely) over-supply is not fair and is also not in the long-term interest of the consumer countries.

- The transition period from an Oil Supply-constrained World to an “Energy-sustainable World” urgently needs to be better managed globally.
- Without a doubt, the world needs more time to adapt to the new reality and should work hard to realize the innovations and to roll out the new alternative fuels – not to replace oil, but to supplement it, in order to meet the expected surge in global demand, particularly in the developing and industrializing countries.
- To avoid turbulence on the international oil market in the coming decade, the world will require OPEC and the other producing countries that still have upside production potential to step to the plate and increase their production capacity. Without this oil, the Oil Supply-constrained World will be much more turbulent than necessary.
- The oil-consuming countries must also take their responsibility and improve their demand management policies and energy efficiency. Moreover, oil-producing and -consuming countries must share the risks and benefits of increased oil production and create security of demand.

#### **THE IMPORTANCE OF IRAQ**

- In the medium term, only one single country could counterbalance these drivers, and that is Iraq. Even if the conflict not triggered by oil, it definitely needs to be finished in a way that its oil potential can reach the market.
- Unfortunately, it does not always appear to be in the interest of some countries to help resolve the conflict.
- Once there is stability, the national oil company of Iraq, perhaps in cooperation with international oil companies (IOC's and NOC's), could start to develop their vast resources by investing in the reconstruction and modernization of the Iraqi oil industry and gradually elevate aggregate output from a little over 2 million b/d today to six or even more.
- Such an expansion of supply could bring back the price regime closer towards the marginal cost based system.

## RESPONSE TO AN OIL SUPPLY-CONSTRAINED WORLD

- Being unable to force OPEC, Russia and a few other major resource-holding countries to change their (national interest driven) policies, the OECD consuming countries have no alternative than to work even harder on conservation and innovation with the objective to achieve a sustained reduction in the rate of demand growth relative to the rate of economic growth, and on developing their most expensive unconventional oil reserves and substitution. The alternative is stagnation; a reduction in the rate of economic growth as supply constraints become binding to overall economic growth.
- What is generally not very well understood is the vast complexity and scale of the oil industry that currently produces 84 million barrels of oil every single day.
- Given this magnitude, any change, any replacement of oil by an alternative fuel will take a long time before it can make any realistic impact. Whilst not different than in other industries, it often takes decades before a new innovation is sufficiently diffused as to affect productivity, and in the case of oil, to really impact supply and demand, and hence price.
- The only realistic complementary fuels today that are available in reasonable quantities are 1<sup>st</sup> generation biofuels. But even this type of fuel represents today only circa 2 percent of total global oil product demand, a percentage that is not expected to grow dramatically in the next decade, even though the use of biofuels worldwide will at least double.
- Other known alternatives to oil (besides 1<sup>st</sup> generation biofuels from sugarcane and corn) are all still in different stages of research and development and thus not able to make any relevant impact before 2020, too late to help avoid the oil turbulence in the next decade.

## OIL MARKETS

- The mores of the international market and its rules and regulations are part of the American model of hegemony, something that was a given fact but has become increasingly contested by non-OECD countries.
- In the past couple of years, the newly emerging geo-economic and political powers have begun to give this model their own twist; they use access to markets, resources and intellectual property to build up their economic prowess.
- In the meantime they (try to) secure oil flows through differently structured bilateral deals with producing countries. After a period of

deepening internationalization of the oil market, oil trade is already increasingly entering a period of bilateralism, where business-to-business is supported at a government-to-government level, and where several parties try to gain a privileged position over others.

- Through bilateral agreements and resource ownership with the intent to produce for a certain market only, purchasing power is no longer enough of a guarantee for access to all oil flows because of market segmentation. This implies that if new oil comes onto the market it becomes increasingly important for price development under which terms this oil becomes available: serving the international market or bilateral trade.
- This already triggers several counter mechanisms and reactions beyond the oil markets themselves, particularly in the US.
- For the OECD countries, which have put so much faith in a global, open, and integrated market system, it is therefore important to understand the dynamics of the two competing models of oil trade and development, the other being much less transparent.

#### **THE GEO-ECONOMIC AND GEO-POLITICAL CONSEQUENCES**

- The ongoing tightening of the oil supply–demand balance, reflected in higher prices, has major consequences for the wider economy and on international relations.
- These knock-on effects manifest themselves in many areas, and each of them will become more apparent in the years to come. The impact of a period of structural supply constraints will be multi-layered, namely on the micro-economic and political level, the macro level, and the geo-political and geo-economic level, each feeding into each other.
- The global challenges to manage the world economies successfully through the transition period towards an Energy-sustainable World are already substantial today and are expected to become more complex.
- The second phase of weak globalization has come with a widening credit crisis, higher inflation rates, interest rates adjustments, balance of payment imbalances, a low US dollar and oil and food price increases. In addition, the high oil prices have resulted in a large transfer of wealth from consumer to producer countries. They constitute a cocktail of instabilities that will challenge the ability of many countries to adjust their national economies to the new circumstances. This will impact their competitive position in the international economic system.

- Many of these problems will necessitate conflicting actions, making economic and monetary policy-making by the central banks, such as the FED and the ECB, extremely difficult.
- The recent oil price increase and the accompanying increase in wealth has again brought the oil-producing countries to the centre of geopolitical attention. Crucially it will be the choices of these countries regarding how and where to invest (or to withhold), and under which circumstances that will vitally impact geo-economic and geopolitical relations in the next few years.
- In principle, the world is again dependent on how the recycling of oil dollars will take place and in which direction the flows will go.

#### **SOVEREIGN WEALTH FUNDS**

- The high oil prices cause a massive money and wealth transfer from the oil-consuming countries, including the OECD countries, to the major oil-producing countries.
- In order to manage these funds, most of these countries have already established government-owned oil funds, commonly referred to as Sovereign Wealth Funds.
- Although the size of the Sovereign Wealth Funds that manage these excess money flows is already large and bound to grow, the impact of this accumulation of wealth and power in the hands of a few governments and their elites will depend on how, when and where this wealth will be employed.
- Finding a home for hundreds of millions of dollars every year and managing trillions of dollars in investments by a handful of firms, of which many are owned by the same governments and most of them having no long-term track record or experience, will become a formidable task in itself.
- Markets only function properly when there is a free flow of information so that price discovery can take place, and when perceived risks do not deviate too much from real risks. Lack of information could cause financial instability that is characterized by valuation risks (of the asset) and macro-economic risks (of the economy at large).
- Unfortunately, many of these Sovereign Wealth Funds are not known for their transparency. It is unclear how these funds are managed and what the level of sophistication in risk management and other management

policies and systems is. So far the discussions about creating more transparency have received a lukewarm response in some jurisdictions.

- If transparency about oil reserves and underlying production decline rates is an example for the expected transparency of their Sovereign Wealth Funds, expectations with regard to full disclosure of the size and asset allocation, their investment objectives and management practices and systems and their governance procedures should be subdued.
- Because OECD economies have committed themselves to the benefits of greater disclosure, regulators in the OECD should not underestimate the potential risks of loose standards employed by investors from elsewhere. OECD countries should be aware that without proper governance structures, oil-producing countries could control and optimize the flow of oil and capital in their own national (political) interests, which do not necessarily reflect the interests of the OECD economies.
- For the same reasons, the fast-growing funds with trillions of dollars under management could also go wrong unintentionally. A dissatisfactory return on investment could be another reason to prefer oil in the ground over money in a fund.

#### **INTERNATIONAL RELATIONS**

- Geopolitical tensions over energy are clearly on the rise, with accelerating global demand growth and new oil supplies increasingly concentrated in a smaller group of countries.
- In the face of supply constraints and the accompanying higher prices, the interesting question is whether producing and consuming countries will be able to muster effective cooperation to manage their way out of the Oil Supply-constrained World or whether they will end up resorting to destructive competition to secure energy and their own wealth.
- The answer to this question much depends on the place of oil and economic security in their wider geo-economic and geopolitical interests and the power of individual states to manage their oil and economic security, through organizing the availability of alternative liquid energies and/or through securing oil flows through the market or bilateral arrangements and/or through securing income from oil.
- The space that the traditional energy consuming countries have to make to accommodate the growth of energy demand in emerging economies in Asia and elsewhere is substantial.

- An affable redistribution of oil towards emerging economies depends on the ability of particularly the US and Europe to move away from oil. But voluntarily moving more quickly along the transition path, if at all technologically and economically possible, is unlikely without politically addressing the potential accompanying impact on the dislocation of employment and production if this is done in an open trading system.
- The intensity of competition to secure oil flows, with the danger of spilling over in strategic and geopolitical rivalry, will be determined by the size of the supply and demand gap and the ability to intervene in energy flows.
- The tight oil or liquids balance is bound to result in more nervous and sometimes confrontational relationships between the major consumer regions and the natural resource holding countries, as well as among the major consuming countries themselves.
- New geopolitical games to secure the natural resources for their domestic economies and to diversify and secure the gateways to their markets already have become an important part of oil consuming countries' political and strategic agendas.
- Yet, our defense organizations and the military disciplines will respond with new policies, systems and programs when traditional energy security policies become less effective.
- Trust and mutual understanding about the allocation of oil and the security of supply will not come automatically, but instead needs to be constantly reconfirmed.
- The leaders of the main economic and political powers have to come up with a plan that guides us through this difficult period of transition and redistribution of oil scarcity. If they fail to do so and instead opt for a competitive solution, the nasty side effect of oil scarcity could be a confrontation in and over oil-producing countries in Africa, Central Asia and the Middle East, leaving many countries to scramble for whatever oil supplies they can lay their hands on.
- Much will depend, therefore, on responsible leadership among the leading nations in this scramble for oil and other liquids.

#### **THE JEDDAH ENERGY SUMMIT AND SUGGESTED ACTIONS**

- The Jeddah Energy Summit was held at the invitation of King Abdullah of Saudi Arabia on 22 June 2008 and brought together representatives of OPEC countries, other main producing countries, and important oil

consuming countries (from the OECD and emerging economies). Saudi Arabia took the initiative to put the issues leading to the current oil market situation on a joint international agenda. This is a very important initiative which deserves a serious follow-up.

- We applaud the Joint Statement by the Kingdom of Saudi Arabia and the Secretariats of the International Energy Agency, the International Energy Forum and the Organization of Petroleum Exporting Countries<sup>1</sup>.
- It has become clear that too much is at risk to leave the current geo-economic, geopolitical and monetary challenges to run its own course in the years to come<sup>2</sup>.
- Instead, the Jeddah Energy Summit should be continued in a formal setting and on an annual basis. The follow-up event planned for the end of this year in London underpins this proposal. Such event can be best organized by the three most important institutions in the field of oil and energy: the secretariats of the IEA, OPEC and IEF. In addition, the agenda should be expanded to inter-related topics that are directly related to high oil prices.
- Several actions could already be taken today in addition to the statements made in the Joint Statement:
  - The global upstream investment framework has to be dramatically improved. All economic, political and technical barriers that frustrate (more) upstream investments in all major oil producing countries have to be identified, discussed and taken away. Accompanying risks in the oil sector have to be lowered, mitigated and resolved.
  - In this respect, OPEC and the major oil producing countries have to accept the new reality: without developing more medium priced oil, the Oil-constrained World will be much more turbulent than necessary. An announcement to this effect can calm today's frenzied oil markets substantially.

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<sup>1</sup> Joint Statement by the Kingdom of Saudi Arabia and the Secretariats of the International Energy Agency, the International Energy Forum and the Organization of Petroleum Exporting Countries, Jeddah Energy Meeting, 22 June 2008. [www2.iefs.org.sa/Pages/home.aspx](http://www2.iefs.org.sa/Pages/home.aspx)

<sup>2</sup> Many of the issues addressed at the Summit are also addressed in this essay. A draft of this paper was circulated among some of the people that participated in the Jeddah Energy Summit and we are grateful for their very useful comments. The views expressed in this essay, however, are those of the authors.

- In return for more investments, the major oil consuming countries have to share the (unlikely) risk of over-supply, by providing mutually acceptable guarantees that in case there is some oversupply, the burden will be shared pro-rationally.
- In addition, commercial stocks in the major consumer countries have to increase substantially, preferably on a voluntary basis, but if needed through regulation. These additional oil stocks have to be seen as a complementary base to the spare capacity held by Saudi Arabia and needs to be managed in close cooperation between the main holders of these stocks and spare capacity. In addition to the benefits of having higher oil inventories in the main oil consumer countries and to share the cost of these extra oil inventories between OPEC and consumer countries, it will also help to reduce oil price volatility in the front-end of the price curve.
- Within such a new framework that is less hostile for upstream investors, OECD countries can and must further develop more energy efficient solutions through conservation, innovation and substitution, not to replace but to complement oil.
- In parallel with the OECD countries accommodating economic growth of the emerging economies, the latter countries have to work away their oil product subsidies, without triggering a jump in consumer price inflation, in order to improve energy efficiency and to reduce world oil demand growth.
- In return for accommodating their growth, hard agreements should be made between OECD countries and China and India in the area of CO<sub>2</sub> reductions.
- Bilateral oil trade for a certain markets only, outside the well-established international oil markets, should be avoided.
- The focus of investigations of the role of Sovereign Wealth Funds should be shifted from where and in what sectors they are going to invest in how they invest and manage their investments.

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# OIL TURBULENCE IN THE NEXT DECADE

## AN ESSAY ON HIGH OIL PRICES IN A SUPPLY-CONSTRAINED WORLD

### 1. A NEW PARADIGM FOR OIL

*What was anticipated to happen in the first part of the next decade has been fast-forwarded to today, more than 5 years earlier, and is unfortunately going to shake the very foundation of our energy systems. Without exaggeration, the recent developments in the international oil market are ground-breaking: a little over a year ago, in January 2007, the West Texas Intermediate crude oil price (WTI) traded for \$50 dollar a barrel. Within a year, the price doubled to \$100 per barrel in January 2008 and pushed through to over \$135 in June 2008, against the backdrop of the fresh market supposition about reaching a whopping \$200 per barrel in 2009. If this proves to be true, the world will not only have moved from an "Oil Demand-led World" to an "Oil Supply-constrained World" (since 2004) but, more importantly, will then also experience a radical change in the oil price formation.*

Until recently, the oil price was largely underpinned by the marginal cost of the last barrel needed to match demand, with some political and economic conjuncture mark-ups or -downs. As will be presented in this paper, the current high oil prices are still primarily driven by structural factors that can be well explained without resorting to blaming speculative investors playing the futures market or the low dollar. But if prices are heading towards \$200 a barrel in 12 months' time, or for that matter even to \$150 a barrel, other drivers will gain prominence over marginal costs as the main driver. In that case, OPEC will have accomplished a long-held wish: oil will then be priced at its real value in the Western world (for instance the economic value of mobility for consumers, or the value of plastic components or cargo transportation). Such a new price regime, pricing at the "User Value", also implies that the oil price will not necessarily invite new supply into the market, since income requirements of producing countries (especially OPEC member states and Russia) will be easily met through price rather than volume. In such a world the current economic logic that crude oil prices tend towards the marginal cost of supply will no longer hold true. Oil will no longer perform as a commodity but will instead be priced for its economic and strategic value, with the User Value of oil further divorcing cost from price.

In the short to medium term, it is likely that this new price regime will further strengthen, because OPEC member states have decided to slow down their

medium-priced oil investments (the long-term structural component of the futures oil price) and to not restore the level of spare capacity in the oil market that existed up to 2004 (this being the major trigger that has led to the world moving from an Oil Demand-led World to an Oil Supply-constrained World). They are doing this at a time when non-OPEC oil is reaching its plateau and new oil from these countries is increasingly more expensive to develop. The recent promise by Saudi Arabia to loosen the export restrictions as of 1 June 2008 and to add 300,000 barrels per day to the market to compensate for lost barrels in other OPEC countries (notably Nigeria), is a small token of goodwill towards the Western world's weakening economies, but is insufficient to reverse the trend. The consequence of a deferred investment climate in the oil industry is that it will become increasingly unlikely that world oil supply (from all sources) could grow substantially above 100 million b/d, which is still 16% below the global demand projected for 2030 in the latest edition of the World Energy Outlook (WEO 2007, reference case).

A 2030 supply/demand level of around 100-105 million b/d, most likely to be published by the International Energy Agency (IEA) in their next edition of the WEO in November,<sup>3</sup> will have far-reaching implications. It appears that world oil (and liquids) supply can only grow at half the rate in the next 22 years than earlier anticipated (circa 13-18 million b/d versus 29 million b/d). If correct, this means that the world will have to go through a period of substantial demand destruction – in the order of a half to two thirds of today's oil demand in the US, or up to 100% of the oil projected to be imported by China in 2030. A possible increase of underlying oil field decline rates at the time that deepwater oil production (circa 10% of global oil supply) goes off plateau in the first half of the next decade could make this pessimistic supply outlook even worse. But even with stable observed decline rates (of approximately 4.5% per annum), the industry still has to bring twice as much new oil and liquids onto the market in the next 22 years than what they have done over the past 22 years – around 80 million b/d if supply and demand were to grow to 116 million b/d by 2030 as per WEO 2007, or 70 million b/d if supply can't grow much further than recently suggested. Higher annual depletion rates later in the period only increases the challenge.

This outlook of new scarcity is now exacerbated by the fact that not only available supply will determine what amount of demand can be satisfied; it will also bring about a new allocation of the available oil due to a lack of adequate supply growth compared with demand. In practice this means that demand rationing will be required in the OECD countries, and particularly in the US, in

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<sup>3</sup> Wall Street Journal, interview with Dr. Fatih Birol, the IEA's chief economist and head of the WEO studies, 23 May 2008.

order to accommodate growth in the newly developing countries, notably China and India. Different fuel price settings to the end-consumers in the different countries will be the dominant factor behind this “Oil Re-distribution”. The alternative is that new and old oil consumers end up in fierce competition for scarce oil supplies at much higher price levels, with the risk of triggering a deep and prolonged recession and/or the eruption of geopolitical conflicts in or over a producing region or country.

Quickly rising oil prices would not be necessary if OPEC and a couple of other major oil resource holding countries, notably Russia and Mexico, would accept their global responsibility and take actions accordingly. The fact is that around 8 to 10 million bbl/day of medium-priced oil is available in these countries<sup>4</sup> in addition to what is currently under development, but it cannot be developed and produced for political reasons, due to ongoing conflicts and demand uncertainties. Should this oil become available, global oil demand could be met for the entire next decade without spiraling oil prices. Oil prices would still (need to) rise, but would do so in a much smoother and controlled way. The transition period from an Oil Supply-constrained World to an “Energy-sustainable World” desperately needs to be better managed globally. The world definitely needs more time to adapt, to realize the innovations and to roll out the new alternative fuels – not to replace oil, but to supplement it, in order to meet the surge in global demand, particularly in the developing and industrializing countries. If this does not happen, the Oil Supply-constrained World will be much more turbulent than necessary. Realistically, things will get worse before getting any better.

Without being able to persuade OPEC, Russia and a couple of other major resource-holding countries to change their (national interest driven) policies, Western consuming countries have no alternative than to work even harder on conservation and innovation with the objective to achieve a sustained reduction in the rate of demand growth relative to the rate of economic growth, and on developing their most expensive unconventional oil reserves (such as Canadian oil sand and ultra deep water developments) and substitution. The alternative is stagnation; a reduction in the rate of economic growth as supply constraints become binding on overall economic growth as predicted as a possible scenario in 2005<sup>5</sup> (the “Fourth Oil Shock and a Supply Constrained World”).

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<sup>4</sup> Iraq: 4 mln b/d+; Iran: 1 mln b/d; Nigeria: 1 mln b/d; Venezuela: 1 mln b/d; Saudi Arabia, Kuwait and UEA: 1 mln b/d+; Russia: 1 mln b/d; Mexico: 0.5 mln b/d+; Rest of OPEC: 0.5 mln b/d.

<sup>5</sup> Jan-Hein Jesse and Frans Kunst, The Fourth Oil Shock and a Supply Constrained World, CIEP paper, June 2005.

In this Oil Supply-constrained world where the major producers strive for receiving the best price for their commodity, ultimately oil prices will then oscillate between: a) the cost of the marginal barrel of supply set by the most expensive barrel (irrespective of whether this comes from Canadian oil sands, 1<sup>st</sup> generation biofuels or gas-to-liquids, or in due course from 2<sup>nd</sup> generation biofuels, plug-in hybrid electric vehicles (PHEVs), offshore arctic oil field developments, coal-to-liquids or even in the very long run from oil shales) plus a margin for supply/demand fundamentals and geopolitical risks, driven by open markets in a Western capitalist consumer framework and b) the real User Value of oil, set by increasingly closed markets (for new reserve exploitation; for bilateral oil trade flows; for refined products), as endeavored by the major OPEC countries and Russia. The first would place the oil price at a floor of around \$110/bbl for 2008, but still rising (as costs are still inflating, although recently at a slower pace); the latter perhaps driving the price up to a super-spike of \$200+ a barrel in 2009 as pointed out by several investment banks, OPEC and Gazprom. In any case, prices will show far more volatility – and hence uncertainty, which is detrimental to the global economy and its growth trajectory.

Although it is very difficult, perhaps even impossible, to accurately and consistently forecast oil prices, there will be increasingly more resistance to drive prices to that \$200-250 a barrel level: Ultimately consumers are going to revolt. At the current oil prices of \$140+ a barrel, this consumer behavior is emerging in some of the OECD countries. Yet, in the absence of a deep and prolonged recession in many countries, it is still reasonable to expect much higher oil prices in the next decade from a pure supply and demand perspective when fundamentals are anticipated to further deteriorate. This is even the case in a low global economic growth scenario, when the OPEC member states and other large resource holders continue their reluctance to accelerate their upstream investments.

Through a combination of the OPEC policies at work and the different price mechanisms in the different consumer regions, the OECD countries pay twice for the burden, once directly at the fuel pump, and secondly indirectly by rationing demand to accommodate the surge in oil demand in the newly industrializing countries that benefit from subsidized prices but drive the oil price in the global markets higher. Of course, the ultimate winners in this game are the major oil producers, at least until they also reach the boundaries of their economic systems.

So far, the developed economies have been able to accommodate the growth in oil demand in the rest of the world and have been willing to pay for it. Energy cost as part of income has been relatively low until recently. The question is, however, if they will continue to accept the current condition if new supplies start falling short of growing demand, something that will become increasingly

unavoidable in the next decade if OPEC countries continue to behave as they do today. In our view it is quite possible that each major economy will ultimately start to take unilateral and more protectionist actions, even if they collectively give a strong preference to a more cooperative and open society. In this sense, more and more countries will face a prisoner's dilemma, having to opt for the obvious, driven by their lack of security of supply. In this view, the glimpse we have seen of a modern *fenqing*, or "angry youth" in China – characterized by patriotic, xenophobic and nationalistic behavior by the well-educated young Chinese people – is worrisome. With a strong sense that the West, led by the US, is trying to keep China down and stop it from taking its rightful ("fair") place in the world, the Chinese feel they have the fullest right to their "fair" share of the oil (and other commodities) pie. In discussions several *fenqing* made it crystal clear that they will not accept the Western world frustrating their peaceful economic development and growth. But how that "fair share" is defined and accepted by the different parties, both West and East, is not clear and will only be tested in the next decade when the oil turbulence further deepens. Most likely, China's internal forces and issues, difficult for Western countries to understand and to anticipate, will define the precise "fair share".

Without pointing a finger only at China, the US – being addicted to oil – is, from a European point of view, equally to blame for its unsustainable extensive oil use. The US currently uses 20.35 million b/d of oil; 42% of total oil product demand in all OECD countries, or 23 percent of global demand. Compared with OECD Europe, which uses 15.26 million b/d, oil use per capita in the US is around 80% higher than that of Europe, with too little action seen to bring this aggressively down to be in line with European consumption. For instance, driving one mile in the US currently requires 37% more fuel on average than in Europe, due both to the larger size of vehicles and to less efficient energy technology. Moreover, demand was basically flat in 2007, in spite of a deterioration of the economy. In this sense, one could equally argue that the US currently uses more than its "fair share" of the world's oil. Naturally, a much stronger change in the US than already proposed will be much applauded. For instance, an estimated 4 to 5 million b/d of oil imports into the USA could be saved by 2020 when the next car that every US citizen buys results in a fuel efficiency that is on par with the EU's fuel consumption level today. Such investment will not only be beneficial for the US, but also for the EU and the rest of the world because it will help to stabilize oil prices at world markets in the years to come.

The mores of the international market and its rules and regulations are part of the American model of hegemony, something that was a given but has become increasingly contested by the developing countries outside the OECD. In the past few years, the newly emerging geo-economic and political powers have given this model their own twist; they have used access to markets, resources and

intellectual property to build up their economic prowess.<sup>6</sup> In the meantime they have (tried to) secure oil flows through differently structured bilateral deals with producing countries. This is already triggering several counter-mechanisms and reactions beyond the oil markets themselves, particularly in the US. However, producing countries are interested in such agreements because they are gaining access to quickly growing markets, and the political terms are so far interesting enough for them to want to embrace both models. For the OECD countries, which have put so much faith in a global, open, and integrated market system, it is therefore important to understand the dynamics of the two competing models of oil trade and development, the other being much less transparent.

Thus, at the same time that the oil price model is shifting for those oil flows that are part of the world oil market, the world oil market model itself is also undergoing changes. In this Oil Supply-constrained World it is no longer guaranteed that all the oil produced will continue to be traded in the world oil market for an indefinite period of time – a market that is truly global, integrated and liquid, and has served us well for the last thirty years. After a period of deepening internationalization of the oil market, oil trade is already increasingly entering a period of bilateralism, where business-to-business is supported at a government-to-government level, and where several parties try to gain a privileged position over others. Through bilateral agreements and resource ownership with the intent to produce for a certain market only, as the Chinese foreign direct investments pursue, purchasing power is no longer enough of a guarantee for access to all oil flows because of market segmentation. This implies that if new oil comes onto the market, it becomes increasingly important for price developments as to under which terms this oil becomes available: serving the international market or bilateral trade. Countries such as China are very much geared towards capturing their share of the energy pie, and they do not want to rely on world markets alone. Their foreign policies are squarely designed to achieve their aspirations. Access to sufficient oil is critical to realizing them.

If major oil producers are indeed going to play this new game and squeeze supplies in the open market to serve the bilateral arrangements, price levels and volatility could increase, making price formation increasingly difficult. In the worst case different price regimes will start to function in parallel, something that is in the hands of OPEC to allow to happen or not. As a consequence, oil security and price insecurity could be seriously impacted.

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<sup>6</sup> Coby van der Linde, *Energy in a Changing World*, CIEP energy paper, March 2006.

In the medium term, only one single country could counterbalance these drivers, and that is Iraq.<sup>7</sup> Even if the war had not started about oil, it definitely needs to be finished for oil. Unfortunately, it does not seem to be in the interest of the most important OPEC countries to help solve the conflict. On the contrary, they only have something to lose in this new game. Iraq is the only remaining country that has substantial untapped volumes of medium-priced oil that could be developed easily under the right political, legal and fiscal agreements. Once there is peace, international oil companies could start helping the national oil companies of Iraq to develop their vast resources by investing billions of dollars in the reconstruction and modernization of the Iraqi oil industry, bringing in technology and project management capabilities, and gradually elevating aggregate output from a little over 2 million b/d today to six or even more. Such an expansion of supply could bring the price regime back closer towards the marginal cost-based system.

Unfortunately, as far as people can remember, the Middle East has been in conflict. The chance that this will change dramatically in the short run is doubtful. But if Iraqi oil were to be developed in the short run, its medium-priced oil would impact global oil prices and the pace of the development of the future most expensive barrel (from offshore arctic fields, biofuels, coal-to-liquids or electric cars) would become less urgent, giving the world more time to innovate and to make a smoother transition to an Energy-sustainable World. Unfortunately, lower oil prices seem not to be in the interest of most of the major producing countries if one listens to their messages carefully. This is particularly true for Iran and Venezuela where the leaders are able to consolidate their power with high oil prices. The expansion of their sphere of influence in their respective regions has to be seen in this context. Such actions only increase interregional tensions that are directly reflected in higher oil prices, profiting their governments.

The new oil paradigm with a different price regime has wide implications, not least for many of the forecasting models underpinning many consumer countries' policies, but also on the expected model of scarcity distribution. The next edition of the World Energy Outlook, currently under development by the IEA, seriously analyzes the impact of the deferred investment scenario, first launched in the WEO 2005. By November we will learn how they evaluate the development of oil markets in the Oil Supply-constrained World that is coming much sooner than initially anticipated.

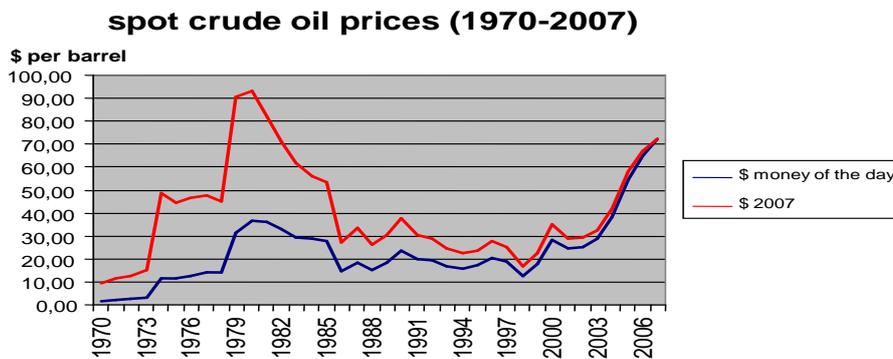
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<sup>7</sup> Coby van der Linde, "Is Iraq a Game changer?" in: *Cannons and Canons: Clingendael Views of Global and Regional Politics*, Alfred van Staden; Jan Rood; Hans Labohm [eds.], Assen, Royal Van Gorcum, 2003.

## 2. A WAKE-UP CALL

2008 will be the seventh consecutive year of global crude oil price increases (see Figure 1). Speculation at the start of 2007 that oil would average \$50 a barrel turned into predictions of breaching the \$100 a barrel mark by the end of the year. On the first stock-trading day in 2008 the West Texas Intermediate crude oil price did indeed breach this psychological barrier; it was just a matter of time. In the first quarter of 2008, oil traded mostly between \$100 and nearly \$110 a barrel, apparently oblivious to the quick deterioration of the global economic outlook. In the second quarter, when the financial markets calmed down, WTI prices easily moved on to an all time high of over \$145 a barrel, breaching barriers of \$105, \$110, \$120 and \$130 a barrel in the space of three months, now standing at more than \$140 a barrel.

**Figure 1: Spot crude oil prices**



As always in rising markets, many in January believed that \$100 oil would not be sustainable and would soon fall back to the high eighties. But only five months later, \$100 already seems cheap, and people are now much more worried that prices will continue to rise. Based on the fact that the booming regions of the world, China and perhaps India (although the latter suffers more from high oil prices) and particularly the Middle East, will continue to show strong oil demand growth, while on the supply side things are increasingly expensive and fragile, with high levels of investments not resulting in much more supply, Goldman Sachs came out with a report suggesting that a price of \$150-200 per barrel in the next 6-24 months is gaining likelihood. This warning was trumped by Chakib Khelil, OPEC's current president and Algeria's oil minister, who warned that prices could increase to as much as \$200 a barrel and, as always, blamed external factors, this time the weak dollar and global political insecurity, for the rising prices. Without a blink, he stressed that OPEC was not to blame for this high oil price environment and could do nothing to reverse it. In that same week,

Abdalla Salem El-Badri, secretary general of the OPEC, issued a statement reiterating that the sharp rise in crude prices is mainly driven by financial market developments and the increased flow of speculative funds into oil futures. Both OPEC statements do little to corroborate the rationale behind the more than doubling of the oil price over the past twelve months.

Apparently even the current weakness in demand cannot drive oil prices down because both the structural drivers of oil price and, surprisingly, the cyclical components are strong, creating a bull-bull market in the global oil markets. Thus, even though oil prices could weaken in the short term, markets believe that oil prices will remain high in the longer term. From an industry perspective, some slowdown in economic growth and hence oil demand growth would definitely be welcome, because it buys some time to improve the current tight oil supply–demand balance. The bottom of oil prices are, however, driven fundamentally by the cost of new oil supply, and it is quite possible that the need for more investments to bring the more costly oil to the market is likely to lead to fiery prices in the coming years. With access to the cheaper oil awaiting development being constrained by producer governments, local conflicts and/or other investment uncertainties, private international oil companies are forced to exploit the more expensive reserves, structurally driving oil prices ever higher. And if OPEC is successful in achieving its long-term goal of setting the oil price at the User Value, prices could indeed spike.

Against this background, talking about \$150+ a barrel does not feel completely ridiculous, although in our view higher prices will meet more resistance because a shift in price regime toward the real User Value for oil will not come automatically and will definitely not be a straight line to the top.

The recent oil price hike is already ringing alarm bells all over the oil-consuming world, not only because of the rapidly changing terms of oil trade and the accompanying immense wealth transfer to producing countries, but also because these oil price increases come amidst a period of a deteriorating economic outlook and soaring food prices. Further price increases in a short period of time will resonate even more loudly. Although the full impact of the credit crisis on the economies of all the consuming OECD countries is still unclear, worldwide inflationary pressures are also growing, with only a small group of countries, notably the EU member states with a strong local Euro currency, that can partly offset the oil price increase by the appreciation of their currency against the dollar. It is clear, however, that oil-consuming countries are concerned about maintaining their purchasing power to import energy, especially oil.

The current uncertain global economic climate and the rise in energy prices are further fueling concerns about changing geopolitical and geo-economic relations. Oil (and for that matter energy) has been elevated to the top of the political

agenda. In some countries, such as the US, Japan, Korea, India and China, energy security is already a major driver of their energy policies and features high on their foreign and security policy agendas. With the upcoming presidential elections in the US, oil can also become the No. 1 topic domestically; oil may become a major 2008 campaign issue in the months to come. In contrast, in Europe, at least at the EU level, there appears to be a widespread underestimation of the short- to medium-term effects on their economies of higher oil prices (or at least a widespread sense of helplessness about being unable to do anything). With respect to energy security, EU politicians tend to focus on natural gas only in context of the dynamic relationship most of the key member states have with Russia, on the perfection of the internal market, and last but not least in the larger context of climate change. But even in Europe, high prices and supply uncertainties in a quickly changing world could lead to energy security replacing the environment as the main driver to diversify away from oil.

At the same time, there is a growing concern that the lack of good and timely substitutes for oil will impact food and water security, ever more pitching countries against each other and undermining cooperation in the multilateral political and economic system. The availability of energy, but also food and water, is crucial for emerging economies as well as oil-consuming developed and developing countries. The current surge in oil prices and the warning by the IEA that supply and demand could become further constrained in the next decade warrant a thorough analysis of the current oil market fundamentals and the impact on international relations. Scarcity will become a dominant factor around the world that is going to impact hundreds of millions of people.

In the next sections, a deeper analysis of world oil markets will be presented for the period up to 2020, covering the decade in which traditional fuels will not have a serious substitute and which was dubbed by the IEA as a decade in which an energy crunch is very plausible. A comprehensive account will be given on how oil prices are formed, why they are as high as they are today and why they will continue to rise in the next decade if policies in the major resource-holding countries are not changed. Already Saudi Arabia has announced that it would not be increasing its production capacity beyond what it had announced before – 12.5 million b/d in 2009 of which 1.5 million b/d of spare capacity will be kept for emergency purposes – on the grounds of demand expectations in the next decade and conservation for the next generation of Saudis.

The huge challenges that the industry faces with respect to delivering the projects that bring new supply to markets to match ever-growing demand are discussed in detail. These challenges will only become bigger once the underlying production decline rates in existing fields begin to accelerate when many deepwater fields go off plateau in the first years of the next decade. Special attention is focused on the role of the OPEC member states and Russia in

managing and mitigating the oil turbulence in the next decade. So far, however, they appear very reluctant to accept global responsibility and are instead focused on national interests, something that could drive the world further into a scramble for oil. However, the Jeddah Energy Summit of this June, to which all ministers from the major oil-producing and -consuming countries plus the chief executives of the larger oil companies were invited by King Abdullah of Saudi Arabia, shows great responsibility that is very much applauded.

It will be argued that the primary solutions in the field of oil will come from technology, through the development of alternative fuels, better oil production technologies and, last but not least, through improving the total energy efficiency. However, it often takes decades before new technologies are diffused sufficiently enough to make a material impact.

At the end of this paper the most important side effects of high oil prices will be discussed. They lie in the area of finance and capital markets, defense, and in managing economic growth and international relations in the face of reduced energy security.

Generally speaking, policy makers and governments either focus on today's issues around oil prices and their impact on e.g. inflation and food prices or they focus on long-term issues around energy security and energy-related climate change where the timeline stretches out 50 years and beyond. However, there is little debate and few publications about what the world could expect in the next decade, namely when the world will enter the worst part of the transition period from an "Oil Supply-constrained World" to an "Energy-sustainable World". We believe that this transition period could be rather turbulent and needs the full attention from all leaders of the major producing and consuming countries. In this respect we will argue that without strong global leadership, tight commodity markets and resultant high prices could easily drive us towards an ugly world, with nations engaging in destructive competition for scarce energy resources. Without this urgently needed leadership to cooperate, the world could continue to move along a "Scramble" storyline, the first energy scenario to 2050 recently having been developed by Shell.<sup>8</sup>

### 3. TWO FUNDAMENTAL DRIVERS TOWARD HIGHER OIL PRICES

Surprisingly, the rally to \$100+ a barrel of oil started when the outlook for the US economy as a result of the credit crises was further deteriorating. Indeed, this occurred on the very day Goldman Sachs suggested the US was "on the edge of a

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<sup>8</sup> Shell International BV, *Shell energy scenarios to 2050 (2008)*. This Shell energy scenario publication can be found at [www.shell.com/scenarios](http://www.shell.com/scenarios).

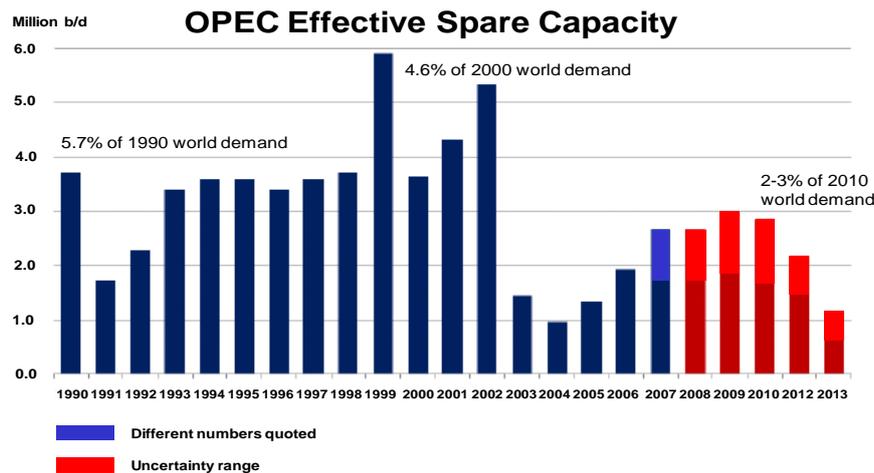
recession". To be sure, even if the credit crisis had not occurred, oil demand growth for 2008 would definitely have been higher, with resulting higher oil prices (although a stronger dollar might have partially compensated for the price increase). Equally surprising is the fact that these price increases took place at a time when effective OPEC spare capacity had improved gradually from an all-time low of 0.5 million b/d in 2004 to around 2 million b/d today, while the average price for WTI oil futures in 2004 was \$41.4 per barrel. Apparently something else is going on, something more structural. Despite the fact that today's oil prices are at an all time high in real terms and can thus contribute to an economic slowdown and temporarily impact global oil demand growth, prices are nevertheless expected to remain high for two very structural, non-speculative reasons.

First, as long as there is no credible cushion of spare supply capacity in the core OPEC countries, comparable to the share of total production capacity levels in the late 1980s and 1990s, the awareness of tightness in the oil markets will remain and possibly even intensify. Although spare capacity has improved some since 2004, it is still fragile, uncertain and not perceived as adequate (see Figure 2). Moreover, the conviction has grown that demand growth will continue to outpace supply growth over the medium term, irrespective of a temporarily downward revision of growth in demand as a result of the financial crises, leading to a common view that spare capacity could go down again in the medium term, as badly as to basically nil. The picture on spare capacity was further blurred by OPEC's quoting gross spare capacity numbers (of 3 million b/d) that include oil closed in for crude quality reasons (that nobody can process) and oil shut in due to civil unrest, making their statement difficult to read.

Second, to mitigate this potentially deteriorating supply–demand balance, there is a need for more investments in the upstream sector, which had already grown to \$1 billion a day in capital expenditures. Unfortunately, the major resource-holding countries – OPEC and Russia – provide limited access to the international oil companies (IOCs) for the cheaper-to-develop oil fields, while also delaying their own investments decisions. In addition, smaller resource holders are also restricting access, while others have such high demands that investors shy away in today's uncertain investment climate. These policy constraints have far-reaching consequences for the flows of capital, which are now restricted so as to only flow towards more expensive, low-yielding investments in new oil supply that is accessible. With no alternative other than not to invest when yields are too low given the risks – with all consequences for global oil supply – the forced flow of capital toward the most expensive projects has resulted in huge cost inflation, driving the cost of the marginal barrel to ever-higher dollar numbers, creating a further upward pressure on oil prices. Fighting an uphill battle, the

IOCs have announced a further increase in their capital investments for 2008 as the cost of building new capacity continues to rise. In the extreme, this will lead to explosive oil prices.

**Figure 2: The effective spare capacity**

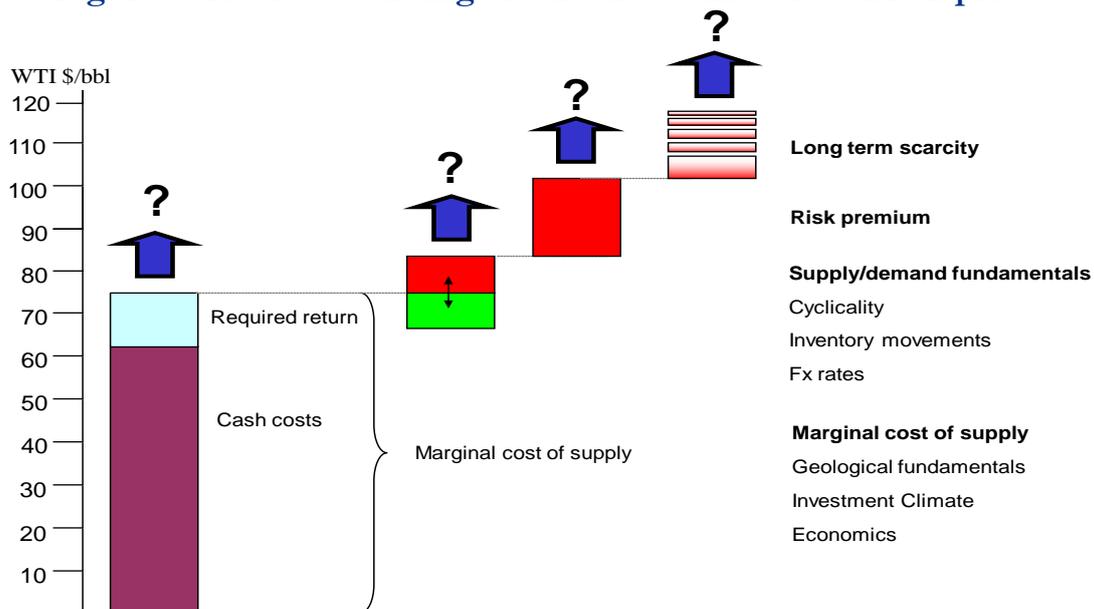


Moreover, these high capital expenditures, now already going on for five years or so, have not resulted in substantially more productive capacity. Most of the money pumped into the oil system went to the most complex projects – many far more complex than initially anticipated, resulting in serious construction delays to first oil and huge cost overruns. Slowly the market is now realizing that there are not enough of these large, complex oil projects under development to increase the global productive capacity and that the ones that are under development will be under increasingly more pressure to replace production from existing fields in decline. The consequences are continuous disappointments in production growth, both in non-OPEC and in OPEC countries. Today there are no signs that this is going to improve; to the contrary, few new large oil projects are standing in the queue waiting for development after the current wave has been finished. The International Oil Companies are becoming increasingly “gassier”.

## 4. OIL PRICE FORMATION

Oil price formation can be best explained along four building blocks (see Figure 3). But before explaining the oil price structure, it is important to realize that high oil prices are a consequence of the lack of spare capacity in the OPEC countries and the policy constraints in those countries. After almost two decades of ample surplus, the market has since 2004 found itself in the situation, unprecedented since 1972-1973, that there is no cushion of spare capacity to cater for unexpected events. Unfortunately, after the twenty years (1984-2004) during which excess capacity was eliminated, from a high of 14 million b/d in 1985 (or 23% of total demand) to an all-time low of 0.5 million b/d in 2004 (less than 1% of total global demand), OPEC countries have made it crystal clear that they will (i.e., can) not invest in new spare capacity, among others because it is very costly. The only exception is Saudi Arabia, which has taken responsibility to build for 1.5-2 million b/d of spare capacity for emergency situations, but even their minister of petroleum and mineral resources confirmed that their maximum productive capacity will not expand above 12.5 million b/d because Saudi Arabia sees that level, including the spare capacity, as plentiful and enough for them. Bearing this in mind, there are no other signs suggesting that this cushion will emerge from a sudden boost in new supply from elsewhere. Hence, this cushion will eventually emerge when oil demand stops growing or even contracts, or when complementary fuels become available in large quantities. Only then will oil prices stop rising further. In our opinion, that time is still far away.

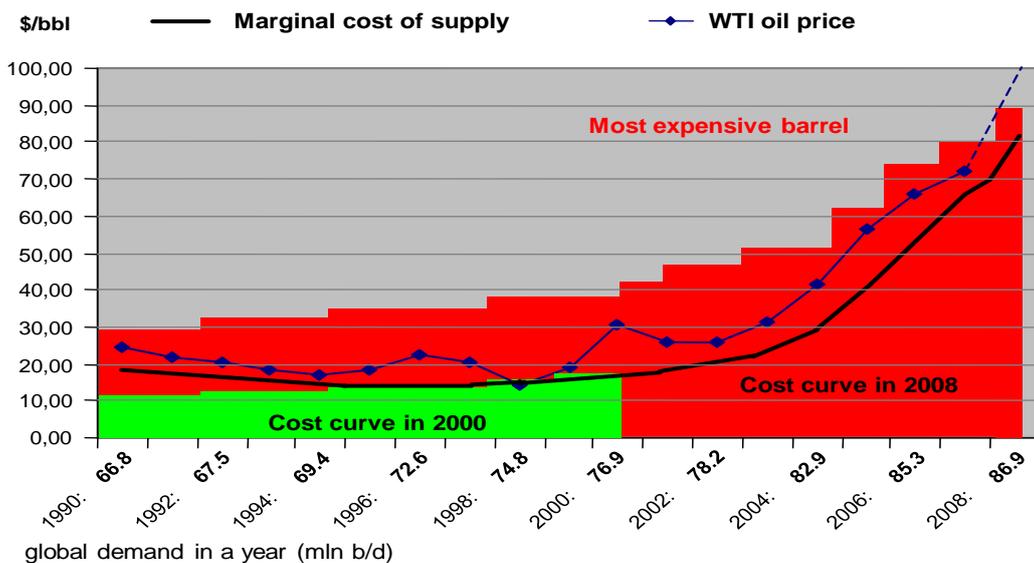
**Figure 3: The four building blocks that define the WTI oil price**



#### 4.1. MARGINAL COST OF SUPPLY

The first building block determines the marginal cost of supply, which is the cost of the production of the most expensive barrel to match global oil demand. It is the first and the most dominant building block of the four. Together with the fourth building block it drives the long-dated oil price (the structural factor behind higher oil prices). It represents the geological fundamentals, the investment climate and economics, including the return the industry players need in order to accept the risks and satisfy their shareholders' requirements. It is the break-even price that oil companies use for their final investment decision. This first block is thus the core of the upstream exploration and production business that is in the hands of the oil industry and the host governments that set the terms and conditions (including taxes) for the companies to find and produce their oil. Since the beginning of this decade, the marginal cost of supply, represented by this building block, has nearly quadrupled to circa \$80 per barrel today (see Figure 4).

**Figure 4: Marginal cost of supply in 2008 (schematic)**



Over time, this building block represented roughly 80% to 75% of the annual average WTI oil price through all oil price cycles from the early 1990s until 2004 when the world moved into an Oil Supply-constrained World. Since 2004, when the fourth building block grew in importance, the percentage has dropped a little bit further to a little over 70%, giving an oil price of slightly above \$110 a barrel in 2008. It is this price that sets the long-time floor for WTI. Further increases in the marginal cost will allow this floor to gradually increase to higher levels. As noted earlier, the cap of the oil price is set by the User Value, a price level that is



currently tested in the market with forecasts of an oil price of \$141 a barrel (WTI) for the 2<sup>nd</sup> half of 2008 and between \$150 and \$200 a barrel for 2009. The User Value is driven by the fourth building block, Scarcity and Policy, which will be discussed further below.

The steep increase of the cost of the marginal barrel is the consequence of a combination of factors:

First, the focus of the IOCs is squarely on the search for and development of the most expensive barrel, as there is lack of access to the “medium expensive” oil in the OPEC countries. Many of the new oil fields that are accessible to IOCs have more complex reservoir characteristics, are located in more isolated and otherwise hostile regions (deep water, arctic, far away from markets, requiring expensive infrastructure), or are unconventional such as (Canadian) oil sands and therefore much more costly to develop. As a consequence, the cost-supply curve becomes increasingly steep at the end of the curve where the most expensive barrels meet final demand. Today, around 4 million b/d of production has a marginal cost of \$80 a barrel or more; without a change in policy, both numbers will only increase over time. Consequentially, oil prices will further rise. To slow this process down, more medium-priced oil has to be developed so that less of the most expensive barrels have to be developed in the years to come. New developments in the Middle East are also increasingly complex and hence more expensive to develop than in the past, but they are still much cheaper than the developments in the more remote areas.

Second, due to a surge in activity to develop these new fields, it is a booming time for the oil services and contracting industries that can barely meet the demand for their services, having led to substantial cost inflation and delays in bringing new fields on stream. In addition, steel and other commodities needed to expand the productive capacity base have substantially increased in price as well. Together, this has resulted in a situation in which average upstream capital costs more than doubled between 2002 and 2007, and where the oil and gas industry is now spending roughly \$1 billion a day on capital expenditures. For instance, the two largest discoveries made in recent years, the Kashagan field offshore Kazakhstan and the Tupi Field offshore Brazil could jointly produce 2.5 million b/d by the end of the next decade, or around 3% of global demand. But they come at a price: Kashagan full development capital expenditures are now estimated at \$130 billion and first estimates of Tupi in a success case are around \$100 billion, and both are still in an early stage of development. On top of this, first oil production of the first phase of the Kashagan development has been delayed several times, now by more than 8 years, with latest target date set for 2013; while expected first production levels have been lowered from 450,000 b/d to 350,000 b/d. Full field start-up of the Tupi field is now expected in 2015, while the field will not reach its plateau production before 2022.

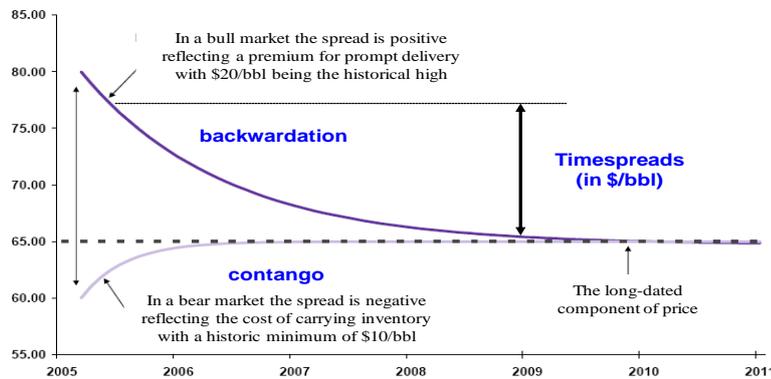
Third, host governments have unilaterally changed the tax terms for existing and new licenses in order to capture a larger share of the value, putting more pressure on oil companies' profitability. So far, major oil-producing countries have increased State takes in the form of taxes and royalties to an average of 85 percent, and some have gone beyond that. They can easily do so because all companies are desperately looking for new deals to expand their production and stabilize their production-to-reserves ratio. In this respect, competition for scarce business opportunities has never been so intense and ruthless as it is today.

At this time, there is no signal that the increase of the oil price as a consequence of the mentioned elements in this first building block will be reversed. On the contrary, further increases in capital costs are expected, at least until the beginning of the next decade when current shortages in equipment will be taken away as a result of new deliveries of drilling rigs, crane vessels, and other service and construction equipment. This being said, it is more likely that the marginal cost of supply, and hence oil prices, will continue to rise, as "easy oil" has peaked and the industry is moving increasingly to unconventional oil and oil found in increasingly inhospitable, relatively inaccessible locations such as the Arctic regions. In addition, the existing installed production base, both small and large producing fields, requires more activity to maintain production. The same is true for new discoveries, which are generally smaller in size, have a shorter production lifetime, and hence call for relative more investment per barrel than before.

#### 4.2. SUPPLY/DEMAND FUNDAMENTALS AND CYCLICALITY

The second building block that affects the price of oil represents the fundamentals and cyclical factors in supply and demand. Different from the first and fourth building blocks, this block drives much more the front-end of the oil price curve (the cyclical cycle; see Figure 5). Although we witnessed price-inelastic demand growth up through 2007 due to strong global economic growth in all large economies for several years, oil prices are strongly impacted by the health of the global economy, projections for economic growth and hence oil demand growth, among others expressed in the net speculative length in the futures market. In fact, around 80% of the increase in oil demand since 2000 took place in non-OECD countries. As long as these new developing countries continue to show high economic growth levels while being able to continue to insulate their economies from higher oil prices through subsidies, growth in demand of oil will be strong, irrespective of demand weakness in the US and other OECD countries.

**Figure 5: The cyclical (time spreads) and structural components (long-dated price) of the price curve**

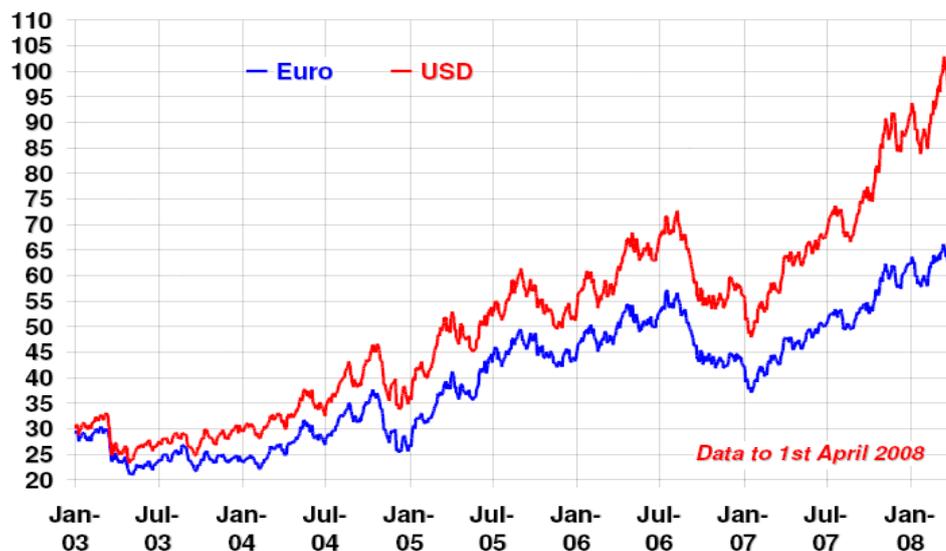


Other factors that drive the supply-demand cyclicity, besides economic growth and oil demand forecasts, include macro-economic factors such as the dollar, inflation, interest rates, etc. For instance, observations show that since 2007 oil has basically been “priced” in euros, in a way that any further deterioration of the US dollar translates directly into the oil price – a relationship that should be viewed with deep suspicion. Looking at the Euro/dollar exchange rate since the inception of the Euro, there has been no apparent relationship between the dollar and the oil price. The same is true for the last few months. While there was a very high correlation ( $R^2= 0.9499$ ) between the Euro/US dollar Fx rate and the WTI oil price during the period from 1 January 2007 until 11 March 2008, this correlation disappeared completely ( $R^2= 0.0413$ ) since then (12 March 2008-12 June 2008). However, quick changes in exchange rates between the major currencies always raise arbitrage opportunities that in this case would lead to higher oil prices. Additionally, given that the most expensive barrel of supply is currently produced in Canada (oil sands), a stronger Canadian dollar versus the US dollar has stimulated global oil prices. A weaker US dollar would therefore result in higher commodity prices due to its impact on oil demand and cost of production in different regions, and also because producer countries want to protect their economic parity. Hence, the dollar depreciation must have contributed to a certain extent to higher oil prices, as reflected in this building block. But to be sure, oil prices are higher in all currencies (see Figure 6).

A third category includes elements such as the level of crude oil and oil product inventories in the major consuming countries, the spare capacity in the OPEC producing countries, as well as crude quality differentials, logistics, oversupply or shortfall in refinery capacity and ability to run different crude slates, weather forecasts and normal planned maintenance of equipment in all segments of the

oil value chain. As a consequence of cyclical changes among these fundamentals, oil prices fluctuate substantially during the year. For instance, in 2004, 2005 and 2006, oil prices reached their annual peak around the end of the third quarter of that year to fall by 21-27% (or by \$15-\$21/barrel) to a low in the first quarter of the following year. However, 2007 was different because prices did not decline but continued to increase – basically doubled – until the very last week of the year. This was because the structural components of oil prices, as described in the first building block, overtook the emerging downward pressure from the aforementioned cyclical elements that follow the economic cycle. But more importantly, OPEC reduced its crude output by 1.5 million b/d at the end of 2006, beginning of 2007, forcing the industry to heavily draw from its inventories, which in turn drove the oil price back from contango into backwardation. Price pressure was thus building at both the back and front ends of the price curve. Particularly the cut in crude output was the principal driver behind the change from a “cyclical bear, structural bull” market to a “bull-bull” market, making the rally in oil prices to \$100 in late 2007 a barrel a foregone conclusion.

**Figure 6: The OPEC price basket**



Low spare capacity directly available in the OPEC countries, in combination with rising prices, the bleak outlook for growth in spare capacity in the years to come and geopolitical uncertainty, is also putting a new perspective on what level of stocks in the consumer countries is seen as adequate. While the consumer countries are extremely pleased that Saudi Arabia has a policy of maintaining some spare capacity, stocks contribute to this capacity in stabilizing oil markets. With growing demand and a fragile, perhaps even deteriorating outlook for supplies, the consumer countries have to help OPEC in increasing stocks to

manage the market. It is therefore important to emphasize the need to have adequate stocks in place, especially ahead of peak demand periods. After years of decline in OECD commercial oil stocks from 60-day coverage in 1990 to around 52 days today, growth in oil stocks in the OECD and in the newly industrializing countries is definitely desired.

This year, demand for middle distillates, the principal driver of the cyclical bull market, is much higher than for gasoline. Resilience in the developing countries that use relatively more diesel and gasoil, and marine bunker fuels switching from heavy fuel oil to distillates for environmental reasons, while demand for gasoline remains weak in the US, something that is expected to continue to last at least for 2008 but probably also for 2009, create a mismatch between product demand patterns and the refinery configuration. This high demand for middle distillates is now also getting a boost from widespread power problems that are leading to more oil use in electricity generation. The devastating earthquake in China, where hydropower and high voltage electricity nets were seriously damaged, will only make this picture worse. The insufficient distillate-oriented conversion currently capacity in place and the unwillingness by US refineries and gasoline-oriented export refineries to run too much gasoline leave distillate inventories low. This forces the refineries to take in more light crude as feedstock because it gives a better return, pushing WTI and other light crude oils higher, and widening differentials between light and heavier crudes.

At the other end of the spectrum one sees extremely weak demand for heavy crude, this being the reason why for instance Iran is not able to sell all its heavy crude output. This temporary mismatch not only drives the WTI price higher, but also the price differential between light and heavy crude oils, in some cases as high as \$20 a barrel. Refineries are currently increasing their investments that would enable them to upgrade more fuel oil into lighter products. In the next three years, global refinery capacity is expected to grow by 1.5 million b/d annually, compared with 0.7 million b/d over 2007. Most of this growth will take place in China, India and, to a certain extent, Saudi Arabia, which is investing heavily in sophisticated refining capacity. This should improve their ability to meet demand growth in distillates. In turn this should again narrow the price differentials between light, sweet and heavy, sour crudes.

At this moment the picture is extremely fragile: if the US goes into a prolonged recession leading to a lower oil demand growth over several years, spare capacity in the OPEC countries could grow modestly in the coming years as projects currently under development come on stream in the next couple of years, and a supply crunch could be deferred. In such a scenario, current prices of \$140-plus a barrel are unlikely to be sustainable, and a partial equilibrium could bring prices temporarily back to slightly below \$110. However, should the recession turn out to be mild and global demand growth go back to levels of 1.2



million b/d a year or above, any easing of expected tightness would not forthcoming. Instead, markets would remain as constrained in 2008-2010 as they are today, and slowing upstream capacity growth post-2010 in combination with ongoing demand growth would pull OPEC's spare capacity levels down rather quickly to uncomfortably low levels. This latter scenario already is supported by the fact that the pipeline for new large oil investment opportunities and developments for the oil industry is drying up fairly quickly. Also, there are no signs that the regions with the highest oil demand growth, the Middle East and China, are prepared (yet) to lower the subsidies to insulate end-consumers from high crude oil prices, leaving oil demand growth rates at high levels. At the same time, fear that demand will slow down plays a major role in OPEC's reluctance to expand its capacity. The card of "security of demand" is used well, and the leaders of the major resource-holding countries see good reasons to postpone investment decisions for several new projects. Under no circumstances do prices have to fall.

#### 4.3. RISK PREMIUM

The third building block captures the risk premium, the cost of geopolitical risks and risk of unexpected supply disruption. Together with the 2<sup>nd</sup> building block described in section 4.2 it forms the short-term, cyclical driver of the oil price. In an Oil Supply-constrained World where OPEC says that it has no pricing power, any event that threatens to limit supply will impact oil prices. Several events have occurred since 2004. Some were technical, like unplanned maintenance; others were driven by accidents or labor strikes. Some were weather-related (e.g. hurricanes) and caused the temporary supply losses. But most were the result of regional or domestic political unrest, guerrilla activity, war or geopolitical tensions. Fear of more supply disruptions at times of rising tensions translate directly in higher prices, as was the case in many oil-producing countries and regions when oil topped \$100 per barrel. New threats of violence to oilfields, pipeline infrastructure, export terminals, especially in the Middle East and Nigeria, will come and go, but as long as markets stay tight and OPEC thinks it cannot do anything, prices will spike with the occurrence of any new event or threat.

Contrary to common belief, there were only few serious price spikes in this area in recent years. The largest spike of the last 25 years took place in 1991 when Iraq invaded Kuwait, resulting in a gross loss of 4.3 million b/d in oil supplies. Since then, prices only increased steeply after the Hurricanes Katrina and Rita and after severe supply disruptions for the first time in Nigeria in 2007. Generally speaking, all other events had little impact on oil prices; they concerned just a couple of dollars and were generally short-lived. However, in a time of increasing tight markets with little spare capacity available in the core OPEC countries, there is little margin for error. In this respect, the role of the IEA

in responding to short-term oil supply disruptions has substantially grown in importance, as could be seen in the excellent response the Agency made directly after Louisiana was severely hit by Hurricane Katrina in 2005 and 1.5 million b/d of oil supplies were lost. OPEC was not able at that time to increase its output due to a lack of spare capacity (around 0.5 million b/d), and the IEA released 60 million barrels of additional oil to the market within days, helping to restore markets adequately. As described in their publication “Oil supply security: Emergency response of IEA countries” published in 2007, it is now important that China and India continue to build emergency stocks as promoted by the IEA and that emergency response measures and mechanisms are further coordinated and harmonized between the IEA member states and these fast-growing industrializing countries.

#### 4.4. SCARCITY AND POLICY

The fourth and final building block is best defined as “long term scarcity”. While the common belief in 2004 was that oil prices only increased as a result of temporary factors and one-off events, today the world slowly but gradually has come to grips with reality. Although reserves in the ground are still plentiful, there is a huge supply challenge for institutional and political reasons (the “policy” factor). In late 2007 it was Total’s CEO who first said that oil production will plateau at around 100 million b/d in today’s world, or 16 million b/d below global demand in 2030 as presented in the latest World Energy Outlook by the IEA. Growth rates of oil reserves and oil production have generally fallen short of expectations, actually already for many years. The investment banks are now also realizing that further growth in non-OPEC oil supply is flattening, while at the same time questioning if OPEC will be more successful in accelerating its production output in order to meet global oil demand. Basically, this building block was absent until recently in the price setting of oil, but it now represents a distinctive value element that will not disappear soon. On the contrary, it is quite possible that the next surprise is waiting to occur: different from the common view, analysis shows that the global average depletion rates (of the existing producing oil fields) will increase faster in the next decade than was anticipated up to now, making it increasingly hard for the industry to raise their oil production above current production levels. This will only be exacerbated by the host governments now taking a much more active interest in their domestic oil industry, taking much more time for negotiating new deals with the major international oil companies than they used to over their share of the revenues and the distribution of risks, thereby delaying the start of new production.

In the extreme, this building block is going to represent the true User Value of oil, where oil prices do not behave as a commodity where crude oil prices tend to fall back towards the marginal cost of supply, but rather, that the User Value of oil will further divorce cost from price. Of course, this is based on the assumption

that crude prices will quickly increase to the \$150-200 range, which is now suggested as a serious possibility.

#### 4.5. CALL ON OPEC

Thus at the time of writing in June 2008, three out of the four building blocks are developing a bullish picture, whereas only the second block, which is more cyclical in nature, is giving some counterweight for lower oil futures prices. With oil prices now much more sensitive to a wider range of influence, the impact of the various drivers will ebb and flow over time as new information becomes available, but for the time being it appears that the structural components of price movements have the upper hand at a time when OPEC is committed to testing the limits of what consumers can bear.

The only way to stabilize world oil prices is to work on these building blocks. The parties best in place to do so are the individual OPEC member states. The alternative is a dramatic and continuous rise in oil prices that will ultimately lead to a sharp and involuntary reduction in oil demand, including in the non-OECD industrializing countries in Asia when, as a result, the US faces a deeper and more prolonged recession than currently anticipated and oil subsidies become too expensive to continue. To avoid turbulence on the international oil market in the coming decade, the world needs OPEC and the other producing countries that still have upside production potential to step up to the plate and increase their production capacity. Although this runs counter to current plans or trends in these countries, opening the substantial resources of several of the major producing countries to International Oil Companies and developing more medium-priced oil together with their National Oil Companies would definitely create relief in the next decade. The rate of further cost increases that drive the first building block will be dampened as a result of this, because immediate pressure to develop the most expensive barrel would be pushed ahead for several years. Without OPEC taking collective responsibility, oil turbulence in the next decade is inevitable.

For many of the same reasons, Iraq will be the key player for the OECD countries in the coming years. To put it mildly, the Western world cannot afford to give up this country's oil potential. At the same time, consumer countries have to improve refinery configuration in anticipation of changing crude qualities and consumption patterns. This will help to relieve some price pressure in the second building block, as will the increase of spare capacity being built by the core OPEC countries. OPEC should also take responsibility in getting their house in order. Today these countries are, as noted above, too much in ideological competition, and too much oil is closed in or can't be developed due to internal or regional conflict. In a nutshell, OPEC has to work on the third building block, too. They have a collective responsibility to help solve the most important

regional conflicts in their member states. A clear indication from OPEC that they take these issues seriously would certainly help to avoid the oil turbulence in the next decade. At the same time, the consuming countries have no time to lose in working on conservation, substitution and innovation, irrespective of the price of oil, as energy transitions are inevitable and necessary. Yet, as noted before, the consumer countries have to take away the security of demand risk for the upstream investors in the main resource holding countries. Together the producer and consumer countries have to work on improving the investment framework.

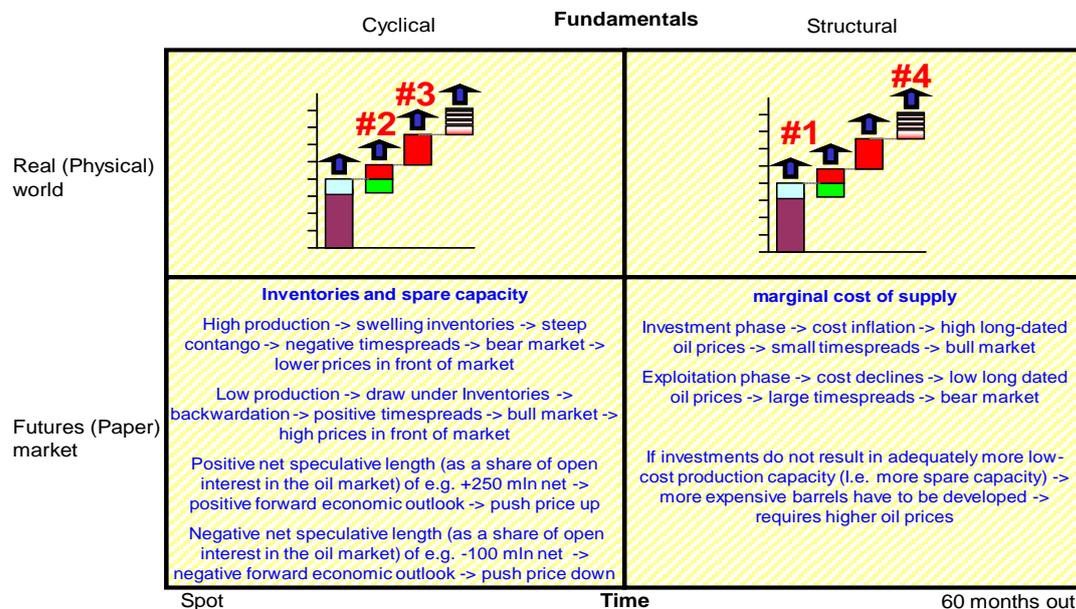
Although higher oil prices will signal the need for greater investments, it is increasingly unlikely that this time it will actually result in more oil if non-OPEC supply (excl. Russia) has to do it alone. The industry is currently already overstretched, but the IOCs will soon be faced with the fact that the funnel of new oil fields ready for development is tailing off. The few big ones that are available are so complex (and expensive) that they will not see first production before the second half of the next decade at the earliest; for several projects this is even later. So it is very unlikely that higher prices will result in many more investments and thus in more oil supplies. This will be further exacerbated by the fact that more of the existing fields will go off plateau in the years to come, resulting in a slow but definite increase in average global underlying decline rates. To mitigate this, oil companies have to work increasingly harder and to invest more just to stand still. The question is if they are willing and able to do so. Generally, international oil companies already fail to achieve this – most of their growth is in natural gas – and things are certainly not becoming easier. To grow without support from OPEC (and Russia) makes any growth in global output increasingly difficult. If further maturing, this process will also give strong support to the unprecedented change in oil price formation, where prices no longer follow the cost cycle but deviate away to the real User Value in consumer economies.

#### 4.6. IMPACT OF TRADING

Changes in the magnitude and direction of each building block are actively managed through oil futures trading at the New York Mercantile Exchange (NYMEX) and the InterContinental Exchange Europe (ICE) in London. All events that take place in the physical markets (categorized in the four building blocks) find their way in the (paper) futures markets (see Figure 7). Investors buying and selling futures and options in different types of crude oils and products set the price for these commodities, the most important one being West Texas Intermediate (light, sweet oil), which provides for physical delivery of oil in Cushing, Oklahoma, USA. In that respect, the futures market follows the physical market, not the other way around.

Many players, commercial ones (hedgers) and noncommercial (speculative) players (speculators), long-term investors (pension funds) and high velocity participants (hedge funds, proprietary trading houses, investment banks) are putting increasingly more money into the oil market. The number of open interests in WTI futures (the number of future contracts standing open, both long and short) grew threefold from 779,513 contracts in 2003 to 2,453,667 contracts in 2007, each contract representing 1,000 barrels. In that year, the total volume of light sweet crude traded at NYMEX was 122 million futures contracts. With eroding opportunities in other financial markets, commodity futures provide a good alternative, especially when the dollar is weakening, inflation is on the rise and gains can be made through exclusive knowledge. However, no hard evidence is found that market players have structurally moved prices up (or down) away from fundamentals.<sup>9</sup>

**Figure 7: The Futures market**

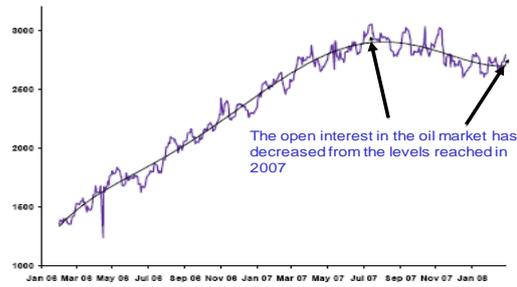


For instance, volatility of WTI futures prices has been on a downward trend since 2000. More specifically, the rally from \$70 per barrel in the summer of 2007 to \$100 in January 2008 took place when the open interest in the oil market had decreased and the net speculative length – the number of million of barrels as a percentage of open interest that the market is net long (positive) or net short (negative speculative length) – had remained largely flat (see Figures 8 and 9).

<sup>9</sup> Written Testimony of Jeffrey Harris, Chief Economist of the Commodity Futures Trading Commission (CFTC), before the Committee on Energy and Natural Resources, United States Senate, April 3, 2008.

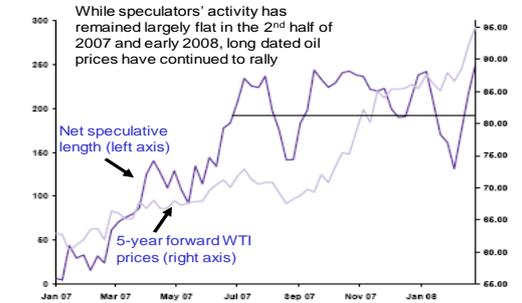
## Figures 8&9: Open interest and net speculative length

**Figure 8: Total open interest in futures oil contracts has remained low**  
Open Interest in NYMEX, WTI, rbob, heating oil and ICE Brent and gasoil futures, in million barrels



Source of chart: NYMEX, ICE, Goldman Sachs Commodities Research

**Figure 9: Net speculative length has remained flat in the 2<sup>nd</sup> half of last year, throughout the long-dated oil price rally**  
Million barrels (left axis) and \$/bbl (right axis)



Source of chart: CFTC, NYMEX, Goldman Sachs Commodities Research

Historically, changes in the net speculative length in the futures market move with the economic cycle, where high positive levels of speculative length reflect a strong economic growth outlook and a bet on higher oil prices, and low positive to negative speculative length reflect a weaker economy, putting prices lower. Speculators thus did not put prices higher during this rally, taking place at a time the US economy was quickly deteriorating, making it impossible for non-commercial traders to bet on higher oil prices without risking the loss of all their speculative investments. Moreover, prices for other crude's not being traded on one of the futures markets showed equal strength during this period, providing evidence that that futures prices have not disconnected from the underlying fundamentals. This is also supported by the fact that long-dated oil prices (60 months out) have rallied to prices to over \$130 per barrel as well. It is also important to note that speculators play an important role in providing the market with liquidity that allows hedgers to better manage various commercial risks. Without speculators the market would be much less deep and transparent, which in turn could have a negative effect on price discovery as long as no excessive speculation (i.e. manipulation) takes place. Studies done by the office of the Chief Economist of the CFTC show similar growth for both commercial and non-commercial interests and that the non-commercial share of total open interest has only increased marginally from 31% to about 37% over the past three years. Mr. Harris concluded in his testimony that there is little evidence that changes in the speculative positions are systematically driving up crude oil prices. He followed by saying that that it appears that fundamentals – along the lines of the four building blocks – provide the best explanation for crude price increases.

These observations were further confirmed in a series of testimonies held in the US over the last month<sup>10</sup>. For instance, the Testimonies of Dr. James Newsome, President and CEO of NYMEX and Charles A. Vice, President and COO of ICE before the Joint Hearing of the US Senate Appropriations Subcommittee on Financial Services and General Government and the Committee on Agriculture, Nutrition and Forestry on 17 June, 2008 stated that analysis of the actual market data from the regulated exchange, which is the best evidence available to date, indicates that prices in the oil futures markets continue to be determined by fundamental market forces. In particular, uncertainty about the availability of supply due to political and security factors, uncertainty about the actual levels of future demand growth in developing parts of the world, and uncertainty about currency fluctuations materially weigh into the fundamental analysis. Current uncertainties in the global oil market, as well as the depreciation of the dollar - i.e. the four building blocks - are clearly having an impact on the assessment of market fundamentals, and contribute to the uncertainty or risk premium to the usual analysis of supply and demand data (i.e. building block 1 versus building block 2, 3 and 4).

In addition, the available data indicate that commercials continue to provide the majority of open interest in crude oil futures. Moreover, Newsome confirmed that the extent of non-commercial participation in crude oil as a percent of open interest on NYMEX has actually declined over the past year, and that there is no evidence to date that the trading by non-commercials has impaired the price discovery functions of the regulated futures markets.

He also shared his view that consumption does not decrease by much in the face of significant price rises, and that the only way a market with highly inelastic demand will equilibrate is through a substantial rise in price as we have witnessed since 2004.

Vice further testified that the function of oil futures markets is to send important price signals about the future price of oil (and other commodities) determined by market forces. In his view, their organization, together with regulators must insure that markets remain open, transparent and competitive, and that they are required to prevent, detect, and punish manipulation or attempts to manipulate markets. However, he also explains that speculation has always been an essential component of all markets whether prices are falling or rising. Ultimately, futures markets involve contracts in which one side of the market is attempting to

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<sup>10</sup> Written testimonies before a Joint Hearing of the U.S. Senate Appropriations Subcommittee on Financial Services and General Government and the Committee on Agriculture, Nutrition and Forestry, held on 17 June 2008.

predict where the price of oil will go in the future, and the other side of the market is attempting to sell or hedge its price risk with respect what the price of oil will be in the future. Importantly, neither of these market participants know what the future will bring. Speculators are simply participants with a view about the future oil price who are willing to put capital to work in assuming the price risk transferred from commercial participants. I.e. they allow hedgers to put aside the risk of oil price fluctuations to others better able or more willing to live with these risks. Speculators are a necessary component of the futures markets, providing liquidity and important pricing information to markets. Without speculators, futures markets would be established solely by commercial participants, in essence driving the market to negotiated prices..

Another useful testimony was given by Edward N. Krapels, Special Advisor Financial Energy Markets, Energy Security Analysis, Inc. before a Joint Hearing of the US Senate Permanent Subcommittee on Investigations of the Committee on Homeland Security and the Governmental Affairs and the Subcommittee on Energy of the Committee on Energy and Natural resources held on 11 December 2007<sup>11</sup>. He summarized that after some ten years during which a number of studies have been conducted, it is fair to say that there is no consensus on whether financial markets exert a unique, distinct, or one-of-kind effect on the price of oil. Although there may be a possibility that – for shorter periods of time – there may be a stronger link between the positions of non-commercials and prices, they do not appear to be correlated over the long run (IMF studies). This underpins our own analysis, in which several of the earlier listed elements were reflected in the building blocks 2 and 3 (cyclical factors causing large swings in spot oil prices on a daily basis), and especially in building block 4 (structural factor), where scarcity and policy, which are the main drivers behind the User Value in the physical markets, is translated in the crude oil futures market.

What can be observed is that near time price risk is driven by the potential for large movements in speculative length when market and economic uncertainties remain high<sup>12</sup>. While the industry and economic outlook provides a likely range for speculative length fluctuations, the possibility of a market over-reaction to these industry and economic concerns, leading to much sharper swings in speculator activity, remains high. For example, should the net speculative length

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<sup>11</sup> Edward N. Krapels, special advisor Financial Energy Markets, Energy Security Analysis, Inc. Wakefield, Massachusetts. Financial Energy Markets and the Bubble in Energy Prices. Does the increase in energy trading by index and hedge funds affect energy prices? Testimony before a Joint Hearing of the U.S. Senate Permanent Subcommittee on Investigations of the Committee on Homeland Security and the Governmental Affairs and the Subcommittee on Energy of the Committee on Energy and Natural Resources.

<sup>12</sup> Amongst others based on Goldman Sachs Commodities Research presented in their Energy Weekly.

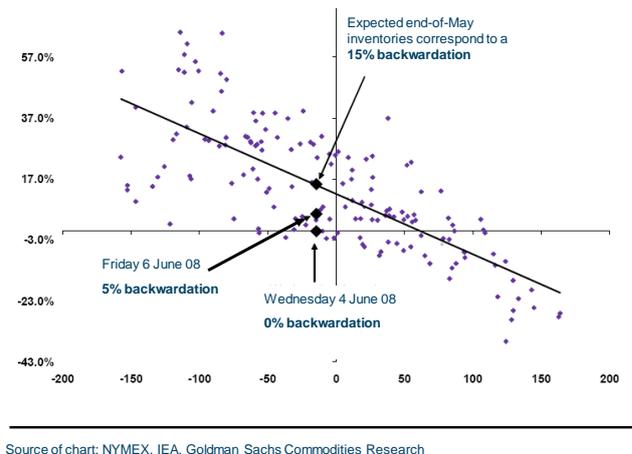
decline to its historic minimum of 100 million barrels net short, this could drive prices down to a level below the structural oil price floor of \$110 a barrel. Conversely, should sentiment become bullish, and the speculative length increase to its historic maximum of 250 million barrels net long, this could contribute to the predicted price hike of \$200 a barrel. Thus for shorter periods of time, speculators could over-react, but it is important to note that these swings in net speculative positions set the near-time oil price, but do not impact the long-term structural fundamentals, which are the over-arching driver behind today's high oil prices. In our view, these structural drivers will continue to play the most important role in the foreseeable future, driving oil turbulence in the next decade.

The main fundamental driver behind the rally in 2007 was actually predominantly caused by OPEC, who decreased its output by more than 1.5 million b/d in the six months leading up to the spring of 2007. This caused a major draw on inventories in the consumer markets, as demand exceeded global supply by 500,000 and 1 million b/d. This placed the oil price curve in the futures market back into backwardation, after having been in contango since February 2005. Historically, the curve of the futures price has moved in line with global inventories, with the market in contango at times the inventories are large, and in backwardation when global crude oil inventories are low. The magnitude of backwardation and contango is the main fundamental driver of time spreads, the price difference between oil futures prices for e.g. 1-month delivery and 3 to 6-month delivery (representing the cyclical factors), or between the long-dated futures for e.g. May 2008 and December 2012. Generally speaking, a market in backwardation is more beneficial for the oil-producing countries.

With so much uncertainty about the US economic outlook and the potential impact of a recession in the US on oil demand and the global economy, it is reasonable to expect that the combined forces will continue to cause volatile prices in the months ahead, to be seen in large movements in the speculative length and changes in the time-spreads between 1-month futures contracts and 60-month futures contracts. In that respect, today's relatively wide trading ranges reflect the current uncertainty among traders about where the market will go from here. For instance, the biggest fall in WTI futures prices in one day since 17 years – since the 1<sup>st</sup> Gulf War – was by \$6/bbl to \$102.54 on 19 March 2008 and was attributed to several factors including profit taking, strengthening of the US dollar, inventory statistics, reverberations of a 75bp interest cut by the FED and an overall flight away from risk into more safe assets such as treasuries and cash. However, long-term trends are intact and the WTI rebounded to a new high of \$111 a barrel within the same week, only to further rally to an all-time high of \$135 a barrel on 22 May.

The best way to dampen high price volatilities at the front-end of the price curve is to consider increasing commercial stocks substantially in the major oil consumer countries (see Figure 10). Higher oil stocks will take away the pre-occupied behavior of market participants on oil stock deviations (from e.g. 10 year average levels) and will bring down the volatility in 1 month/60 months time spreads. It will also help to avoid steep backwardation in the front-end of the curve. Preferably this increase in commercial stocks can be accomplished on a voluntary basis, even acknowledging that this very expensive (100 million barrels today cost \$14 billion). The alternative is that it has to be enforced through regulation. These additional oil stocks have to be seen as a complementary base to the spare capacity held by Saudi Arabia and should be managed in close cooperation between the main holders of these stocks and spare capacity.

**Figure 10: 1m/60m WTI timespreads in % (vertical) versus total OECD Stocks in deviation from 10-year average levels, mln bbls (horizontal)**



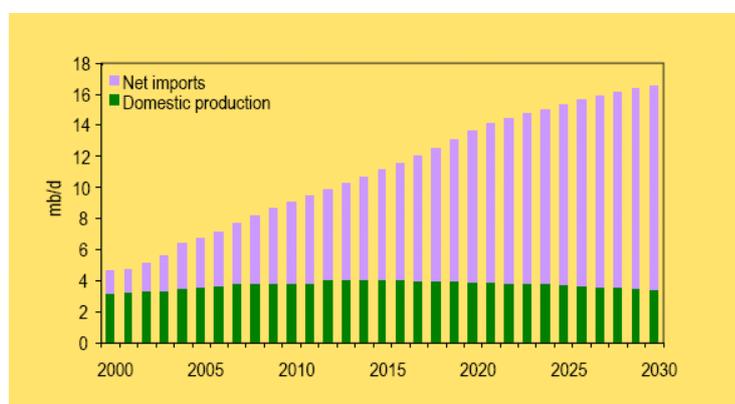
## 5. THE OUTLOOK FOR OIL DEMAND

In the following sections the structural physical drivers behind rising oil prices are described. It gives the reader insight into today's challenges that the industry faces in delivering the oil that consumers take so easily for granted.

The newly industrializing countries and the major oil exporters themselves are the predominant contributors to the increased demand for oil (and other energy sources). Average growth in global oil demand was 1.13 million b/d per year

over the past 10 years, or 12.3 million b/d between 1999 and 2008 (to 86.9 million b/d in 2008). The regions with the largest growth in oil demand are China, the rest of developing Asia, and in the oil-producing countries in the Middle East. High growth in these areas is expected to continue, especially in China (see Figure 11). As Wen Jiabao, China's Premier, recently indicated, economic growth remains the overarching priority for China. "We must ensure that our economy will grow ... in order to ensure employment", while having to deal with the consequences of a weak dollar, quickly rising domestic inflation, and huge losses in the downstream oil markets in China as a result of unprecedented high oil prices. As long as China and several other non-OECD countries in Asia, South America and the Middle East also continue to subsidize oil prices for their inhabitants, there will be a strong upward pressure on global oil demand growth. With oil production struggling to expand, soaring rates of domestic fuel consumption growth in the major oil-producing countries will soon cannibalize export capacity if domestic oil use is not slowed down and substituted by alternative fuels. For instance, crude oil exports from the Middle East only grew with 300,000 b/d between 2004 and 2008, from 16 to 16.3 million b/d by the end of this year.

**Figure 11: China's oil balance**

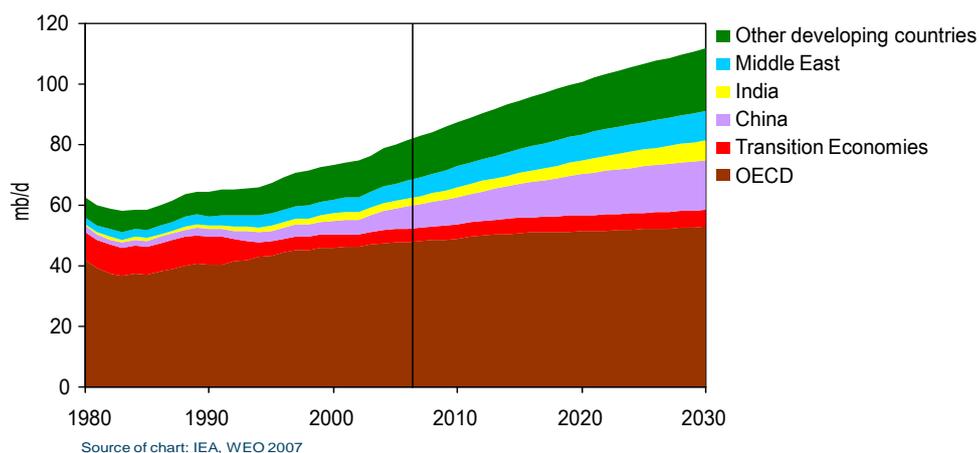


Source of chart: IEA, WEO 2007

The IEA estimated in its 2004 World Energy Outlook, the first year in an Oil Supply-constrained World, that oil demand would grow to 90 million b/d by 2010 and 121 million b/d by 2030. In its 2007 edition, the latter number for 2030 was adjusted downwards to 116 million b/d in its reference scenario, or a 1.3 percent annual growth rate for the period 2006-2030 (see Figure 12). Growth was particularly high in 2003 and 2004 but has now reverted to slightly below-normal trends of around 1.1 percent for 2007, resulting in an average

2007 global demand of 85.9 million b/d. Apparently, demand destruction has already started to kick in because no more oil could be brought to end-consumers at these high oil prices. However, at that level of growth per annum, global oil demand would still increase to 110 million b/d by 2030. To arrive at the level of 100 million b/d by 2030, the possible maximum sustainable plateau level of oil supply as suggested by Total, average annual growth has to fall back to 0.65 percent, a level that we have not seen for any extended period since the early 1980s. Since this slowdown is unlikely to happen, additional supply to meet higher than 100 million b/d has to come from more alternative, complementary sources, such as 2<sup>nd</sup> generation biofuels, gas-to-liquids, coal-to-liquids and electricity to fuel up plug-in hybrid electric vehicles (PHEVs). It is highly unlikely that any of these complementary fuels will have lower cost levels than oil; some are actually very expensive and require many years, if not decades, of incremental efficiency improvements in order to bring costs per barrel output down.

**Figure 12: Primary oil demand**



The most viable alternative fuel type to supplement oil is currently 1<sup>st</sup> generation biofuels, standing at roughly 1.1 million b/d in production with substantial growth expected in the years to come to meet the US Renewable Fuels Standard and similar objectives in the EU. Globally, total biofuel production is expected to grow by 425,000 b/d in 2008 and, despite the recent negative press that it pushes food prices higher, biofuels are clearly representing the single largest component in non-OPEC oil or liquid output growth. Purely from a security of supply point of view, it is unthinkable that the 1<sup>st</sup> generation of biofuels will be taken out of the market again with no oil readily available to replace it. Also, oil

prices would be much higher if these biofuels has not been available. Other known alternatives to oil are all still in different stages of Research and Development, and not able to make any relevant impact before 2020, too late to help avoid the oil turbulence in the next decade.

What has become apparent only recently is that the agricultural sector is now facing the same supply/demand constraints as oil, natural gas and metals, continuing to drive prices up for all these four categories of commodities. Due to the strong biofuel-related demand for food crops, especially for corn and sugar, oil and agriculture prices for these crops are converging on an energy-content basis. With oil prices rising steeply at the end of the supply curve where the most expensive barrel is produced to meet global demand (now around \$80 per barrel), and with oil being an important product needed in the production of food, the cost of biofuels will not fall below the most expensive barrel, and will thus not contribute to the overall reduction of fuel prices, irrespective of government subsidies for ethanol or sugar cane. To the contrary, higher oil prices will drive corn prices higher. Actually it is possible that rising food prices will cause the oil price to follow, now no longer set by oil itself but by crop prices through increased connectivity between those two markets.

Although several new fuel sources are very likely to become available in substantial volumes by the end of the next decade, their market penetration will necessarily commence in the affluent OECD countries. However, it will take a long time before the current global vehicle base of 900 million units (excluding 2-wheelers) that is expected to grow to 2 billion vehicles by 2030 will be substantially more fuel efficient, especially in the non-OECD countries and the US. The IEA forecasts already take into account a slowdown in demand growth for the OECD countries. For instance, in its 2007 reference scenario, OECD North America is assumed to grow on average by 0.7 percent a year up to 2030, the European countries by 0.1 percent and the Pacific basically by zero percent. In the IEA's alternative scenario, where global oil demand is 14 million b/d lower in 2030 than in the reference scenario (at a global demand of 102 million b/d) as a result of the implementation of new policies that should curb the growth in demand and related emissions, these growth levels for OECD countries are even lower. Moreover, a major constraint on oil consumption will be global warming, which will propel new policies and innovation as reflected in this alternative policy scenario to the forefront. And it is probably true that every dollar the consuming countries spend in their own economies on alternative fuels and efficiency, which slow down growth in demand, is a dollar saved from larger import volumes of crude oil against ever higher prices. But ultimately high prices will do their work, especially in those countries where end-consumers feel the price increases directly. Restriction in OECD demand is therefore expected to continue, although not as straightforwardly as often thought. After all, economic

growth will continue to be the overarching driver of economies, and oil plays a crucial role.

With the knowledge of the recent news<sup>13</sup> that the IEA is preparing a sharp downward revision of its oil-supply forecast for its next edition of the WEO to be released in November 2008, probably in line with – but not as bad as – Total’s warning that the industry will struggle to surpass 100 million b/d over the next two decades, the pressure on companies to accelerate the developments of alternative fuels will only increase.

In an Oil Supply-constrained World that increasingly accepts that change has to come from conservation, substitution and innovation to avoid stagnation, another new phenomenon is materializing, with a potential large impact on international relations. With a smaller pie than earlier anticipated and the possibility that demand growth is outpacing overall supply (from all oil/liquid sources, including biofuels), the total pie has to be redistributed between the OECD low-growth consumer countries, the developing high-growth consumer countries, particularly China and India, and the high growth producer countries (OPEC, Russia and, to a lesser extent, Brazil). With the total pie not growing fast enough to meet all “unconstrained” demand as it was able to do until 2004, the traditional consuming countries have to accommodate the increased oil demand from the rest of the world. So far this has started in a peaceful manner, with high oil prices doing their work in combination with a weak US economy and a financial crisis that is hitting the financial institutions all around the world. As a consequence, oil demand in the OECD countries has already stopped growing (actually, it is expected that it will shrink for the 3<sup>rd</sup> successive year in 2008 by approximately 0.6%, given the stagnation of the US economy). But also in the developing consuming countries the rate in oil demand growth is slowing steadily. For instance, average annual oil demand growth in China fell from 7.6% per annum between 1989 and 2004 to 4.9% p.a. between 2004 and 2007. For India the annual average growth in oil demand went from 5.7% to 3.6%, and for the other Asian developing countries it went down from 5.4% to 1.8% p.a. Despite the more modest growth rates, which led to repeated downward revisions by the IEA, total global demand growth is still expected to grow by 1 million b/d in 2008 (or 1.2%), also as a consequence of rising demand in the oil-producing countries themselves. If and when economic growth in Europe is impacted by the downturn in the second half of 2008, oil demand growth could be little lower. But once the US economic recession bottoms out, it is very likely that the demand growth pressure will come back again.

Many people do not realize that demand growth in non-OECD countries is driven by a completely different set of factors than in the Western world. Both the

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<sup>13</sup> Wall Street Journal, interview with Dr. Fatih Birol, 23 May 2008.

different levels of demand growth between the OECD countries and the major developing countries and the drivers to redistribute the available oil amongst them are finding their roots in a complete set of different price mechanism factors used in these countries for setting the end-consumer price for different oil products. While the US consumer feels the crude oil price rise directly at the fuel pump (currently slightly above \$1 a liter), and European consumers are already paying very high prices (around \$2.3 a liter in NW Europe) due to a lofty tax regime (which is becoming increasingly differentiated to stimulate cleaner cars in order to bring greenhouse gas emissions down and optimize road use), many of the world's end-users have little knowledge of the recent price increases because they are shielded for these price increases by their governments. This is particularly the case in the Asian industrializing countries with strong export economies, notably China (with retail gasoline prices of \$0.6 a liter in Malaysia, \$0.7 a liter in China, \$1.15 a liter in India and \$1.65 a liter in South Korea), and in all the OPEC countries where gasoline prices are very low indeed (as low as \$0.1–0.2 a liter in Venezuela and Saudi Arabia). It is these countries that have recently made a strong contribution to oil demand growth. Many (but not all) of these governments can afford to do so because they quickly generated large surpluses on the balance of payments before the oil bill began to rise. Producer countries have generated these surpluses through selling oil and many other commodities to the rest of the world well above the marginal cost of their oil supply, while the surpluses of China were generated by hoarding labor productivity gains at the State level.

As a consequence, the recent slowdown in oil demand growth in China was not so much the result of higher prices (although prices have increased, they still stood at the very low level of 5 Yuan a liter - approximately \$0.72 a liter - before they were unexpectedly raised with 17-18% on 20 June 2008, three days before the Jeddah Energy Summit), but had much more to do with supply constraints along the value chain with a shortage of refinery capacity in country, maximum substitution to cheaper energy sources, and most importantly due to the fact that the national oil companies were only selling the bare minimum of government-mandated volumes of oil products to end-consumers to minimize their cash losses they made on every liter they sold in the market. For instance, Sinopec, the largest refining company in China, saw 20.64 billion Yuan (\$3 billion) in losses in its downstream business in the first quarter of 2008 alone, while the company was granted a 7.4 billion Yuan (\$1.06 billion) subsidy covering the 1<sup>st</sup> quarter of 2008. According a presentation given by Sinopec's Chairman Su Shulin at a conference in Hong Kong in April, oil prices have to drop to \$76 a barrel to achieve a balanced budget again. Similarly, PetroChina, the 2<sup>nd</sup> largest refiner in China, is also making substantial losses. Late March, its Chairman Jiang Jiemin said the break-even point of their refining business was about \$66-67 a barrel of crude, and that they losing on a yearly basis 3.24 billion Yuan (\$463 million) for

every dollar higher crude price than that. At current crude prices this will result in losses (gross before any refund) for PetroChina of more than \$20 billion for 2008. The latest estimates are now predicting China's total losses on oil product sales for 2008 before any refunds to be as large as \$55 billion if oil prices stay as high as they are today.

Given these untenable losses, the Chinese government has agreed to partly refund the three largest national oil companies as of April this year again. With Foreign exchange reserves of \$1.8 trillion and still growing, there is basically no pain in continuing to subsidize oil consumption if that is seen as beneficial for the country in the eyes of their leaders. The consequence is, however, that price signals are not reaching end-consumers, helping demand growth to stay at a high level. Consequently, the Chinese bought 5.5 million cars and 3 million commercial vehicles last year, a number expected to grow by 1 million annually through 2015, hitting 10 million vehicles sold this year and more than 17 million annually by 2015. More shocking, the segment that saw the largest increase last year was the most expensive SUV segment, while the lowest growth was realized in the small car segment. With "only" 50 million vehicles on the road today – or 38 per 1,000 people – compared with 200 to 300 vehicles per 1,000 people in countries like Brazil, Malaysia, Mexico and Korea, it does not take much imagination to see where the Chinese fleet and therefore oil demand is headed in the next decade. Only over time, when the Chinese authorities decide to slowly bring consumer prices in line with global market prices, will demand growth slow down. When this is going to happen is completely dependent on how quickly global crude oil prices will further rise, making the losses unacceptably large for the government and their national oil companies. Important to note is that domestic oil production in China has reached its plateau. The consequence is that every extra barrel consumed has to be imported, making the bill much higher. But for the time being it is more likely that the Chinese government will opt for a cap on the total supply of oil products in the market, leaving the price untouched, and thus opting for volume constraints on vehicle owners.

Across the Pacific, oil product demand in the US is poised to contract as much as 2.1% to 20.4 mln b/d in 2008, with gasoline demand decreasing by about 1%. With retail gasoline prices currently at about \$3.4/gallon, which is 20% more expensive than last year, and diesel at around \$4/gallon, or 42% higher, the high oil price is now starting to impact the driving behavior of US car owners. Between March 2007 and March 2008, the kilometers driven per car owner decreased by 4.3%, the first time this number has declined since 1979. With further rising crude prices in the recent weeks, retail gasoline prices now average more than \$4/gallon in a dozen US states, while California has become the first state where diesel fuel prices average \$5/gallon, price levels that create increasingly more public outcry. As a consequence, the price of oil has now become the No. 1 issue for US politicians. However, it is important to note that

with its projected annual demand decline of 440,000 b/d in 2008, the US is the only region that will show a decline. OECD-Europe is expected to show zero growth, OECD-Asia will show a very small growth percentage. All other regions will show growth this year, resulting in a latest estimate of 1 million b/d oil demand growth globally. With this growth level, the world will reach the 100 million b/d in 2020, assuming that this level of global supply can be reached within this time frame. If indeed the industry cannot deliver much more than 100 million b/d on a sustainable basis, it means that by 2020 there will be no room for further demand growth other than that supported by new alternative fuels currently still in the R&D phase, something that will have far-reaching consequences on global economic growth.

While the consuming countries ultimately have to pay the real price of oil, either by their government or by the end-consumers themselves, the major oil-producing countries with the majority of cheap and medium-priced oil in their possession could easily subsidize their domestic markets from the steep profits they make in a \$100+ a barrel market. Without having received any price signal, oil demand growth in the Middle East has been so strong since 2000 that all increased oil production in these countries has been easily absorbed domestically, leaving exports from this region to the rest of the world basically flat. These low domestic prices are very likely to continue even in countries that are faced with severe shortages in refinery capacity such as Iran and Nigeria.

## 6. THE SUPPLY OUTLOOK

In every likely scenario, oil remains the dominant resource available for meeting global demand in the next few decades, because there are no real alternative transportation fuels currently available in large enough quantities to replace oil. Today the following resources meet the oil supplies:

**TABLE 1 OIL PRODUCTION**

Production	2003	2008	Average Annual Growth Between 2003 and 2008
Non-OPEC *	46.3 mln b/d	50.2 mln b/d	0.78 mln b/d
OPEC condensates and NGLs	3.8 mln b/d	5.1 mln b/d	0.27 mln b/d
OPEC-11 crude **	27.0 mln b/d	29.9 mln b/d	0.58 mln b/d; incl. Iraq, excl. Angola and Ecuador
Global production***	78.2 mln b/d	84.9 mln b/d	1.34 mln b/d

\* This includes 1<sup>st</sup> generation biofuels, which are estimated to grow from 1.1 mln b/d to over 1.5 mln b/d by the end of 2008 (1.7% of global production).

\*\* Including Angola and Ecuador, OPEC crude supply is 32.2 mln b/d for 2008 (37.9% of global production; including condensates and NGLs this is 43.1%).

\*\*\* This includes supply contingency but excludes processing gains. It includes unconventional oil (oil sands in Canada & Orinoco extra-heavy oil in Venezuela), which is estimated at circa 1.9 mln b/d for 2008 (2.2% of global production). It also includes gas-related liquids (capacity) of circa 17.4 mln b/d in 2008 (19% of global production), which includes condensates (8.0 mln b/d), NGLs (9.3 mln b/d) and GTL (0.2 mln b/d).

From Table 1, one can calculate that around 75% of total oil production comes from crude oil; the remainder comes from biofuels, unconventional oil, or is gas related. In the years to come, this percentage of 25% will only grow at the expense of crude oil. Overall crude supply is expected to flatten early in the next decade. Percentage-wise, oil (crude oil, condensates, NGLs and unconventional oil) should come increasingly from OPEC and the CIS countries as presented below:

**TABLE 2 SHARE OF OIL PRODUCTION**

Oil production *	2008	2020	2030
OECD	23.7%	17.4%	14.6%
OPEC	43.1%	48.5%	53.0%
CIS	15.9%	18.1%	18.8%
Other	17.3%	16.0%	13.6%

\* These percentages are based on crude oil, NGLs, condensates and unconventional oil, but exclude any production of fuels from biofuels, GTL, CTL and electricity.

It is important to note that oil exports from the major oil-producing countries to the major oil-consuming regions will come under pressure due to high domestic demand in combination with slow production growth. To a large extent, OPEC exports already slowed down over the past couple of years (lower exports from e.g. Venezuela and Indonesia being matched by export growth from offshore deepwater fields in Angola and Nigeria), with the gap being filled by growing exports from Russia, the other CIS countries and Brazil. Net oil exports from the Former Soviet Union increased from 7.8 million b/d (including 2.4 million b/d in products) in 2005 to 8.8 million b/d in 2008 (including 2.7 million b/d in products). But now it is becoming clear that oil production growth in Russia will stall for at least the next couple of years (and Mexico's exports will plummet). This requires OPEC, Kazakhstan and Azerbaijan to take over the helm, together with Brazil and other deepwater basins. Although crude and liquids production capacity from the latter mentioned countries will grow in the next few years until 2010, assuming no further delays in new delivery, the pipeline of sanctioned projects for first oil production in the years thereafter is worryingly low. Analysis shows that the number of new projects sanctioned in 2007 and during the first half of 2008 are at a 5-year low. Given the 5-10 year lead times, this is going to impact new oil production in the next decade badly.

Driven by population growth and higher standards of living, oil demand is growing persistently, especially in many of the large developing countries. This ongoing growth in demand carries enormous challenges in bringing new oil supplies to market, especially if oil exports come under pressure as well. These challenges are far tougher for the industry than they have been in the past.

First, the oil companies have to cope with much more difficult fields, deeper water, deeper (sub-salt) reservoirs, arctic environments and heavy oil – the complexity in building the oil production structures and operating the fields is immense from both a technical and managerial point of view. The time needed to bring these complex fields into production has been grossly underestimated. Currently delays of a year or more are typical. As a consequence, supply growth has consistently fallen short of expectations, one of the key reasons behind the recent oil price increases. As complexity of the development of the most expensive barrel is not going to disappear, supply growth forecasts have to be adjusted accordingly. Finally, the fact is that production from heavy oils, oil sands and shales, but also from coal-to-liquids, result in substantially higher carbon emissions, running counter to the climate change policies of the OECD countries. These greenhouse gases must be captured through Carbon Capture and Storage (CCS). Such additional projects will add more costs to the already expensive projects. In addition, it will require increasingly more energy to win oil from these unconventional resources, making the net production increasingly small and inefficient.

Second, costs are rising continuously at a high pace, in line with higher project complexity for an industry that is heavily stretched. The highly uncertain evolution of cost inflation factors are a major risk factor for the industry. Cost variations already run in the billions of dollars per project; cost inflation results in higher dollar amounts spent but not necessarily in higher oil production; to the contrary. The uncertainty around future inflation factors forces the industry to include substantially higher cost overrun contingencies in their project budgets. This leads to a deterioration of the overall economics, in the worst case to a postponement of the investment, particularly when the macro-economic and political risks are also high, and host governments make it difficult to mitigate these risks.

Third, new challenges have to do with gaining access, given the balance of power between international players and the resource holders. The fact that the role of the NOCs has increased greatly in this decade only makes the challenges larger. The NOCs control around 85% of the remaining proven oil reserves in the world and produce over 65% of total world output, a percentage that is expected to grow rapidly in the years to come. The important decisions surrounding bringing new oil into production and the timing thereof will henceforth be made by the NOCs instead of the IOCs. That implies a completely new market structure. The leaders of the major oil-producing countries will understandably look after their own interests first.

Thus, with limited access to the oil in the major resource-holding countries and facing steep oil production declines in their existing portfolio, the remaining five largest multinational oil corporations, Exxon, Shell, BP, Total and Chevron, will have to accept that they are, at best, becoming minority partners in the State-run systems of the major resource-holding countries, and that they must also focus on the few remaining exploration basins in OECD countries that deliver the most expensive oil. In parallel, they have to develop new technologies for large-scale production of alternative fuels that complement fuels from existing resources. They are also well placed to make a substantial contribution in the fight against higher greenhouse gas emissions. The IOCs and the smaller Western oil companies are not the only ones facing these challenges. Also the major oil companies of China, India, and, to a lesser extent, Japan and Korea face exactly the same issues. Hence, they are all fighting for the same few upstream opportunities in order to secure access, although not necessarily on a level playing field.

Combined, these new realities do not make it easier to increase global supplies. Although already ongoing for a while, the industry analysts and investment banks have only recently recognized the struggle to expand non-OPEC oil supply. Because they don't expect this situation to improve soon, they are coming to the

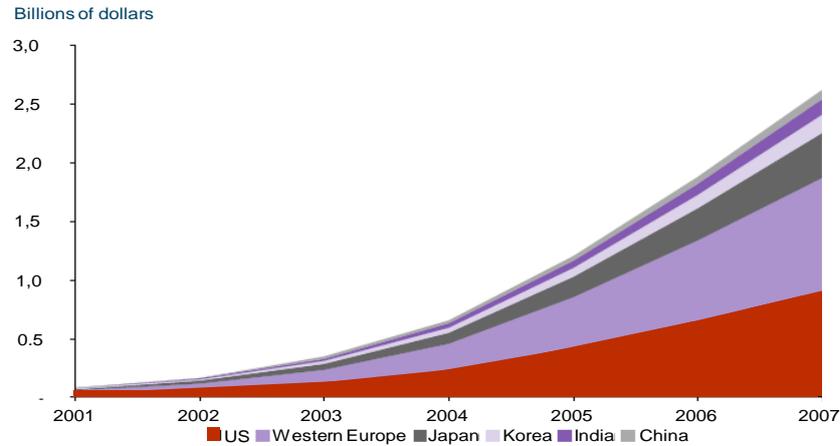


conclusion that oil prices have to rise further in order to incentivize investments and to curb demand.

In the meantime, oil companies have to adapt their customer value propositions to stay in the game without getting into conflict with Western standards, values and principles. One of the new emerging trends is that after having already accumulated more than \$3,000 billion in foreign financial assets (see Figure 13), the leaders of the major oil exporting countries are now shifting their focus away from just being oil exporters of raw commodities. Having invested relatively little in building their (non-oil) economies, they are now embarking on a development path that should lift their domestic economies to a much higher level with the objective to create more jobs, to raise living standards, and to prepare their economies for the “post-oil” era. This will require major investments in infrastructural and industrial projects, but also in services, health care, utilities and education. In turn, this demands a substantial influx of money, hence their keen desire to control oil prices and to protect those against any substantial drop. It is exactly why they stress the issue of security of demand so much, and there should be no doubt that OPEC will act swiftly and decisively to defend their external balances if prices drop below comfort levels. In that respect, several OPEC countries already need an oil price of \$60-\$100 a barrel to balance their economy. At same time, many of the oil-producing countries are experiencing double-digit inflation and there is a growing concern about the ability of their economies to absorb the oil revenues. This could put a further break on willingness to increase production capacity.

They also know that the next decade is crucial to accumulate as much money as possible. Beyond 2020, they fear that much of their easy oil is also expected to be in structural decline, while they see the development of crude oil demand as increasingly unpredictable. It is therefore now time to develop new oil depletion policies and to build sufficient financial reserves for generations to come and to stretch out the time available for transforming their economies. As a result, also in Africa the IOCs are now pushed to play an important role in these socio-economic developments in order to earn access to new exploration and production blocks. Companies are requested to provide loans to national oil companies and on several occasions to build refineries and power utilities and to provide support for major infrastructure projects. Time will tell if the oil industry is willing to do so and to stretch its business activities outside traditional areas, but the Chinese have already embraced this new customer value proposition in order to expand their business relations with many natural resource-rich African countries.

**Figure 13: Wealth transfer to energy producing countries**



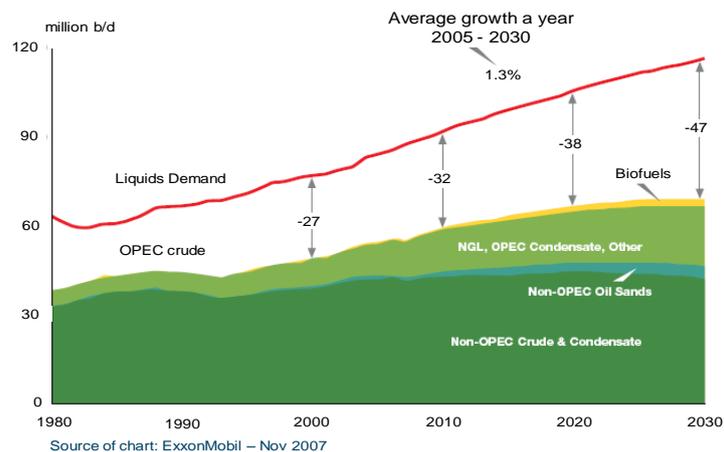
Source of chart: IEA, Goldman Sachs Commodities Research

## 7. NON-OPEC SUPPLY

Although with some reluctance, the industry has now accepted that non-OPEC oil is close to its plateau and that underlying decline of existing fields in production is offsetting much of the growth from new discoveries and developments (see Figure 14). At best, non-OPEC oil output could slowly increase with just a couple of million b/d, but to expect that it will increase with another double digit percentage number in the coming decade is not realistic. Above all, most of this small increase is from other resources than crude oil (but predominantly from condensates, natural gas liquids and biofuels). Over the past couple of years, new supply from non-OPEC countries has been constantly disappointing (see Figure 15). Since 2000, new fields with an aggregate output of approximately 28-29 million b/d have been brought on-stream outside OPEC, or on average 3.5 million b/d a year. However, most of that new supply was needed to compensate for existing fields in decline and for a growing volume of oil that is not available due to maintenance on aging facilities. In 2003, world non-OPEC oil supply was 46.3 million b/d. By 2008 this is expected to increase to 50.2 million b/d only. If one were to include all condensates and OPEC NGLs, biofuels and non-conventional oils in the equation, net supply/capacity growth has increased by 3.9 million b/d since 2003, or an annual 0.78 million b/d on average over the past four years. To make the picture even bleaker, global crude supply outside OPEC and the Former Soviet Union has almost stopped growing for at least 8 years, irrespective of a substantial rise in activity. The only exceptions to this are

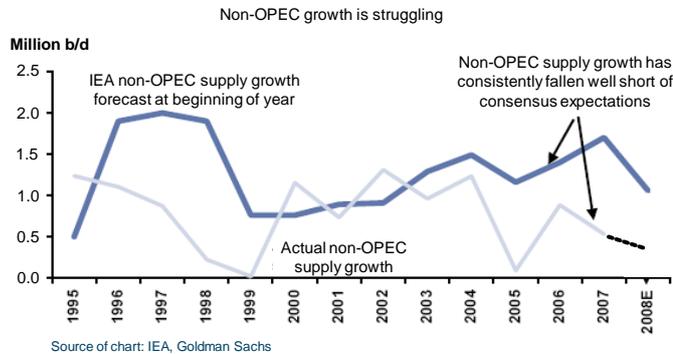
the real growth areas of Brazil (offshore deepwater), Canada (oil sands) and biofuels.

**Figure 14: Liquids supply and demand**



This means that future growth in supply to meet projected demand has to come predominantly from the major OPEC players (including Venezuela’s bitumen, most of it recently nationalized) and from the Former Soviet Union, actually from Russia and Kazakhstan only because Azerbaijan will be reaching its production plateau within the next 3-4 years as well. Unfortunately, also Russian oil supply is expected to grow at much slower rates in the foreseeable future. Outside OPEC and the Former Soviet Union, there are basically only three areas left for new oil production: deepwater fields in the Gulf of Mexico, Brazil and in West Africa other than the OPEC countries Nigeria and Angola; new discoveries in the Arctic waters (Alaska, Norway, Russia and Greenland) of which most not yet accessible; and unconventional oils (expensive and dirty if CO<sub>2</sub> is not properly dealt with). The latter provides immediate benefits to energy security, but will later come with substantial negative environmental consequences if the much higher CO<sub>2</sub> emissions are not properly dealt with. New production technologies, field upgrades and enhanced oil recovery (EOR) will continue to be important in slowing down the underlying decline rates and maximizing ultimate recovery from existing fields. The gap that remains has to be filled by new alternative fuels such as 2<sup>nd</sup> generation biofuels, gas-to-liquids (GTL), coal-to-liquids (CTL) and electricity. By 2020-2025, around 12 to 15 million b/d of global supply is expected to come from unconventional oil (Canada and Venezuela), biofuels, gas-to-liquids and coal-to-liquids.

Figure 15: Non-OPEC supply disappointments



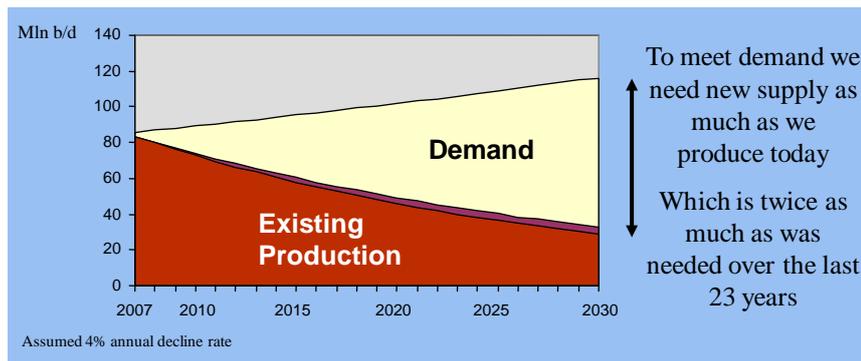
## 8. UNDERLYING DECLINE RATES

Although information about underlying decline rates from existing fields in production in the Gulf OPEC countries and in Russia is sparse, best estimates by several industry consultants show an aggregate global observed decline rate of conventional oil fields in production of approximately 4-5% per year (see Figure 16). In other words, every year, production from existing fields decreases by 3.0-3.8 million b/d and needs to be replaced by new production from field upgrades, EOR, exploration and new developments.

Taking into account the different or even zero decline rates of oil sands, biofuels and liquids from gas production, and assuming stable annual decline rates of 4.5% per annum, this means that by 2030 only around 34 million b/d of today's oil production will be left. The implication, therefore, is a need to bring new supply of circa 82 million b/d to the market in order to fulfill projected demand of 116 million b/d by 2030 (reference scenario). Thus in the next twenty-two years, the industry has to deliver new oil (from crude oil, condensates, GTL and CTL, biofuels, oil sands, etc.) in the order of 80-85 million b/d, which is close to today's production. To put this in perspective, over the past 23 years, from 1985 to today, the industry has brought only half of this number – 42 million b/d – of production from new oil fields on-stream. This number assumes an underlying decline rate of 4.5% annually between 1985 and 2007, which arguably is somewhat on the high side. Although actual need for new oil during this time (1985-2007) was close to 57 million b/d, roughly one-fourth of the growth could

be served by using available productive capacity that was closed-in by OPEC countries to match supply with demand. Without exaggerating, this investment requirement will be a formidable challenge for the industry in the coming two decades, and something that is already an unbelievably big challenge from a technical point of view, but what is seen as perhaps a bridge too far if one includes the geo-political reality.

**Figure 16: The decline of the existing oil production base**



What is important to note is the fact that this decline rate is expected to gradually increase over the next decade and beyond when relatively more ageing fields come off plateau. This is evidenced by the fact that the ratio of natural gas liquids (NGLs) to total oil production has been rising steadily and will continue to increase for the foreseeable future (i.e., over time more wet gas is produced with the crude oil production in oil fields with associated gas caps). For instance, OPEC's NGL and condensate production volumes are expected to increase to 7.1 million b/d in 2012 from 5.2 million b/d in 2008, with part of this growth coming from the production of associated gas. Many of the oil fields have gas caps (associated gas). As an oil field matures, the resulting loss of reservoir pressure releases dissolved natural gas, resulting in a rising ratio of natural gas to oil and hence an increasing ratio of natural gas liquids to oil production. Modern technologies such as enhanced oil recovery (EOR) are then needed to maximize oil output and to stem rising underlying decline rates. Unfortunately, gas liquids, which are much lighter than crude oil, are ill-suited for diesel production, for which demand is growing fastest, and are not a viable substitute for crude oil in the production of transportation fuels.

Particularly the offshore deepwater regions in the golden triangle of the Gulf of Mexico, offshore Nigeria and Angola and Brazil will have a major impact on increasing global decline rates. Deepwater oil production is projected to grow rapidly to around 10% of global oil supply in the coming years. However, given their characteristic of steep decline rates of more than 15% per annum once these offshore deepwater fields go off plateau, with individual field decline rates as high as 20%, oil production from deepwater fields is expected to stop growing before the middle of the next decade. The declines will be slowed down by development of the smaller oil accumulations in the vicinity of the big fields now in production or development, but it is unlikely that this will reverse the process.

A region that is already in structural decline is the North Sea. For example, Norway's continental shelf is maturing faster than anyone predicted a few years ago, with their crude production now 29% below its peak in 2000. Also Mexico, another large oil producing country, is facing steep declines if production from new deepwater fields in the Gulf of Mexico is not forthcoming soon. Recently, the energy minister made a statement in which she predicted that oil output at ageing oil fields operated by State-run oil company PEMEX will drop from 3.1 million b/d to 2.1 million b/d by 2016 unless production from deepwater fields is increased. First quarter average production in 2008 even decreased 9% to 2.875 million b/d over 3.164 million b/d in 2007, while exports fell 13% to 1.484 million b/d, both far worse than anticipated. Unfortunately, given that their Constitution does not allow foreign companies to drill for oil in their territories, the State oil company PEMEX stands a formidable challenge to keep its oil output flat.

OPEC has the potential to raise its liquid output towards 50 million b/d, mainly by adding heavy, difficult oil and NGLs. Together with non-OPEC, this is expected to lead to a plateau of around 100 million b/d. For how long the plateau production can be held before decline sets in is a topic of debate. Peak-oilers forecast this to happen quickly after 2015, whereas the more optimistic advisors do not see this happening before 2030. In our view, the latter is (much) more realistic, with the plateau to stretch out until at least 2030, assuming that new fields are developed timely in the major resource holding countries. However, it is a fact that several OPEC countries are now facing serious declines from existing fields as well. Particularly Iran and Venezuela are struggling to maintain production because several of their more mature fields show decline rates of 10-15% per annum. But here it is noted that most of the challenges they face have their origin in the behavior of their governments rather than in nature.

But also Saudi Arabia is going to face a decline in their very old giant fields soon. So far Saudi Arabia has officially committed to expanding its liquid production capacity to 12.5 million b/d by 2009. But Saudi Arabia has yet to commit to boosting capacity beyond its 12.5 million b/d target. Until recently, Saudi Arabia

argued that it first needs to see solid evidence of demand for its oil before going any further. However, concerns of the consumer countries that Saudi Arabia may not be able to realize much higher output was unfounded according one of the executives of State-run Saudi Aramco. At the same time, in late 2007, they also informed the world that the next large project to be developed – the 900,000 b/d Manifa field for which approval is expected this year – will not boost Aramco's capacity but would compensate for production declines from other existing fields. In addition, Saudi Arabia recently announced that it was not increasing its production capacity beyond what they had previously announced – 12.5 million b/d in 2009, of which 1.5 million b/d of spare capacity will be kept for emergency purposes on the grounds of demand expectations in the next decade and conservation for the next generation of Saudi's. Its minister of petroleum and mineral resources confirmed that their maximum productive capacity will not grow above 12.5 million b/d as Saudi Arabia sees that level, including the spare capacity, as plentiful and enough for them. Based on these announcements, from a consumer point of view it is prudent to assume that Saudi Arabia's oil production is not going to grow to a level far above what is currently announced. In that respect, all oil supply and demand forecasts have to be adjusted accordingly.

While Saudi Arabia confirmed its 2010 target, many other OPEC countries recently revised their 2010 production targets downward, as a result of rising costs causing slowing expansion timelines, reduced role of IOCs in upstream production, revenue maximization, decline rates in existing production and prioritization of natural gas developments. Was the previous 2010 target for OPEC (excl. Ecuador and Angola) 47.5 million b/d, today this is 5.7 million b/d less, or 41.8 million b/d. This has led the IEA to post a serious warning in its latest World Energy Outlook that either a further 12.5 million b/d of gross capacity would need to be added or demand growth has to curb before 2015; otherwise a supply crunch cannot be ruled out. To avoid such a crunch, it is very important that Iraq become safe and stable (with a solid legal and fiscal system for its natural resources industry), and can start to expand its production from reserves waiting in the ground to be produced. It is the only remaining country that can increase its oil output substantially in a relatively short time frame. Without doubt, it is crucial for the world as to how Iraq will perform in the years to come. In this respect the United States has a large responsibility. Withdrawing troops and leaving Iraq before the country is stabilized as suggested by some advisors is not an option that sounds attractive for the oil market development. Without Iraq global oil prices will become much higher because the impact of the fourth building block, which is determined by long-term scarcity, will grow to a magnitude never seen before.

Iraq is the most visible country that could help the world through the transition period, but definitely not the only one that is needed. As mentioned in the first

chapter, around 8 to 10 million b/d of crude is waiting for development in the OPEC and other major resource-holding countries. The more this oil becomes available for development, the better it is for the world. Without this oil, underlying decline rates make it very difficult to raise global supply to the 100 million b/d level. The chance of stagnation will then become a much more realistic outcome.

## 9. OPEC'S ASSESSMENT

As noted before, there is a great deal of uncertainty over future demand growth, not so much in the years up to the second half of the next decade, but in particular in the years beyond when innovation is going to impact the growth levels for crude oil demand. It is this situation of uncertainty that worries the OPEC countries most. As OPEC used to be the swing producer, closing in production when markets need less oil (quotas), they are afraid of having to absorb most of the risk (and costs) of the 14 million b/d in difference between demand as per the reference scenario and demand as per alternative scenario for 2030 (WEO 2007). It is exactly this reason why the major oil-producing countries hammer so much on "security of demand" in their dialogue with the major consuming countries. In their view, the downside risks to demand are more substantial than the upside potential. Continuous downward revisions to demand projections from organizations such as the IEA as reflected in the numbers quoted earlier create questions as to whether this downward revision process is set to continue. This seems a fair question, but they have to realize that these revisions are much more driven by the high oil price and new policies to tackle global warming. Given the fact that the OPEC countries feel that they cannot control the transition process towards an Energy-sustainable World, they are worried that one day a lot of their future upstream investments will become obsolete, in a sense that the very large investments that they are asked to make and that are subject to considerable long lead times and payback periods will prove not to be good investment decisions giving an adequate return. See here the catch-22, in the foreseeable future we definitely need much more oil to get through the transition period safely, but investments are not forthcoming fast enough because the long-term outlook is too uncertain.

In today's world, where the investment levels have reached astronomic amounts and risks are perceived as too high, new upstream investments in many major producing countries are just deferred until better and more certain times. In the meantime, the IOCs have no alternative than to explore for the most expensive barrel. But at a certain price level, higher oil prices will no longer result in more investments that lead to more supplies in the foreseeable future. This price level might actually be close to today's prices. In essence, there are just not enough



large-scale oil projects outside OPEC available that are accessible, rank and fit with the companies' strategies, and give them growth. The ones that they will do are so risky that it will take a long time to get them approved and, given their complexity, even longer to build. At some point, price signals will not work any longer.

In our opinion, OPEC's reasoning for worrying about structural over-supply as a result of diminishing demand is to some extent flawed: If the governments of the major producing countries do not allow their National Oil Companies (NOCs) to make these large investments due to the high demand uncertainties, it would be logical to invite other parties, such as the IOCs, to share the risks. Historically, the IOCs were responsible for most of the upstream oil and gas investments, much more than what has been invested by the NOCs. Particularly the NOCs in the Middle East did not have to explore for oil and only had to invest small amounts of money in development and production, given the availability of spare capacity built in the 1970s. But today, in a world where resource-nationalism flourishes, the host governments and their NOCs have little interest in accommodating the IOCs and the OECD countries, China, India and the other newly industrializing countries. High oil prices are tremendously beneficial for them for many reasons. It gives them real global power (over the countries that want their oil and are willing to pay fortunes), and that power is well received by their local populations. Above all it creates substantial windfall profits as the high cost developments outside their countries only drive oil prices higher. Consequently, it is logical that they want to halt the oil price from declining, while the OECD countries would like to see prices be determined by open, free and transparent markets. Thus, if the major resource-holding countries are not willing to realize the necessary investments in their upstream oil industry through their NOCs, the best thing for them and the rest of the world is to invite the IOCs to again carry the risks. Volume off-take guarantee to the respective OPEC country by the refiner in the consumer countries might have to be considered by the IOCs to enable the investment in medium-priced oil, even if this creates vertical integration and works against the philosophy of open markets.

In addition to OPEC's interest in the long-term security of demand outlook for its oil, where it has taken a cautious position regarding the level of investments in its upstream industry, it also has a short focus on the near-term cyclical components of oil prices – near-term supply–demand balances and inventory levels. For the past 6 months OPEC energy ministers have rebuffed US and European calls for the oil cartel to pump more oil and to rein in prices. But the ministers believe there is no need to produce more, as inventory levels in the OECD countries seem to be adequate and demand would soften over the next months. They argue that the high prices had little to do with supply. Instead, they are blaming high prices on refinery bottlenecks, market speculation and the

weak dollar, all issues that are out of their control. But what they do not say is that their policy-driven investment constraints drives oil prices further up and that the only alternative investment opportunities are so complex that they face serious delays, causing (part of) the bottlenecks. Above all, their miscalculation to close in oil in late 2006 was one of the key drivers behind the doubling of the oil price in 2007. Also, what OPEC sees as adequate levels of oil stocks in the consumer markets is never challenged by Western consumer countries aside from the IEA, who might have a very different view about what is adequate.

As noted earlier, lower spare capacity in the OPEC countries will demand that crude oil and product stocks in the consumer countries structurally increase throughout the year and particularly ahead of peak demand periods. It is important that OPEC supports this view by actively selling more oil than perhaps needed from a pure supply and demand point of view. Higher stock levels are expensive (for oil companies) but are also extremely important for market stability.

The dialogue on the impact of trading needs to be intensified in order to reach agreement about its impact. Different from what OPEC wants us to believe, there is no evidence that oil prices have been lifted to today's levels solely due to speculation and that oil prices have decoupled from fundamentals (see also section 4.6). As presented earlier in the sections 4.1 to 4.4, about 70-75% of the current oil price is set by the first building block, the other 25-30% by a combination of structural and cyclical components and unexpected events, characterized by the other three building blocks. Actually, these percentages have not changed a lot in the past 15 years. Also in the late nineties when oil prices were below \$20 a barrel, the first building block was around \$14-15 a barrel and the other three around 4-5 dollars. Only the decoupling of the oil price from the real User Value, where prices quickly accelerate without costs following the same increase, would push this percentage of 70-75% down, to the benefit of the fourth building block (scarcity and policy; see section 4.4) that would then grow further in importance.

## 10. IMPACT ON TECHNOLOGY-DRIVEN CHANGE

In a world in which oil prices oscillate between a high marginal cost of supply and the User Value (where the upper limit is constantly tested), technical innovation is the main instrument for change. After above-trend levels of high productivity growth from 1995 to 2003 as a result of the application of new IT and communication related technology innovations, growth in output per hour slipped to a low in 2007. Profitable opportunities for further progress appear to have dwindled as innovation has slowed down. The next much needed surge in innovation should take place in the field of energy. Given the fact that global

demand for energy is only set to grow, which is a good thing because it is fueling economic growth around the world, investments in and the use of new energy technologies are vital to make sure that the new energy demand can be satisfied in a cleaner and more efficient manner. The international (private) oil industry has already embraced technology and innovation as its core activity, after having ignored this for too long. During this supply-constrained transition period, players must reshape and reposition themselves much more as high-tech companies, active in the energy sector, in order to become part of the next generation of energy mixes. New technologies and innovations should lead to more and cleaner oil production at relatively lower costs and, more importantly, lead to new alternative fuels that could supplement oil in order to satisfy ever-growing global demand. The largest area of innovation lies, however, in the field of energy efficiency and conservation through advanced energy technologies. Most importantly, to combat climate change we need substantive technology that leads to real reductions in consumption as well as reduced emissions of greenhouse gases. It is thus in this arena where the next challenges lay to enable future economic growth.

However, what is generally not very well understood is the vast complexity and scale of the oil industry that currently produces 84 million barrels of oil every single day. The fact that wherever you go, from Alaska to the world's most southern city of Ushuaia in Patagonia in Argentina, and from the villages high in the mountains of Tibet to the most isolated locations such as the islands in the Pacific Ocean or the desert in Saudi Arabia, you will be able to fill up your car's tank. Literally, everything we use or consume includes oil: as feedstock in our products, in the manufacturing processes and for transportation. Given this magnitude, any change, any replacement of oil by an alternative fuel, will take a long time before it can make any realistic impact. The only realistic complementary fuels today that are available in reasonable quantities are 1<sup>st</sup> generation biofuels. But even this type of fuel today represents only circa 2 percent of total global oil product demand, a percentage that is not expected to grow dramatically in the next decade even though the use of biofuels worldwide will more than double.

Other known alternatives to oil (in addition 1<sup>st</sup> generation biofuels from for instance sugarcane and corn) are all still in different stages of Research and Development, and will not be able to make any relevant impact before 2020, too late to help avoid the oil turbulence in the next decade. For instance, the US has a very aggressive renewable fuel standard (RFS) based on the Energy Independence and Security Act of 2007 (EISA 2007). The RFS sets a requirement for 36 billion gallons of total renewable fuels by 2022 (2.35 billion b/d oil equivalent), a fourfold increase from 2008 (9 billion gallons or circa 580,000 b/d). Although a big number in itself, it will still not reach a market share of 10 percent of total US oil product demand in any year before 2030 and 2 percent of

global oil product demand by 2030 (based on the reference case of the WEO 2007). The 36 billion gallons include 21 billion gallons of advanced biofuels (biodiesel, cellulosic 2<sup>nd</sup> generation biofuels and other advanced biofuels). The other 15 billion gallons of biofuels (circa 1 million b/d of oil equivalent) comes from 1<sup>st</sup> generation biofuels, predominantly from corn (already mandated by 2015). However, today, the US Energy Information Administration (EIA) already recognizes that based on the current state of the industry and its view of projected rates of technology development and market penetration of cellulosic biofuel technologies, the available quantities of cellulosic biofuels prior to 2022 will be insufficient to meet the RFS target for cellulosic biofuels. In addition, one could challenge the targeted number for 1<sup>st</sup> generation biofuels made from corn as well. Recently, the US Department of Agriculture revealed that the US biofuel industry would consume one-third of the country's corn crop in the 2008/2009 season, or 4 billion bushels, up from about 22% a year earlier, or 3 billion bushels.

Besides complementary fuels from ethanol production, the US also targets 8 billion gallons of efficiency savings annually, or half a million b/d, by having increased the CAFE standards. However, improvements in efficiency in vehicles, planes and ships are more than offset by growth in travel. It appears that the only way to turn this growth around to a decline is a higher oil price. Also in the rest of the OECD and some developing countries, notably China, fuel efficiencies are expected to make an impact in slowing down demand growth. However, in all cases it will go gradually and in small steps, and in all cases the improvements will be more than offset by growth in travel, as in the US.

Although there are no specific targets set, the auto industry is also stepping up its activities in developing plug-in hybrid electric vehicles (PHEVs), a sector that is growing in importance, especially now that 1<sup>st</sup> generation biofuels are causing problems for the world's food supply. However, here again the challenges are of similar magnitude and need time to overcome. First, the costs of a PHEV car are several thousands of dollars higher for a similar car driving only on a fossil fuel. Secondly, further technical advances have to be made in battery technology. The limitations of the traditional lead, acid or even nickel metal battery have made it less attractive for hybrid vehicles and fully electric vehicles because of the time required to charge the battery. In addition, the technical lifetime expectancy and reliability is still too low for full acceptance by a wider public of purchasing such car. However, further advances in battery technologies, particularly in lithium-ion-battery technology, life expectancy and charge time through ongoing research are gaining momentum and will help to accelerate the development of successful PHEV cars, where the range of car models is becoming attractive. The third serious challenge of electric cars is the fact that charging requires electricity from a power grid to charge the batteries. To make this charging an efficient and convenient process it needs to take place during off-peak hours

(during the night), requiring great battery storage capacity or the ability to quickly replace the batteries during the high peak daytime at service stations (to be stored and recharged during off-peak times at night). Still, there is every indication that electric cars have a great future and will become a part of world transportation. According to one market and technology research company, hybrid electric vehicles may reach 4.3 million units by 2015 and that number may double by 2020. The focus of the hybrid market will be the OECD countries, but also China is expected to become a player by the end of the next decade. But again, 8-9 million hybrid electric cars sold annually by 2020 is a fraction of the annual car sales. In China alone, car sales will pass that number this year.

Another new technology that is getting increasingly more attention is the use of coal as a feedstock for processing liquids (coal-to-liquids). The success of this technology, also used in gas-to-liquids processing, will be ultimately set by the price advantage for the end consumer between coal used to generate electricity for charging the batteries of a plug-in hybrid electric car versus coal used in the coal-to-liquids process of synthetic fuels.

Not different from in other industries, it often takes decades for a new innovation to be diffused sufficiently enough to affect the productivity, and in the case of oil, to really impact supply and demand, and hence affect price. In the case of 2<sup>nd</sup> generation biofuel production, the first pilot plant for cellulosic biofuel production has still to be built and tested. It is expected that it will take another 10 years from today before the first world-scale plant will become operational. In addition to the development of the technologies itself and the challenges of up-scaling the volumes from a successful pilot plant to a world-scale facility, there are also big challenges in the logics; the complexity and cost of the infrastructure needed to convert raw materials into alternative fuels and to supply these to consumers are perhaps the main factors that will determine whether and how fast those fuels will achieve mass-market impact. The same is true for electric-powered vehicles and the infrastructure required to replace and recharge batteries in a convenient way. Thus, what is crucial in this respect is how the pace of development of new oil resources, the pace of development of alternatives and demand for energy relate to each other. The larger the mismatch between supply and demand, the larger the strains on the energy and international relations system. However, these complexities must not stop us from taking action. To the contrary, the challenges are huge and growing, and the time frame to realize the dramatic energy system change is limited.

To be sure, oil will remain the single largest fuel for decades to come. In the Reference Scenario of the IEA's latest World Energy Outlook, published in November 2007, oil demand will reach 116 million b/d in 2030, 37% higher than in 2006. Oil's 35% share in the global energy mix actually will not change much during these years, predicted to decline to 32% by 2030, despite the efforts of

several countries to introduce more biofuels to their energy mix, and the car manufacturing industry having embraced the concept of plug-in hybrid electric cars. If this is accurate, the Oil Supply-constrained World will be with us for much longer than currently anticipated by policy-makers and will turn the current turbulence into a long drawn out everyday affair. Even taking a conservative view, one should at least assume that the Oil Supply-constrained World would last during the entire next decade. As said before, realistically, things will get worse before getting any better.

## 11. THE GEO-ECONOMIC CONSEQUENCES

The ongoing tightening of the oil supply–demand balance, which is reflected in higher prices, has major consequences for the wider economy and on international relations. These knock-on effects manifest themselves in many areas, and each of them will become more apparent in the years to come. The impacts of a period of structural supply constraints will be multi-layered, on the micro-economic and political level, the macro level, and the geo-political and geo-economic level, each feeding into each other. These impacts will be discussed in more detail here below.

### 11.1. GEO-ECONOMIC AND MONETARY CONSEQUENCES OF HIGH OIL PRICES

The world economy is entering a new phase of globalization. In the previous phase, which began in the mid-1990s, the growth in trade and investment and the rapid integration of countries such as India and China into the world economy has brought large social-economic benefits. The acceleration of growth in China, India and other emerging economies was based on their export-led strategies and low-cost labor. The low-cost imports from these emerging countries reduced inflationary pressures in the OECD countries. Productivity growth in the OECD countries, which started to revive in the mid-1990s due to technical innovations, notably in IT and telecoms, found its way into successful commercial applications. Equally, productivity growth in emerging economies also improved by importing new technologies and production processes. High national saving rates and large buildups in foreign exchange reserves, particularly in China but also in the other East Asian developing countries, found their way into the global capital markets, because at first local markets were not deep enough to absorb the growing export income and growth of domestic consumption only recently began to accelerate.

According to McKinsey Global Institute, global financial assets – including equities, private and government debt securities and bank deposits – reached

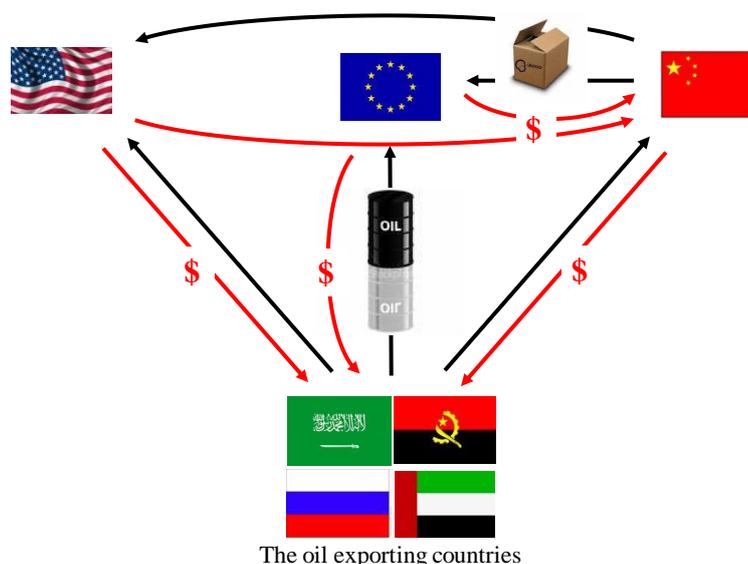
\$167 trillion in 2006<sup>14</sup> from \$66 trillion in 1995. As a result of its large trade surpluses, China became the world's largest net exporter of capital by 2006 (net \$217 billion), particularly to the US, which attracted \$1.86 trillion or around 23% of global capital flows of \$8.2 trillion in 2006. During the period 2001-2006, the US was by far the largest net consumer of foreign capital, absorbing at least 70% of the world's total since 2001. Average annual net capital inflows minus net capital outflows were \$597 billion, or 5.2% of GDP. These purchases of assets by foreign investors helped to keep long-term real interest rates around the world low and made domestic investments less dependent on local saving. However, the consequence was an ever-growing trade deficit that reached \$753.3 billion in 2006 before declining to \$700.3 billion in 2007, and a spending boom (i.e., the US housing boom and the broader credit boom) that stimulated asset prices, which together served as prologue for the recent financial and economic turmoil in the US. Above all, the strong growth of cross-border capital flows helped to create a credit boom, in which lenders and investors aggressively pursued new opportunities to take credit risk even as market risk premiums contracted. Through increased financial interconnectivity, portfolios of different groups of asset classes could be re-packaged and sold on from US financial institutions to banks and other investors throughout the world, but particularly to European banks. These large inflows into the US allowed it to invest and consume more than it produces, importing capital from other countries to cover the difference.

In recent years the cross-border flows have received a further stimulus from the enormous increases in revenues received by the oil exporting countries as a result of higher oil prices (see Figure 17). Annual average settlement prices of futures contracts have nearly tripled since 2001, from \$25.9 a barrel for WTI in 2001 to \$41.4 a barrel in 2004 to \$72.4 in 2007. Calculations show that an additional \$3 trillion has been transferred from energy-consuming countries (i.e., millions of consumers and industries) to the producer countries (i.e., a handful of governments and their elites) since 2001 as a result of higher oil prices. Consequently, the net capital flows (outflow minus inflow) from the most important oil exporting countries that had current account surpluses increased from \$127 billion in 2001 to \$222 billion in 2004 and to \$478 billion in 2006 (see Figure 18), nearly matching the net capital outflow of East Asia in that year. These large outflows from the Middle East in combination with very large dollar outflows for oil purchases developed into today's financial situation in the global financial markets. In April 2008 alone, US crude oil and oil product imports accounted for 57% of the month's trade deficit of \$60.9 billion.

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<sup>14</sup> McKinsey Global Institute, Mapping Global Capital Markets, fourth annual report, January 2008.

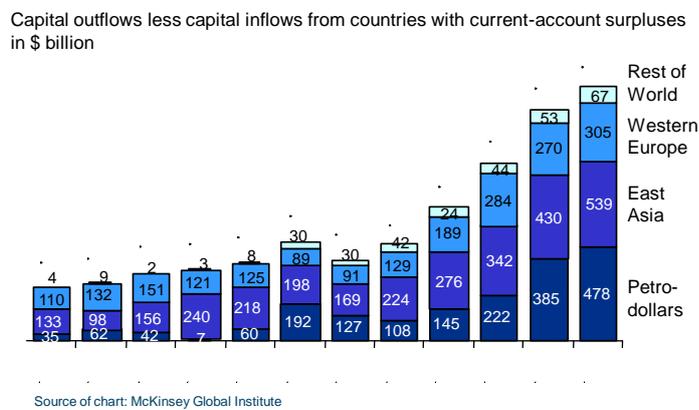
Figure 17: The cross border flows from OECD countries to China, Russia and OPEC countries



The second phase of the globalization cycle, which has just begun, is basically the consequence of the success of the previous phase of globalization; the genie is out of the bottle. Until the mid-1990s, the bulk of the economic growth took place in the OECD countries. These countries had traditionally put a firm claim on most of the world's natural resources needed to support economic growth. With ample supplies and a strong buyer's position without competition, commodity prices were able to be kept low from the mid-1980s onward. However, the ongoing integration of emerging economies in the 1990s gradually but firmly unlocked the potential for an additional 1 billion people to raise their living standards, bringing a new lifestyle within reach to include houses, cars and many electric appliances. In a very short period of time, the number of people benefiting directly or indirectly from integration into the world market almost doubled. Unfortunately, the pace of this demand expansion cannot be matched by a similar expansion in resource production. The world economic system began to hit the limits of current resource supplies in the beginning of this decade. Around 2002, in the last days of an Oil Demand-led World, this resulted in an irreversible process of structural price increases of crude oil and all hard commodities, and recently also accompanied by price increases in soft commodities, coal and natural gas. Moreover, economic development at this level also has its consequences for environmental degradation, in particular the expansion of energy consumption of fossil fuels. The accompanying increase in energy-related carbon emissions runs counter to the initiatives to curb CO<sub>2</sub> emissions and limit global warming. At a time when newly emerging economies are claiming their share of the energy and environmental pie, the ability to accommodate their growth turns out to be constrained. The consequence of the

pie not growing fast enough is that the available oil resources have to be re-allocated. This re-allocation is set in motion by higher oil product prices for end consumers and tighter energy regulation and efficiency policies implemented by OECD governments. Without government protection for these price increases, the end consumers in the OECD countries are pushed to accept prices closer to the User Value of energy and thus are forced to accept this re-allocation. At the same time, end consumers in some emerging economies are shielded by their governments from these price developments.

**Figure 18: Net capital out flows**



The current stresses and strains in both energy and capital markets are an indication of the challenge to manage the world economies successfully through the transition period towards an Energy Sustainable World. The current phase of globalization, with its widening credit crises, increasing inflation, fluctuating interest rates, balance of payment imbalances, the US dollar and the oil and food price increases, presents us with a cocktail of instabilities that will challenge the ability of many governments to adjust their national economies to the new realities. Many ask for conflicting policy measures, for instance in interest rates or other money supply policies, making economic and monetary policy making by the central banks such as the FED and the ECB extremely difficult.

In the next three sections, the impact of higher oil prices on monetary and economic policies will be explained in more detail. In particular, a brief account of the situation in the 1970s and early 1980s, when oil prices also increased fourfold in a short period of time, is instructive to understand the current policy dilemmas.

## 11.2. HISTORICAL EXPERIENCE

Like today, the monetary and economic challenges in the 1970s and early 1980s were driven by a familiar cocktail of rapidly rising oil prices, a falling dollar and high inflation. The monetary consequences of the first oil price crisis were very serious, and changed the growth and development paths of many countries. Although the fourfold oil price increase in 1973-74 was not the only factor contributing to world economic instability and the major reshuffle in world production, trade and investment, they were in many ways the straw that broke the camel's back. The Bretton Woods system of steady exchange rates collapsed months before the oil price increase in March 1973, and the ensuing decline in the value of the US dollar further eroded the purchasing power of a barrel of oil. Oil-producing countries were keen to remedy that, and the political circumstances surrounding the Arab-Israeli conflict were an ideal pretext to finally take matters into their own hand.

Western monetary authorities and the IMF in the 1970s feared the deflationary effect of the massive transfer of dollar income to the OPEC oil-producing countries and the inability of these countries to quickly increase spending due to a low absorption capacity in their domestic economies. Moreover, the Western countries for political reasons did not believe that the oil price increase was a structural adjustment of oil prices, but instead believed that within a year oil prices would return to their pre-October 1973 war levels. As a consequence, they treated the oil price increase as a temporary imbalance. To neutralize the expected deflationary effect they allowed the money supply to widen substantially to maintain – or better, to stimulate – aggregate demand in the economy, which had suffered severely as a consequence of earlier poor monetary policy performance. Like today, the large transfer of money from oil consumers to OPEC member states had to find their way back into the system. With no ability to invest the large sums of excess money in their own countries, and the proposal to recycle the oil dollars through the IMF unpalatable, the Gulf oil-exporting countries decided to recycle the large flows of US dollars back into the global (Western) capital markets, much supported and promoted by the large US commercial banks (Citibank, the Chase Manhattan Bank, Manufacturers Hanover Bank, Bank of America and Chemical Bank). This came as a surprise to the FED and the US Treasury Department, who expected the monies to end up at the IMF. The devastating consequence of the reintroduction of the US dollars into the system was, however, an acceleration of world inflation and a further depreciation of the US dollar.

The foundation of the 1980s financial crises in the developing countries was also laid in this period. During the oil crises, demand for investment capital was low in OECD countries when a major restructuring of the economy commenced. The

Western banks then acted as intermediaries to transfer the funds from OPEC countries to the oil-consuming developing countries, notably Latin America.

The second oil shock started in late 1978 when foreign oil workers had to leave Iran, resulting in a fall in output of 2 million b/d and a stoppage of oil exports. The ensuing panic on the international oil market created a price spike on the small spot market (most oil was still traded under long-term contracts). Soon oil producers began to shift long-term contracted oil to the spot market in an effort to benefit from the higher prices. In the preceding years the OPEC countries had seen the value of a barrel of oil undermined by a depreciating dollar and high world inflation (13%). This had substantial consequences for the functioning of international capital markets, in particular the trade in US bonds, and for the effectiveness of US foreign policy. Official oil prices for Saudi Arabian light increased from \$12.70 a barrel in July 1977 to \$24 a barrel in December 1979 and to a high of \$36 a barrel in October 1981. In 1982 OPEC introduced a quota system with an initial cap in production of 18 million b/d to defend the new price level.

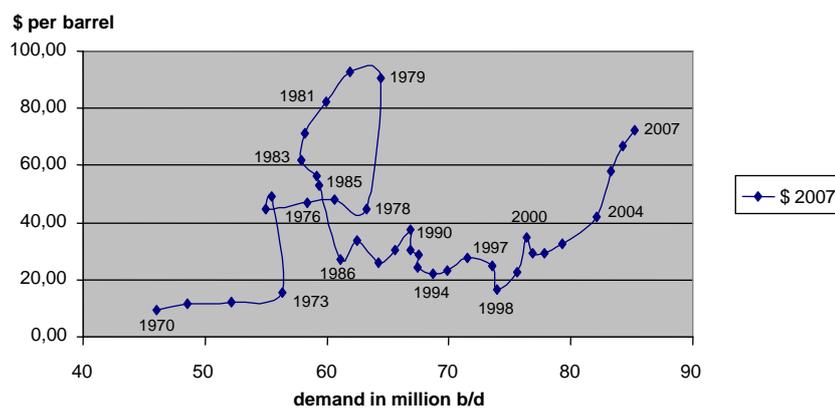
On 25 July 1979, with the US economy in bad condition, President Carter appointed Paul Volcker as Chairman of the FED. Under his leadership radical changes in the US monetary policy were implemented. When oil prices began to increase in 1979, he understood that this would further spur consumer inflation and that it would paralyze money markets and further impair the value of the US dollar. At that time, the most urgent challenge was to avoid the collapse of the US dollar, something that was considered a very serious possibility.

Understanding that high inflation can seriously destabilize the economy, and that the Central Bank must take responsibility for achieving price stability over the medium term, Volcker's first priority was to get inflation under control by implementing anti-inflationary monetary policies. The most visible action was to restrain money supply drastically. For instance, in 1979 the FED has proposed to let the money supply grow by 1.5 to 4.5%. In reality, it had already grown by 9.5% in the third quarter of that year. Although his anti-inflation policy was successful, it came with significant costs in terms of loss of output and jobs – the highest unemployment rates in the US since the 1930's financial crises – when interest rates increased dramatically. For example, in order to limit the creation of new money, the FED actively intervened in the money market by setting the range of federal fund rates at 11.5 and 15.5% in 1979. In 1980, the range had already to be increased to 13 and 20% when interest rates continued to increase, while the prime rate increased to 16.5% in February 1980. The impact on the economy became particularly large after the implementation of new oil import taxes and credit restrictions, which were announced by President Carter in March 1980. The credit restrictions resulted in new credits completely drying up and the economy shrinking.

Although at a high cost, also in Europe, the strict monetary policy of 1981 and 1982 had a purifying effect on the economy and brought consumer inflation back to an acceptable level. The restrictive policy by the FED ended the inflationary bubble, but drove the US economy into the worst recession since the 1930s, with a real GDP decline of 4.9% on an annual basis by the 4<sup>th</sup> quarter of 1981. In 1982 consumer inflation declined to 3.9%.

The combination of high oil prices and economic recession forced industries and households to change their energy consumption (see Figure 19). World consumption declined from 64.4 million b/d in 1979 to 57.9 million b/d in 1983 and began to increase in 1984 again, helped by weakening oil prices.

**Figure 19: Oil price (in 2007 \$) versus global oil demand**



The impact of higher oil prices in those years was that companies in the OECD, that already were facing cost inflation before the oil price increases, had to restructure their businesses. In order to improve their management of the cost of capital, labor and energy, they divided previous integrated production processes in separate units in different countries. The result was disinvestment in OECD economies and a sharp reduction of employment, as well as increasing investments in developing countries that offered a better cost-revenue balance. At the same time, developing countries were keen to tap into the money flows from international private banks, which were looking for investors, to use the relatively 'cheap' money to increase production and consumption. High inflation and relatively low but adjustable interest rates lured these countries into international dollar/capital markets in the late 1970s, early 1980s.

The high indebtedness built up during the late 1970s by many Latin America countries, when interest rates were low, became increasingly unsustainable in the first years of the 1980s when, as a result of the tight monetary policy, US interest rates increased and the dollar appreciated. Eventually, the post-1973-74 oil crisis investment boom in the developing countries burst on Friday 13 August 1982, when Mexico went into default. Studies demonstrated that US commercial banks had loans outstanding in Latin America in the order of \$83.9 billion in 1982, equal to 119% of the total equity of all the important US banks together, while the largest nine Latin American banks had loans outstanding equal to 176% of their combined equity. As a result of the ensuing debt restructuring, US commercial banks had to write off large sums of money, restructure large volumes of credits, create additional reserves and diminish the importance of the credits to Latin America within their total portfolio. Through distress debt trading, debt-to-debt conversion and debt/equity swaps, large portfolios of outstanding loans were traded at substantial discounts, allowing these banks to clean up their balance sheets while making substantial profits (on these trades). By the end of the 1980s, the commercial banks had probably rescheduled \$250 billion of principle. Between 1983 and 1989 the Paris Club had to restructure \$88 billion, equivalent to an average of \$14 billion a year. By 1989 the most important bankers, including current ECB president Jean-Claude Trichet, at that time the Director of the Treasury of France and the Chairman of the Paris Club, noted that “we are still living in a very dangerous world, no more but perhaps no less dangerous than in 1981 or 1982”. In the end, it took the whole decade and the first years of the 1990s before the financial crises were resolved. Hence the oil-consuming developing countries suffered severely from the 1980s debt crisis; for many it was a lost decade in which they continued to experience weak growth, low investment, high inflation, intermittent capital flight and serious payment problems. For a large part, this could be traced back to the way petrodollars were recycled and how the monetary authorities in the OECD countries handled the transfer of wealth in that period.

The irony is that the response of the American monetary authorities, followed by other OECD countries, to the second oil price increase in 1979-80 with a strict monetary policy, was based on the belief that oil prices had structurally increased and the fact that the room to finance the temporary price increase was no longer there. Tackling inflation thus became a first priority. In reality, the second oil price increase was a spike, reflecting the price of a panic barrel after the stoppage of oil production in Iran during the Islamic revolution and the panic buying on the barely existent spot market for oil. Policy makers were twice wrong in their judgment about the structural or temporary nature of oil prices and their policy response. The first shock of 1973 was structural; the second one was, in hindsight, temporary: in the first half of 1986, oil prices collapsed from

around \$30 a barrel to \$9, thereafter to stay in the \$10-20 a barrel range until 1999.

### 11.3. TODAY'S IMBALANCES

Today again, the monetary authorities are in a predicament, and again the current instability is not only due to higher oil prices, but these price increases certainly complicate the policy options for remedying the existing imbalances. Most, if not all, ingredients that created the economic downturn and financial crises in the 1970s and 1980s are present again today.

First, the credit crisis is already challenging the policy options of central banks, and the repercussions are international. While the mortgage and financial crisis in the US are seen as one of the worst financial crises in modern history, it is important to note that it escalated and hit the markets when oil prices were still at comfortable levels. Around \$300 billion of credit losses and asset write-downs have been reported by US and European banks, while they were able to raise more than \$80 billion in new capital so far this year to improve their balance sheets. But listening to senior bankers, it seems likely that more write-offs will need to be announced. Hence, the turmoil in the financial markets is likely to continue for a while, and financial institutions must continue their efforts to raise more capital. Recovery and repair of the financial markets, restoring trust amongst the banks, will be a gradual process that requires much more understanding of their own and others' exposures. Greater transparency and less complexity in credit instruments are needed. New risk-management and control practices, including liquidity-risk management systems, and new valuation practices have to be developed and implemented. Commercial banks are expected to curtail their lending until sufficient confidence in the financial markets has returned. In the meantime, any new lending will (have to) be coupled with debt reduction and balance sheet reparation. In some cases the market for certain asset classes has pretty much dried up, making price discovery and debt reduction for certain types of asset classes extremely difficult. In combination with tightened lending standards and terms, credit conditions are expected to stay tight, causing reduced availability of credit to non-financial corporations and households.

Second, the dollar has substantially depreciated against the Euro in the past year after a period of relative stability between 2004 and 2006. This decline was driven by the outbreak of the sub-prime crisis. The impact of this crisis on the US economy led the FED to give higher priority to demand stimulation in the US economy than to worrying about rising inflation. Interest rate reductions were needed to save the banking industry in the US from collapsing, while the low dollar also stimulated exports. This improved the trade balance, particularly with China. Earlier efforts to convince the Chinese authorities to allow a further

appreciation of the Renminbi had been unsuccessful. The relatively low inflation at the start of the sub-prime crisis gave the FED the space to target other issues first. The fact that the European Central Bank (and the Chinese Central Bank) were already more focused on inflation, resulting in interest rate policies different from that of the FED, did not help the value of the dollar, either. As opposed to in the OECD countries, Chinese inflation, particularly in foodstuffs, was already on the rise. With \$1.8 trillion in foreign reserves, they opted to control domestic price levels, including energy, to maintain social-economic stability. Many other emerging and industrializing countries around the world, both in Asia and in Latin America, follow a path similar to China's in order to shield their consumers from inflation driven by energy and food prices.

Third, the US has only very recently started to express concern about the value of the dollar against the other major currencies due to imported inflationary pressures in the oil and food markets. As a result, the US interest rate policy might have to be reversed. Unfortunately, forecasting prices of oil (and that of other hard and soft commodities) has become increasingly more difficult with the deviation of oil price development from its marginal cost underpinning. As noted earlier, we expect that prices will certainly rise if producing countries fail to develop their 8 to 10 million barrels a day, but prices will also increasingly meet more resistance on their way to the ultimate User Value. In addition, we also expect prices to be more volatile. In turn, this will make the highly uncertain conditions under which central banks have to act very difficult indeed. In the 1970s and the early 1980s, higher growth than expected in money supply, high inflation and inflation expectations, a deep recession and high oil prices forced central banks to roughly readjust their policies and manage issues in real time.

Fortunately, the current OECD economies have become much more robust, flexible and – so far – able to adapt to the new challenges. Also, since 1975, the energy required to produce a given amount of output in the US has fallen by about half. Monetary policymaking has improved substantially since the 1970s, but the President of the European Central Bank, Trichet, recently called on oil producers and consumers to learn from past mistakes if Western economies were to avoid a repeat of the high inflation and unemployment that followed the first global oil shock in 1973. This is important because the increase in inflation, both as a result of strong demand for natural resources and food and rising cost of production to meet that demand, is taking place before any serious recycling of petro-dollars has begun.

So far this year, consumer prices in the US are rising at an annual rate of 4 percent, compared with a 4.1% increase for all of 2007. Core inflation, excluding energy and food, is rising at an annual rate of 2% this year, down from an increase of 2.4% for all of last year. The oil prices increases since the beginning of this decade have had only modest effects on inflation for other goods, initially

as a result of cheap imports from China and recently accompanied by softening domestic demand as a result of a weakening US economy. Yet many economists now state that they expect core inflation to rise when the prolonged increase in energy prices starts to impact other areas. This is causing markets to factor in an increase in interest rates by the FED by the end of the year before the economy has recovered. In recent speeches, FED Chairman Ben Bernanke and Governor Fredric Mishkin<sup>15</sup> stated that supply shocks such as the recent increase in the price of oil drive inflation and output in opposite directions. In such a case, the overarching goal of the FED to stabilize inflation might conflict with the other overarching goal of stabilizing economic activity, because a tighter monetary policy to reduce inflation can lead to lower output. The difference between the early 1980s and today is that inflation expectations so far have been substantially lower. In addition, a focus on stabilizing core inflation leads to better economic outcomes than stabilizing headline inflation. Given the fact that higher (and likely further rising) oil prices will cause a more persistent influence on inflation (not temporary), the FED has to factor that expectation into the outlook for overall inflation. Two other significant upside risks to inflation are the high headline inflation and the low foreign exchange value of the US dollar. The first is already leading the public and industries to begin to expect higher long-term inflation rates, which could become self-fulfilling. The second leads to an undesirable weak dollar, which contributes to the unwelcome rise in import prices and trade deficit. All policy makers, including the President, Bernanke and Paulson agree that the dollar is too weak and has to appreciate.

While headline consumer inflation rates are already around 4% in the OECD countries, most of the industrializing countries are struggling with much higher inflation rates, while oil-producing countries are now experiencing double-digit consumer price increases. This inflation is caused by increased spending and low interest rates to maintain the peg with the dollar, while the low dollar also causes imports to be more expensive. Many of these countries try to address this with measures like price controls and wage adjustments, which only delay the macro-economic adjustments, while a readjustment of their currency to the dollar increasingly becomes an attractive option.

Fourth, again today we are witnessing large balance of payment imbalances around the world, with a few countries with large surpluses and the US with a very large deficit (which has been difficult to reduce due to rising oil prices for their crude oil imports). Like in the past, high oil prices have instigated another round of huge increases in capital flows, in addition to the flows already

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<sup>15</sup> Several speeches, including "Remarks on the economic outlook" by Ben Bernanke, June 3, 2008, and "Does stabilizing inflation contribute to stabilizing economic activity?" by Governor Fredric Mishkin, February 25, 2008

generated by the 'factories of the world' such as China, towards a small group of oil-exporting countries (and often only to a small elite segment of society).

At \$125 per barrel oil, the world spends around \$11 billion a day on crude oil purchases, slightly less than a third to be paid by the OECD countries for their imports. At this price level the United States, importing 10.7 million b/d of oil, might have to spend \$500 billion on crude imports in 2008 alone, its single largest element of its trade deficit. Indirect costs, such as military costs to guarantee the global oil flows, double this amount. Similarly, it will start to affect the major export-oriented countries in East and South-East Asia as well. Already India and Indonesia have been forced to reduce their subsidies for energy products because of increasing budgetary constraints. For instance, at this price level, China, having to import every additional barrel of oil consumed, will have to pay circa \$185 billion on crude imports this year. This amount is to accumulate to an amount of \$8 trillion for its oil imports between 2008 and 2030 (assuming the cumulative oil imports as per IEA's 2007 World Energy Outlook reference scenario). Although the pockets of China are much deeper than those of other countries, the sustainability of their domestic energy policy will much depend on spending by oil-producing countries, in particular the OPEC member states, Russia and Central Asia, the largest recipients of oil export income.

Fifth, surging oil revenues have led to a massive accumulation of capital in the Gulf OPEC countries in a very short space of time. The six GCC countries, Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Oman and Bahrain, will provide about 18% of global capital exports in 2008. At \$125 a barrel, total crude oil export revenues for these six countries are estimated at \$1.5 billion a day, or \$550 billion a year. The total Middle Eastern and the Central Asian region's oil and gas exports receipts are likely to amount to \$940 billion in 2008 according the latest Regional Economic Outlook<sup>16</sup>, slightly more than the total US trade deficit and 23.7 percent of the world's total annual crude oil spending (of \$3.97 trillion). Other major oil exporting countries such as Russia and the other OPEC countries (Venezuela, Nigeria and Angola) will enjoy similar revenue income streams.

This is only the beginning. According to analyses conducted by McKinsey Global Institute, the cumulative GCC oil revenues are growing (in constant 2006 prices), expected to increase from \$0.6 trillion in 2007 to \$8.8 trillion by 2020 if oil prices remain at \$100 per barrel. Although a growing share of their export revenues will be invested in their local economies, their domestic markets are not big enough to absorb such vast quantities of dollars and offer acceptable returns. Hence, a large portion of their oil profits not spent within their region must find its way into the global capital markets. The amount to be invested

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<sup>16</sup> IMF, Regional Economic Outlook, Middle East and Central Asia, May 2008



outside their own economies could be as large as \$5 trillion between today and 2020 (based on \$100 a barrel oil price), almost twice as much as their foreign wealth today. Including asset appreciation, the total foreign wealth of these six GCC countries could accumulate to \$10 trillion in 2020. At a possible \$200 a barrel, this amount becomes really enormous.

It is important to note that these enormous amounts are going to flow from many hundreds of millions of individual consumers to a handful of governments and their elites. Our guess is that there is no way that they can recycle these petro-dollars at a high performance rate. Like in the 1970s, it is possible that too much money will chase too few goods and too few attractive investments.

The question for monetary and economic authorities, like in the 1970s, is whether the increase in the oil price reflects a structural adjustment in relative prices or a temporary misalignment due to macro-economic imbalances. They now struggle with their domestic responses and must choose either to finance or adjust to the new oil prices. Also they must assess if, how, where and when the petro-dollars amassed by oil-producing countries will be reinvested in the global financial markets in order to decide on the room for monetary relaxation. As a result, the impact of domestic policy actions on the economy might become more uncertain, or even less predictable, while domestic economies become more sensitive to foreign shocks. Should oil prices rise further in the medium term – 5 to 7 years – which is not unthinkable, central banks must have to factor in the impact of such price increase on inflation and their ability to adjust. The balance of payment imbalances, the credit crisis and the oil price increase are a cocktail of instabilities that will challenge the central banks' and the departments of treasury's abilities to adjust their national economies and will also impact their competitive position in the international economic system.

From the above it is clear that in the space of a few years, oil demand has structurally shifted upwards and that the marginal cost of supply is also increasing. Today, world production seems to have hit on a (temporary) upper limit of the production possibility curve. The supply of cheap labor and capital cannot overcome the current constraints in raw material resources, energy and food due to political, institutional, economic and time-lag factors. As pointed out in earlier sections, in energy there is a shortage in high-skilled labor and a shortage in access to (medium cost) resources to lift supply constraints, rather than in capital. More specifically, the shift in the marginal cost of supply also reflects the limited access to medium-cost oil that is withheld from the market due to institutional, political and national interests. Monetary and economic authorities in consumer governments thus need to make an assessment of the likelihood of medium-cost oil coming onto the market soon, or in the alternative, that oil prices have been structurally adjusted upwards to reflect the price of a marginal liquids barrel. The monetary consequences of the 1973-74 and 1979-

80 price increase have shown that getting this wrong has major consequences for the domestic and world economies.

#### 11.4. SOVEREIGN WEALTH FUNDS

The high oil prices cause a massive money and wealth transfer from the oil-consuming countries, including the OECD countries, to the major oil-producing countries. In order to manage the excess funds, all these countries have established government-owned oil funds, commonly referred to as Sovereign Wealth Funds. While the nature of these funds differs across countries, their main objective is to invest the money so as to earn a decent return. Of course a key question is why such a small group of investors with so much money available is able to make wise investments in all kinds of asset classes abroad, and if these investments are allowed to take place for strategic reasons.

Although the size of the Sovereign Wealth Funds, managing a substantial part of these excess money flows, is already large and bound to grow further (Table 3), the impact of this accumulation of wealth and power in the hands of a few governments and their elites will depend on how, when and where this wealth will be employed. In their quest for security of demand and steady future income flows, the oil-producing countries are principally interested in direct investments which give control over the investment or ownership. They are interested in investments further down the oil value chain, particularly in dynamic oil markets, and investments towards the diversification of their domestic economies. But they are also interested in gaining stakes in the international financial institutions and non-financial corporations and above all, real estate and hotel and leisure groups. Rather than opening bank or portfolio accounts, like they did in the 1970s, they are now also interested in real assets (ownership), which will bring future returns and influence.

Markets only function properly when there is a free flow of information so that price discovery can take place and so that perceived risks do not deviate too much from real risks. Information asymmetries could cause financial instability, characterized by valuation risks (of the asset) and macro-economic risks (of the economy at large). Unfortunately, these fast growing Sovereign Wealth Funds are not known for their transparency. For instance, it is unclear how these funds are managed and what the level of sophistication in risk management and other management policies and systems is. So far the discussions about creating more transparency have been little appreciated. If transparency about oil reserves and underlying production decline rates is an example for the expected transparency of their Sovereign Wealth Funds, the prospect is weak with regard to full disclosure of the size and asset allocation, their investment objectives and management practices and systems, and governance procedures. Because OECD economies have committed themselves to the benefits of greater disclosure,

regulators in the Western world should not underestimate the potential risks of loose standards employed by investors from elsewhere. OECD countries should be aware that without proper governance structures, oil-producing countries could control and optimize the flow of oil and capital in their own national (political) interests, which do not necessarily reflect the interest of the OECD economies nor level the playing field. But for the same reasons, the fast-growing funds with trillions of dollars under their management could also go wrong unintentionally. Finding a home for hundreds of millions of dollars every year and managing trillions of dollars in investments by a handful of firms, of which many are also owned by the same governments, and without a long-standing track record or experience in investing this size of funds, is a formidable task in itself.

**TABLE 3 THE SOVEREIGN WEALTH FUNDS IN THE OIL EXPORTING COUNTRIES**

Country	SWF	Estimated Assets
UAE	Abu Dhabi Investment Authority (ADIA)	\$875 bn
	Dubai International Capital (DIC)	\$12 bn
	Dubai Investment Group (DIG)	\$6 bn
	Mubadala	\$10-20 bn
	Sheikh Mohammed's Dubai Holdings	\$ ?
	Istithmar (Dubai World)	\$ 14 bn
	Investment Corporation of Dubai (ICD)	\$ ?
Saudi Arabia	Saudi Arabia Monetary Agency (SAMA) + pension funds	\$350 bn
	Prince Alwaleed's Kingdom Holdings	
Kuwait	Kuwait Investment Authority (KIA)	\$250 bn
Qatar	Qatar Investment Authority (QIA)	\$60 bn
Oman	Oman State General Reserve Fund (SGRF)	\$10 bn
Bahrain	Mumtalakat	\$ ?
Norway	Government Pension Fund	\$397 bn
Russia	Stabilization Fund	\$144 bn
Algeria		\$43 bn
Brazil		\$ ?
Libya	Libyan Investment Authority	\$40-100 bn
Canada	Alberta Heritage Fund	\$18 bn
Azerbaijan		\$2.5 bn
Kazakhstan	Stabilization Funds	\$22 bn

In principle, the world is again dependent on the recycling of oil dollars and on the direction these flows will go. The last time around, the recycling of oil dollars restructured economic and political relations in the world, with some winners and many losers, the latter mostly in the developing world. Some countries nearly took 15 years to recover, while others were forced to expedite their integration in the world economy and restructure their economies in order to qualify for international institutional help. This integration was at the root of new imbalances, with periodic debt or monetary crises plaguing developing or emerging countries' political and socio-economic balance, refocusing some countries on more managed integration or 'weak globalization'<sup>17</sup>. The recent oil price increase and the accompanying increase in wealth has again brought the oil-producing countries to the center of geopolitical attention because the choices of these countries of how and where to invest (or to withhold), and under which circumstances, will vitally impact geo-economic and geopolitical relations in the next few years.

## 12. GEOPOLITICAL RELATIONS: ACCOMMODATION OR COMPETITION?

In the face of supply constraints and the accompanying higher prices, the interesting question is whether producing and consuming countries will be able to muster effective cooperation to manage their way out of the Oil Supply-constrained World or whether they will end up resorting to destructive competition to secure energy and their own wealth. The answer to this question will depend on the place of oil and economic security in their wider geo-economic and geopolitical interests and the power of individual States to manage their oil and economic security. They can manage security either through organizing the availability of alternative liquid energies and/or securing oil flows through the market or bilateral arrangements and/or securing income from oil. Higher oil prices and the accompanying security concerns will be an important stimulus for the development of alternative liquids. The US is already venturing along this route through biofuels, despite the possible negative impact on the world food and water balances.

The space that the traditional energy-consuming countries have to make to accommodate the growth of energy demand in emerging economies in Asia and elsewhere is substantial. The current energy policies foresee a further increase in energy efficiency, which will be further invoked by higher energy prices in OECD countries and the partial switch to non-fossil fuels. However, the transition

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<sup>17</sup> Coby van der Linde, Energy in a Changing World, CIEP paper 2005.

to non-fossil fuels will be a slow process, particularly when compared to the rapidly emerging supply gap in the oil market. As a consequence of demographic developments and economic growth in Asia and other economies, demand for oil, and food and other natural resources for that matter, will expand. The intensity of competition to secure oil flows, with the danger of spilling over into strategic and geopolitical rivalry, will be determined by the size of this gap and the ability to intervene in energy flows.

Judged by the recent policy initiatives, both the US and the EU, as well as other OECD countries, are looking at biofuels as an acceptable alternative for their liquid or transportation fuels demand. Biofuels, with all their growing pains and their own environmental footprint, offer the advantage of diversification of source and origin, freeing countries from the impending political trap of structural dependency on but a few oil exporting countries. Currently biofuels are benefiting from the increase in oil prices, making the competitive gap smaller, and the introduction easier. If this policy is successful in OECD countries over time, the relative importance of Middle Eastern oil supply for OECD countries will decline, but will increase for emerging economies such as China and India, despite their efforts to enlarge flows from elsewhere. Already the bulk of Gulf oil is exported to Asian markets. Yet in the short to medium term, the interest of the OECD countries in Middle Eastern flows is substantial, partly to fend off the pull on their suppliers to switch to Asian consumers. The strategic importance of securing sufficient oil flows for the market-based system is large and as such belongs to the vital interests of the US. Yet some Asian countries feel uncomfortable about the ability of the US to secure oil for their markets, and they are developing their own securitization strategies to increase their level of comfort.

Asia's strategic stake in the Gulf region's oil potential will increase with the growth in imports. With their soft powers they are already trying to expand and secure oil flows from Iran and Saudi Arabia and other areas. Access to the dynamically growing demand for oil products in Asia is tempting producer countries with agreements which trade access to flows for access to the downstream part of these markets. Yet the current price controls on oil products in many of the Asian markets are a disincentive for producers to invest in refining in these markets and instead will prefer to export refined products from their home markets if they can.

Despite the growth potential of the emerging economies, the price controls also pose a problem for producer countries. How must they assess the ability of governments to continue to stimulate domestic energy demand, and the call on oil in the future. If the price controls disappear the demand outlook will change substantially, forcing these countries onto a slower growth path. The reluctance of oil producers to fully take current demand projections into account is



understandable. They do not want to commit to large investments to reduce the supply gap when demand projections are based on perhaps unsustainable subsidies, while the steady demand in OECD countries could be eroded by biofuels and in due course other complementary fuels. The lack of confidence in demand and supply policies of consumer and producer countries further feed the uncertainty about future needs. The consequence of this ongoing uncertainty is a damaging waiting game, with the current oil prices testing the players' nerve. Instead, producers and consumers should better understand their joint interests in avoiding an oil crunch and stop blaming each other for the current market circumstances.

Both in the Middle East and in Africa, Asian companies invest in oil production in countries where the US has difficulty in disciplining them to act within the mores of the (Western) market-based system. In 2007, to underline the new importance of African energy flows to the US and almost certainly also because of the inroads made by China in the region, the US started a Central Command for Africa, the first new regional command center established since the 1970s. Despite the efficient use of its soft powers, China cannot yet match the hard powers of the US to secure its energy flows from abroad. For this it has to reluctantly rely on the hard powers of the US. But efficient use of its soft powers has at least made Chinese and Indian companies credible competitors for equity in Africa.

Despite the new efforts of the US to reduce its crude oil import dependency with alternative fuels, they are aware of the widening gap between demand and supply, as well as the long time frame required to close that gap, either with alternatives or increased crude oil production in OPEC countries. Nevertheless, due to the lax track record in energy efficiency, they can make a prompt contribution by tightening legislation on energy efficiency, particularly cars. High prices are having a substantial impact on oil demand, and car sales already have switched to more fuel-efficient models, showing that when incentivized, the US can switch gears quickly. For now, biofuels at best arrest the growth in oil imports of the US. Nevertheless, any reasonable change in behavior will only help, but not cure the problem. As mentioned above, to accommodate growth in the non-OECD countries, growth in OECD oil demand has to slow down substantially in order to accommodate future demand in the rest of the world.

In Europe, the impact of biofuels on import dependency is even lower because of public protest about the environmental footprint of first generation biofuels and the faster than anticipated decline of domestic oil production. Biofuels are therefore no panacea to solve the mismatch in timing between transition and the impact of an Oil Supply-constrained World in the coming decade, but higher oil prices certainly make this an avenue easier to travel than a lower price environment. The likelihood that the OECD countries will be able to

accommodate the emerging markets in this timeframe is small, while high oil prices may destroy more demand and leave the world with a smaller gap, but also with an oil product demand that currently does not match the refinery configuration around the world. The risk of fierce competition for oil supplies and certain oil products will not become smaller.

The substantial step change in the price of oil is also a real challenge to the emerging economies that are still in a fairly energy-intensive phase of development. The competitive advantage in world markets based on cheap labor is eroded by the negative development in the energy terms of trade. The transfer of wealth from oil-consuming to oil-producing countries thus also involves the oil-importing emerging countries. Very often energy prices in emerging economies are subsidized. Already countries such as India and Indonesia have had to reduce these subsidies to close the gap between domestic and world market oil prices and avoid further losses in State energy companies and the government budget. China has recently adjusted its prices with 18-20% since the Fall of 2007, basically pricing oil very close to the current marginal cost level of \$80 a barrel (see section 4.1; building block 1). The elevated level of inflation already experienced in China might make the government hesitant to adjust prices further. Yet the gap between domestic and world market prices is still growing, making the next adjustment – when it comes – all the more difficult for consumers. Perhaps the government is gambling on oil prices falling, making the gap smaller and the adjustment smaller. The probability that oil prices will decline so as to be much closer to Chinese prices is, however, small if the price formation building blocks are taken into account. Currently the government allows shortages to exist in certain parts of the market. It is allocating oil supplies to the earthquake operations, demand originating in the Olympic Games, strategic sectors and certain cities, while in other parts of the country a type of inflation is emerging known from the command economy days: the waiting line. Nevertheless, subsidizing the 2008 energy balance might make this policy option very costly indeed, jeopardizing social-economic stability in the future when the adjustment must come in a world price environment, leaving a big gap between domestic prices and world market prices.

Emerging economies are certainly not in a better position to sustain their economic growth in the face of increasing oil prices. As noted, alternative fuels are no reprieve from high-cost oil and require more sophisticated energy infrastructures and vehicles than currently available within purchasing reach of the middle classes in these countries. The monetary link to the dollar of many emerging economies is another complication for policy makers. Despite some minor exchange rate adjustments, the link to the dollar allowed the countries to open markets for their export products. The drawback is that they have not been

able to benefit from the slower increase in oil prices in local currency terms as Europe and Japan have.

The absence of fierce protestations at the political level in some OECD countries to the recent oil price increases – although certain consumer groups are beginning to stir – is perhaps an indication of how competition for scarce resources is going to play out. With the oil-producing countries holding out on their oil production capacity investments in an attempt to price oil at the level of the User Value and to find firmer ground for making the capacity enlargements, a new balance must be found in the distribution of oil scarcity. Although the pain of high cost oil is also felt across the OECD countries, the higher oil prices in reality are also seen as an ideal underpinning for the transition policies in these countries. It makes it easier to finance and, more importantly, it levels the playing field with emerging economies. Ironically, the recent oil price increase may not only make demand meet supply, but will also bring energy transition, both for environmental and security reasons, within reach. Yet a transition in the current economic circumstances, provoked by high oil prices, is economically much more painful than the earlier more evolutionary versions communicated to the public, where time was less of the essence. In this more long-term approach to the current situation, the accompanying shake out of energy inefficient parts of industry in the OECD countries is nothing but a nasty byproduct of the shifting energy balance. Above all, most industries in the OECD countries already took all steps to lower their energy bill a long time ago. To further improve the energy efficiency of their processes and products, dramatic steps have to be taken, and fundamental research and development is required to make this happen.

### 12.1. SECURITIZATION OF OIL

The hard power of the US has been instrumental in securing oil flows for the market-based economies. Particularly seaborne oil trading and certain bottlenecks in trading routes were securitized by the US. The power of the US, however, could not secure access to resources by foreign direct investments. The special relationship between the US and Saudi Arabia served for a long time as the political equivalent of spare capacity in a world oil market managed by OPEC production policy. Saudi Arabia played an important role in accommodating the market impact of regional instabilities. After 9/11/2001 and the intervention in Iraq in 2003, the special relationship has perceptively changed under the pressure of maintaining Saudi domestic political stability. First, American headquarters in the Gulf region were moved from Saudi Arabia to Qatar, the small gas-rich emirate, where the presence of many American troops was less controversial. Secondly, Saudi Arabia strengthened its ties with countries such as China and India, partly due to the increased economic importance of these

markets and partly to realign themselves in the new geopolitical make up of the world. Thirdly, the regional power relations in the Middle East were shifting as a result of the long drawn-out conflict in Iraq. The sharpening conflict among the various religious groups in Iraq, the threat of civil war in the country and the interest of both Saudi Arabia and Iran in the outcome of the conflict, required a subtle reorientation by Saudi Arabia on the US, as the main actor in that country. The relationship of the countries in the region, including Saudi Arabia, with Iran is a delicate one. Iran has substantial trade and financial relations with countries in the region, including Dubai, Bahrain and Kuwait. Also, substantial Shia populations live in the Gulf countries, complicating internal social and political relations. Both in Saudi Arabia and in Iraq, the Shia populations live in the oil-rich provinces. In the case of Iraq, the Shia majority in the south has been controlling the oil riches around Basra since the removal of Saddam Hussein in 2003. The implied influence of Iran on these populations requires careful balancing.

The resulting complexity of relations with important geopolitical actors such as China and the US will determine the future relations. If the US fails to discipline the oil-producing countries in the Gulf and too much oil remains locked in because of civil war or other regional conflicts, China and other Asian countries, greatly dependent on these flows, may want to increase their influence to change the course of events. So far the attraction to oil-producing countries of closer relations with China, in addition to market access, is the non-interventionist approach of China in domestic affairs, as opposed to the regime-change approach of the US. The latter is a very unattractive proposition to the elites in all Gulf countries. Yet the underlying assumption of China's approach is of course that the regimes provide China with sufficient oil. If this premise would change to the detriment of oil supply to the rest of the world, a sharper geopolitical conflict could be the result.

Nevertheless, such a geopolitical conflict over oil would not necessarily lead to a confrontation in the Gulf, but could easily erupt in the other oil producing countries first. The complexity of the conflicts in the Middle East and the example of Iraq as a hard to stabilize country, could actually cause a conflict over Gulf oil to shift to Central Asia and Africa, since those countries are easier to pressure or manipulate. In case of Central Asia, such a confrontation would also involve Russia, and given the cooperation in the Shanghai Cooperation Organization (SCO) the deft-balancing Kazakhstan has employed in managing its relations with Russia, China and the West, the eruption of a conflict in that region would be less likely, at least when it comes to geopolitically-inspired conflicts. The Caucasus is less stable and already has led to intensifying conflicts of interest between Russia, Europe and the US. These conflicts have to do with the energy dependency of European countries on Russian supplies and their quest for diversifying routes, as well as the further enlargement of NATO with former

Soviet Union States. This part of the Caspian Sea region is less important for its oil reserves than for its strategic transit role. The oil and gas rich Eastern Caspian Sea countries seem more solidly embedded in the Russian sphere of influence and the SCO arrangements, which makes a standoff between Russia and the EU and the US over security arrangements in this region less likely.

The geopolitical interests of the US, Europe and Asia seem to converge in Africa, which would make it the most likely theater of geopolitical friction. The still weakly developed institutional and political make-up of many of these countries and the looming differences among the various minorities threaten internal cohesion, and the promise of oil monies and subsequent 'big power' coercion to commit to a certain economic or trade model could further undermine the stability of these fragile states. Another important advantage of Africa is that its oil supplies, when shipped, can reach the main markets in North America, Europe and Asia without additional shipping bottlenecks. Although Africa is now booming due to the increased interest in its resource industries, the internal conflicts could convince the US, Europe and China to increase their presence and protect their interests.

When Middle Eastern oil is either diverted away from Asia/China or the US and Europe, particularly when production in the region already fails to live up to expectations with substantial volumes of medium-priced oil not becoming available to the market (leaning towards the IEA's deferred investment scenario), stronger competition could cause intense pressure on the other net exporting countries to produce more oil. This is further exacerbated by the high domestic demand in the OPEC Gulf countries, stalling oil export volumes to consumer countries. The tightness of the market and the ability to absorb the higher cost of oil in the balance of payments will co-determine the emphasis on securing oil through multilateral trade or closed bilateral deals and other security arrangements.

The current level of Asian comfort with the military presence of the US in the Middle East will thus depend on the ability of the US to continue to guarantee the necessary oil flows for Asia. For now, the US is unable to convince Saudi Arabia to expand its production capacity beyond 12.5 million barrel a day, nor to expand its spare capacity to levels at which it can stabilize markets in the future. The recent invitation of Saudi Arabia to discuss the current tight oil market situation, including the mismatch in refinery configuration to demand, must be seen as a response to the difficulties the main Asian consumers are experiencing rather than a response to the repeated request by the American government.

In addition, the 2003 intervention in Iraq reduced the Chinese level of comfort, because they were well positioned to unlock the Iraqi potential after the UN sanctions would be lifted. Instead, Iraqi production took a long time to recover to

pre-intervention levels of about 2 million b/d, with a continued dim outlook for expansion in the years to come. The US policy towards Iran has also negatively impacted the potential flow of oil to world markets because of the US sanctions policy. The strategic ambitions of Iran, exemplified by its nuclear program, have been frowned upon by the US and EU. Through the Security Council of the UN they are trying to bring Iran back into the institutional fold of non-proliferation and the IAEA. Up to now they have not received the full support of China for this policy, although they did act in the case of North Korea, and China is engaged in intensifying its energy relation with Iran. Whether this relationship will be successful remains to be seen, because Iran needs jobs and market access, not imported Chinese labor accompanying the investments. Saudi Arabia then is deftly trying to balance its interests in Asia and the OECD countries, but will increasingly have to address domestic issues to maintain social-economic stability. Its young population needs jobs, while the government does not want to upset the delicate religious and social construction of the country. China and the other Asian countries are increasingly challenged to accept also the political responsibility for their integration into the world economy. Access to oil comes at a price.

The tight oil or liquids balance is thus bound to result in more nervous and sometimes confrontational relationships between the major consumer regions and the natural resource-holding countries, as well as among the major consumer countries themselves. New geopolitical games to secure the natural resources for their domestic economies and to diversify and secure the gateways to their markets already have become an important part of their political and strategic agendas. China is busy building new energy corridors to connect its market with Central Asia's oil and gas production, and would also like to develop connections with Russia's resources in Eastern Siberia. China's relationship with Russia is also interesting because both countries are trying to grow into a position of geopolitical and geo-economic importance. Although they cooperate in the Shanghai Cooperation Organization (SCO), their interests do not run parallel<sup>18</sup>. Russia wants to stay in control of its natural resource development and needs to also secure domestic energy supply. With the skewed distribution of its population over the country, the eastern developments may or may not be favored for priority development, while China would welcome such a decision. It would offer much-wanted diversification to origin and source, and a possibility, in time, to play Russia against the Central Asian pipeline suppliers of oil (and gas). The dedicated investment in oil pipelines ties, on the one hand, supplies to a certain market for a very long time, providing security of demand and supply, but it also reduces the competitive position of those supplies, on the other hand,

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<sup>18</sup> Coby van der Linde, "The geopolitics of EU security of gas supply" in: *European Review of Energy Markets*, volume 2: issue 2, December 2007, pp.209-232.

when no other market can be reached. So far, Russia has been surprisingly careful in expanding its energy relations with China and seems more interested in extending its infrastructure to its Pacific seaboard than developing direct routes to the growing Chinese markets.

## 12.2. OIL TRADE BOTTLENECKS

In order to further reduce strategic dependence, China would also like to develop a corridor to (partly) avoid the Strait of Malacca (see Figure 20), currently one of the strategic sea lanes for China, which falls under the protection of the US Navy. Also China's endeavors in Africa are intended to diversify away from its growing dependence on Middle Eastern flows. China's investments to access Central Asia are accompanied by its political cooperation in the SCO and underpin its interest in stabilizing relations with the major resource holders in Russia and Central Asia. The balance in Central Asia is delicate because Russia is keen to manage gas flows from both Russia and Central Asia to both Europe and, in the future, also to China, to optimize Central Asian flows with flows from its own major gas field developments. As long as China is mainly focused on securing oil flows, its routing strategy will not conflict with Russia's ambitions in the international gas market.

**Figure 20 Developing new energy corridors**



But in 2007, Chinese overtures to buy gas from Turkmenistan were answered with promptly executed energy diplomacy on the part of President Putin, securing the flows for the Russian gas system. Europe and also East Asian countries are also interested in diversifying their imports to Central Asia; Europe

wants to manage its dependency on substantial Russian oil flows without returning to a dependency on the Middle East; while East Asian countries are interested in reducing their dependency on the Middle East. The drive in recent years to diversify could easily change into a strategy to consolidate the origin of flows when supply is tighter and new flows are harder to attract. Asian countries are already intensifying their relations with countries that have a troubled relationship with the US and/or Europe, offering markets to countries such as Iran and Sudan.

Trust and mutual understanding about the allocation of oil and the security of supply will not come automatically, but instead needs to be constantly reaffirmed. The OECD countries cooperate in the IEA's International Energy Program's emergency policy. They coordinate their demand measures and the deployment of strategic reserves in supply emergencies. Already the IEA is offering to cooperate with other non-member state major consuming countries to include these countries in the benefits of collaboration. Notwithstanding these initiatives to cooperate in times of supply constraints, such a strategic organization as NATO is also increasingly prioritizing energy as a new strategic concern. Although with regard to Russia, this NATO focus on energy could backfire in a greater effort on the part of Russia to reduce dependency on the European market when it feels that NATO is encroaching on its national interests. The concentration of oil exports in a few countries re-emphasizes the importance of keeping narrow straits, such as the Strait of Hormuz near the horn of Africa and the Strait of Malacca, which create real shipping bottlenecks, open for oil tankers. (See Figure 21).

Since 1973, the US has been the predominant protector of naval oil routes and, with the increase in LNG (Liquefied Natural Gas) exports, also LNG trading routes. The cost of protecting these oil trading routes has been absorbed by the US, serving the interests of both producers wanting to reach markets and consumers wanting to access flows. US policy has always been to ensure the flows; ownership of reserves was a matter for the international oil companies. Given its special relationship with Saudi Arabia, the country historically with the largest spare capacity, the US government considered supplies secure as long as oil flows from the Middle East reached the international market. As a matter of fact, the Iran (Libya) Sanctions Act and the pre-2003 sanctions applied to Iraq reduced potential supply to the world market and squeezed American and other companies out of potential equity investments in the region. Interestingly, China has also clearly learned from Western foreign policy objectives (successes and failures). Their over-arching foreign policy of non-intervention in the domestic affairs of other nations will attract many of the oil-exporting countries in developing closer economic ties.

**Figure 21 Increasing volumes of oil and LNG have to pass the narrow Strait of Hormuz**



In a period when international oil companies have difficulty maintaining their reserves-to-production ratios and are subsequently forced to move to marginal fields, access to medium-cost oil is becoming increasingly important, including for companies in Asia. The American Middle East policy has so far limited these possibilities. Consequently, in pre-2003 Iraq, French, Russian and Chinese companies, not ensnared by the sanctions act, were bidding for equity stakes that would be available after sanctions would be lifted. The Iranian offshore, which was developed by American oil companies, was sold in the 1990s as a result of the sanctions act, and recently two European companies, Shell and Repsol, were unable to participate in the next phase of the South Pars (gas) development due to the sanctions act. The American policy towards Iran is currently challenged in two ways: by companies less vulnerable to the sanctions act which, in a situation of short supplies, could be forced to direct supplies only the home market; and by Iran who is (to a certain extent) able to develop its resources with the help of Asian companies and to shift its business to Dubai as a major hub in doing business with the rest of the world.

In Iraq the security situation is still precarious, and a situation where Iraqi oil potential developed for the world market is far off. Since the Iraqi oil development is frozen, much will depend on the American exit strategy and how the resources will eventually be brought to the market. For the OECD countries that rely on the American policy for the availability of oil flows on the international market, it is important that Iraqi crude oil is not hampered by bilateral deals. Although satisfying demand bilaterally also reduces the pressure

on the market, it does reduce oil market liquidity and can potentially lead to there being less medium-cost oil in the supply mix in multilateral trade.

Consequently, our defense organizations and the military disciplines will respond with new policies, systems and programs when traditional energy security policies become less effective. In this respect it is in our vital interest to diversify our energy supplies, even if this comes at a higher price. NATO is expected to play an important role in this, at least in the western hemisphere. As a broader security provider, NATO fills a particular role in protecting energy-related infrastructures, including maritime surveillance, and in helping to restore large-scale supply disruptions when needed, but whether this role will be universally accepted will depend on the willingness to share the flow of oil with potential geopolitical adversaries and *vice versa*.

### 13. MANAGING THE GAP

The major importers of oil (and gas) are going to look for alternatives to diversify energy supplies and thus become less dependent on the major resource-holding countries that have the oil, gas, money and power. Alternatives will be sought in different areas. Some of these new fuels will help in stabilizing the concentration of greenhouse gasses in the atmosphere; others will create more benefits from a security of supply point of view. To start with, more expensive oil (and gas) will lead to even higher coal consumption in all major energy consuming countries, especially in the coal reserve-rich countries such as China, India and the US. Already the coal market is experiencing similar constraints, as the oil market and prices have doubled in a year. Higher coal consumption will, however, contribute to higher carbon dioxide emissions and global climate change if not captured through CCS, as is already foreseen for the period to 2030 as a result of accelerating global energy demand. So far, coal is only used for power generation, applied in stationary use but not in transportation. However, with the ongoing development of electric cars, in the longer term electricity may become a vital energy source for mobility.

Biofuels is another area that will help to reduce the dependency on oil. The big political drive on biofuels by the United States and the EU will make this industry a major player in the field of alternative fuel supplies in the years to come, irrespective of the side effect of its contribution to rising food prices and water security. Especially the US has embraced biofuels as a way to become less addicted to oil, predominantly for security of supply reasons and to decrease the share of the costs of oil imports in the trade deficit, where oil now takes the largest share. In addition, any replacement of oil by biofuels has the advantage of lowering the overall crude oil demand, removing some price pressure. Yet biofuels come with their own uncertainties of bad harvests due to weather-

related mishaps. Overall, the largest benefits in the transport section, both in the area of energy security and with respect to climate change, will come from improved fuel efficiency, 2<sup>nd</sup> generation cellulosic ethanol that does not compete as much with food, and plug-in hybrids.

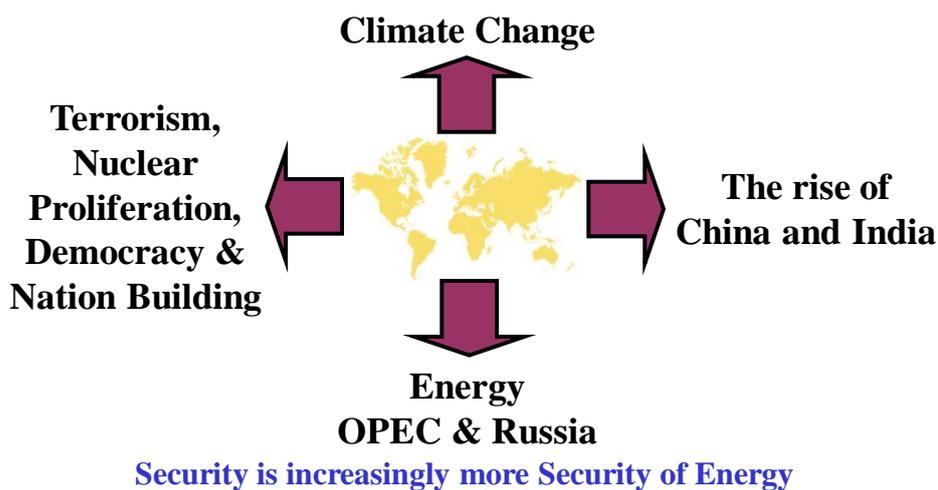
What is crucial in this respect is how the pace of development of new oil resources, the pace of development of alternatives and demand for energy relate to each other. The larger the mismatch between supply and demand, the larger the strains on the energy and international relations system. However, these complexities must not stop us from taking action. Conversely, the challenges are huge and growing, and the time frame to realize the dramatic energy system change is limited. In order to overcome the insecurities related to the oil supply constrained world and reduce the potential political and strategic conflicts over energy, effective global leadership is urgently needed.

An affable redistribution of oil towards emerging economies depends on the ability of particularly the US and Europe to move away from oil. But voluntarily moving more quickly along the transition path, if at all technologically and economically possible, is unlikely without politically addressing the potential accompanying impact on the dislocation of employment and production if this is done in an open trading system. The US will want some sort of concession from the emerging economies to level the playing field, either through trade or investments, or perhaps by participating in a CO<sub>2</sub> cap and trade system, to secure the pre-dominance of the market-based system and the US position in it. The low dollar strategy of the US is a warning to the oil producers and China that world trade and monetary balances can be seriously undermined if they fail to act within the constraints of their new role and responsibility in the world system. Revaluation and a managed reintroduction in the world economic system of monetary surpluses is one venue to realign the economies; trade barriers would be a second one. Just like the availability of oil in the remotest corners of the world, dollars are still a widespread storage of value in many economies around the world. As such, the role of the US remains crucial in managing the impact of the looming supply gap.

The leaders of the main economic and political powers have to come up with a plan that can guide us through this difficult period of transition and redistribution of oil scarcity (see Figure 22). If they fail to do so and instead opt for a competitive solution, the nasty side effect of oil scarcity could be a confrontation in and over oil-producing countries in Africa, Central Asia and the Middle East, leaving many countries to scramble for whatever oil supplies they can lay their hands on. Moreover, the increasing demand for oil in the producing countries could in itself function as an accelerant in geopolitical tensions when export capacities decline rather than increase. The likelihood of the multilateral oil trade system to survive such a scarcity is slim, given the national interest-

driven world of today. The recent food crisis showed how quickly export barriers can be erected in the face of domestic social unrest over food price increases or shortages. Energy shortages in producing countries could easily lead to a managed reduction of exports to satisfy domestic demand, particularly when the side effect is that oil income does not need to suffer. If the world fails to manage the supply gap and the accompanying monetary flows, cutthroat competition will be the result, with oil-consuming developing countries, having less ability to pass on price increases in their exports, as the first victims. Such a purchasing power standoff between national interest-oriented countries would therefore be a detriment to the weakest economies in the world, as well as to the weakest social groups in all consuming countries. Much will depend, therefore, on responsible leadership among the leading nations in this scramble for oil and other liquids. The G-8 does not yet organize the main actors in this important discussion. China, India and Brazil and Saudi Arabia need to be included to provide the appropriate political platform to discuss the oil issues. Yet a crucial forum such as the G-8, in cooperation with large oil producers, offers the best platform available to deal with this serious matter expediently, due to its size and organization. When the members/participants are able to overcome their own agendas and instead focus on de-bottlenecking the oil, oil product and financial markets, the inevitable gap can perhaps be managed much better.

**Figure 22: The global political agenda for the years ahead**



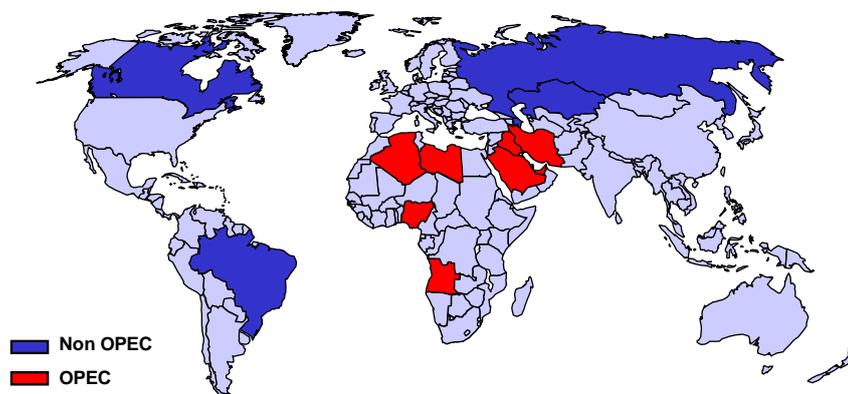
#### 14. CONCLUSION

Geopolitical tensions over energy are clearly on the rise, with accelerating global demand growth and new oil supplies being concentrated in an ever smaller

group of countries. Analysis shows that only 15 countries will account for most of the net growth in global oil production capacity in the next decade (see Figure 23). These countries include the Middle Eastern countries of Saudi Arabia, Iraq, Iran, the United Arab Emirates, Kuwait and Qatar; the former Soviet Union countries of Russia, Kazakhstan and Azerbaijan; The North and West African countries of Algeria, Libya, Nigeria and Angola; and in the western hemisphere, Canada and Brazil. With the exception of the latter two, all these countries face serious domestic and regional political, economic and security uncertainties. In addition, and more worrisome for world markets, many of these countries increasingly formulate policies that are generally more in line with their own national pace of development than with the interest of the global oil market to balance supply and demand. Saudi Arabia is a good example of this new oil policy, as its long-standing steadfast concern with the world economy is being rebalanced to also include its national economic interests.

Energy consumption is rising rapidly in the Gulf producing countries, and those governments are challenged to create many new jobs for the young population while struggling to keep inflation under control. Moreover, with the unwavering demand for their hydrocarbons and rising prices, their political and economical clout has increased exponentially in a very short period of time. In that sense, OPEC's role is far from over. To the contrary, with new members like Angola and Ecuador having (re)joined the club in 2007, and Brazil and Sudan contemplating joining, they increasingly represent "world oil supply" and again dominate the oil agenda in global politics.

**Figure 23: Growing concentration of productive capacity**



Source of chart: Cambridge Energy Research Associates

Unlike the 1970s and 1980s, there are fewer alternative oil provinces waiting to be explored and balance the market power of OPEC, and the ones that are available have a much higher cost profile. Moreover, there are doubts about the sustainable level of world oil supply, limiting production below the expected demand for oil in 2030. Consequently, the OECD countries are looking harder at energy efficiency and alternative fuels, also in the context of global warming and climate change. And it is exactly the unknown impact (and the timing of the impact) of these OECD measures on oil demand that allows OPEC to stress security of demand. Yet oil demand forecasts have never been better than today, albeit that most of the growth will come from developing countries of which it is unclear how long they will be able to sustain their subsidized oil demand. The same demand outlook, however, creates anxiety among oil-importing countries about the reliability and adequacy of supplies, translated in security of supply. It appears that the incentives are running in wrong direction to equilibrate demand and supply in the coming years. In addition, the current monetary balance make it further unlikely that the world economic system can find a virtuous path to recovery.

The lack of trust and growing uncertainties between producing and consuming countries and among consuming countries themselves could lead to harmful management of energy relations.

Instead of falling victim to distrust and geopolitical clashes, they have to work hard to build bridges. One of those bridges is the availability of spare capacity and oil product stocks to balance the world oil market in case of supply calamities. Many consuming countries have strategic oil reserves to help overcome short-term supply discontinuities, while OPEC used to have spare production capacity to do the same. Over the past few years, when security of supply and demand became an issue in the energy relations, there has seemed to be an unresolved dispute about the distribution of the costs and benefits of these emergency capacities, but also about the circumstances under which they are employed. Energy security – security of supply and security of demand – should be a common goal for both consumer countries and exporters alike. Greater transparency (about reserves and underlying production declines, as well as about the investment outlay and the recycling of petro-dollars through their Sovereign Wealth Funds) is a must, just as much as producer countries need insights in the impact of alternative fuels, despite the uncertainties surrounding the breakthrough technologies that are factored into the plans of consuming countries. OPEC should be stimulated to develop its medium-cost oil, in return for more demand certainty. Consumer countries and oil companies can help the market by addressing the refinery bottlenecks. Emerging economies can help by reducing their subsidized oil demand. Failing this, markets will do their work, evidenced by the acceleration of oil price increases in 2008, and political

competition for oil will intensify in the coming decade. Therefore, a much more cooperative world is needed to manage this period adequately. There is a major role for governments and their leaders to avoid a confrontation in oil and capital markets.

Irrespective what will happen with the oil price in the short run, the outlook for the next decade is bleak, and effective global leadership and a determination to cooperate are urgently needed. Many countries are taking the right initiatives to combat oil dependency and climate change. However, these are long-term actions of which the impact will only become visible over time. In the interim period, the coming decade, things could get worse before turning better, especially if interests (especially between the major resource holders and consumer countries) further diverge. In the absence of a more harmonious world, the world economy could suffer terribly, which is ultimately bad for consumers and producers alike. In this light, there is no alternative than to change positions and to become more cooperative in adequately tackling the energy and climate change challenges, so that world can become a better place by 2020 and beyond.

## 15. FINAL REMARKS

King Abdullah of Saudi Arabia invited representatives of the major oil-consuming and -producing countries to discuss the oil markets and record-high oil prices on 22 June 2008 in Jeddah, Saudi Arabia. This meeting could be the start of cooperative management of oil relations between the various stakeholders. We sincerely hope that the suggestions and recommendations made in this paper will contribute to a better understanding of the issues the world is currently facing. In our view, such discussions should not only focus on the narrow aspects of oil prices today, but also on the wider aspects of world oil supply and demand in the next decade and on monetary policies and international relations as well. All initiatives that will help to mitigate the risk of Oil Turbulence in the Next Decade to materialize must be applauded.

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The views expressed in this paper are those of the authors.





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