

# Energy MegaTrends – Ten Years in Ten Minutes

## Global Energy and Environment Initiative

### SAIS International Policy Program 27-Oct-2008

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# Energy Crisis

## Defining the problem and outlining the solutions

- **The energy crisis... “is the inevitable consequence of the explosive growth of world-wide demand outrunning the incentives for supply”**
- **The long-term solution is... “a massive effort to provide producers an incentive to increase their supply, to encourage consumers to use existing supplies more rationally, and to develop alternate energy sources”**

Source: International Energy Agency

# Energy Crisis Déjà Vu

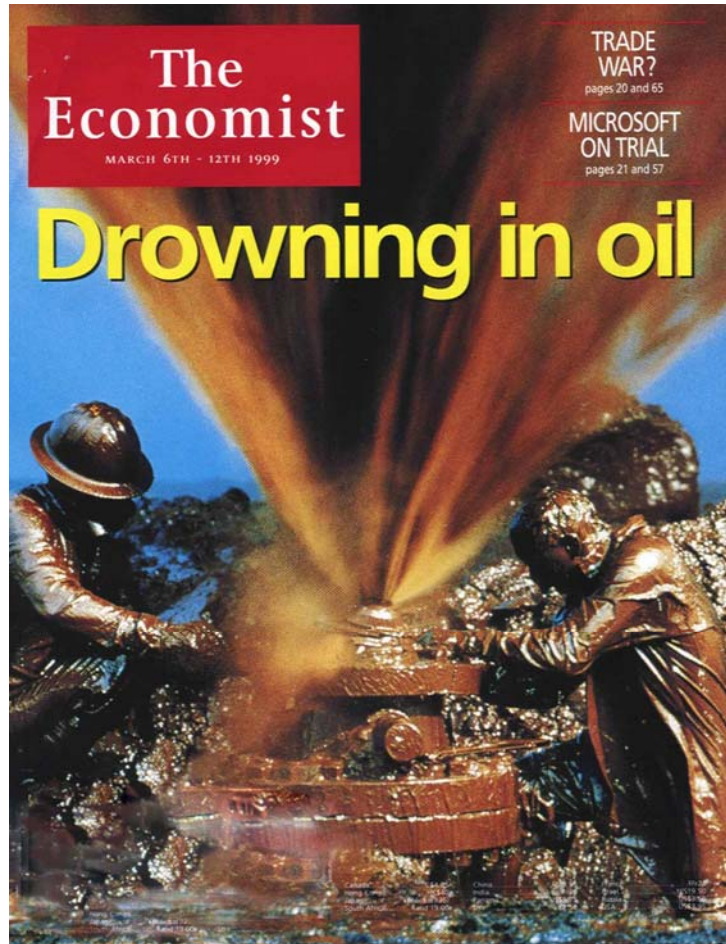
## Defining the problem and outlining the solutions

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**Henry Kissinger**  
**Speech to the Pilgrims Society**  
**London 12 December 1973**

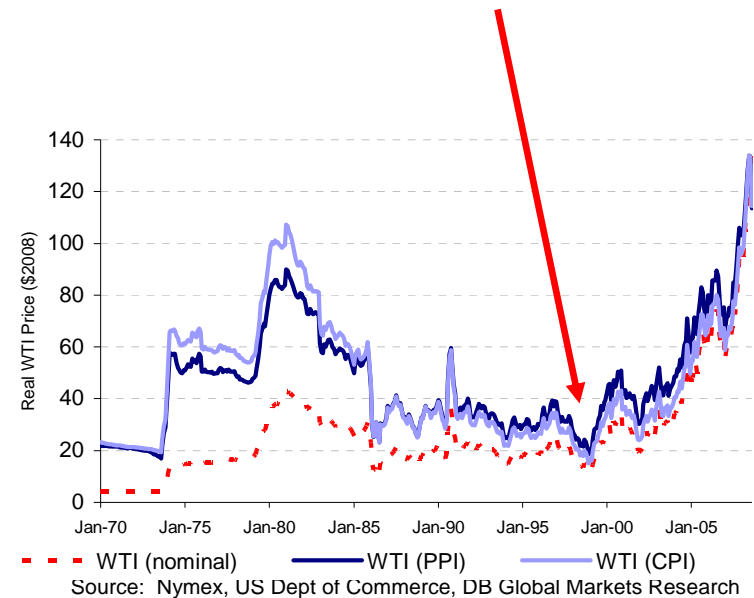
Source: International Energy Agency

When it seemed like oil would be cheap forever



Source: *The Economist*

### Oil Prices Bottom in Early 1999



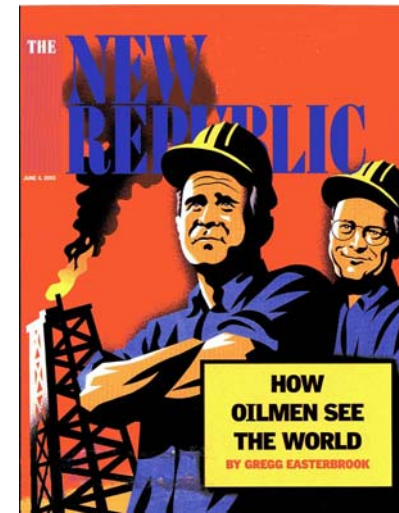
# What to Do about Global Warming November 2000

Europe was way ahead of the US curve on this topic



Source: *The Economist*

Dealing with Climate Change Got Delayed



- There were still a lot of climate skeptics in 2000.
- The Bush administration thought US voters would never accept the pain.
- Al Gore had not yet won the Nobel Prize.

Source: DB Global Markets Research

Too much of a good thing? *The Economist* is four years ahead of the White House

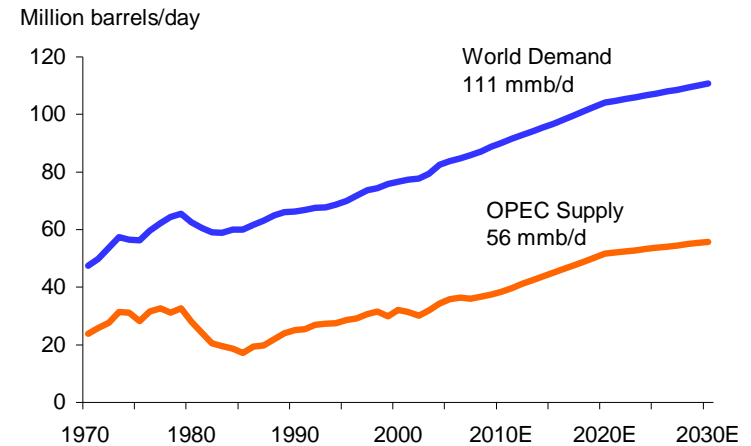
“America is addicted to oil, which is often imported from unstable parts of the world.”

George Bush  
State of the Union  
January 31, 2006



Source: *The Economist*

## Oil Demand



- Increasing reliance on OPEC post 2010
- Rising doubts about ability of supply to reach the levels implied by demand

Source: IEA, DB Global Markets Research

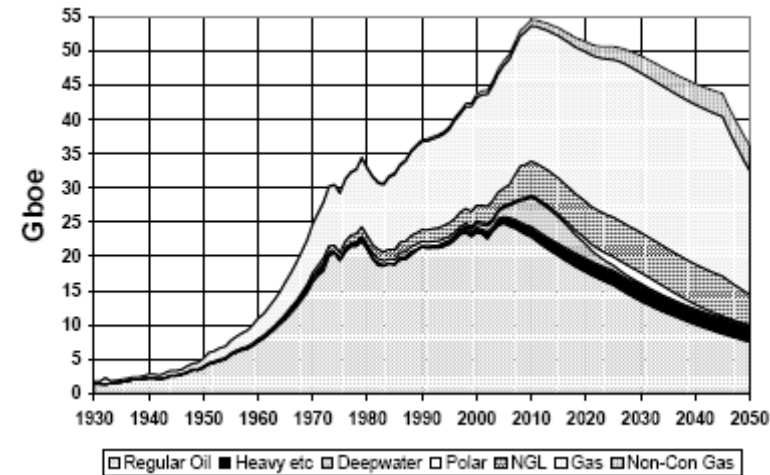
## Not enough of a good thing?

Some analysts think that global oil production will peak within the next few years.



Source: *The Economist*

### Peak Oil and Peak Gas



Source: Association for the Study of Peak Oil

Most of the growth in oil production is NOT coming from vacation spots

Many experienced international oil companies say that instability is more of a problem than “danger”



Source: *The Economist*

### Oil Supply (mmb/d)

	1990	2000	2010E
Saudi Arabia	6.97	9.07	10.64
Russia	10.36	6.50	10.33
United States	9.00	8.08	7.55
Iran	3.15	3.76	4.37
Canada	1.97	2.72	3.75
China	2.77	3.23	3.73
Venezuela	2.31	3.22	3.70
Mexico	2.98	3.45	3.24
Nigeria	1.85	2.16	3.04
Kuwait	1.27	2.16	2.90
Brazil	0.85	1.45	2.85
UAE	2.42	2.62	2.78
Iraq	2.02	2.58	2.72
Norway	1.72	3.35	2.33
Kazakhstan	0.53	0.72	2.20
Algeria	1.24	1.44	2.01
Libya	1.38	1.47	1.76
Angola	0.48	0.75	1.70
Azerbaijan	0.25	0.29	1.40
Qatar	0.45	0.86	1.39
United Kingdom	1.94	2.71	1.34

Source: IEA, DB Global Markets Research

## What oil price level will it take to shock US consumers? Developing countries?

Consumers in low-tax countries feel the impact of crude oil price increase more than those in high-tax countries.

Many nations still control (subsidize) consumer prices.



Source: *The Economist*

### Oil Price Required to Qualify as Extreme

Indicator	Oil price level
In real terms (PPI)	USD94
Analyst forecasting error	USD116
In real terms (CPI)	USD118
Versus the US dollar	USD120
Futures market forecasting error	USD130
Relative to per capita income	USD134
As a percent of US disposable income	USD145
As a share of the S&P500	USD145
As a percent of global GDP	USD150
<b>Average</b>	<b>USD128</b>

- Nominal prices of WTI went up by a factor of 10 between 1970-73 and 1980-83, roughly \$3.50 going to \$35/bbl).
- If we take 2000-03 as a starting point (nominal price of about \$25/bbl) it appeared to some that we might need to get to \$250/bbl in 2010-13 to have a similar “shock” impact on consumer behavior.

Source: DB Global Markets Research

## Nuclear Weapons Controversy

Iran is the 4<sup>th</sup> largest oil producer in the world...  
..and the 5<sup>th</sup> largest exporter.



Source: *The Economist*

### Top World Oil Net Exporters, 2006 (thousand barrels per day)

Rank	Country	Exports
1	<a href="#">Saudi Arabia</a>	8,525
2	<a href="#">Russia</a>	6,816
3	<a href="#">United Arab Emirates</a>	2,564
4	<a href="#">Norway</a>	2,551
5	<a href="#">Iran</a>	2,462
6	<a href="#">Kuwait</a>	2,342
7	<a href="#">Venezuela</a>	2,183
8	<a href="#">Nigeria</a>	2,131
9	<a href="#">Algeria</a>	1,842
10	<a href="#">Mexico</a>	1,710
11	<a href="#">Libya</a>	1,530
12	<a href="#">Iraq</a>	1,438
13	<a href="#">Angola</a>	1,379
14	<a href="#">Kazakhstan</a>	1,145
15	<a href="#">Qatar</a>	1,032

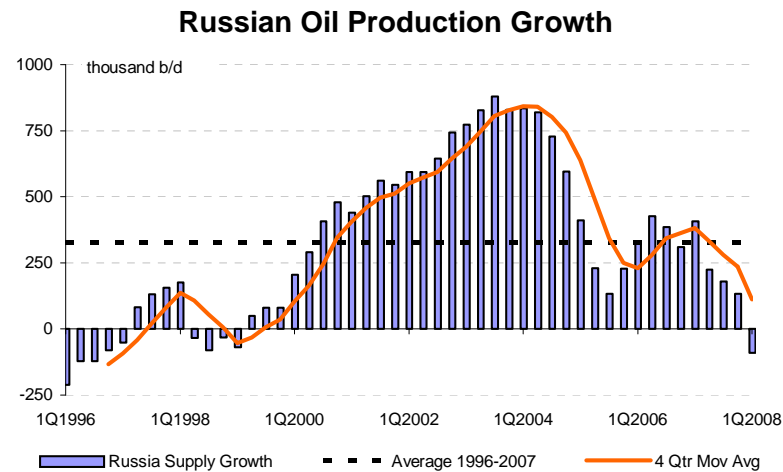
Source: US DOE/EIA

## Russian production declines for the first time in a decade

Putin's policies in his first term worked and in his second term have been a disaster for oil output.



Source: *The Economist*



Source: IEA, DB Global Markets Research

- The Russian government's policy of hostility to its own oil entrepreneurs, growing disdain for foreign capital, and desire to maximize taxes regardless of the impact on capital investment has brought an end to the growth in production that President's Putin's first term.
- Although "peak oil" proponents are citing the development as proof that global production is faltering because of geological constraints, we see the situation as offering strong evidence that oil production problems are being driven more by "above the ground" problems.

## Controlling carbon and saving the polar bears

Could the American people be on the verge of really changing long-held habits?



Source: *The Economist*

July 2002



June 2007



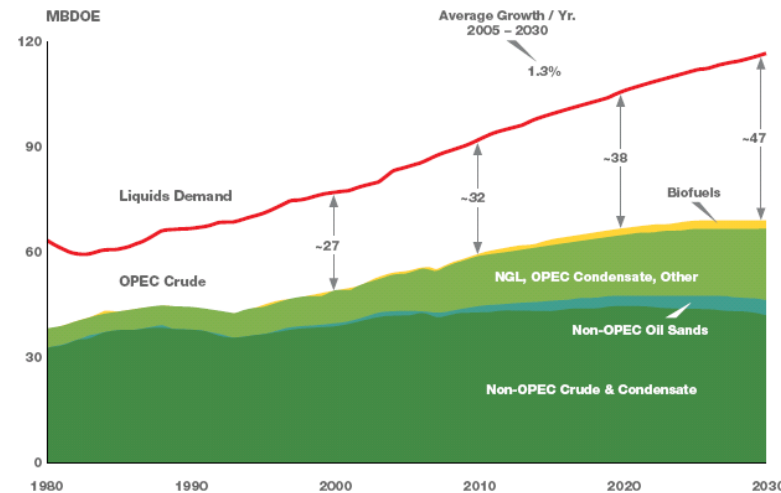
## What are biofuel mandates doing to the world's food costs?

What happens when we get a good drought and the corn crop fails?



Source: *The Economist*

## Global Demand for Liquid Fuels



- Converting food (corn and soybeans) into gasoline and diesel turns out to be not such a good idea.
- Second-generation biofuels (cellulosic) that do not depend on edible plants make much more sense.
- The scale of liquid fuels demand, however, remains a difficult obstacle for biofuels (see figure above from ExxonMobil Energy Outlook 2008).

Source: DB Global Markets Research

## What is the falling dollar doing to commodities and oil?

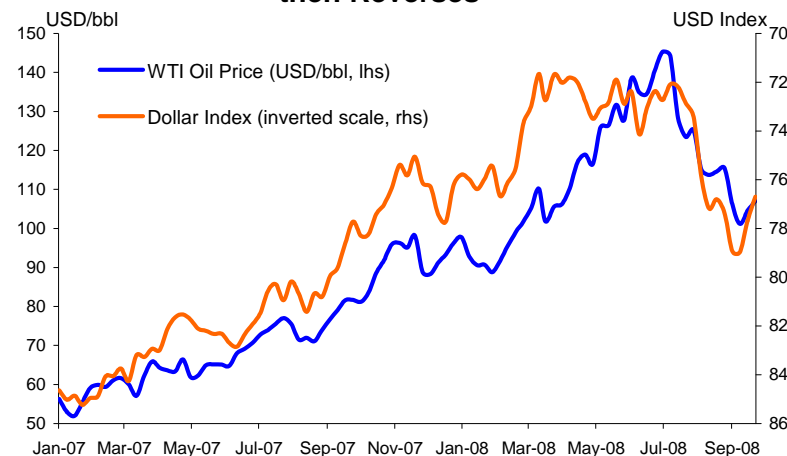
The dollar-oil regression is not perfect, but traders like it...

...and a recent study by the IMF says that gold and oil are sensitive to movements in the dollar.



Source: *The Economist*

## Oil Climbs as the Dollar Flames Out... then Reverses



- According to the IMF, in the long run, a 1% depreciation in the US dollar is associated with increases for gold and oil prices of more than 1%.
- In the short run, the elasticity is close to 1, but higher for gold than for crude oil, says the IMF.
- We believe the relationship between oil prices and the US dollar is highly unstable. However, if EURUSD moves towards 1.40 before the end of the year, then it would imply the oil price declining towards USD85/bbl.

Source: Nymex, Bloomberg, DB Global Markets Research

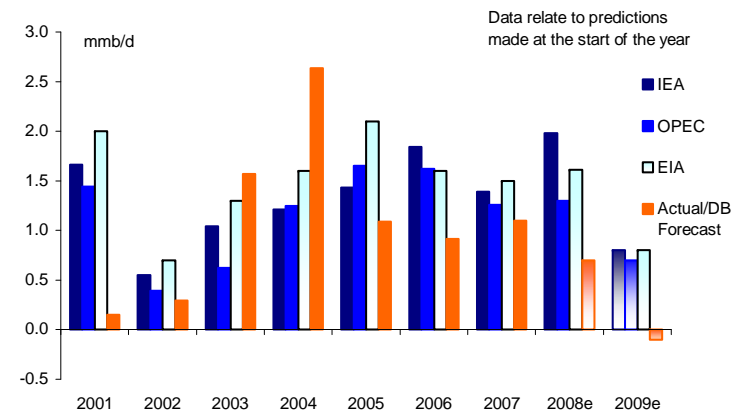
## Can a recession bring down oil demand / prices?

The US accounts for about 22% of global GDP.



Source: *The Economist*

## If Asia Slows- Oil Demand Is In Trouble



- According to the IMF, the world economy is entering a major downturn and the most dangerous financial shock in mature financial markets since the 1930s.
- Nearly half of the world's GDP is now generated outside the "advanced economies" measured on a purchasing power parity. Will US troubles spill over?
- In contrast to the IMF's 3% GDP growth forecasts for 2009, Deutsche Bank expects only circa 1%.

Source: IMF, DB Global Markets Research

## What oil price level will it take for a downside shock?



Source: *The Economist*

### How Low Could It Go?

Indicator	Oil price level
Budget balance	USD55-95
Marginal cost of production	USD80
Based on futures forecasting error	USD80
As a share of S&P500	USD60-90
As a percent of US disposable income	USD60-85
As a percent of global GDP	USD40-75
Relative to G7 per capita income	USD45
Versus US dollar	USD30-60
In real terms (PPI)	USD35
<b>Average</b>	<b>USD61</b>

Source: DB Global Markets Research

# This Really Looks Difficult

## What it Takes to Offset a Gigaton of CO<sub>2</sub>

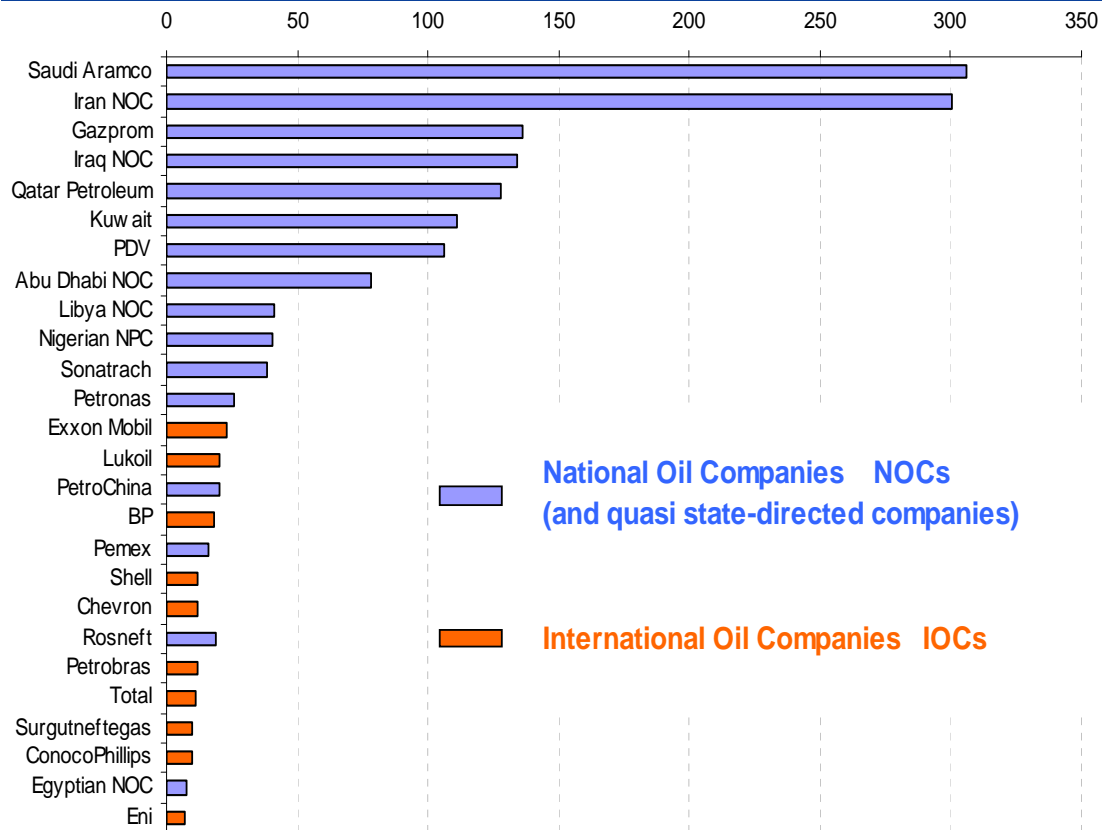
TODAY'S TECHNOLOGY	Actions providing 1 Gt mitigation/year
Coal-fired power plants	Build 1,000 "zero-emission" 500 MW coal-fired power plants (without carbon capture and storage)
Geologic sequestration	Install 3,700 sequestration sites like Norway's Sleipner project (0.27 MtC/year)
Nuclear	Build 500 new nuclear plants, each 1 GW in size
Efficiency	Deploy 1 billion new cars at 40 miles per gallon (mpg) instead of 20 mpg
Wind energy	Install capacity to supply 50 times the current global wind generation
Solar photovoltaics	Install capacity to supply 1000 times the current global solar PV generation
Biofuels for transport	Convert a barren area 15 times the size of Iowa's farmland (30 million acres) to biomass production
CO <sub>2</sub> storage in forests	Convert a barren area 30 times the size of Iowa's farmland to new forest

Source: DOE Climate Change Technology Program

# Who Has the Oil and Gas Reserves?

The bulk of remaining oil and gas reserves are in state-controlled or state-directed hands.

## NOC and IOC Reserves (billion boe)



Source: Petroleum Intelligence, DB Global Markets Research

## Outlook

- The National Oil Companies (NOCs) control the bulk of the remaining oil and natural gas reserves around the world. In many cases, access to these reserves by International Oil Companies (IOCs) is restricted.
- What are the lessons about access and technology that come from natural gas shale development in the US?

# The Cover They Have Not Yet Published

Politicians are looking for somebody to blame



## The blame game

Source: CFTC, DB Global Markets Research

Source: **NOT** *The Economist*  
...YET!

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Adam Sieminski

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