# THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS

"ASPO"

# NEWSLETTER No. 84 – DECEMBER 2007

**ASPO started as a European network of scientists and others, having an interest in determining the date and impact of the peak and decline of the world's production of oil and gas, due to resource constraints. Now, associates are active in Australia,** Austria, Belgium**, Canada, China,** Croatia, Denmark, Egypt**,** Finland, **France, Germany,** Hong Kong**, Ireland,** Isle of Man**,** Israel**, Italy,** Luxembourg**, Japan,** Korea, Malaysia, **Mexico, Netherlands, New Zealand,** Norway **Portugal,** Russia**,** Singapore, Slovenia, **South Africa, Spain,** Sweden**, Switzerland, United Kingdom, USA,** and Venezuela**.**

(The formally constituted entities are shown in bold face)

***Missions:***

***1. To evaluate the world's endowment and definition of oil and gas;***

***2. To study depletion, taking due account of economics, demand, technology and politics;***

***3. To raise awareness of the serious consequences of oil and gas decline for Mankind.***

Foreign language editions are available as follows:

Spanish: www.crisisenergetica.org

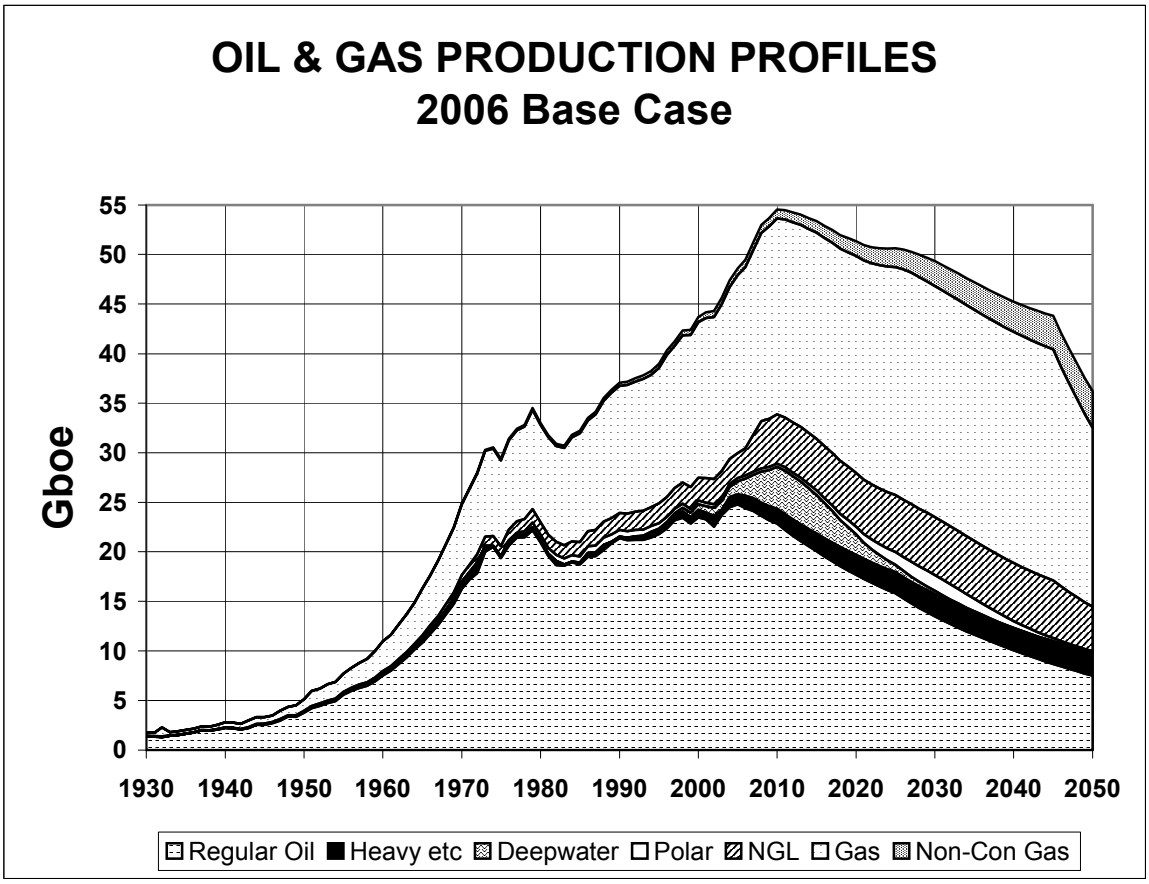
French: www.oleocene.org (press "Newsletter")

**CONTENTS**

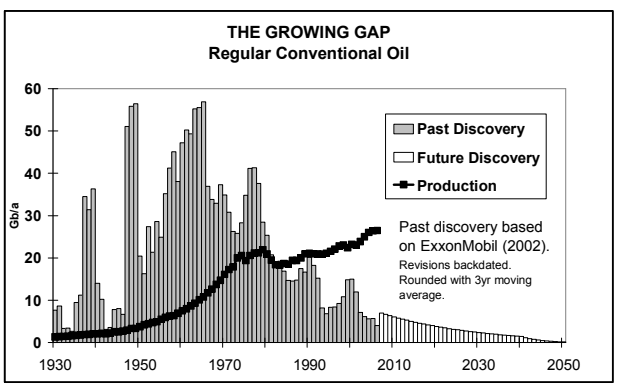


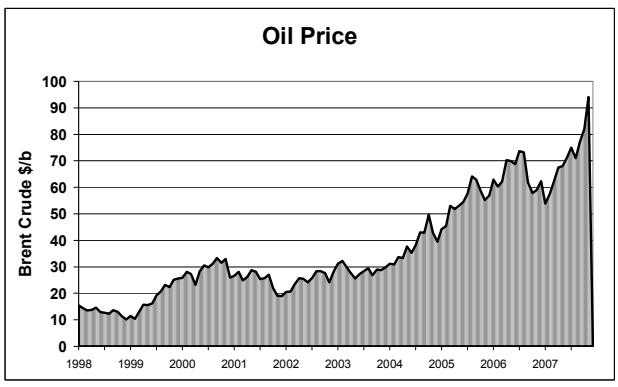
**Index of Country & Regional Assessments with Newsletter Reference** (*revised)

## *The General Depletion Picture*




| ESTIMATED PRODUCTION TO 2100 | | | | | | | | | | End 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| Amount | | | Gb | Annual Rate - Regular Oil | | | | | | Gb | Peak |
| Regular Oil | | | | Mb/d | 2006 | 2010 | 2015 | 2020 | 2030 | Total | Date |
| Past | Future | | Total | US-48 | 3.6 | 3.0 | 2.3 | 1.8 | 1.1 | 200 | 1970 |
| Known Fields | | New | | Europe | 4.5 | 3.6 | 2.5 | 1.7 | 0.8 | 76 | 2000 |
| 1001 | 773 | 126 | 1900 | Russia | 9.5 | 9.5 | 7.6 | 6.1 | 3.9 | 230 | 1987 |
| | 899 | | | ME Gulf | 20 | 20 | 20 | 20 | 18 | 693 | 2015 |
| All Liquids | | | | Other | 29 | 27 | 22 | 19 | 13 | 701 | 2004 |
| 1102 | 1398 | | 2500 | **World** | **67** | **63** | **55** | **48** | **37** | **1900** | 2005 |
| 2006 Base Scenario | | | | Annual Rate - Other | | | | | | | |
| M.East producing at capacity | | | | Heavy etc. | 2.8 | 4 | 5 | 5 | 6 | 212 | 2030 |
| (anomalous reporting corrected) | | | | Deepwater | 3.6 | 12 | 11 | 6 | 1 | 66 | 2011 |
| *Regular Oil* excludes Heavy Oils | | | | Polar | 0.9 | 1 | 1 | 2 | 4 | 52 | 2030 |
| (inc. tarsands, oilshales); Polar & | | | | Gas Liquid | 7.6 | 8 | 9 | 9 | 10 | 261 | 2035 |
| Deepwater Oil; & gasplant NGL | | | | *Rounding* | | | | -1 | 2 | 8 | |
| Revised 30/09/2007 | | | | **ALL** | **82** | **87** | **80** | **70** | **60** | **2500** | 2010 |



## *888. The Secrets of Intangible Wealth*

The following article from the Wall Street Journal touches on one aspect of the matter, but does not exactly cover the important issue of happiness, which can be achieved in very different ways by different people, and at the end of the day is probably what matters most. Unhappy people can cause much unhappiness to others. It speaks of *kleptocrats* but does not address directly the issue of foreign debt, which may in fact rob a country more subtly but more effectively than any War Lord.

By **RONALD BAILEY**
September 29, 2007

A Mexican migrant to the U.S. is five times more productive than one who stays home. Why is that?

The answer is not the obvious one: This country has more machinery or tools or natural resources. Instead, according to some remarkable but largely ignored research — by the World Bank, of all places — it is because the average American has access to over $418,000 in intangible wealth, while the stay-at-home Mexican's intangible wealth is just $34,000.

But what is intangible wealth, and how on earth is it measured? And what does it mean for the world's people — poor and rich? That's where the story gets even more interesting.

Two years ago the World Bank's environmental economics department set out to assess the relative contributions of various kinds of capital to economic development. Its study, *Where is the Wealth of Nations?*: *Measuring Capital for the 21st Century*, began by defining natural capital as the sum of nonrenewable resources (including oil, natural gas, coal and mineral resources), cropland, pasture land, forested areas and protected areas. Produced, or built, capital is what many of us think of when we think of capital: the sum of machinery, equipment, and structures (including infrastructure) and urban land.

But once the value of all these are added up, the economists found something big was still missing: the vast majority of world's wealth! If one simply adds up the current value of a country's natural resources and produced, or built, capital, there's no way that can account for that country's level of income.

The rest is the result of *intangible* factors — such as the trust among people in a society, an efficient judicial system, clear property rights and effective government. All this *intangible capital* also boosts the productivity of labor and results in higher total wealth. In fact, the World Bank finds, *Human capital and the value of institutions (as measured by rule of law) constitute the largest share of wealth in virtually all countries.*

Once one takes into account all of the world's natural resources and produced capital, 80% of the wealth of rich countries and 60% of the wealth of poor countries is of this intangible type. The bottom line: *Rich countries are largely rich because of the skills of their populations and the quality of the institutions supporting economic activity.*

What the World Bank economists have brilliantly done is quantify the intangible value of education and social institutions. According to their regression analyses, for example, the rule of law explains 57% of countries' intangible capital. Education accounts for 36%.

The rule-of-law index was devised using several hundred individual variables measuring perceptions of governance, drawn from 25 separate data sources constructed by 18 different organizations. The latter include civil society groups (Freedom House), political and business risk-rating agencies (Economist Intelligence Unit) and think tanks (International Budget Project Open Budget Index).

Switzerland scores 99.5 out of 100 on the rule-of-law index and the U.S. hits 91.8. By contrast, Nigeria's score is a pitiful 5.8; Burundi's 4.3; and Ethiopia's 16.4. The members of the Organization for Economic Cooperation and Development — 30 wealthy developed countries — have an average score of 90, while sub-Saharan Africa's is a dismal 28.

The natural wealth in rich countries like the U.S. is a tiny proportion of their overall wealth — typically 1% to 3% — yet they derive more value from what they have. Cropland, pastures and forests are more valuable in rich countries because they can be combined with other capital like machinery and strong property rights to produce more value. Machinery, buildings, roads and so forth account for 17% of the rich countries' total wealth.

Overall, the average per capita wealth in the rich Organization for Economic Cooperation Development (OECD) countries is $440,000, consisting of $10,000 in natural capital, $76,000 in produced capital, and a whopping $354,000 in intangible capital. (Switzerland has the highest per capita wealth, at $648,000. The U.S. is fourth at $513,000.)

By comparison, the World Bank study finds that total wealth for the low income countries averages $7,216 per person. That consists of $2,075 in natural capital, $1,150 in produced capital and $3,991 in intangible capital. The countries with the lowest per capita wealth are Ethiopia ($1,965), Nigeria ($2,748), and Burundi ($2,859).

In fact, some countries are so badly run, that they actually have negative intangible capital. Through rampant corruption and failing school systems, Nigeria and the Democratic Republic of the Congo are destroying their intangible capital and ensuring that their people will be poorer in the future.

In the U.S., according to the World Bank study, natural capital is $15,000 per person, produced capital is $80,000 and intangible capital is $418,000. And thus, considering common measure used to compare countries, its annual purchasing power parity GDP per capita is $43,800. By contrast, oil-rich Mexico's total natural capital per person is $8,500 ($6,000 due to oil), produced capital is $19,000 and intangible capita is $34,500 — a total of $62,000 per person. Yet its GDP per capita is $10,700. When a Mexican, or for that matter, a South Asian or African, walks across our border, they gain immediate access to intangible capital worth $418,000 per person. Who wouldn't walk across the border in such circumstances?

The World Bank study bolsters the deep insights of the late development economist Peter Bauer. In his brilliant 1972 book *Dissent on Development*, Bauer wrote: *If all conditions for development other than capital are present, capital will soon be generated locally or will be available . . . from abroad. . . . If, however, the conditions for development are not present, then aid . . . will be necessarily unproductive and therefore ineffective. Thus, if the mainsprings of development are present, material progress will occur even without foreign aid. If they are absent, it will not occur even with aid*.

The World Bank's path-breaking *Where is the Wealth of Nations?* convincingly demonstrates that the *mainsprings of development* are the rule of law and a good school system. The big question that its researchers don't answer is: *How can the people of the developing world rid themselves of the kleptocrats who loot their countries and keep them poor? (Reference furnished by Virginia Abernathy)*

### *889. Energy Equivalence*

All animals throughout time have lived on no more than the energy supplied by the muscles, and *Early Man* was no different as he lived by hunting and gathering wild fruit. Then, only 10 000 years ago, came *Agricultural Man*, who started to rely on external energy from draught animals and slaves, supplemented by firewood, plus a little wind and water power. He numbered about 300 million at the time of Christ, 2000 years ago, and his numbers no more doubled over the next seventeen centuries as he lived on whatever his region could support.

Then came coal, followed by oil and gas, coinciding with the end of slavery, and his numbers increased six-fold, the increase being made possible by these new sources of energy. It can be said with assurance that *Hydrocarbon Man* will be virtually extinct this Century, posing the question of how many notional slaves will be needed to replace the energy now supplied by oil.

Professor Blendinger of ASPO-Deutschland makes the following calculation:

**The slave, the whip, and economic value**

We consume (somewhat simplified) 80 million barrels of crude oil per day, from each of which (159 litres) about 125 litres of product (fuel, diesel, aviation fuel etc.) are distilled (= 10.000.000.000 litres per day).

A Human Being (the slave) works 8 hours per day (may be longer if whipped, but not for much longer as he too needs food and sleep) with a performance of 0.08 KW x 8 hours = 0.64 KWh per day.

One litre of fuel contains ca. 10 KWh (from a reliable Swiss website). This corresponds to the performance of 15,26 slaves working for 8 hours a day to provide the energy provided by one litre of fuel.

The daily worldwide fuel consumption thus corresponds to a *labour equivalent* of 15,25 x 10 billion = 152,5 billion slaves.

If all slaves could work for 24 hours a day, this value reduces to about 50 billion slaves (but, remember the limits of the whip...see above).

Now what has been worrying me for some time is the value of one Litre of fuel expressed in terms of human labour:

With a *minimum wage* (so much discussed in Germany these days) of 5 EURO the *human labour value* of one litre of fuel transforms to 15,26 x 5 EURO x 8 hours = 610 EURO.

Remember, the actual price for 1 litre of (heavily taxed) fuel is about 1,40 EURO in Germany.

So an adequate salary for an ordinary Energy Slave should be around 0,00229 EURO per hour or 0,2 EURO-Cents (1,6 cents per day, because, with higher energy costs, the economy would burst).

Is this a purely theoretical calculation? Certainly not: because we will have to replace diminishing fossil fuel consumption by human labour.

Why? Because a shrinking economy is unthinkable! So the next task for our democratically elected representatives will be to either gradually increase world population (following the depletion profile) to at least the above figure, or to increase the energy output of human beings (for instance, by generously granting research programs to the so called *Elite-Universities*). As an aside, these decision makers will also have to invent a magic wand for how to survive with the above salary, but this will be only a minor complication (I am sure...). Vivat Neo-liberalism!

## *890. Peak Minerals*

The following article by Professor Ugo Bardi of ASPO-Italia addresses the important question of the production profile of other minerals. Since, like oil and gas, they are fossil resources, formed in the geological past, they are clearly also subject to depletion. The extraction of these minerals also consumes energy.

**PEAK MINERALS**

By Ugo Bardi Aspo-Italy, www.aspoitalia.net , Oct 25 2007

The same theory that is commonly used for crude oil, the *bell-shaped* Hubbert curve, has been applied to minerals extraction by Ugo Bardi and Marco Pagani. In a recent article published on *The Oil Drum* (http://europe.theoildrum.com/node/3086), they find that there are at least eleven cases where the worldwide production of important minerals has peaked and is now declining. These cases include mercury, lead, cadmium, zirconium, selenium, and others. Other minerals appear to be close to peaking, while in some cases, for instance, copper, production still shows a robust growing trend.

The declining trend of the production of these minerals is clearly related to geological factors and not simply to market factors. Using a logistic function for fitting the data, the total extractable amount turns out to be close to the estimation of the reserves for that mineral reported by the USGS. In other words, metals and other minerals behave like crude oil in their global trends: the production curve is bell-shaped and the area under the curve is close to the value of the *Ultimate Recoverable Resource* (URR), estimated from geological studies.

This result can be seen as a strong confirmation that the Hubbert model is very general and applicable worldwide. The fact that several minerals have already peaked halfway through their URR estimation demolishes the commonly heard criticism that the Hubbert model has no experimental validation since no mineral resource has peaked worldwide, so far. More studies are needed in this field, but already now it is possible to consider this behaviour as consistent with the existence of a *mineralogical barrier* proposed by Brian Skinner in 1979 which says that most extractable mineral resources exist in limited amounts as highly enriched ores.

(http://www.pnas.org/cgi/reprint/76/9/4212.pdf)

The authors also propose an interpretation of their results based on the energy needed for extraction:

*The energy involved in the extraction of a mineral commodity, say, copper, does not just depend on the energy needed to extract it from the ore and refine it. It depends also on the energy needed for extracting oil (or coal, or gas, or uranium) and turning it into power and machinery useful for extracting copper. Since fossil fuels are being depleted, more energy is needed for their production and the result is a further increase in the energy needed for the extraction of all minerals. The whole world extractive system is connected in this way. This connection may explain why the peaking of most mineral commodities appears to be clustered in a period that goes from the last decades of the 20th Century to the first decades of the 21st Century, the period when difficulties in the production of fossil fuels started to be felt worldwide. This connection may also explain why several minerals are peaking for values of the cumulative extraction that are lower than what would be derived from the USGS estimation of the available reserves. Unless new and inexpensive sources of energy become available, we may never able to exploit the abundant "reserve base" of most minerals, and not even the reserves as they are estimated today.*

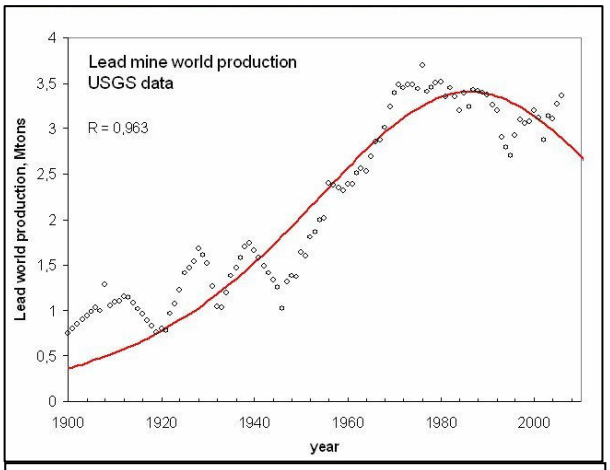



Figure: an example of a mineral that has peaked in the late 1970s, namely lead. The production data are from the USGS and have been fitted with a logistic function

## *891. Peak Soil Too*

Evidently, the soil resources of the world are subject to depletion too. It looks as if food supply will decline in parallel with oil-based energy, for, as the article explains: s*oil, water, energy, climate, biodiversity, and food production are all interconnected.* It is reported that food prices have risen greatly over the past year: 18% in China; 13% in Indonesia and Pakistan; 10% in Latin America, with global wheat prices double and rice up 20%. But there is another way of looking at it. Since the basic need of Man is to eat, the rise in food cost may rather signify inflation, which indeed is likely to be the easiest mechanism by which to handle

the transition from *Expansion* to *Contraction* as it removes the false liquidity of debt which has been delivered by the financial system on the flawed flat-earth economic assumption of perpetual growth. It looks as if the extinction of *Hydrocarbon Man* this Century will be accompanied by an overall decline in the numbers of *Homo sapiens* if increasing numbers can no longer afford to eat.

**ENVIRONMENT:**
**Dirt Isn't So Cheap After All**
**By Stephen Leahy**

**BROOKLIN, Canada, Aug 30 (IPS) - Soil erosion is the "silent global crisis" that is undermining food production and water availability, as well as being responsible for 30 percent of the greenhouse gases driving climate change.**

"We are overlooking soil as the foundation of all life on Earth," said Andres Arnalds, assistant director of the Icelandic Soil Conservation Service.

"Soil and vegetation is being lost at an alarming rate around the globe, which in turn has devastating effects on food production and accelerates climate change," Arnalds told IPS from Selfoss, Iceland, host city of the International Forum on Soils, Society and Climate Change which starts Friday.

Along with many other international partner institutions, Iceland is marking the centenary of its Soil Conservation Service by convening this forum of experts.

Every year, some 100,000 square kilometres of land loses its vegetation and becomes degraded or turns into desert.

"Land degradation and desertification may be regarded as the silent crisis of the world, a genuine threat to the future of humankind," Arnalds said.

Food production has kept pace with population growth by increasing 50 percent between 1980 and 2000. But it is an open question whether there will be enough food in 2050 with an estimated three billion more mouths to feed.That means more food has to be produced within the next 50 years than during the last 10,000 years combined he noted

Global food production per hectare is already declining," said Zafar Adeel, director of the United Nations University's Canadian-based International Network on Water, Environment and Health.

There are a number of reasons for this decline, including the fact that soil degradation is producing growing shortages of water. Soil and vegetation act as a sponge that holds and gradually releases water, Adeel explained.

The newest challenge to food production and conserving land and water resources is the boom in vegetable-based biofuels, says Andrew Campbell, Australia's first National Landcare Facilitator.

"Soils are under greater pressure than ever before," Campbell said in an interview. "Governments around the world are subsidising crops to produce biofuels."

Hundreds of millions of square kilometers of farmland will soon be used to meet a small part of the world's rapidly growing thirst for fuel. And even if rainforests aren't being cleared to grow biofuel crops, as is the case in parts of Asia and South America, they offer little if any net environmental benefits, Campbell argues.

Another reason to rethink the stampede to biofuel: These crops use a lot of water. In future, there will simply not be enough water to grow the food we need, he says.

By most analyses, biofuels do little to help out the problem of climate change, but preventing deforestation and soil loss the quickest and easiest way to reduce emissions of greenhouse gases.

Paradoxically, the environmental problem of climate change may finally move the world to act on another long-term fundamental environmental issue -- the protection of soils.

Land degradation and desertification may account for as much as about 30 percent of the world's greenhouse gas releases, according to researcher Rattan Lal of Ohio State University. These changes to the land also alter the water, temperature and energy balance of the planet.

And climate change makes land degradation much worse and more extensive, mainly through changes in precipitation and increased evaporation that trigger more extreme weather.

Carbon dioxide is the main greenhouse gas and "keeping carbon molecules in the soil and in forests and grasslands is the quickest and best bang for the buck in addressing climate change," Adeel said.

There is money to be made in the new carbon markets by sequestering or storing carbon in the soil and vegetation. As much as 20 percent of anticipated net fossil fuel emissions between now and 2050 could be stored in this way, said Maryam Niamir-Fuller of the U.N. Development Programme.

However, the so-called Clean Development Mechanism (CDM) rules under the Kyoto Protocol treaty on climate change need to be changed to ensure the triple benefits from climate mitigation, climate adaptation and sustainable development for the poor are achieved, said Niamir-Fuller in a statement.

A number of other fundamental policy changes are also needed if conservation of soil and vegetation and restoration of degraded land to ensure humanity's future survival, experts say.

Ending the estimated 30 billion dollars in food subsidies in the north that contribute directly to land degradation in Africa and elsewhere, and which force poor farmers to intensify their production in order to compete, would be a good start, Adeel said.

For Andrews, a sweeping change in how land use decisions are made at all levels of government is needed. Soil, water, energy, climate, biodiversity, food production are all interconnected, which demands integrated policy-making. Decisions and policies are currently set by different governmental departments and agencies with little regard for the impacts on other sectors, he said.

Energy ministries will happily spend billions on biofuels without worrying about where the water will come from, or how they will impact soils, biodiversity and food prices, he warned.

There is also no formal agreement on protecting the world's soils. Delegates at the weekend forum in Iceland will consider propositions for an International Year of Land Care to focus attention on soil stewardship, which affects food and water security worldwide.

"We have battled very severe land degradation in Iceland that has taken us 100 years to tackle," Arnalds said.

That degradation means one-third of Iceland's 103,000 sq km area is still desert.

Iceland has should serve as both a warning to other countries and hope that it is possible to restore degraded lands with enough resources, he says. "It is far better to preserve than restore," the scientist noted. *(Reference furnished by William Tamblyn)*

### *892. US Department of Energy admits to Peak Oil*

The Energy Information Agency of the US Department of Energy has issued an educational poster entitled *Peak Oil- The Turning Point,* which illustrates the key elements of the peak oil analysis, including: the Hubbert Curve; estimates of Ultimate Recovery; the relationship between discovery and production, and a list of estimated peak dates. It even includes a quotation from Campbell & Laherrère: *The World is not running out of oil – but it does face the end of the abundant and cheap oil on which all industrial nations depend*. But having supplied the evidence to the contrary, it comforts its readers with a quotation from its Director saying that the date of peak is decades, not years, away.

( www.fe.doe.gov/programs/npr/publications/Peak_Oil)

### *893. Oil Companies Peak too*

It is obvious that the major oil companies of the world are motivated to deliver the maximum amount of profit to their shareholders, most of whom have a short-term view of the future, buying and selling positions on the stock market in the hope of a quick return. Flat-earth economics proclaim that money to-day is worth more than money tomorrow. Oil has been trading on a trend of rising prices, which might provide the companies with a motive to withhold production to reap higher returns tomorrow, but on other hand the investment in installed facilities gives them an incentive to maximize the throughput of existing capacity.

It is reported by the oil journal, Platts, that the combined production by BP, Shell, Chevron, ENI, ConocoPhillips and Marathon declined by 6% for Third Quarter of 2007 compared with the corresponding period of the year before. Shell apparently led the pack with a decline of 9%. It rather suggests that the fields owned by these companies have passed peak, and are not only in decline but are not being replaced by new fields.

Clearly the major oil companies face contraction in the years ahead, which, if intelligently managed, can still be achieved profitably. It will be interesting to see which of them admits to the new policy first : there are signs that it might be BP, which is already shedding staff. *(Reference furnished by ODAC)*

### *894. Britain's soaring energy costs*

British Energy has announced that two of its eight nuclear reactors, supplying 20% of Britain's electricity, are to be shut down indefinitely following the discovery of corrosion. Forty percent of the country's electricity is generated from Natural Gas, of which imports are set to rise as indigenous production depletes, and costs have recently risen by 2.4%. The crisis builds but evidently lags behind that in other places as the tide of immigrants continues to rise, prompting the Government to announce a massive house-building programme, while the major banks face a growing financial crisis having over-extended themselves with bad debt. *(Reference furnished by Richard O'Rourke)*

It does not on the face of it look to be too rosy a picture, especially as the Government also announces what it describes as growing terrorist threats. They are presumably related to rising geopolitical tensions as the Muslim world, especially in Iran, Iraq, Turkey, Africa and now Pakistan, demonstrates increasing resentment. It presumably stems from sympathy for the fate of the dispossessed Palestinians, and subsequent invasions, some of which may be perceived to have been motivated by control of oil supply.

As television stations beam in images of affluence in distant lands, people in these countries may perceive themselves to be the victims of exploitation. There is nothing particularly new about the suicide bomber : Armistice Day commemorating the end of the First World War in November 1918 reminds us of how perfectly normal and decent people were motivated to climb out of a trench and charge into a hail of machine-gun fire, a situation not far removed from suicide.

### *895. Neutral Zone.*

At the end of the First World War, Britain faced the challenge of dividing up the spoils of war in the Middle East following the defeat of the Ottoman Empire. It was not an easy task in the barren lands because the notion of frontier meant little to the many different tribal people and local communities. The Ottoman Empire had been run delegated lines with various semi-autonomous and ill-defined spheres of administration, called Vilayets.

During the War, Britain had indeed encouraged various risings against the Ottomans by the Grand Sharif of Mecca belonging to the Hashemite dynasty as well as by the Sauds. Britain itself had interest in the trading port of Kuwait at the mouth of the Tigris-Euphrates Rivers, the primary transport route into Iraq, while to the east it had an exclusive control of Iranian oil, through the Anglo-Persian Oil Company (later BP). There was no doubt plenty of tension and dispute between these various factions, so determining new frontiers was not an easy task.

In the case of Kuwait and Saudi Arabia, Britain fell on the happy compromise of leaving a No-Man's-Land in between the two new countries. At the time, it was of no particular concern to either party being a stretch of desert occupied by no more than a few wandering Bedouin.

Then in 1938, came the discovery of the giant Burgan Field in Kuwait, raising hopes that the same productive trend would extend south into the undesignated territory, which became known as the Neutral Zone. But resolution of the matter was delayed by the Second World War until the late 1940s, when the US Government took an interest, wishing to encourage the entry of smaller US companies into the Middle East to break the cartel-like power of the major companies. This led to the formation of a consortium of Sinclair, Ashland and Phillips Petroleum, called Aminoil, which won a concession to the northern part of the Neutral Zone in return for a substantial bonus, a 15% net profits interest and the gift of a yacht to the Emir of Kuwait, while Getty Oil successfully negotiated with the Sauds, offering a 50:50 split of profits to the great dismay of the major companies which had much more favourable terms. The new terms told the governments that their prior concessions were too lenient, and may have led them in the path towards the formation of OPEC and eventual nationalisation.

It was not until 1969 that Saudi Arabia and Kuwait formally agreed their frontier through the Neutral Zone and its offshore extensions, but agreed to split equally the oil revenue of the fields that were found both on the Burgan trend running south from Kuwait, and on the trend running offshore north from Safaniya in Saudi Arabia. Both were nationalized in the 1970s.

| **Neutral Zone** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Production** | | | | | | **Peak Dates** | | | **Area** | |
| **Amount** | | | **Rate** | | | | Oil | Gas | '000 km$^2$ | |
| | Gb | Tcf | Date | Mb/a | Gcf/a | Discovery | 1953 | 1967 | Onshore | Offshore |
| PAST | 7.5 | 2 | 2000 | 230 | 47 | Production | 2004 | 2010 | 6 | 7 |
| FUTURE | 5.5 | 9 | 2005 | 212 | 58 | Exploration | 1953 | | **Population Growth** | |
| Known | 5.0 | 8 | 2010 | 181 | 60 | **Consumption** | | | 1900 | 0.05 |
| Yet-to-Find | 0.6 | 1 | 2020 | 124 | 50 | | Mb/a | Gcf/a | 2006 | 0.3 |
| DISCOVERED | 12.5 | 10 | 2030 | 86 | 20 | 2006 | 11 | ? | Factor | 6 |
| **TOTAL** | 13.0 | 11 | **Trade** | +199 | ? | Per capita | 36 | ? | Density | 53 |

The Oil & Gas Journal database recognizes the reserves and production of the Neutral Zone, but it seems likely that Kuwait and Saudi Arabia include their shares in their national statistics, an additional source of confusion.

### *896. New Deepwater discovery in Brasil*

Petrobras has announced a new deepwater discovery off Brasil, called Tupi,. It lies in 300 kms offshore in 2000m of water and at a depth of 4000m. It apparently lies in an early rift, 800 kms long and 200m wide, which formed when the South Atlantic opened in the early Cretaceous, and relies on reservoirs underlying mid-Cretaceous salt deposits.

It is claimed to hold 5-8 billion barrels, but before opening the champagne it might be worth checking to find out if this relates to oil, or what is called oil equivalent. Since it has been shown that all known reservoirs of oil and gas have a temperature in the range of 60$^{o}$C to 120$^{o}$C , one might wonder if a reservoir at this depth might be too hot. The chances of gas-condensate sound rather more than for oil itself. The reservoir quality of those particular sandstones at such a depth might not be the best. Lastly, is the question of whether the quoted size refers to the specific prospect or to the entire trend. That said, salt does form an excellent seal to preserve whatever hydrocarbons were formed beneath it.

In any event developing such a find will prove difficult and expensive, such that production is unlikely to commence before the remaining production in Brasil passes its peak when it will be desperately needed to support the needs of the people of that country. To search for prospects in such extreme conditions rather suggests that there are few easier options left.

## Calendar - Forthcoming Conferences and Meetings

ASPO members and associates [shown in parenthesis] will be addressing the subject of Peak Oil at the following conferences and meetings. Information for inclusion in future newsletters is welcomed.

**2007**

Dec. 4-5 VorArlberg Sustainability Conference, **Bregenz**, Austria [Campbell]

## NOTE



*Compiled by C.J.Campbell, Staball Hill, Ballydehob, Co. Cork, Ireland.*

-oOo-

Multi-Science Publishing Co. (Sciencem@hotmail.com) wish to advise that copies of the book *Oil Crisis* by C.J.Campbell, providing background reading, are still available for purchase.