

# THE ASSOCIATION FOR THE STUDY OF PEAK OIL AND GAS “ASPO”

## NEWSLETTER No. 64 – APRIL 2006

**ASPO is a 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. Independent national affiliates are in existence or formation in Australia, Canada, Egypt, France, Germany, Ireland, Italy, Netherlands, New Zealand, Portugal, South Africa, Spain, Sweden, United Kingdom and the United States.**

**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 for Mankind.**

**Newsletter:** The newsletter is currently compiled under the auspices of ASPO IRELAND, which maintains a full and searchable archive of past issues at [www.peakoil.ie](http://www.peakoil.ie).

Foreign language editions are available as follows:

Spanish: [www.crisisenergetica.org](http://www.crisisenergetica.org)

French: [www.oleocene.org](http://www.oleocene.org) (press “Newsletter”)

Newsletter communications should be addressed to ASPO IRELAND at [www.peakoil.ie](http://www.peakoil.ie)

### CONTENTS

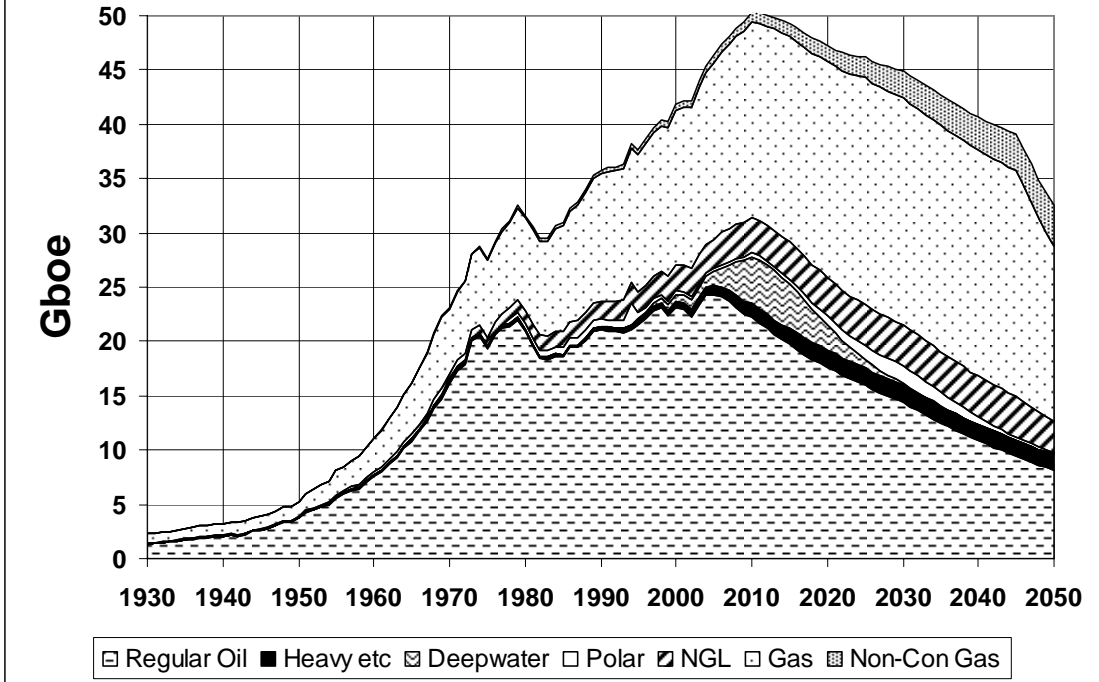
- 690. ExxonMobil’s Hidden Message**
- 691. Decoding the IEA**
- 692. An Updated Depletion Model**
- 693. The Last of the Khans**
- 694. US Military Recognises Peak Oil**
- 695. Discovery in 2005**
- 696. G8 Ministers firmly on the flat earth**
- 697. CNN broadcasts a film on Peak Oil**
- 698. Less from Shell**
- 699. ASPO Deutschland**
- 700. Mission Statement**
- 701. ASPO IRELAND**

#### Index of Country Assessments with Newsletter Reference (\*revised)

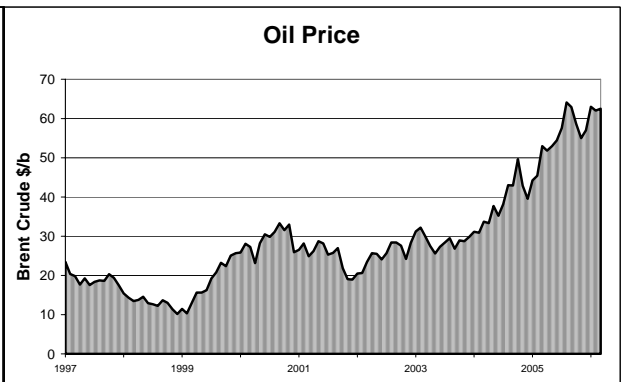
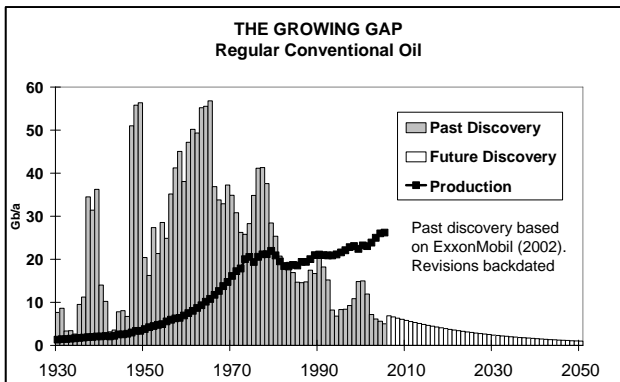
Abu Dhabi	42	Canada	48	Indonesia	*61	Netherlands	57	S. Arabia	21
Algeria	41	Chad	59	Iran	32	Nigeria	27	Trinidad	37
Angola	36	China	40	Iraq	24	Norway	25	Turkey	46
Argentina	33	Colombia	*62	Italy	43	Oman	39	UK	20
Australia	28	Denmark	47	Kazakhstan	49	Peru	45	USA	23
Azerbaijan	44	Ecuador	29	Kuwait	38	Qatar	58	Venezuela	22
Bolivia	56	Egypt	30	Libya	34	Romania	55	Vietnam	53
Brasil	26	Gabon	50	Malaysia	51	Russia	31		
Brunei	54	India	52	Mexico	35	Syria	*60		

*The General Depletion Picture*

**OIL & GAS PRODUCTION PROFILES  
2005 Base Case**



ESTIMATED PRODUCTION TO 2075								End 2005		
Amount			Annual Rate - Regular Oil					Gb	Peak	
Regular Oil			Mb/d	2005	2010	2015	2020	2050	Total	Date
Past	Future	Total	US-48	3.6	2.8	2.2	1.7	0.4	200	1971
Known Fields	New		Europe	5.0	3.4	2.3	1.6	0.2	75	2000
968	794	138	Russia	9.2	8.5	6.9	5.7	1.5	220	1987
	932		ME Gulf	20	19	19	19	11	680	1974
<b>All Liquids</b>			Other	29	27	23	20	9	725	2004
1073	1377	2450	<b>World</b>	<b>67</b>	<b>61</b>	<b>54</b>	<b>48</b>	<b>22</b>	<b>1900</b>	<b>2005</b>
<b>2005 Base Scenario</b>			<b>Annual Rate - Other</b>							
M.East producing at capacity (anomalous reporting corrected)			Heavy etc.	2.3	3	4	4	4	151	2021
<i>Regular Oil</i> excludes oil from coal, shale, bitumen, heavy, deepwater, polar & gasfield NGL			Deepwater	3.6	12	11	6	4	69	2011
Revised 03/03/2006			Polar	0.9	1	1	2	0	52	2030
			Gas Liquid	6.9	9	9	10	8	276	2035
			Rounding				-1	-2	2	
			<b>ALL</b>	<b>80</b>	<b>86</b>	<b>80</b>	<b>70</b>	<b>37</b>	<b>2450</b>	<b>2010</b>



### 690. ExxonMobil's Hidden Message

Few people would deny that you have to find oil before you can produce it (*extract* would be a better word), and most people would identify a radical difference between a free-flowing Middle East well, producing 50 000 barrels a day under its own pressure, and digging up tar impregnated sand in Western Canada before processing it into synthetic oil. The tar offers much less net energy than the regular oil, and is slow and costly to extract, having little impact on overall peak

In 2002, Harry Longwell, a senior executive with ExxonMobil, published to his great credit a key graph showing how discovery has been in relentless decline for forty years, which is the basis of the *Growing Gap* illustration on page one of this newsletter. This alone points to an imminent corresponding peak in production. With this background, it is at first sight curious to find ExxonMobil stating in a major advertisement in the Washington Post, that *Contrary to the theory, oil production shows no sign of a peak.*

The Company must have noticed that the United States itself peaked in 1971, despite advanced technology and every incentive, so it must know that Peak is more of a reality than a theory. The advertisement refers to the USGS estimate of 3.3 Gb for *Conventional Oil*, despite the fact that the authors of that study have recently stated that it was less than reasonable (see Item 686), with actual discovery coming in far below forecast. Having added another billion for *Non-Conventional*, the advertisement ends with the words that *peak production is nowhere in sight.*

But in fact the advertisement carries a hidden message in the illustration accompanying it which depicts a high mountain whose peak is shrouded in clouds. It is evidently also quite a close peak, judging from the angle of the binoculars. In a self-depreciatory style, the viewer does look rather gormless, and perhaps does not know what he is looking at. So, after all, not only does ExxonMobil identify the Peak, however cloudy the details, but, much more important, its proximity and the steep slope on the other side of it. As Nemesis points out in the following Item, major institutions have to choose their words with care and deliver veiled messages. Evidently, ExxonMobil is no exception.

The investment community is not altogether deceived. One prominent analyst sees the major companies barely able to hold production for the next few years, before heading into to contraction and merger. He speaks of companies trying to be the "last man standing" (see Maxwell@weedenco.com).

The advertisement has led to at least one complaint to the Securities and Exchange Commission under Rule 10b-5(b) that requires companies not *To make any untrue statement of a material fact or to omit to state a material fact necessary in order to make the statements made, in the light of the circumstances under which they were made, not misleading.*



**Peak oil?**

### 691. Decoding the IEA

After an absence of some months, our source from the heart of the oil industry returns under his *nom-de-plume* to offer a penetrating assessment of the not-so-hidden messages from the International Energy Agency

#### **The Truth will Out?**

By Nemesis

International organisations suffer from what might call institutional conservatism – they can only proceed at the pace of the slowest and most reluctant member of the oversight committee. They have, however, found a way out of this constraint, and that is to print divergent opinions providing clues as to which view should really be noted.

In this respect, the IEA's International Energy Outlook 2005 is a gem. The report goes into great detail about the reserves and production potential in each of the so-called MENA countries, namely the major producers in the Middle East and North Africa. The report considers two scenarios: a *Reference Case* and a *Restricted Investment Case*. In the latter, the MENA countries (effectively Opec plus Egypt) will invest in new production capacity only in the same proportion of their GDP as they do now. In the *Reference Case*, they will invest lots more. Only a congenital optimist could believe that the IEA thinks this is likely (except on a public platform). To add a little confusion, the report half-heartedly examines a scenario in which consuming country governments act to restrain demand. And just to make sure we're all looking out for clues, on p.140 it has a nice little box asking *When will World and MENA oil production peak?*. Amongst some convoluted verbiage, we learn that Non-OPEC peaks between 2010 and 2015. MENA will peak later but *how soon* after will depend on investment. It is hard to argue with that.

In the light of the continuing debate on the veracity of Middle East OPEC's published reserves, the IEA report offers some pretty useful clues.

**Iran:** On p.358, the report gives a detailed breakdown of remaining proven and probable reserves at end 2004, broken down by field but excluding NGLs and condensates, citing the sources as IEA databases, the Arab Petroleum Research Centre (2005) and IHS Energy. It is discrete enough not to add up a total, but my calculator finds that the total is 71.5 billion barrels. This is quite close to the ASPO reserve figure for Iran, and quite a long way from the official reserves figure. The report also notes on p.357 that onshore fields are estimated to be declining on average at 8% per year and offshore fields at 10%, adding that the natural decline in production is thought to be about 270 kb/d per year.

Now, the 71.5 billion barrel figure does not include the NGLs and condensates which are significant in terms of the developments of the South Pars Field. It also does not include the discovered but not yet developed fields., comprising Azadegan (3-5 bn. barrels), Yadaravan (3 bn. barrels), Kushk-Hosseineh (2-3 bn. barrels), Darkhovin (1-2bn barrels) Anaran block field(s) (1-2 bn barrels) as well as the South Pars field (15-18 bn. barrels condensates/NGLs). On even the most optimistic assumptions, they contain no more than 28-35 billion barrels in total. So are Iranian liquids reserves really around 100 billion barrels, 71 developed and 30 undeveloped?

**Iraq:** Citing IHS Energy and IEA databases plus Verma et al, (2004) on p.391, we have a breakdown of recoverable reserves in 18 named fields plus 'others' that have been in production. Here, remaining Proven and Probable Reserves at end 2004 amount to 84.9 billion barrels. However, only five fields have had significant production to-date, with the Kirkuk and Rumaila fields accounting for a staggering 86% of cumulative production to 2004, and 72% of production in 2004. The IEA notes on p.390 that the water-cut at Rumaila has risen to about 25% on average, and the natural decline rate is reported to have accelerated to about 10%. That Iraq has great potential is not in doubt. But, realising that potential requires order and stability. On p.393, the IEA identifies nine major undeveloped oilfields in Iraq earmarked for development: the data sources being IHS Energy databases and Verma et al. (2004). The 'proven' oil reserves in these nine fields are assessed at 26.3 billion barrels.

In total the IEA appears to assess Iraqi reserves as at least 111.2 billion barrels.

**Kuwait:** Citing IHS Energy and IEA databases on p.422, remaining Proven and Probable Reserves at end 2004 are reported as 52.3 billion barrels in Kuwait and a further 2.6 billion barrels in the Kuwaiti share of the Neutral Zone. As all known fields are in production, incremental production can only be achieved by more intensive development of existing fields. Recent deep high-pressure condensate discoveries in the north of the country represent the only significant undeveloped resources.

Recent articles (Reuters, PIW) have suggested that Proved Reserves are no more than 24 billion barrels with a similar volume rated as Probable. Given Kuwait's limited area and long production history, the Probable Reserves would seem more appropriately labelled as Possible Reserves.

**Qatar:** Citing IHS Energy and IEA databases on p. 472. remaining Proven and Probable Reserves at end 2004 are assessed at 7.1 billion barrels of oil in seven fields and 25.7 billion barrels of condensates in the North Field.

**UAE:** Remaining Proven and Probable Reserves at end 2004 (including NGLs and condensates) are quoted on p. 546, citing IHS Energy and IEA databases. Nine of the thirty producing oilfields have individually identified reserves, with rest being grouped together to give a total of 55.1 billion barrels, or roughly half the official reserves.

To sum up so far, the IEA has indicated that the reserves of UAE and Kuwait are much smaller than the official figures and quite close to the ASPO assessment. For Iran and Iraq, the IEA indicates that the official figures are too high but not by as much as ASPO has suggested. However, the IEA assessment of Saudi Arabia is higher than the official estimates, in sharp contrast to all the other Middle East producers

Citing IEA and IHS databases and itemising Remaining Proven and Probable Reserves at end-2004, we find on p.508, a total 289.4 billion barrels in Saudi Arabia. With a further 2.6 billion barrels, as the Saudi share of the Neutral Zone. This gives a grand total of 292.1 billion barrels, a figure that is some 30 billion barrels above the official Saudi figure of 262 billion barrels.

Clearly having effectively questioned the reserves of the other four Gulf producers, the IEA felt unable to go through with its own logic and question Saudi reserves (perhaps the implications were just too terrifying) but it has left some tantalising clues. On p.146, it declares the remaining reserves of Ghawar to be 70bn barrels, adding that 60% of Ghawar's 115bn barrels of Original Reserves have already been extracted. Simple math gives us 69bn barrels extracted and 46bn barrels remaining. On p. 508, adding to the confusion, we find Ghawar's cumulative production is 60.7 bn barrels and that 1P Remaining Reserves are 65bn barrels, with 2P reserves estimated at 86.3bn barrels. We also learn that Ghawar's water-cut, which reached 37% in 2000, had been reduced to 33% in 2003 and 31% in 2004. Reading on, we learn on p. 511 that the natural decline rate at existing fields is around 6%.

The real stunner comes on p.509 where we learn that It (Saudi Aramco) has a very conservative approach to managing its reservoirs, generally aiming for fairly low depletion rates – less than 5% per year—in an attempt to maximise the long term recovery factor.

This gives us an analytical breakthrough. We know OPEC's current production capacities, as they've been effectively producing flat out for the last year. We know the Saudi spare capacity. We can calculate

annual capacity in million barrels, so we can draw up a table of the reserves needed to support a range of depletion rates. Rates of 1%-7% are tabulated (with the possible exception of Indonesia none of the OPEC countries are likely to be outside this range).

Country	Capacity		Depletion Rate							Published estimates				Undev. Reserves	Yet-to-Find
	Gb	kb/d	Gb/a	1%	2%	3%	4%	5%	6%	7%	BP	ASPO	IEA		
Saudi Arabia	10.20	3.72	372	186	<b>124</b>	<b>93</b>	<b>74</b>	62	53	263	159	289	120-140	80-110	12
Iran	4.00	1.46	146	<b>73</b>	<b>49</b>	<b>37</b>	29	24	21	133	69	72	35-45	30-35	12
Iraq	2.50	0.91	<b>91</b>	<b>46</b>	30	23	18	15	13	115	61	85	80-100	25-30	9
Kuwait	2.30	0.84	<b>84</b>	<b>42</b>	28	21	17	14	12	99	54	55	45-55	1	2.5
Neutral Zone	0.60	0.22	22	11	7.3	<b>5.5</b>	<b>4.4</b>	3.7	3.1	incl.	5.1	5.2	na	0.2	1.6
UAE	2.65	0.97	97	<b>48</b>	<b>32</b>	24	19	16	14	98	44	52	40-50	2	5.4
Algeria	1.37	0.50	50	25	17	<b>13</b>	<b>10</b>	8	7	12	12	12	na	1	2.9
Indonesia	0.98	0.36	36	18	12	9	<b>7</b>	<b>6</b>	<b>5</b>	5	8	na	na	2	1.5
Libya	1.65	0.60	<b>60</b>	<b>30</b>	<b>20</b>	15	12	10	9	39	21	39	na	3	4.9
Nigeria	2.60	0.95	95	47	<b>32</b>	<b>24</b>	<b>19</b>	16	14	35	19	na	na	5-7	4
Venezuela	2.20	0.80	80	<b>40</b>	<b>27</b>	20	16	13	11	77	34	na	na	5-20	5.7
Total Opec	31.05	11.33	1133	567	378	283	227	189	162	875	485	na	na	145-212	61.5
Opec Gulf Five	22.25	8.12	812	406	271	203	162	135	116	707	392	558	320-390	135-178	42.5
Bold - Most likely															

We can then apply the 'Colin Campbell' test to the Neutral Zone. Capacity is no more than 600,000 b/d or 219 million barrels/year. If depletion is 4%/ year remaining reserves are 5.5 billion barrels. We're pretty confident the remaining reserves are 5.2 billion barrels from the IEA figures. So we can also be confident reserves depletion is running at just over 4%/year. Now with this confidence we can apply the logic to all the MENA countries.

This has been done in the table, which also includes the main independent estimates of remaining reserves. Then without great difficulty we can home in on the most probable level of reserves. Note these are the remaining reserves of the fields in production. To get total future production we then need to add the undeveloped reserves and yet-to-find. For 'Yet-to-find' the latest ASPO figures have been used.

Now, it is possible to come to some conclusions.

For Saudi Arabia, remaining reserves in fields currently in full or large scale production are around 90 billion barrels. There are around 100 billion barrels in undeveloped (or minimally developed) known fields and 12 billion barrels of yet-to-find, giving a grand total of around 200 billion barrels.

For Iran, the figures are respectively 40, 30 and 10 giving around 80 billion barrels.

For Iraq, the figures are respectively 60, 30 and 10 giving around 100 billion barrels.

For Kuwait, the figures are respectively 40, 1 and 5 giving around 46 billion barrels.

For the Neutral Zone, the figures are respectively 5.2, 0.2, and 1.6 giving around 7 billion barrels.

For the UAE, the figures are respectively 45, 4 and 5.4 giving around 54.4 billion barrels.

All these figures have been generously rounded so we can have great confidence that for the Gulf Five (including the Neutral Zone) we have remaining reserves for fields in production of 250 billion barrels. The undeveloped but known field reserves amount to a further 165 billion barrels. That yet-to-find amounts to 44 billion barrels according to ASPO.

As a final check we can now go back to the future production graphs for the Gulf Five in the IEA's World Energy Outlook 2005. It shows the point at which production from existing fields peaks; the point where additional production from known future developments peaks; and finally how far production could get with the development of reserve additions and new discoveries. Without stretching things too far, we could refer to this as 1P production, 2P production and 3P production or in other words *certain, probable and possible*.

So according to the IEA, we have peaking dates as follows:

Country	1P	2P	3P
Iran	2014	2030+	2030+
Iraq	2025-30	2030+	2030+
Kuwait	2015	2022	2030+
Saudi Arabia	2015	plateau	2030+
UAE	2014	2030+	2030+

We can conclude that The Middle East Five will *almost certainly* be able to expand production to 2015; that they'll *probably* be able to expand production to 2025-2030; and that they'll *possibly* be able to expand production beyond 2030. In the light of these reserve calculations, we would be wise to rely only on 2P-production growth and anticipate that even the Middle East Five will, at best, go ex-growth after about 2025.

Perhaps when President Bush announced that US imports from the Middle East would fall by 75% by 2025 he was describing what would actually happen rather than stating a policy.

Sounds unbelievable? Remember a 6% decline rate halves production in 11.7 years, a 7% decline rate in 10 years and an 8% decline rate in 8.75 years. And we're seeing those decline rates already.

### 692. *An Updated Depletion Model*

As anyone familiar with the subject will know full well, forecasting future oil production is a good deal less than an exact science primarily because of ambiguous definitions and lax reporting practices. Nevertheless, attempts are continually made to improve the model using data from a wide variety of sources, some of which has been given in strict confidence. As is well known, the reporting of Reserves is heavily influenced by commercial, financial or political considerations, making it a term that is perhaps better avoided. For these reasons, we have adopted a somewhat new approach, which involves two main steps:

Step 1 is to go out into a starlit night and seek inspiration by which to answer the questions of how much oil by category and country will have been produced by 2075 – a rounded cut-off date to avoid having to worry about minor amounts of irrelevant tail-end production.

Subtracting Past Production gives Future Production

Step 2 involves a second spell under the stars to gain inspiration by which to answer the question of what percentage of future production will have come from currently known fields (*Reserves* by another word), with the balance having to come from as yet undiscovered fields.

Having gone through this exercise, with the starlit inspirations being supplemented by all available datasets, we come to similar results to those already proposed. The total production by country for *Regular Conventional Oil* to 2075 adds up to 1869 Gb, which is only slightly above the previous estimate of 1850 Gb. We have rounded it up to 1900 Gb, describing 31 Gb as *Unforeseen*. The total of *All Liquids* comes to 2450 Gb, which is close the USGS *High Probability* case of 2452 Gb for total discovery to 2025, suggesting that little will be found thereafter.

The breakdown is shown in the table, and the full country listing is included as an Appendix. The model gives Peak production for *Regular Conventional* in 2005 and for *All Liquids* in 2010. These dates themselves are of no particular significance when what matters is the vision of the long decline that comes into sight on the other side of peak. (The tables and graphs on Page 1 have been revised accordingly).

The model forecasts future production for countries outside the Middle East on the basis of a simple Depletion Rate (annual production as a percentage of what is left), using current Depletion Rate for countries that have used more than half of their total, most of which are already in decline. The Middle East countries, apart from Iraq, are assumed to remain at about their current levels until their Depletion Rates rise to about 3% a year. The actual situation is naturally more complex with offshore fields declining at higher rates when they come off plateau, but the present evaluation seems a reasonable approximation, even if perhaps verging on the optimistic. With current fields ageing and new discovery coming in far below consumption (see Item 695), it may be that near term production will fall faster than modelled on current Depletion Rate.

Production	Gb
Past	968
Future	932
Known Fields	794
New Fields	138
Total to 2075	1900

### 693. *The Last of the Khans*

Mr Ali Samson Bakhtiari, the well known Middle East oil man, who has contributed greatly to the peak oil debate, has written a charming and informative book *The Last of the Khans* about his antecedents who lived and held dominion in the Zagros Mountains where the first oil in the Middle East was found. Those who know the author might question the word *Last*, as the genes evidently continue to flow in his veins.

The tribal name Bakhtiari literally means the “companions of good fortune.” And the twentieth-century discovery of crude oil in this paradise seems to confirm the meaning. An elite family, founded by the great Haydar, has ruled the Bakhtiaris for the past four hundred years. Their leaders marched on Tehran in 1909 to save the young, fragile Constitution and reopen the Parliament. Among those in command was Morteza Quli Khan, a rather unique individual with an extraordinary life. *The Last of the Khans* recounts his, and the ancient tribe’s, great heritage.

### 694. *US Military Recognises Peak Oil*

A new study by the US Army Corps of Engineers by Westerfelt and Fournier opens with the words: *The energy situation is highly uncertain for the Army, the Nation and the world. Now is the time to develop enduring energy policies and solutions for our military installations to discern an effective and viable path for the Army’s future.* A few lines later it makes the ominous comment that its consumption may increase .....resulting from the world energy situation, adding *World oil production is at or near peak ....*

(see [www.cecer.army.mil](http://www.cecer.army.mil))

This follows an earlier study with similar conclusions, published by the Department of Defense in 2003 (Hardy et al.) whose emissaries made an unannounced call on the editor of this newsletter.

### **695. Discovery in 2005**

According to Infield Systems, offshore discovery for 2005 amounted to 4.3 Gb of oil and 23 Tcf of gas, of which respectively 2.0 Gb and 6 Tcf were in deep water (>500m). There are few reports of significant onshore discoveries, so probably total discovery amounted to a rounded 5 Gb. If so, six barrels were consumed for every one found. It is called eating into capital, which is not a practice that can continue for long.

The AAPG Explorer (Jan.2006) also reports on discovery in 2005 based on the IHS database, listing no more than 33 discoveries worldwide. The tone is upbeat, as befits an explorer's journal, but the actual numbers sum to no more than about 5 Gb for oil (of which 3 Gb are in deepwater) and 27 Tcf for gas. Although several of the reports are less than specific, the general picture seems clear. A particularly surprising discovery was made by San Pedro-1, which allegedly found a Palaeozoic basin off Peru that may contain up to 1 Gboe of oil and/or gas, in what in regional terms is a most unlikely setting.

Another indicator of dwindling discovery is falling exploration. The peak of exploration drilling was in 1981 when some 11000 wildcats were drilled, but the number has declined to about 2500 last year. Even small oilfields are highly profitable, and there is no shortage of funding for valid prospects. The problem is that they have become ever harder to find, especially as advances in knowledge and seismic resolution have made it easier to distinguish the valid from the flawed.

The latest possible major discovery is the recently announced Noxal-1, drilled in 930m of water off Mexico, for which as much as 10 Gb is claimed. It is not clear if this is oil-in-place or recoverable, or if it includes gas equivalent, which might be expected given that it is a deep well. The deepwater Gulf of Mexico is here recognised as a promising area with an assessed potential of 7.5 Gb, which seems reasonable in order of magnitude, given that the US sector of the deepwater Gulf-of-Mexico has about 10 Gb. So the discovery itself comes as no surprise, whatever its size may turn out to be.

Sceptics may wonder if the announcement is designed to quell doubts about the financial position of the national oil company, Pemex. It lost \$4 billion last year and is in debt to the tune of \$50 billion, so some good news would be welcome. In any event, it will probably take five to ten years to bring the new field onto production, by which time Mexico's production will have fallen from 3.1 Mb/d to about 1.8 Mb/d, assuming the current depletion rate of 5.5% a year.

### **696. G8 Ministers firmly on the Flat Earth**

It is reported that the G-8 Ministers, who met in Moscow on March 15th and 16th, considered an Energy Security Plan, to cost 17 trillion dollars, which is designed to secure world energy supplies for the next 25 years. It is built on five proposals :

- To find new reserves of oil and gas at a faster rate than the existing reserves are depleted;
- To increase oil and gas output by, among other things, more drilling on the continental shelf;
- To expand production capacity in oil-refining, petrochemical and gas processing industries;
- To develop new electric power facilities, with an emphasis on nuclear and hydro-power plants; and
- To introduce clean coal technology.

The first two strategies are doomed because there is not enough to find in Nature even if all administrative and political barriers were to be removed. It is furthermore a deeply flawed plan because if by some miracle, production were to be stepped up over the next 25 years, by for example the subjugation of the Middle East, the subsequent decline would be that much steeper, making a bad situation worse. The third strategy is redundant because in the real world there will be less left to refine and process, which presumably explains why the industry has not invested in more refining capacity. The fourth might make partial sense provided nuclear energy can be made safe and benign, although large hydroelectric dams commonly destroy much needed agricultural land. The fifth makes good sense as there is plenty of coal. The score is accordingly one out of five.

There is talk of entrusting the project to the World Bank, underlining the link between oil and finance. During the First Half of the Age of Oil, banks lent more than they had on deposit, with the collateral being provided by the resulting economic growth, which in large measure was indirectly based on cheap oil. The Second Half now dawns and will see the decline of oil and all that depends on it, including the collateral for debt. So, the notion of having the World Bank create another 17 trillion dollars out of thin air is as flawed as the underlying project. Having successfully impoverished the Third World by the burden of foreign debt, with the countries themselves being forced to export resources, product and profit, the Bank does begin to see the new reality as it tries to win haloes for forgiving, albeit uncollectible, debt. That may be a diplomatic way of meeting its desperate need to destroy the mountain of "capital" whose collateral is set to wither away in parallel with oil supply. Mr Wolfowitz, the World Bank Chairman, was one of the architects of the Iraq

invasion, and may learn from that experience in planning this venture.

The Plan can be seen on [www.priceofoil.org](http://www.priceofoil.org) (Reference furnished by David Fleming)

### 697. CNN broadcasts a film on Peak Oil

On March 18th and 19th, CNN broadcast an impressive film on the pending oil crisis, entitled *We Were Warned: Tomorrow's Oil Crisis*. While the consequences are well documented and illustrated, the film slightly misses the point by attributing the crisis itself to the impact of a simultaneous hurricane in the United States and an explosion at a Middle East oil facility. It is true that a crisis might indeed be triggered by such events, but the underlying cause is long-term depletion imposed by Nature. That said, the perception of the dawning of the Second Half of the Age of Oil and all that it implies may indeed explode upon the financial world with the force of a hurricane.

### 698. Less from Shell

A presentation by the Chairman of Shell, dated September 2004, gives an upbeat forecast of rising production in terms of oil equivalent, with much coming from gas and tar sand operations. We face as usual the difficulty of obscure definitions but the numbers derived from the pie-diagrams show ordinary oil production declining from 1.9 to 1.2 Mb/d. Much of the new field production is expected to come from deepwater fields, so the position for *Regular Conventional Oil* is even worse. The decline is consistent with the general industry position, although rising prices may protect profits.

	2004	2009	2014
Mboe	3.7-3.8	3.8-4.0	4.5-5.0
Existing fields	50%	40%	25%
New Field		15%	20%
Total Mb/a	1.9	1.6	1.2

[www.cyberasesor.com/shell%20pe2004.pdf](http://www.cyberasesor.com/shell%20pe2004.pdf) (Reference furnished by Chris Bailey)

### 699. ASPO Deutschland

Professor Blendinger reports that the formal formation of ASPO Deutschland is well advanced, and contributes the following item concerning the recognition of Peak Oil in Saudi Arabia

#### GEOARABIA and Peak Oil

GEOARABIA is a leading journal specialized at publishing scientific articles focussing on Middle East petroleum geological aspects. In its latest issue (Vol. 11, No. 2), two articles deal with peak oil. Both were written by the journal's Editor-in-Chief, Moujahed Al-Husseini, and are entitled *When will peak oil occur* (p. 13) and *The debate over Hubbert's peak: a review* (pp. 181-210).

The fact that the first, one-page article, appears as an "Editorial" in this issue, highlights the level at which peak oil is now discussed in the petroleum world. The main article covers 21 (!) pages and documents, and discusses at length the different scenarios of EURR (estimated ultimate recoverable reserves). ASPO activities are extensively quoted.

The main surprise (at least to the writer) is that *Peak Oil* is no longer rejected in such a journal, and that the discussion proceeds in a very un-polemic manner. The main article concludes with a few questions: Does the recent high price of oil represent a temporary supply-demand imbalance that will pass if and when supply rises to 90-100 million barrels/day? Or is the record price a signpost for the world's Hubbert's peak?

As an aside, the same issue of the journal contains a two page advertisement by Chevron with the, now well-known, willyoujoinus.com, content.

### 700. Mission Statement

ODAC, which represents ASPO in the United Kingdom, proposes the following mission statement for the international organisation.

#### ASPO STATEMENT OF AIMS

ASPO (The Association for the Study of Peak Oil and Gas) is a network of non-profit, independent organisations based in many countries. Our shared aims are:

- To evaluate the world's endowment of oil and natural gas
- To evaluate the rate at which reserves of oil and gas can be produced and to assess the security of future sources of supply
- To determine the probable date and impact of the peak and decline of the world's production of oil and gas

- To pursue the release of reliable and transparent data on the world's oil and gas reserves/production rates in order to provide a firm basis for policy-making
- To raise international public awareness and promote better understanding of oil and gas depletion and its consequences
- To urge governments to adopt strategies to mitigate the effects of oil and gas depletion with new policies aimed to cut waste, improve energy efficiency, and bring in alternative energies.
- To promote the adoption of an Oil Depletion Protocol, whereby imports are cut to match supply.
- To warn of the consequences of delay.

### **701. ASPO IRELAND**

Discussions are in progress for the appointment of a new management team to run ASPO IRELAND. It involves development of the website ([www.peakoil.ie](http://www.peakoil.ie)); production of the Newsletter; liaison and co-ordination with the international organisation; media relations; conference organisation as well as the maintenance of the database and depletion model. This new initiative will depend on successful fund-raising and sponsorship.

#### **KEY TO TABLE 2 (APPENDIX)**

##### Columns

A – Production in 2005 in kb/d	J – Future production of known fields (Reserves)
B – Production in 2005 in Gb/a.	K – Total discovered through 2005
C - Cumulative production through 2005	L – Estimated Yet-to-Find
D - Production trend in % over last 5 years	M – Future production from known and new fields
E - Preliminary discovery in 2005 in Gb	N – Total produced by 2075 (Ultimate)
F – Average of published reported reserves	O – Annual production as % of remaining
G – Total production for period of unchanged reports	P - Date when half the total produced
H – Identified non-conventional and false reports	Q – Year of maximum discovery
I - Percent of Total discovered	R – Year of maximum production

#### **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.

April 5	Ireland's Response to Peak Oil, Dublin [Campbell].
April 12	The Future of Oil and Beyond. Austrian biomass. Vienna [Zittel]
April 24	CERI, Calgary, Canada [Gilbert]
April 27	Energy Solutions for New York, New York [Andrews and others]
May 17	Energy Security of Supply, London [Campbell]
May 18-21	Ankelohe Conversations Symposium, Hamburg, Germany [Campbell, Leggett]
June 2	The End of Cheap Oil.....Swiss Energy Foundation, Zurich [Zittel]
June 21-22	Global Commodity Markets, Zurich [Campbell]
July 4	Peak Oil Debate, Limerick University, Limerick, Ireland [Campbell]
July 18-19	ASPO-5 International Conference, San Rossore, Italy

February 15 FII Advisory Group on Energy Brussels [Gilbert]

#### **Note**

The Newsletter is produced and distributed by ASPO IRELAND for perusal by ASPO members and others. It currently has a direct electronic circulation of about 2000 and is reproduced on several websites.

**Permission to reproduce the Newsletter, with acknowledgement, is expressly granted.**

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

RESOURCE BASED PRODUCTION FORECAST											
Revised						18/03/2006					2005
Regular Oil by Country						Regular Oil by Region					
Mb/d	2000	2005	2010	2020	2030	Mb/d	2000	2005	2010	2020	2030
Russia	6.3	9.2	8.5	5.7	3.8	ME GULF	18.5	20	19	19	18
Saudi Arabia	8.0	9.2	9.0	9.0	7.7	EURASIA	11.1	15	15	11	8
Iran	3.7	3.9	3.9	3.9	3.9	N.AMERICA	5.3	4.7	3.6	2.1	1.2
China	3.2	3.6	2.9	1.8	1.1	L.AMERICA	8.0	7.3	6.0	4.0	2.8
USA	4.2	3.6	2.8	1.7	1.0	AFRICA	6.7	7.8	7.4	5.2	3.7
Mexico	3.0	3.3	2.5	1.5	0.9	EUROPE	6.3	5.2	3.6	1.7	0.8
Norway	3.2	2.7	1.9	0.9	0.4	ME OTHER	2.9	2.9	2.2	1.3	0.8
Nigeria	2.0	2.4	2.1	1.6	1.2	THE EAST	4.0	3.7	3.0	2.0	1.3
Kuwait	1.8	2.1	2.0	2.0	2.0	Minor	0.5	0.6	0.7	0.4	0.2
Abu Dhabi	1.9	2.1	2.1	2.1	2.1	Unforeseen			0.4	1.0	2.7
UK	2.5	1.9	1.3	0.6	0.3	Non MEast	45	47	42	29	21
Iraq	2.6	1.8	1.6	2.0	2.0	MEGulf Share	29%	29%	31%	40%	46%
Venezuela	2.6	1.8	1.7	1.4	1.2	<b>WORLD</b>	<b>63</b>	<b>67</b>	<b>62</b>	<b>48</b>	<b>39</b>
Libya	1.4	1.6	2.1	1.6	1.2	<i>Excl. bitumen, heavy, deepwater, polar, NGL</i>					
Algeria	0.8	1.4	1.2	0.9	0.6	<b>Other Liquid Petroleum</b>					
Canada	1.1	1.1	0.8	0.4	0.2	<b>Oil</b>	Mb/d				
Kazakhstan	0.7	1.0	2.1	2.1	2.1	Heavy Oils (#1)	<b>1.7</b>	<b>2.2</b>	<b>3.3</b>	<b>4.5</b>	<b>4.3</b>
Indonesia	1.3	0.9	0.8	0.6	0.4	Canada	1.0	1.2	1.6	2.5	2.5
Malaysia	0.69	0.83	0.64	0.39	0.23	Venezuela I	0.2	0.6	1.2	1.5	1.3
Qatar	0.69	0.80	0.66	0.45	0.30	Venezuela II	0.5	0.3	0.3	0.2	0.2
Oman	0.93	0.77	0.61	0.39	0.25	Other	0.0	0.2	0.2	0.3	0.3
Egypt	0.81	0.70	0.53	0.31	0.18	Deepwater (#2)	<b>1.6</b>	<b>3.6</b>	<b>11.8</b>	<b>6.4</b>	<b>0.6</b>
India	0.65	0.66	0.54	0.35	0.23	G. Mexico	0.6	1.0	2.4	1.7	0.3
Argentina	0.75	0.61	0.46	0.27	0.16	Brasil	0.8	1.6	4.4	1.4	0.1
Angola	0.74	0.59	0.46	0.28	0.17	Angola	0.0	0.6	2.7	1.2	0.0
N.Zone	0.63	0.58	0.49	0.35	0.25	Nigeria	0.0	0.0	1.5	1.2	0.0
Colombia	0.69	0.52	0.40	0.24	0.15	Other	0.2	0.4	0.8	0.8	0.2
Ecuador	0.40	0.51	0.41	0.27	0.17	Polar	<b>1.0</b>	<b>0.9</b>	<b>0.9</b>	<b>2.1</b>	<b>4.4</b>
Syria	0.52	0.48	0.35	0.18	0.10	Alaska	1.0	0.8	0.6	0.4	0.3
Australia	0.72	0.44	0.34	0.21	0.13	Other	0.0	0.1	0.3	1.7	4.1
Azerbaijan	0.28	0.40	1.10	1.10	0.62	Other (#3)	0.0	0.1	0.3	0.5	1.0
Denmark	0.36	0.38	0.26	0.12	0.06	Subtotal	<b>4</b>	<b>7</b>	<b>16</b>	<b>13</b>	<b>10</b>
Dubai	0.28	0.37	0.26	0.13	0.07	<b>Gas &amp; Gas Liquids</b>	(Gas at 6cf=1boe)				
Yemen	0.35	0.35	0.25	0.12	0.06	Gas	39	45	49	55	57
Vietnam	0.30	0.34	0.32	0.21	0.13	Non-con gas	1	2	2	4	7
Sudan	0.19	0.29	0.30	0.21	0.13	Subtotal	<b>40</b>	<b>47</b>	<b>52</b>	<b>59</b>	<b>64</b>
Brasil	0.36	0.26	0.21	0.15	0.10	Gas Liquids					
Congo	0.27	0.24	0.17	0.08	0.04	NGL (#4)	<b>6</b>	<b>7</b>	<b>9</b>	<b>10</b>	<b>10</b>
Gabon	0.33	0.23	0.19	0.12	0.08	<b>All Categories</b>					
Turkmenistan	0.14	0.22	0.19	0.13	0.09	Gas	<b>40</b>	<b>47</b>	<b>52</b>	<b>59</b>	<b>64</b>
Brunei	0.18	0.19	0.14	0.09	0.05	Liquids	<b>74</b>	<b>80</b>	<b>87</b>	<b>72</b>	<b>60</b>
Chad	0.00	0.18	0.25	0.13	0.07	Processing Gain	<b>1.5</b>	<b>1.6</b>	<b>1.7</b>	<b>1.4</b>	<b>1.2</b>
Thailand	0.11	0.18	0.16	0.08	0.04	Total	<b>116</b>	<b>128</b>	<b>140</b>	<b>132</b>	<b>125</b>
Uzbekistan	0.16	0.16	0.15	0.10	0.06	<b>Balance</b>	<i>Demand+1.5%/yr</i>				
Trinidad	0.12	0.15	0.12	0.08	0.06	Liquids Mb/d					
Italy	0.09	0.12	0.09	0.06	0.04	Supply	75	82	89	73	61
Peru	0.10	0.11	0.09	0.07	0.05	Demand	75	82	88	103	119
Romania	0.12	0.10	0.09	0.08	0.07	Balance	0	0	0	-30	-58
Ukraine	0.07	0.09	0.08	0.07	0.05	<b>NOTES</b>					
Cameroon	0.09	0.08	0.06	0.03	0.02	Regular Oil includes condensate (in oilfields)					
Tunisia	0.08	0.07	0.06	0.04	0.03	(#1) Bitumen, Extra-Heavy Oil, Heavy Oil (<17.5)					
Germany	0.06	0.07	0.05	0.03	0.02	(#2) Oil in water depth of more than 500m					
Pakistan	0.04	0.06	0.05	0.03	0.01	(#3) Oil from oil-shales, coal					
Sharjah	0.05	0.05	0.04	0.02	0.01	(#4) Liquids from Natural Gas plants & gasfields					
Papua	0.07	0.05	0.04	0.03	0.02	Base Case Scenario assumes negligible spare capacity with decline at current or midpoint depletion rate, save in Middle East Gulf					
Netherlands	0.05	0.04	0.04	0.03	0.02	ME-Gulf = A.Dhabi, Iran, Iraq, Kuwait, NZ, S.Arabia					
Turkey	0.06	0.04	0.03	0.02	0.01	Eurasia= FSU, E.Europe & China					
Bolivia	0.03	0.04	0.04	0.04	0.03	N.America = USA & Canada					
Bahrain	0.03	0.03	0.03	0.02	0.02	Venezuela I = ordinary heavy					
France	0.03	0.02	0.02	0.01	0.01	Venezuela II = 4 Extra-Heavy oil projects					
Hungary	0.03	0.02	0.02	0.01	0.01	Demand is based on a notional increase of 1.5% a year, which is unlikely to be met as shortages grow and prices soar.					
Croatia	0.02	0.02	0.02	0.01	0.01						
Austria	0.02	0.02	0.01	0.01	0.01						
Chile	0.01	0.01	0.01	0.00	0.00						
Albania	0.01	0.01	0.01	0.01	0.00						

REGULAR CONVENTIONAL OIL PRODUCTION TO 2075 (Excluding heavy, deepwater and polar oils, and NGL)															Reference Date: end 2005 Revised 18/03/2006				
Country	Region	KNOWN FIELDS										NEW	ALL	TOTAL	DEPLETION		PEAK		
		Present		Past	Reported Reserves			%	Future	Total	FIELDS	FUTURE		Rate	Mid	Disc	Prod		
		kb/d 2005	Gb/a 2005	Gb	5yr Trend	Disc 2005	Average	Deductions Static Other	% Disc.	Gb	Found	Gb	Gb	Gb	Gb	Gb			
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R		
Saudi Arabia	A	9155	3.34	104	4%	0.3	262	0.00	0.0	94%	154	258	17.1	171.2	275	1.9%	2015	1948	2014
Russia	B	9215	3.36	134	7%	0.7	75	-9.61	-37.0	92%	73.0	207	18.3	91.3	225	3.6%	1996	1960	1987
USA	C	1084	1.31	175	-3%	0.1	24	0.00	-7.6	99%	22.9	197	1.9	25.4	200	4.9%	1971	1930	1971
Iran	A	3880	1.42	58.6	1%	0.5	132	0.00	0.0	91%	69.2	128	12.2	81.4	140	1.7%	2013	1961	1974
Iraq	A	1840	0.67	29.3	-4%	0.0	115	-9.00	0.0	93%	63.6	92.9	7.1	70.7	100	0.9%	2029	1928	2020
Kuwait	A	2140	0.78	33.0	5%	0.0	100	0.00	0.0	94%	51.3	84.3	5.7	57.0	90	1.4%	2023	1938	1971
Venezuela	D	1806	0.66	48.1	-5%	0.1	71	0.00	0.0	93%	33.5	81.6	5.9	39.4	88	1.6%	1999	1941	1970
Abu Dhabi	A	2050	0.75	20.1	2%	0.1	89	-11.00	0.0	93%	40.4	60.5	4.5	44.9	65	1.6%	2022	1964	2015
China	B	3635	1.33	32.4	2%	0.1	18	-3.85	0.0	95%	24.8	57.2	2.8	27.6	60	4.6%	2003	1959	2005
Mexico	D	3320	1.21	33.7	1%	0.2	17	0.00	0.0	94%	19.0	52.6	3.4	22.3	56	5.1%	2000	1977	2004
Libya	E	1640	0.60	24.6	4%	0.0	38	0.00	-6.0	92%	25.9	50.4	4.6	30.4	55	1.9%	2009	1961	1970
Nigeria	E	2379	0.87	24.9	3%	0.1	36	0.00	-6.0	92%	25.6	50.5	4.5	30.1	55	2.8%	2004	1967	2005
Kazakhstan	B	970	0.35	7.0	7%	0.7	26	-1.03	0.0	91%	36.9	43.9	4.1	41.0	48	0.9%	2030	2000	2020
Norway	F	2710	0.99	19.5	-4%	0.2	9	0.00	0.0	94%	10.6	30.1	1.9	12.5	32	7.3%	2001	1979	2007
Indonesia	G	945	0.34	20.9	-4%	0.1	5	0.00	0.0	97%	10.0	30.9	1.1	11.1	32	3.0%	1993	1945	1971
UK	F	1865	0.68	21.8	-4%	0.2	5	0.00	0.0	97%	7.4	29.2	0.8	8.2	30	7.7%	1997	1974	1999
Algeria	E	1350	0.49	13.5	12%	0.0	13	0.00	0.0	92%	12.3	25.8	2.2	14.5	28	3.6%	2006	1956	2006
Canada	C	1084	0.40	20.0	1%	0.1	51	0.00	-17.4	97%	5.1	25.1	1.2	6.0	26	6.2%	1988	1958	1973
Azerbaijan	B	400	0.15	8.5	7%	0.1	7	-0.37	0.0	91%	10.6	19.1	1.9	12.5	21	1.2%	2013	1871	2015
Qatar	H	800	0.29	7.6	4%	0.0	18	-1.08	-25.0	90%	5.9	13.5	1.5	7.4	15	3.8%	2005	1940	2005
Egypt	E	696	0.25	9.5	-2%	0.1	4	-0.79	0.0	95%	3.9	13.3	0.7	4.5	14	5.3%	1995	1965	1995
Oman	H	765	0.28	7.8	-4%	0.0	6	-1.54	0.0	96%	5.5	13.4	0.6	6.2	14	4.3%	2002	1962	2001
N.Zone	A	575	0.21	7.3	0%	0.0	5	-3.00	0.0	93%	5.3	12.6	0.9	6.2	14	3.3%	2002	1951	2000
Argentina	D	608	0.22	9.0	-4%	0.1	2.7	0.00	0.0	98%	3.8	12.8	0.2	4.0	13	5.3%	1996	1960	1998
India	G	660	0.24	6.3	1%	0.1	5.1	0.00	0.0	95%	5.1	11.4	0.6	5.7	12	4.1%	2003	1974	2004
Malaysia	G	828	0.30	6.2	2%	0.1	3.8	-0.91	0.0	95%	5.2	11.4	0.6	5.8	12	5.0%	2004	1973	2004
Colombia	D	520	0.19	6.3	-3%	0.1	1.5	-0.58	0.0	94%	3.1	9.4	0.6	3.7	10	4.9%	1999	1992	1999
Angola	E	595	0.22	5.3	-3%	0.0	8.1	-2.09	-9.7	91%	3.4	8.7	0.8	4.2	9.5	4.9%	2003	1971	1998
Australia	G	440	0.16	6.3	-6%	0.1	3.2	-0.32	-1.0	90%	2.2	8.5	1.0	3.2	9.5	4.8%	1997	1967	2000
Romania	B	100	0.04	5.9	-3%	0.1	0.8	0.00	0.0	92%	1.5	7.4	0.6	2.1	8.0	1.7%	1970	1857	1976
Ecuador	D	510	0.19	3.8	5%	0.1	4.8	0.00	0.0	97%	4.0	7.8	0.2	4.2	8.0	4.3%	2006	1969	2005
Brasil	D	255	0.09	5.0	-6%	0.1	8.4	0.00	-22.0	97%	2.3	7.2	0.3	2.5	7.5	3.6%	1997	1975	1986
Syria	H	475	0.17	4.3	-2%	0.0	2.7	-2.36	0.0	96%	2.4	6.7	0.3	2.7	7.0	6.1%	2000	1966	1995
Dubai	H	367	0.13	4.1	7%	0.0	2.6	0.00	0.0	88%	1.1	5.3	0.7	1.9	6.0	6.7%	1991	1970	1991
Turkmenistan	B	220	0.08	3.2	8%	0.1	1.18	-0.41	0.0	89%	1.7	4.9	0.6	2.3	5.5	3.3%	1999	1964	1973
Gabon	E	234	0.09	3.1	-4%	0.0	2.43	-0.80	0.0	92%	1.5	4.6	0.4	1.9	5.0	4.3%	1999	1985	1996
Trinidad	D	145	0.05	3.3	6%	0.1	0.94	-0.20	0.0	91%	1.0	4.3	0.4	1.4	4.8	3.6%	1986	1959	1981
Ukraine	B	85	0.03	2.8	3%	0.1	0.66	-0.18	0.0	86%	1.1	3.9	0.6	1.7	4.5	1.7%	1989	1962	1970
Brunei	G	185	0.07	3.2	0%	0.0	1.21	-0.92	0.0	97%	1.2	4.4	0.1	1.3	4.5	4.9%	1990	1929	1978
Vietnam	G	340	0.12	1.3	2%	0.1	1.71	-0.89	-0.3	96%	3.1	4.3	0.2	3.2	4.5	3.7%	2009	1975	2005
Peru	D	105	0.04	2.4	3%	0.0	0.92	0.00	0.0	91%	1.0	3.4	0.3	1.3	3.8	2.8%	1988	1861	1983
Yemen	H	350	0.13	2.0	0%	0.1	3.44	-1.65	0.0	86%	1.2	3.2	0.5	1.8	3.8	6.8%	2004	1978	1999
Sudan	E	290	0.11	0.5	9%	0.0	3.46	-0.38	0.0	79%	2.2	2.8	0.7	3.0	3.5	5.0%	2014	1980	2010
Denmark	F	378	0.14	1.7	2%	0.1	1.40	0.00	0.0	77%	1.0	2.7	0.8	1.8	3.5	7.3%	2005	1971	2004
Congo	E	240	0.09	1.8	-2%	0.1	1.65	-0.97	-0.5	82%	0.7	2.5	0.5	1.2	3.0	6.7%	2002	1984	2000
Uzbekistan	B	160	0.06	1.2	2%	0.0	0.64	-0.33	0.0	81%	1.0	2.2	0.5	1.5	2.8	3.7%	2008	1992	1998
Germany	F	70	0.03	2.0	0%	0.0	0.34	0.00	0.0	96%	0.4	2.4	0.1	0.5	2.5	4.9%	1977	1952	1966
Tunisia	E	72	0.03	1.3	1%	0.0	0.48	-0.18	0.0	96%	0.7	1.9	0.1	0.7	2.0	3.5%	1995	1971	1981
Chad	E	180	0.07	0.2		0.1	1.14	0.00	0.0	63%	1.1	1.3	0.7	1.8	2.0	6.1%	2015	1977	2008
Italy	F	115	0.04	1.0	6%	0.1	0.61	-0.12	-0.3	93%	0.8	1.9	0.1	1.0	2.0	4.0%	2005	1981	2005
Thailand	G	180	0.07	0.6	12%	0.0	0.54	0.00	0.0	94%	1.0	1.6	0.1	1.1	1.7	5.7%	2009	1981	2007
Cameroon	E	82	0.03	1.1	1%	0.0	0.40	-0.74	0.0	95%	0.4	1.5	0.1	0.5	1.6	5.8%	1995	1977	1986
Bahrain	H	34	0.01	1.0	2%	0.0	0.12	-0.02	0.0	92%	0.4	1.4	0.1	0.5	1.5	2.5%	1985	1932	1970
Netherlands	F	44	0.02	0.9	-2%	0.0	0.13	-0.05	0.0	93%	0.4	1.3	0.1	0.5	1.4	3.4%	1990	1980	1987
Bolivia	D	41	0.01	0.5	7%	0.1	2.72	-0.05	0.0	87%	0.6	1.1	0.2	0.8	1.3	1.9%	2016	1966	2010
Turkey	H	42	0.02	0.9	-3%	0.0	0.30	-0.05	0.0	90%	0.2	1.1	0.1	0.3	1.2	4.5%	1992	1969	1991
Hungary	B	20	0.01	0.7	-3%	0.0	0.14	0.00	0.0	100%	0.2	1.0	4.1	0.3	1.0	2.4%	1987	1964	1987
Croatia	B	18	0.01	0.5	-4%	0.0	0.07	0.00	0.0	83%	0.3	0.8	0.2	0.5	1.0	1.3%	2003	1950	1988
France	F	22	0.01	0.7	-4%	0.0	0.15	0.00	0.0	95%	0.2	0.9	0.1	0.3	1.0	3.0%	1987	1958	1988
Austria	F	17	0.01	0.8	-2%	0.0	0.07	-0.01	0.0	92%	0.1	0.9	0.1	0.2	1.0	2.9%	1970	1947	1955
Pakistan	G	64	0.02	0.5	1%	0.0	0.29	0.00	0.0	92%	0.3	0.8	0.1	0.4	0.9	5.9%	2001	1983	1992
Papua	G	46	0.02	0.4	-4%	0.0	1.00	-0.05	0.0	97%	0.5	0.9	0.0	0.5	0.9	3.2%	2006	1987	1993
Albania	B	6	0.00	0.5	0%	0.0	0.19	0.00	0.0	92%	0.2	0.7	0.1	0.3	0.8	0.8%	1986	1928	1983
Sharjah	H	50	0.02	0.5	1%	0.0	1.50	-0.08	0.0	69%	0.0	0.6	0.2	0.3	0.8	6.2%	1998	1980	1997
Chile	D	10	0.00	0.4	9%	0.0	0.13	-0.03	0.0	99%	0.1	0.5	0.0	0.07	0.5	5.1%	1979	1960	1982
Regions																			
M.East Gulf	A	19640	7.17	252	2%	0.9	701	-23	0	93%	384	258	48	431	684	1.6%	2018	1948	1974
Eurasia	B	14829	5.41	196	5%	1.9	121	-16	-37	92%	151	348	30	181	378	2.9%	2003	1964	1987
N.America	C	4672	1.71	195	-2%	0.2	75	0	-181	98%	28	223	4	31	226	5.2%	1977	1930	1972
L.America	D	7321	2.67	113	-1%	0.8	110	-1	-22	94%	68	181	11	80	192	3.2%	1999	1977	1998
Africa	E	7758	2.83	86	3%	0.3	106	-6	-22	91%	78	163	15	93	179	3.0%	1999	1961	2006
The East	G	3688	1.35	46	-1%	0.6	21	-3	-1	95%	29	74	4	32	78	4.0%	1999	1967	2000
Europe	F	5221	1.91	48	-3%	0.6	16	0	0	95%	21	69	4</						