

# S E Asia; \$100 Oil and Geoscience

## 2022 Update

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In January 2008, I gave the following talk at KLEX

## **S E Asia and \$100 Oil**

Industry status, emerging trends  
and future challenges as seen by  
Singapore Scout Check Members

**Peter B Woodroof**

Genting Oil & Gas

Singapore Scout Check Chairman

KLEX 30<sup>th</sup> January 2008

This is an update and a review of industry changes since 2008

# The Asia-Pacific Scout Check

In 2008 the operators group was called the Singapore Scout Check (SSC). In 2013 the SSC changed its name to the Asia-Pacific Scout Check (APSC)

In 2008 there were over **80** operating companies. This increased to **104** in 2013. Currently (2022) there are **45** members

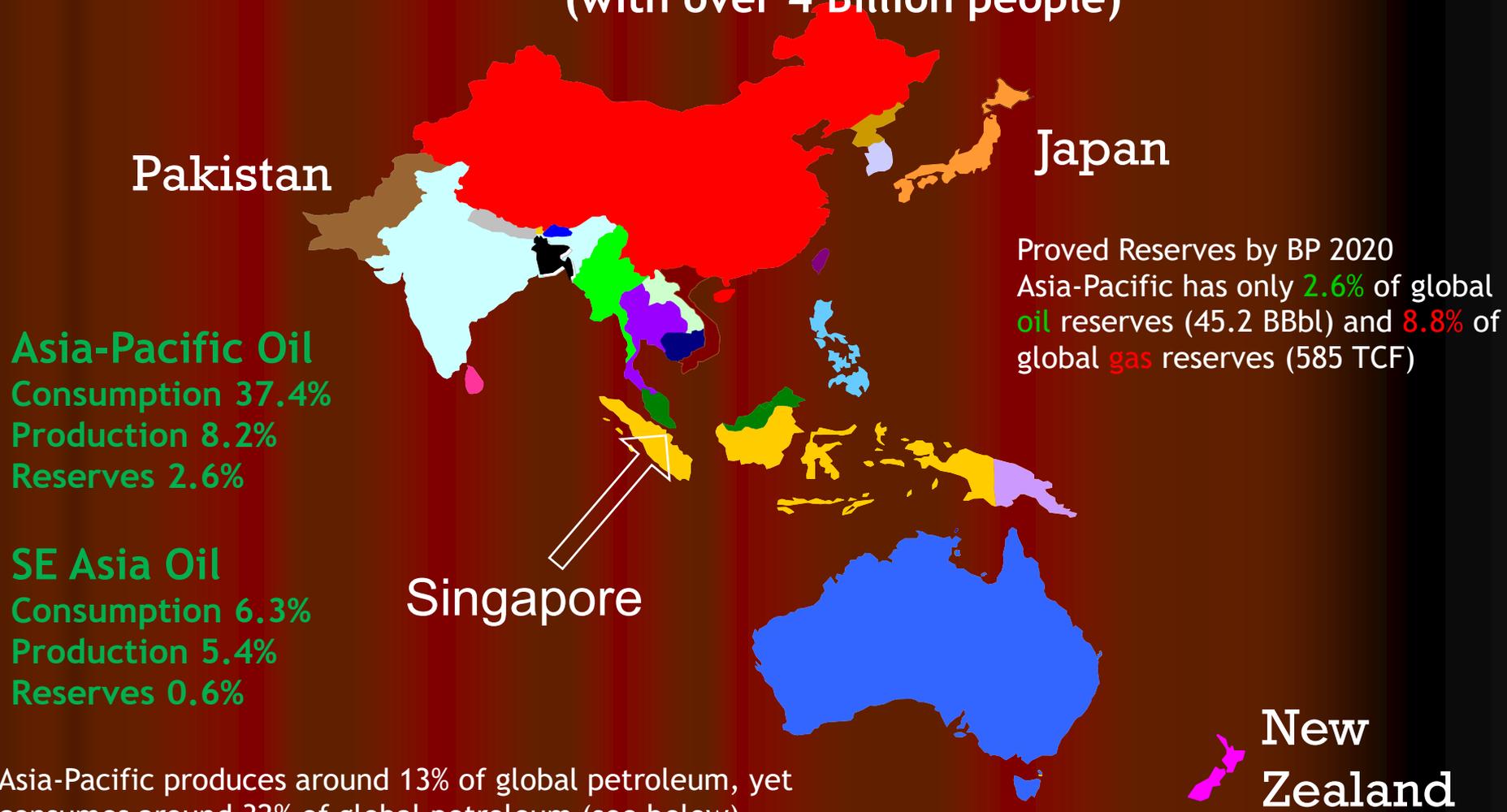
From 2008 to 2022, the number of IOCs and NOCs only declined slightly, but the number of **small independent oil companies** dramatically reduced from 42 to only **15** (most were in SE Asia)





# For Reference, the APSC Region Covers Half of the World

(with over 4 Billion people)



Pakistan

Japan

**Asia-Pacific Oil**  
Consumption 37.4%  
Production 8.2%  
Reserves 2.6%

**SE Asia Oil**  
Consumption 6.3%  
Production 5.4%  
Reserves 0.6%

Singapore

Proved Reserves by BP 2020  
Asia-Pacific has only 2.6% of global oil reserves (45.2 BBbl) and 8.8% of global gas reserves (585 TCF)

New Zealand

Asia-Pacific produces around 13% of global petroleum, yet consumes around 32% of global petroleum (see below)

$$\begin{aligned} \text{Asia-Pacific Petroleum Yearly Production (\% Global)} &= 2.68 \text{ BBbl oil (8.2\%)} + 23 \text{ TCF gas (16.6\%)} \\ \text{Asia-Pacific Petroleum Yearly Consumption} &= 13.23 \text{ BBbl oil (37.4\%)} + 32.1 \text{ TCF gas (22.7\%)} \end{aligned}$$

In 2007, Scout Check members indicated that the most important issues for the E & P business were:-

- 1) Oil prices & investment - 87% of members
- 2) Increased drilling (and other) costs & its impact  
- 87% of members
- 3) Difficulty in finding appropriate staff & poor work  
- 69% of members

While the least important issue was considered as:-

- 4) Growth of renewable energy  
- 74% of members

I will update these items along with a 5th 'Other Technical & Financial Issues'

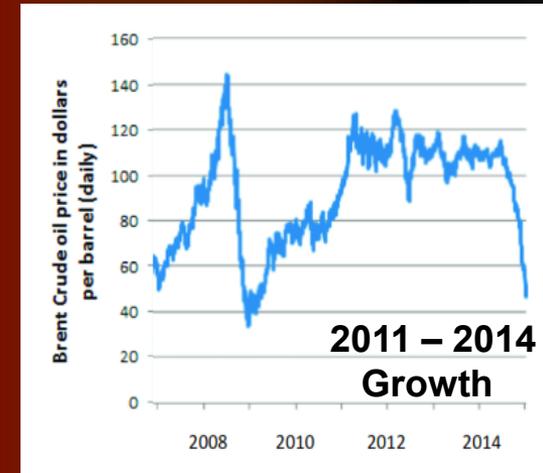
# 1) Update on Oil Prices & Investment

In early November 2007, Tapis crude exceeded US\$100/bbl. The price of Tapis light sweet is frequently the highest in the world. In 2008, Tapis crude was the primary regional benchmark, but since 2011 Malaysia has priced all its crude in reference to dated Brent

Oil prices peaked in June 2008 (equivalent to over US\$ 163 / bbl today), then dropped in early 2009, but recovered to stay above US\$ 100 / bbl (in 2022-adjusted \$) for most of 2011, 2012, 2013 & 2014 - **providing a 4-year upstream growth period**

Since hitting a low of US\$ 20 / bbl in April 2020, Brent oil prices have increased, and in late February 2022 Brent crude once again exceeded US\$ 100 / bbl

Geopolitical and economic events frequently impact oil markets

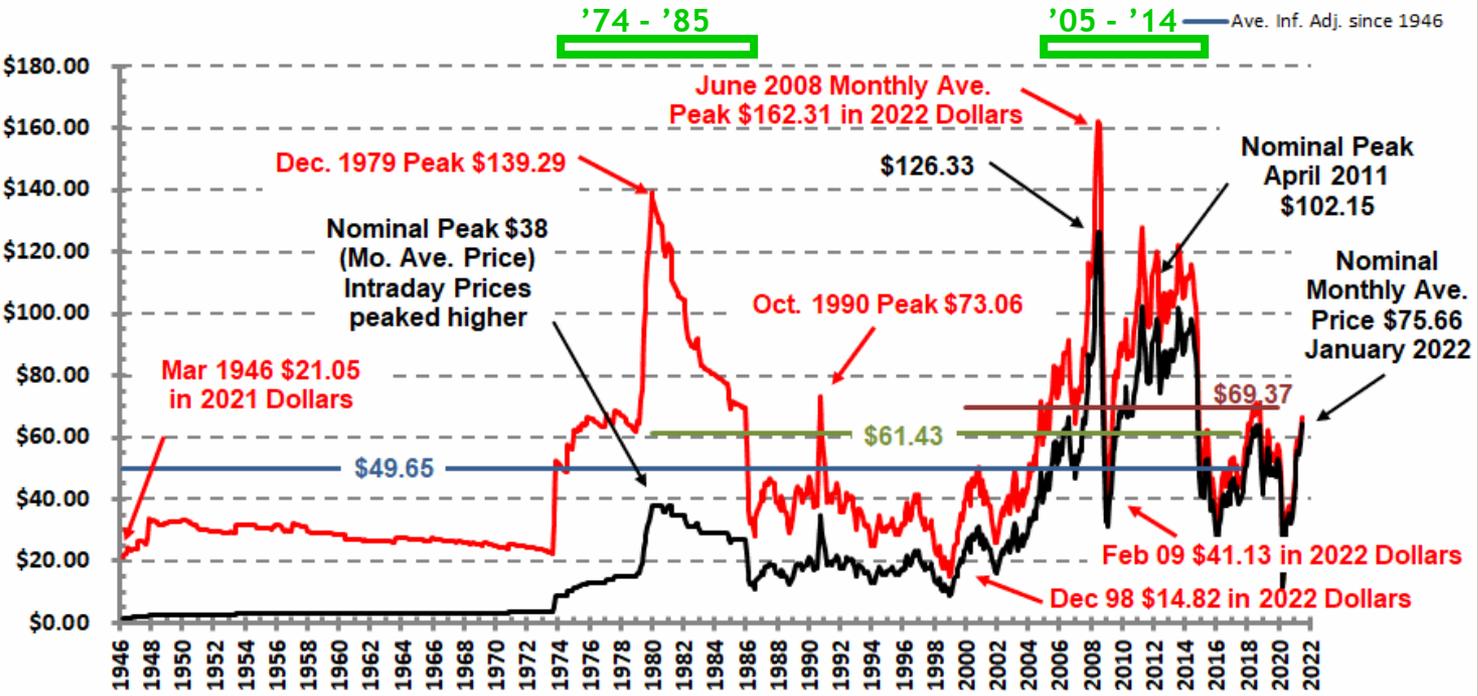


# US Crude: Inflation-Adjusted Oil Price Chart

Two prior periods of +\$60 oil prices (from **1974 to 1985**; and **2005 to 2014**)

**Inflation Adjusted Monthly Average CRUDE OIL PRICES**  
 (1946-Present) In January 2022 Dollars  
 © www.InflationData.com  
 Updated 2/10/2022

- Inf. Adj. Oil Price
- Nominal Oil Price
- Ave. Inf. Adj. Since 2000
- Ave. Inf. Adj. Since 1980
- Ave. Inf. Adj. since 1946



76 year period

Illinois sweetcrude price: Based on data from Plains All American

Each period lasted around 10 years (but were separated by 20 years)

Note the short-term but very significant impact of the Financial Crisis in early 2009

June 2008 oil prices are still the highest

# Recent Oil Price Movements

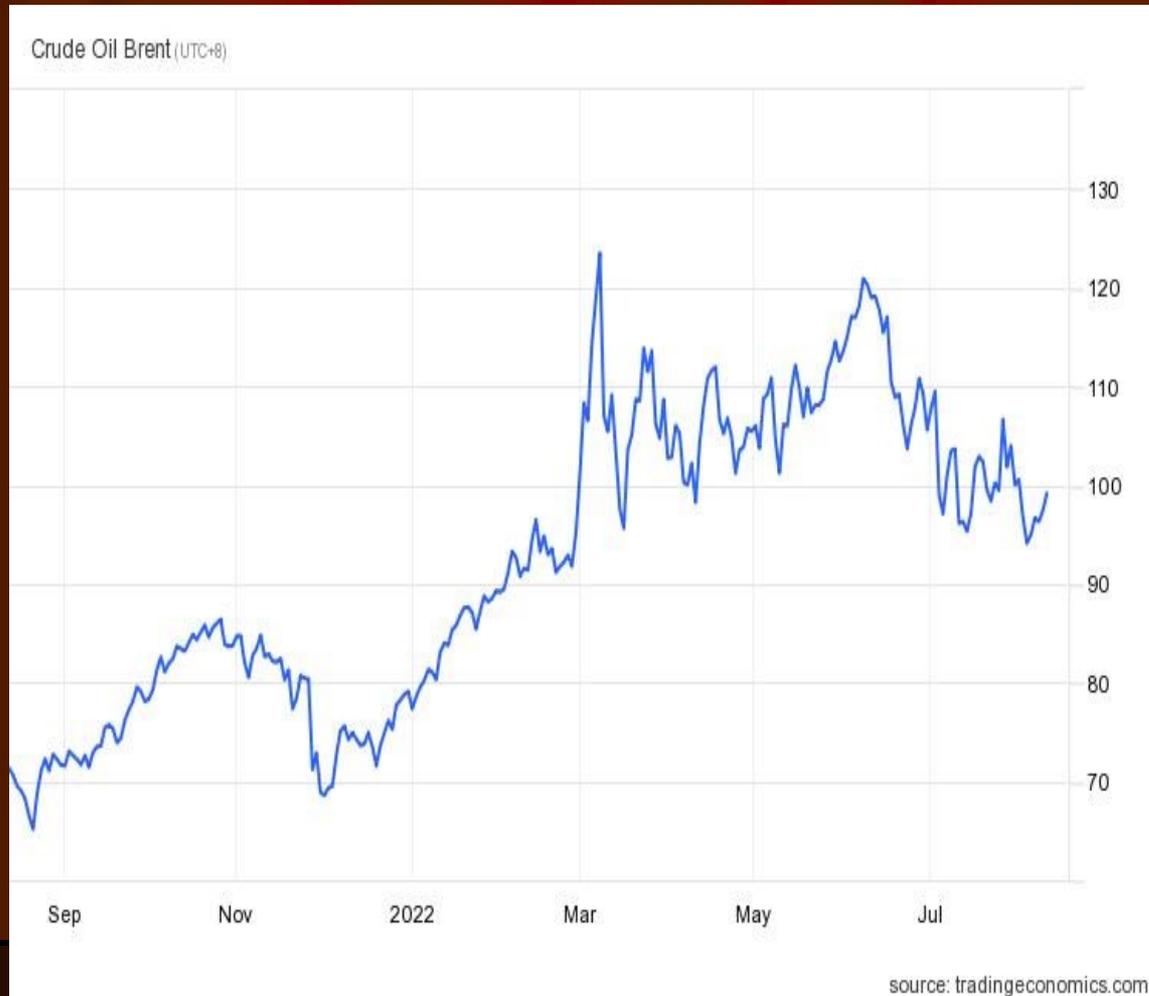
The latest period of 'high' +\$70 Brent oil prices actually started in mid 2021 (only 7 years after the last). It is just beginning to feed through to increased investment. The Russian oil embargo is also supporting higher prices, but

other factors are in play

Many factors have changed when compared to previous periods of high oil prices

So determining where prices will go, or how much new upstream investment will come, is uncertain

Because Russia benefits from high oil prices, great efforts are being made to reduce them (e.g. requesting Saudi and others to increase production)



A wide variety of attempts are currently being made to reduce the oil price, besides requesting for increased production

For example,

In March 2022 the OECDs policy advisor - the IEA - issued a plan to cut oil use (see plan in chart)

## A 10-Point Plan to Cut Oil Use

Immediate actions in advanced economies can cut oil demand by 2.7 million barrels a day in the next 4 months.

### Action 1



**Reduce speed limits on highways by at least 10 km/h**

Impact: Saves around 290 kb/d of oil use from cars, and an additional 140 kb/d from trucks.

### Action 2



**Work from home up to three days a week where possible**

Impact: One day a week saves around 170 kb/d; three days saves around 500 kb/d.

### Action 3



**Car-free Sundays in cities**

Impact: Every Sunday saves around 380 kb/d; one Sunday a month saves 95 kb/d.

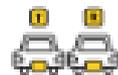
### Action 4



**Make the use of public transport cheaper and incentivise micro-mobility, walking and cycling**

Impact: Saves around 330 kb/d.

### Action 5



**Alternate private car access to roads in large cities**

Impact: Saves around 210 kb/d.

### Action 6



**Increase car sharing and adopt practices to reduce fuel use**

Impact: Saves around 470 kb/d.

### Action 7



**Promote efficient driving for freight trucks and delivery of goods**

Impact: Saves around 320 kb/d.

### Action 8



**Using high-speed and night trains instead of planes where possible**

Impact: Saves around 40 kb/d.

### Action 9



**Avoid business air travel where alternative options exist**

Impact: Saves around 260 kb/d.

### Action 10



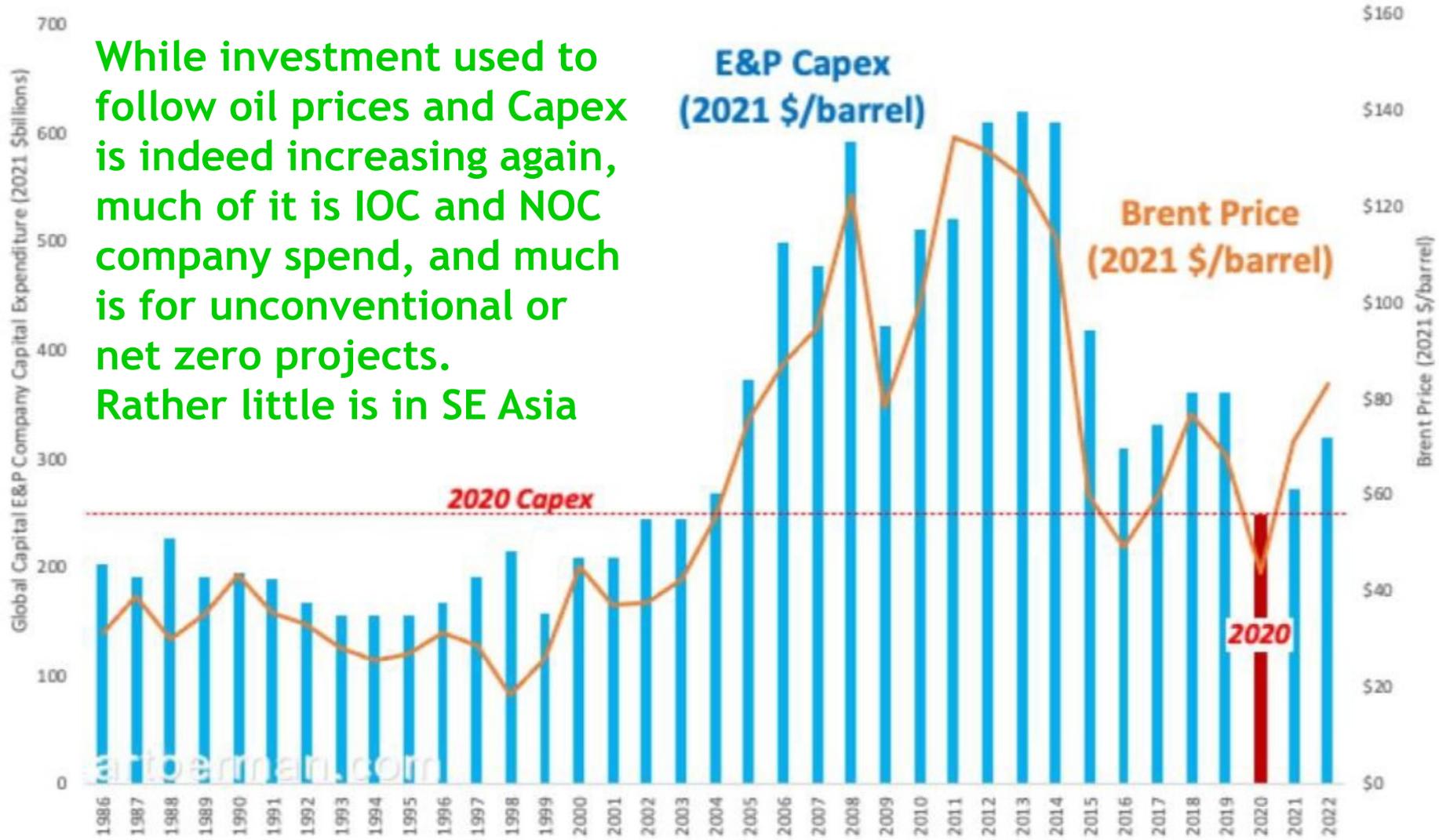
**Reinforce the adoption of electric and more efficient vehicles**

Impact: Saves around 100 kb/d.

# Global E&P Capex in 2021 \$: 1986 to 2022 (37 years)

High oil prices are followed by increased investment in upstream oil & gas  
Capex was low from 1986 to 2001; but high 2005 to 2015 (oil price linked)

While investment used to follow oil prices and Capex is indeed increasing again, much of it is IOC and NOC company spend, and much is for unconventional or net zero projects. Rather little is in SE Asia



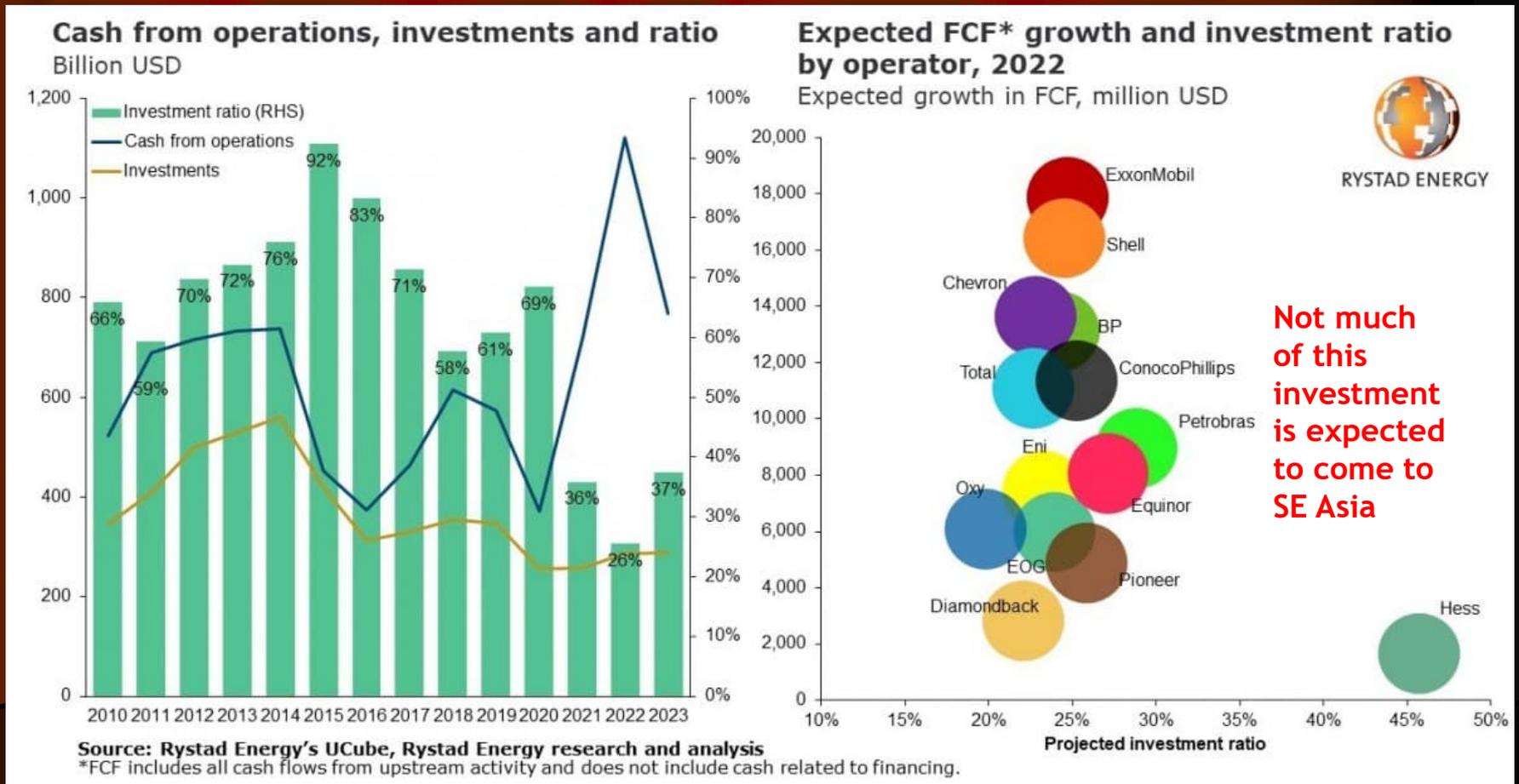
# Investment and Jobs in E&P

Since 2014, the financial credit previously available to oil companies has been severely restricted

- Net Zero policies have successfully halted much E&P investment
- More emphasis has been placed on profit margins, rather than on production growth
- Investment has moved to wind & solar in the belief that this electricity would replace that from fossil fuels
- Consequently it became almost impossible for small private oil companies (as had proliferated prior to 2013) to raise capital and create jobs
- However, we are now beginning to see some Government-instructed return of capital into petroleum E&P

# Investment by Public E&P Companies

Publicly listed E&P companies are expected to have record profits in 2022. Their E&P investment dropped significantly in 2021 and 2022, and may not increase much in 2023. Much of their 2021 profit was spent on reducing debt, and much of their 2022 profit is expected to be paid to shareholders



# Summary of Oil Prices and Investments

We have entered the 3<sup>rd</sup> period of  
> \$ 60 / bbl high oil prices, partly supported by  
the embargo on some Russian oil; but major efforts  
are being made to reduce oil usage and oil prices

While renewed investment in  
upstream oil & gas is being seen,  
it will not be as significant or as broad as that in  
the late '70s and 2011-2014

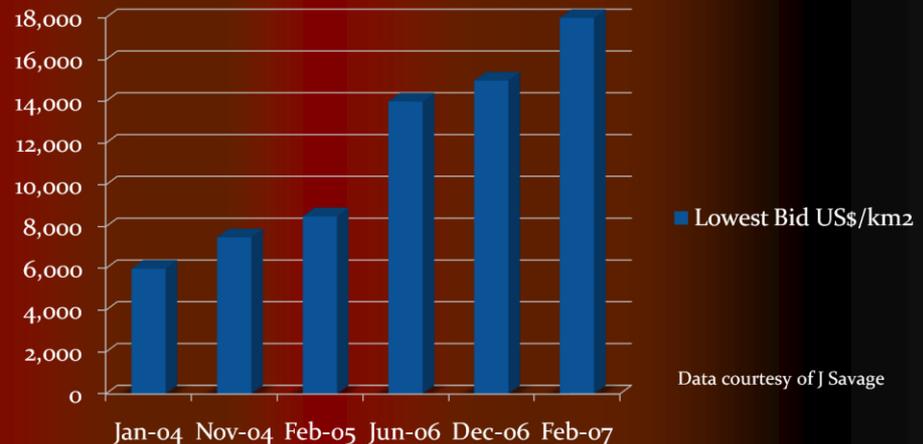
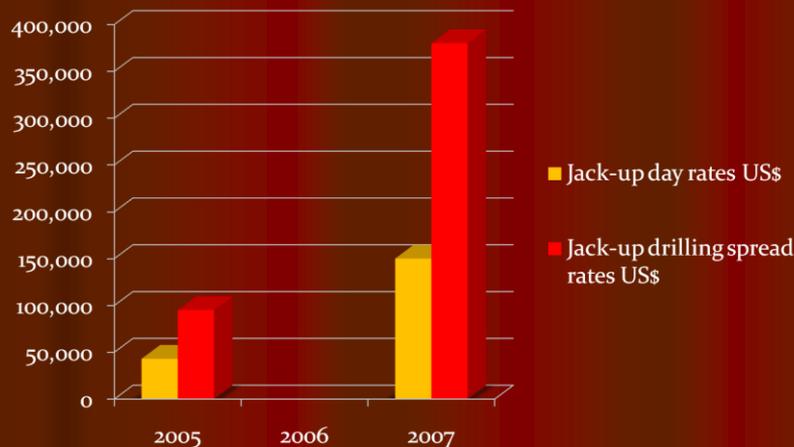
## 2) Increased drilling (and other) costs The impact on Upstream Activity

After 2005, along with increased oil prices we saw a major rise of drilling and other costs. For SE Asia this led to:-

Less exploration than expected

Delays for rigs or boats

Poorer economics for many projects



Rig and Seismic contractors were trying to maximize gains after years of being squeezed. New-build rigs and vessels were high-spec, but with very high rates

# The Impact of Cost Increases after 2005 on PSC Projects

“The increase in exploration costs has been offset by oil price rises; but under PSC regimes e.g. India, Indonesia, Malaysia, Vietnam, the impact can be less”

However, under PSC regimes this increased cost recovery was often viewed as a national loss. This led to:-

- intense scrutiny and audit of cost recovery claims
- more exceptions
- even contract renegotiations

Since 2021 we have seen some of the same dynamics, but this time:-

- as yet no rapid increase in service company costs
- PSC improvements look set to stay



**From 2005 to 2015, increased oil prices created ideal conditions for new companies and new investment**

**New companies obtained funding from stock exchange listings especially SPACs, from new private equity, and the Risk Service Contract model in Malaysia**

**Not everyone thought this was good - the following comments were made by SSC members regarding these new oil companies**



*“there is increased competition from non-exploration and investment companies with little technical experience or understanding”*

*“companies seeking assets for IPO has created a class of buyers whose economic perspective on exploration risk and asset values does not match that of companies engaged in more conventional E&P”*

**Current high oil prices might again cause an increase in new companies, but this will be subdued as funding is much harder to obtain**

# Summary of Increased Costs & Activity

Upstream cost increases (following the oil price rise of 2005)

triggered an upsurge of newly-funded oil companies  
and oil service companies looking to become oil companies

For example, there are now over 10 Malaysian-owned or  
Malaysian-based oil companies

Similar changes have happened in other SE Asian countries

### 3) Difficulty in finding appropriate staff and poor geoscience work quality

After 2005, many operating companies indicated that access to qualified staff was affecting their activities. However, they often stated that they had become more efficient

Yet the most cited problem was that:-

“work had been delayed or was of poor quality”

This problem has not gone away

If activity levels pick-up, this quality problem may once again become more obvious. However, outsourcing overseas is easier



Petroleum geoscience covers a wide range of scientific and technical disciplines that require many years to master

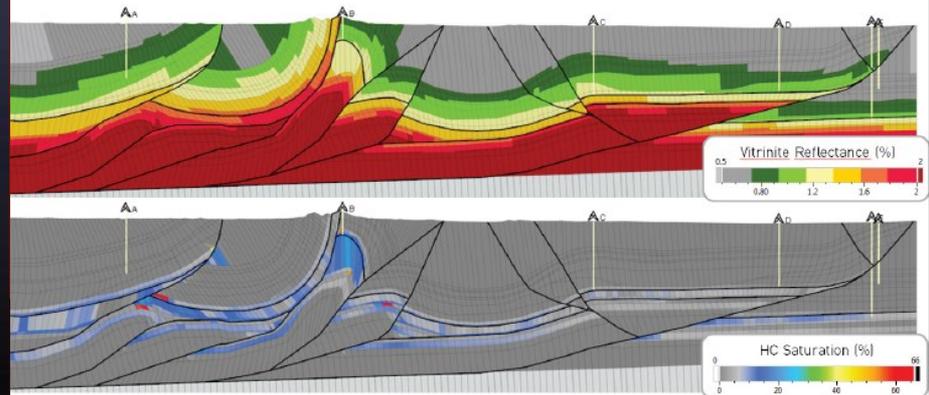
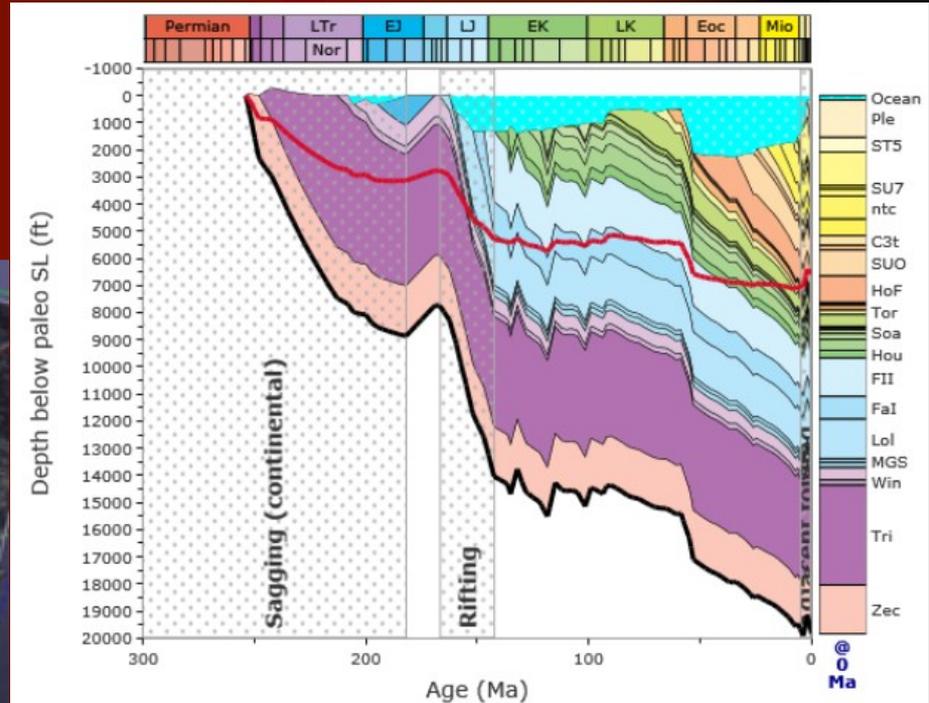
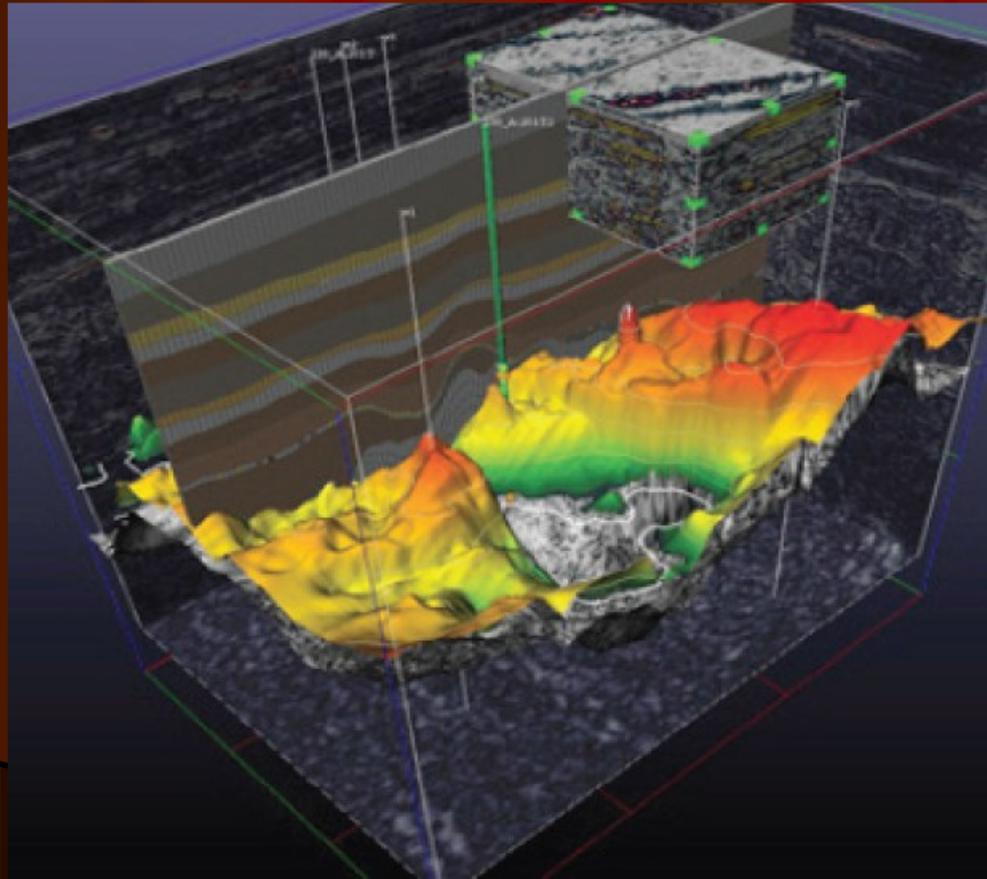
# We Missed the Last Crew Change

It is now imperative that important geoscience skills and knowledge are passed along to younger geoscientists

We plan to raise the profile of this important issue



# Since 2007 there has been a proliferation of comprehensive and exciting new geoscience software tools



**However, the geoscience needed to support these new tools has not always kept pace**

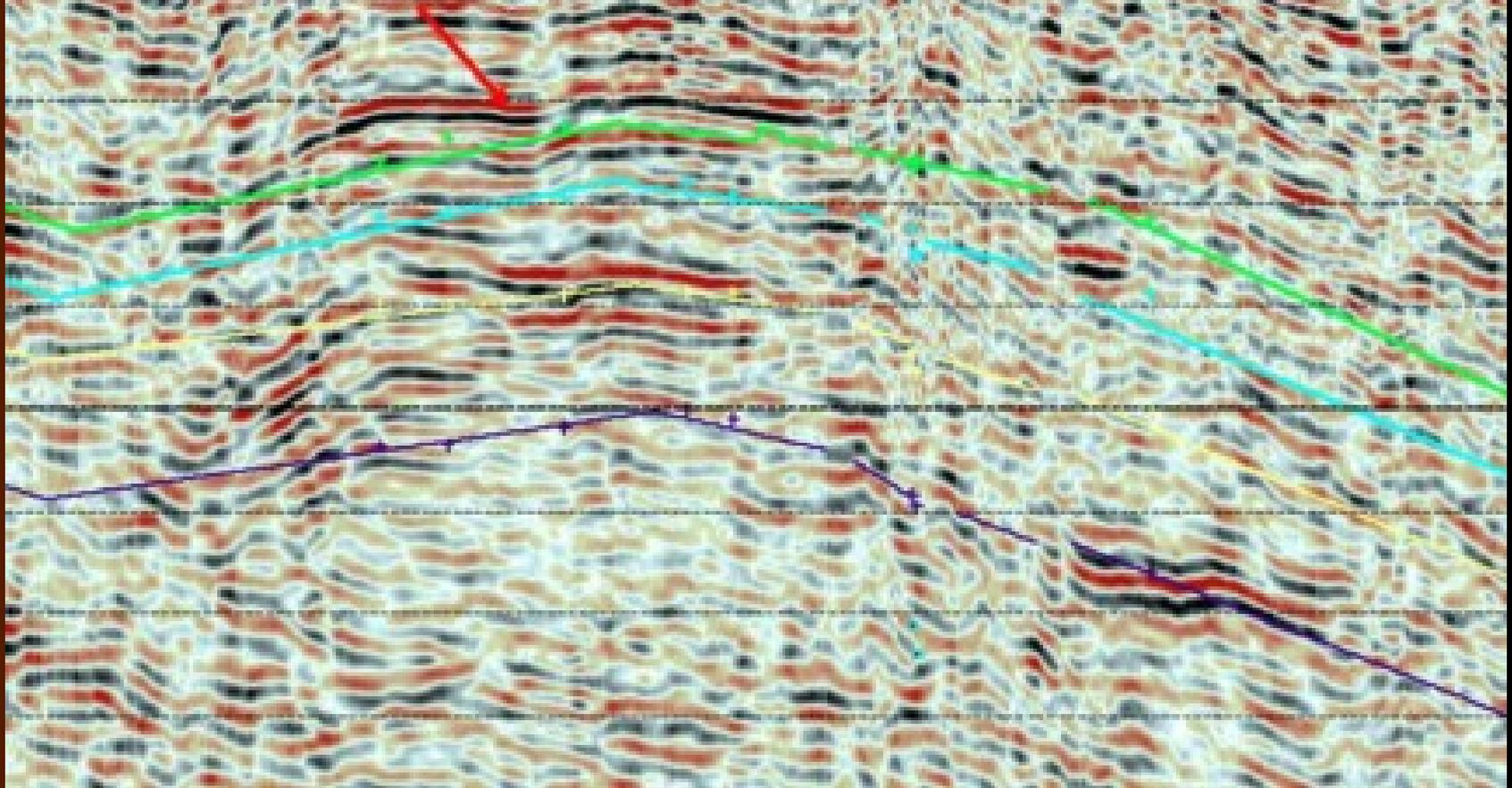
**Some examples follow, of areas of petroleum geoscience in need of improvement:-**

**These examples have been raised to me over the years by various geoscientists, while some derive from my own observations**



# 2D Seismic Interpretation and mapping skills are nearly lost

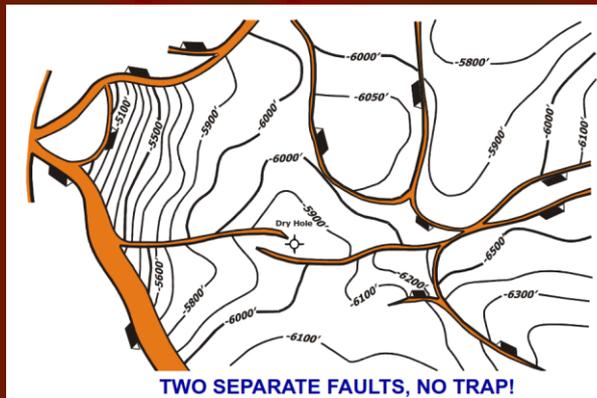
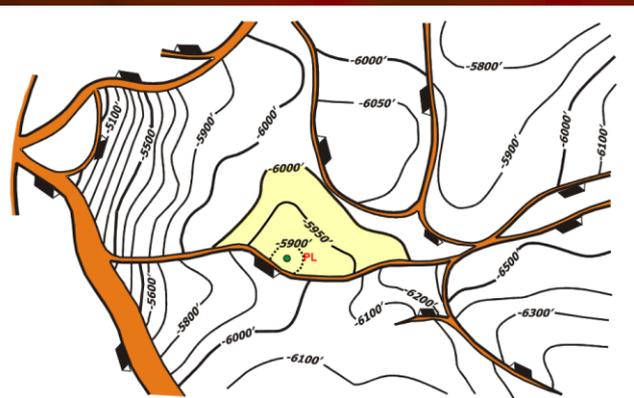
Simple line-tie interpretation without re-iterative mapping



2D seismic requires constant interpretation, mapping, re-interpretation etc

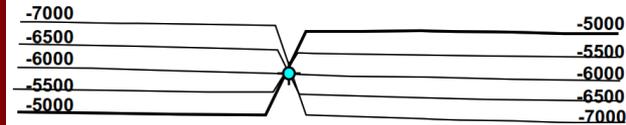
# Mapping skills (especially using 2D seismic) are frequently lacking

Faults are often poorly interpreted and mapped. To correctly map fault patterns and the contours around them requires much work, structural understanding and then editing (work that is infrequently undertaken)

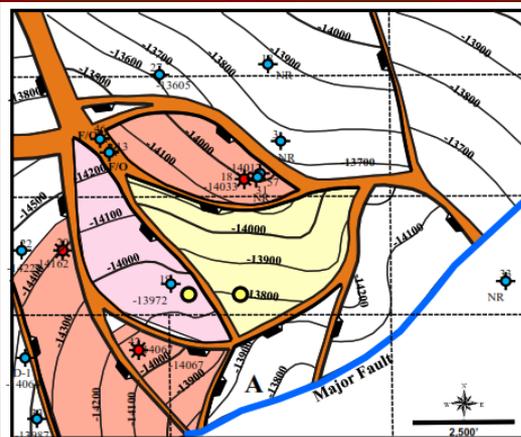


TWO SEPARATE FAULTS, NO TRAP!

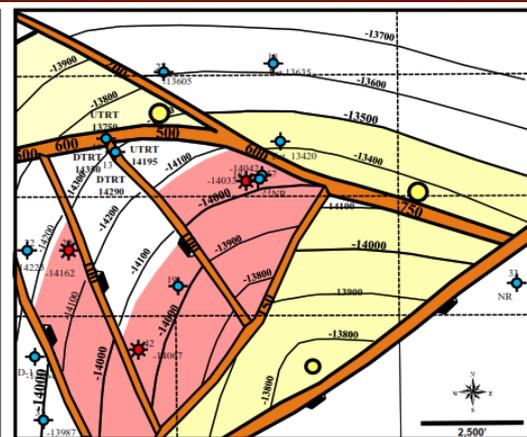
A fault surface map would have prevented this dry hole



A fault surface map takes a few hours to construct.



Incorrect



Correct

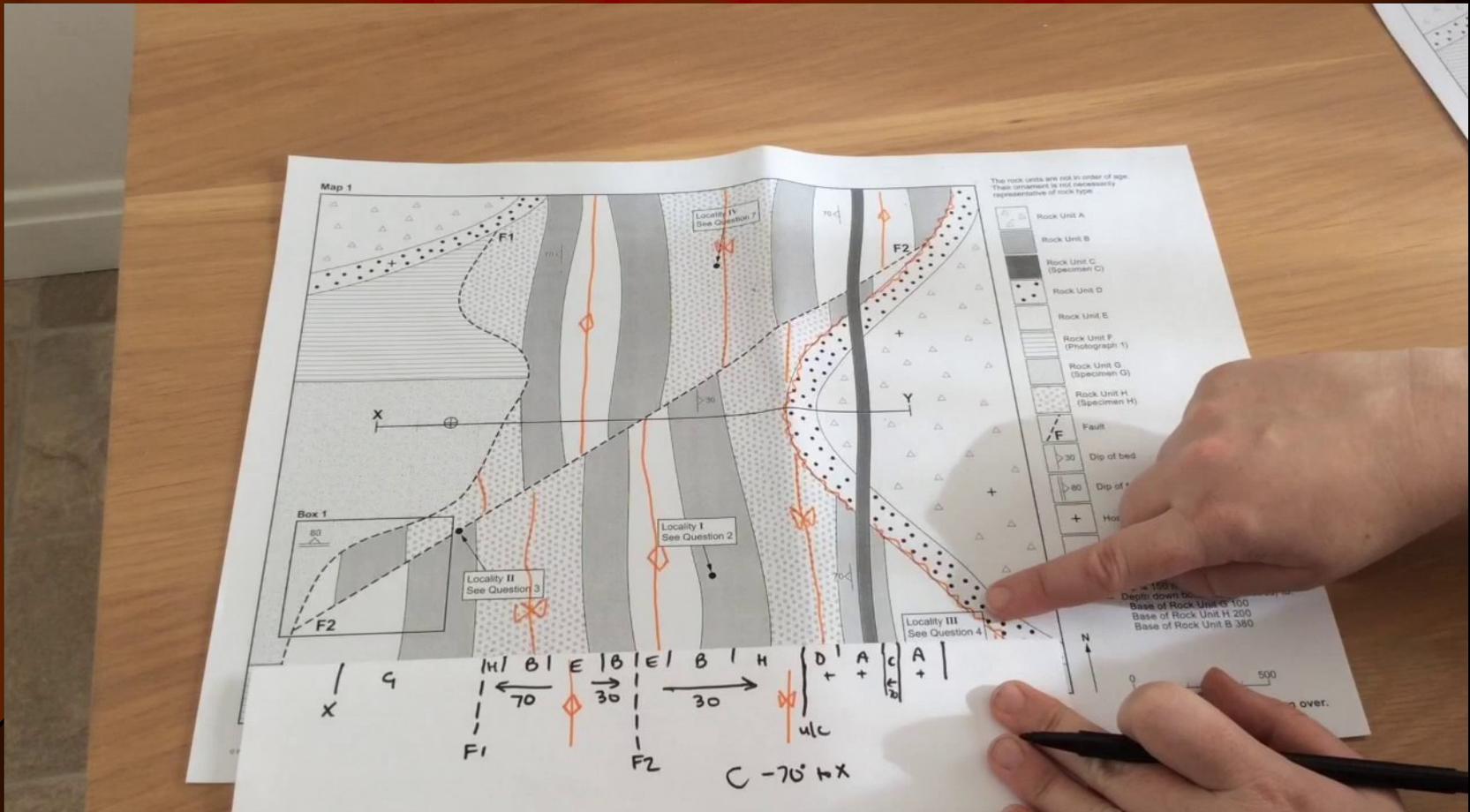
Getting the fault pattern correct can not only avoid dry holes, but also identify untested opportunities



Courtesy of  
Bob Shoup  
& SCA

# The Use of Cross Sections has declined

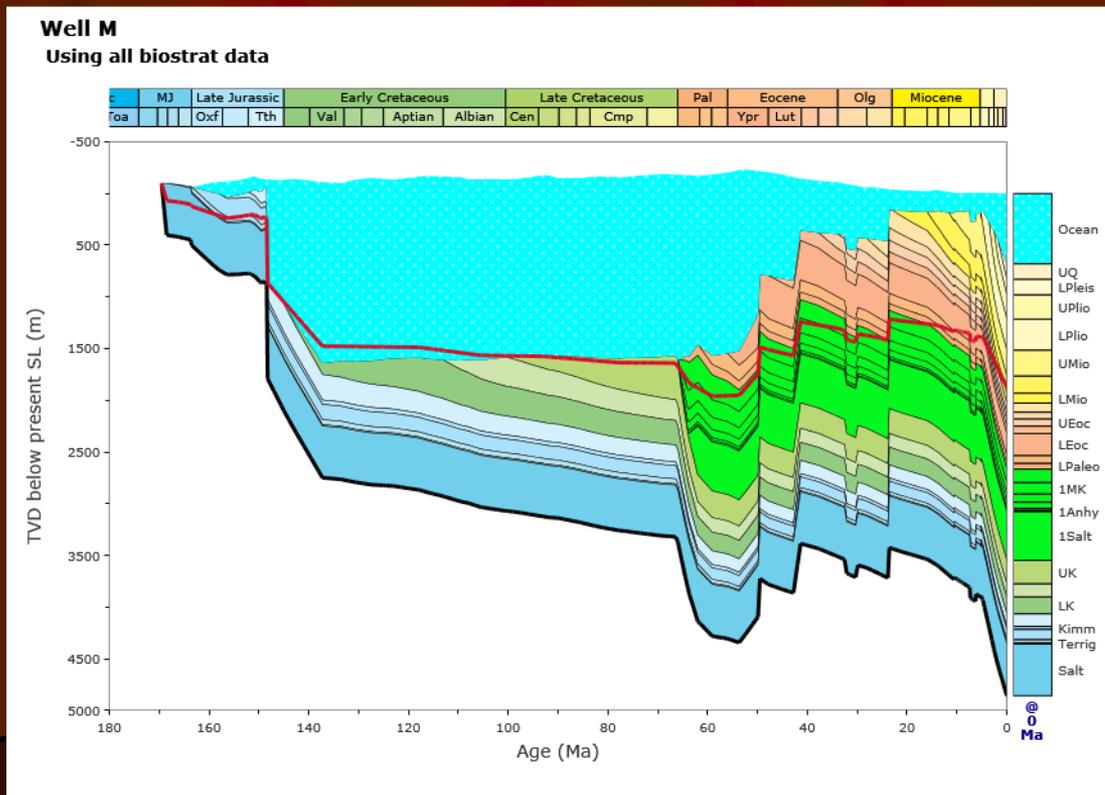
These are important learning aids that all geoscientists should routinely use, but they are still remarkably uncommon and can be hard to make on a workstation



# The Use of Geohistory Analysis is Rare

Geohistory provides an important geoscience tool, but it is rarely used (it requires thorough, thoughtful, and evidence-based geoscience study)

Geohistory (unlike burial history) is a full geoscience tool. It uses sea-level and elevation above sea level in its modeling, along with data from all geo-sources (such as facies, rates, tectonics, unconformities & isostasy)



Geohistory analysis performed at selected points in a basin can reveal much new information about basin development and plays

Geohistory analysis should be routine tool for petroleum geoscientists before any 3D basin modelling is undertaken

# Stratigraphic Usage

The use of stratigraphic terminology must be tightened up. It is a mess

Rock strata should be defined by either their

- a) lithology (lithostratigraphy), or
- b) relative age (time-rock or chronostratigraphy)

From the published literature, this appears to be poorly understood

For example, 'sequences' are time-rock, not lithostratigraphic units

Time-rock (or chronostratigraphic) units are **rocks** (and are called Systems, Series, Stages, Sequences, Upper, Lower etc)

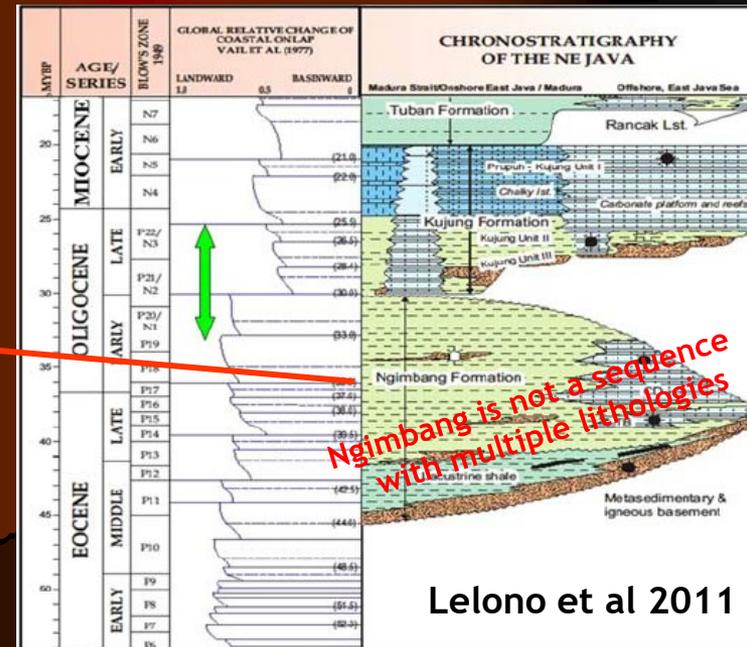
There is only one geological time scale (with time units referred to as Eras, Periods, Epochs, Ages, Early, Late etc)

Common mistakes -

Formations used as sequences which contain many lithologies;

Stages used as geologic time;

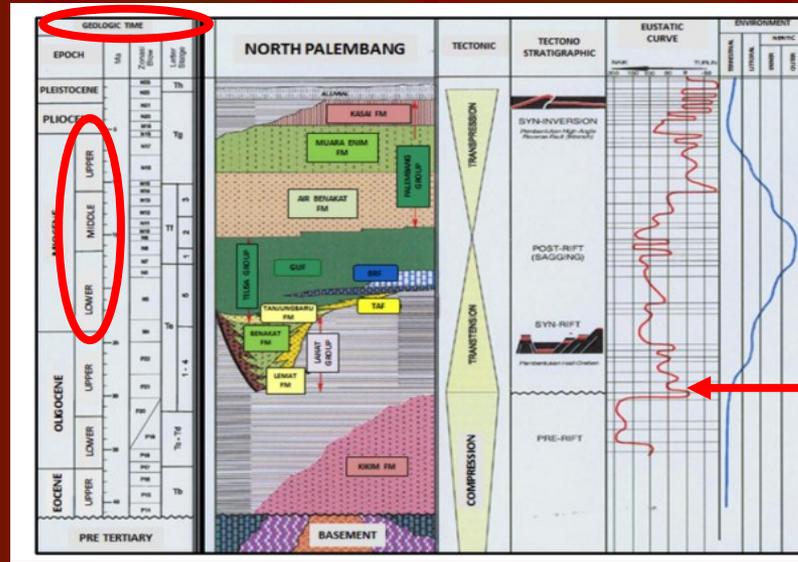
The mixing of units such as Lower with Late, or Early with Upper, etc



# Mixing Geologic Time with Rock Stratigraphy

‘Lower’ and ‘Upper’ are not units of Geologic Time!

They are stratigraphic divisions of rock!

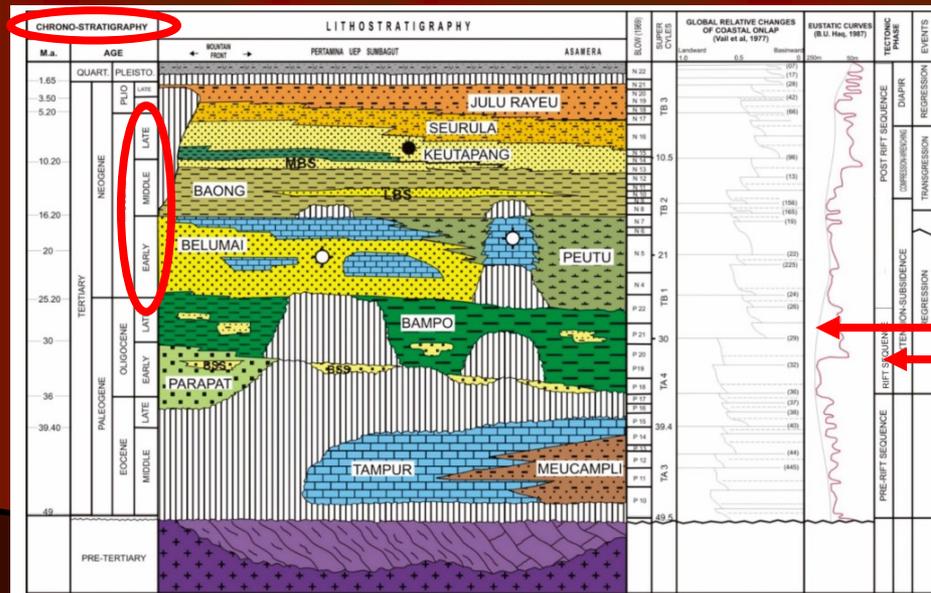


Showing a global eustatic curve usually only demonstrates its irrelevance to SE Asia

The supposed massive mid-Oligocene sea-level drop, matches (if anything) only the onset of basin subsidence

‘Early’ and ‘Late’ are divisions of geologic time

They are not stratigraphic divisions of rock



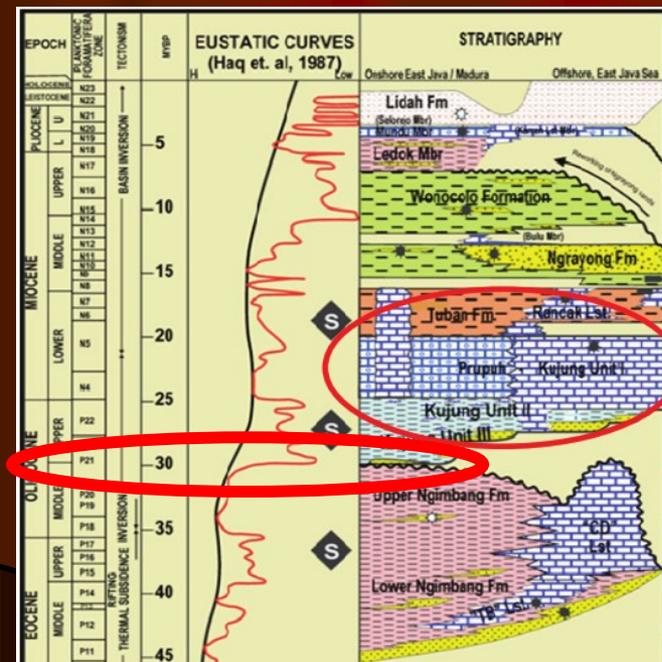
Neither of these major sea level drops is recognisable in the stratigraphic record of SE Asia

# Stratigraphy and Global Eustacy

Matching stratigraphic sequences to global sea level charts ('snap-to-fit') has been widely debunked; yet it still persists in SE Asia (of all places!)

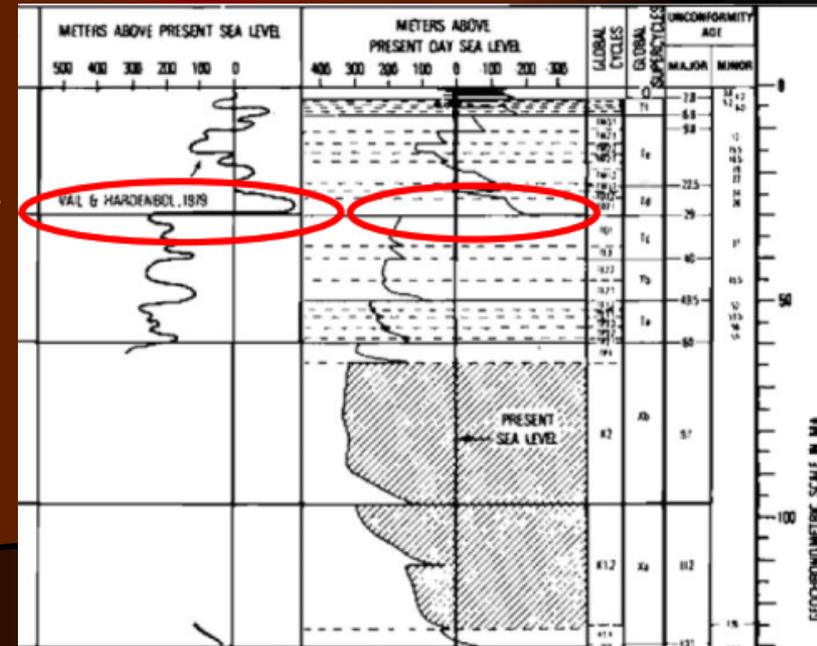
Bilal Haq - the primary author of the more recent global eustatic curves, has now accepted that the primary component for creating accommodation space is 'tectonism not eustacy'

For many years, the mid-Oligocene (Ampliapertura) eustatic sea level drop (at over 300 m) was the largest known event related to eustacy; but not observed in SE Asia

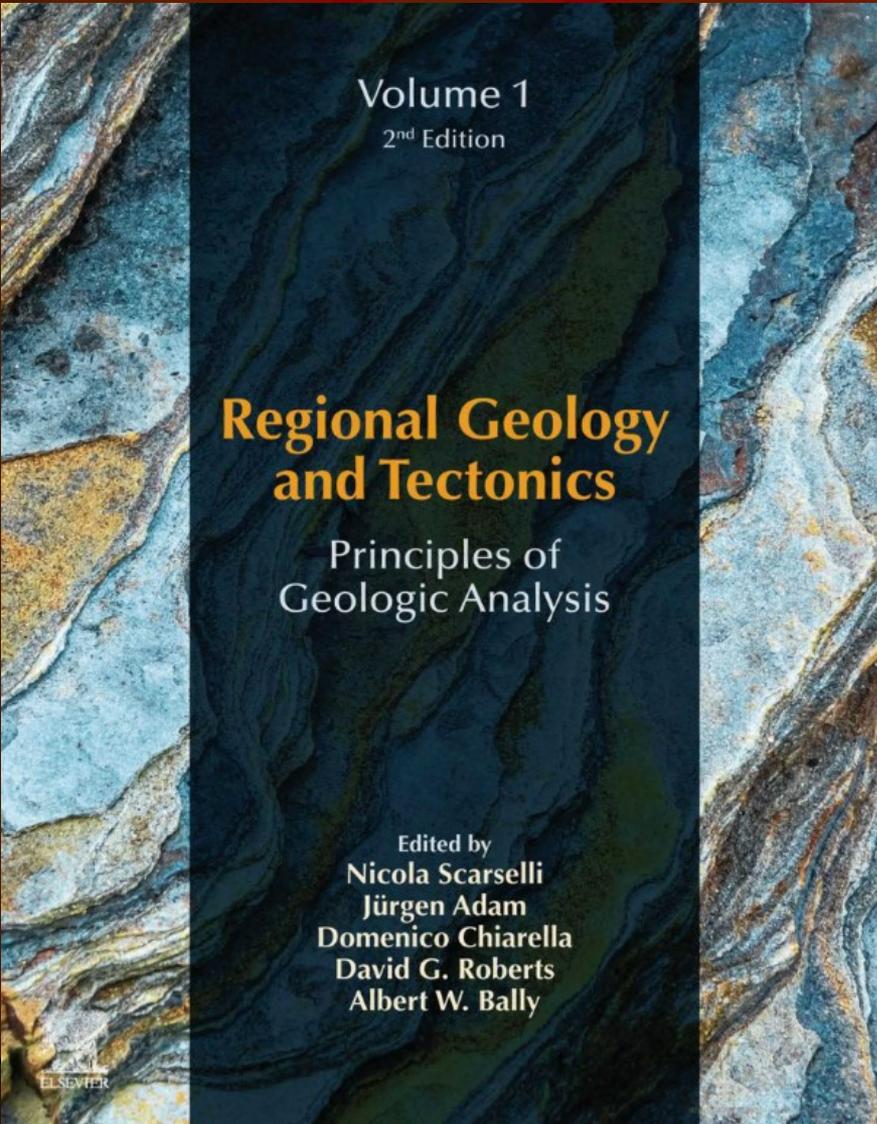


In SE Asia - unconformities matched to this mid-Oligocene event usually indicate sea level rises, and are related to tectonic subsidence not to eustacy!

It is time to move on



# Recent comment from Stewart 2020 in new textbook by Scarselli et al 2020



“The ‘Haq Curve’ is still used in some oil companies as a predictive tool, without understanding its derivation.

For the curve to have predictive value, it requires all basins to have the same subsidence history and the same sedimentation rate as the original type section for the particular age being studied, and for each individual basin to have a constant subsidence rate and sedimentation rate along its entire depositional strike”

# Summary of Staff & Geoscience Quality

With the spread of complex software tools available to all in petroleum geoscience, it is extremely important that high-quality and precise geoscience knowledge, skills and experience be transferred to younger generations

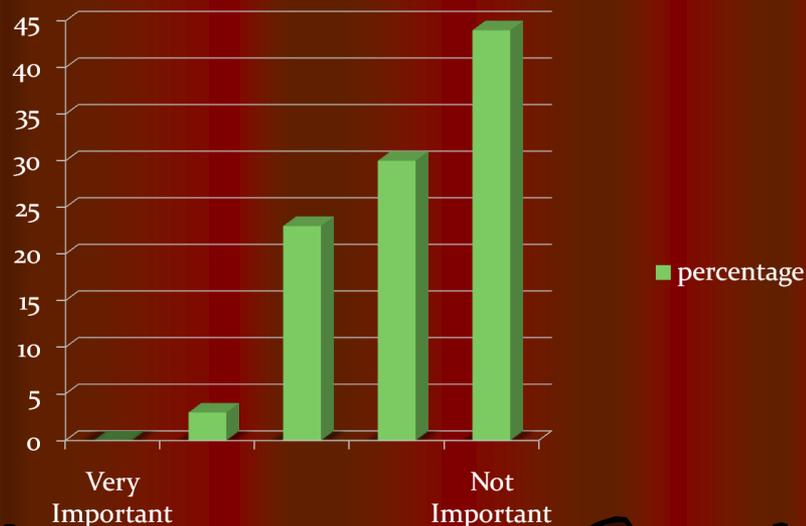
We need to raise the profile of this matter

# 4) Growth of renewable energy & CO2

Not considered important by Scout Check Members in 2007

Most companies did not foresee the policy issues that this growth would cause

However, most oil companies were afraid to criticise renewables and now many oil companies even give talks in front of windmills



Only recently has the over-reliance on renewable (unreliable) energy sources become obvious to many governments

Note: Metals like lithium, cobalt etc are not renewable

# Renewables

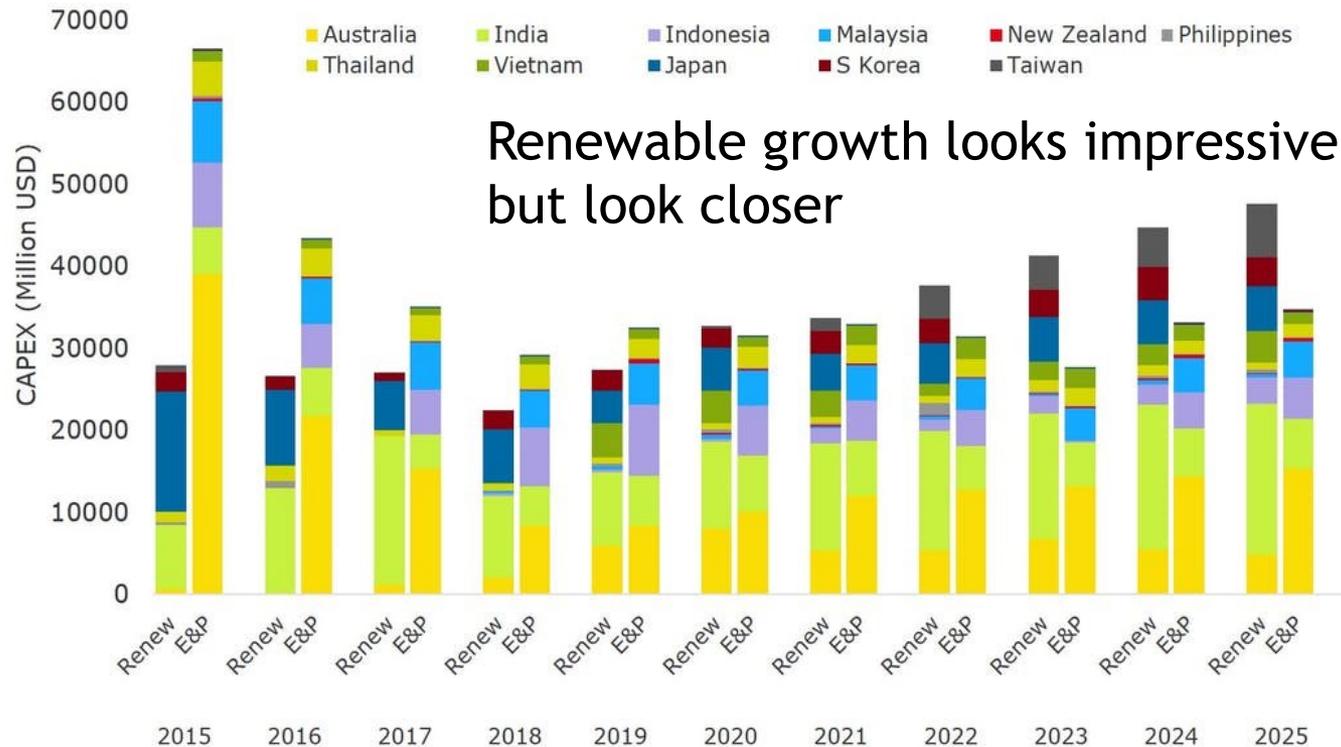
Apart from geothermal; wind, solar, wave, tide, hydro etc do not provide much of SE Asia's current or future planned energy investment

For most areas of SE Asia there is insufficient wind, tide or even sun

Note; E&P investment in Indonesia and Malaysia dominate now & future

**Capital expenditure on renewables vs E&P in APAC (ex. China)**

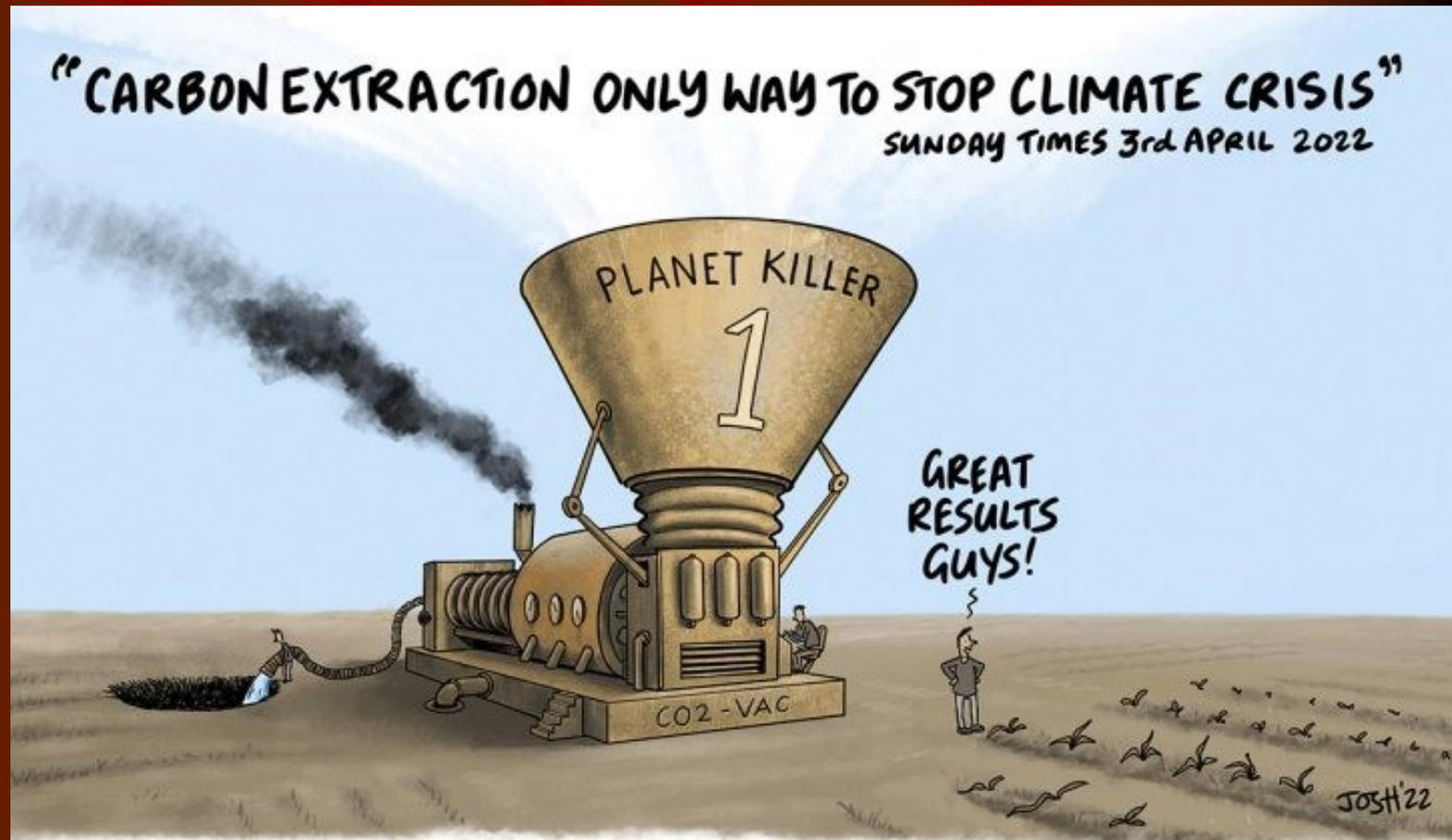
Million USD



Renewable investment shown here is largely by or planned for Australia, India, Japan, South Korea & Taiwan

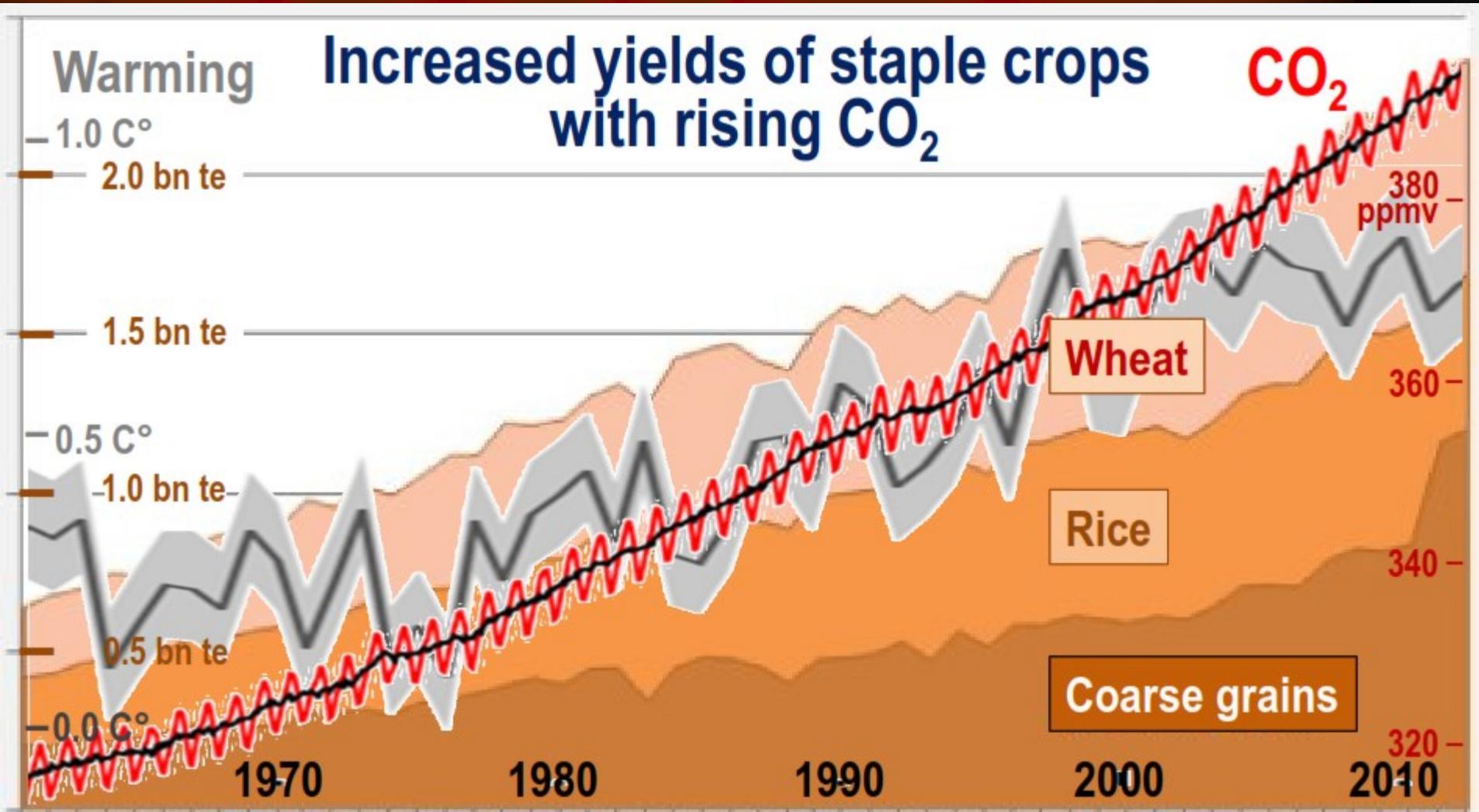
China renewable investment (not shown) is larger

Demonizing CO2 as a pollutant and dirty - like carbon soot, has been very successful; but at last a number of groups are seeing through this nonsense

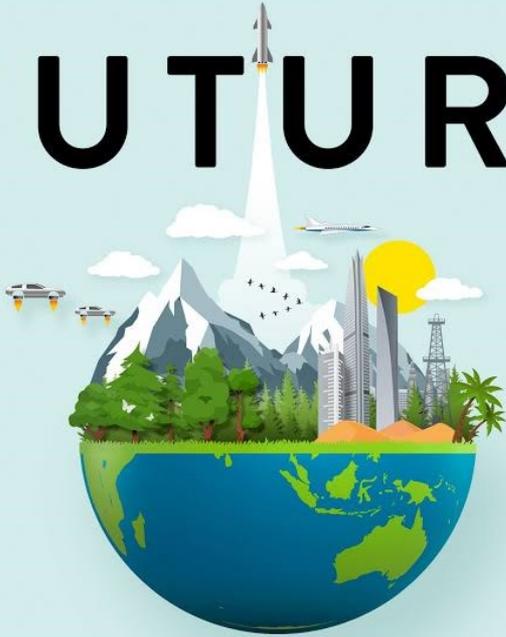


WHAT COULD POSSIBLY GO WRONG WITH REMOVING CO2 - THE GAS THAT FEEDS ALL PLANT LIFE?

CO2 increases are hugely beneficial for crops along with methane used for fertiliser



# FOSSIL FUTURE



Why Global Human Flourishing  
Requires More Oil, Coal,  
and Natural Gas—Not Less

**ALEX EPSTEIN**

## Just Published A must-read for Petroleum Geoscientists

Alex Epstein says what most leaders in the petroleum business have failed to voice

“Fossil-fueled development has brought global poverty to an all-time low”

“Soon enough, events will reveal more and more glaringly, that being anti-fossil fuel is a truly destructive position”

“The anti-impact green energy movement is therefore a menace to our future, spreading deadly lies about energy to achieve deadly, anti-energy goals”

There has been little concern over the massive loss of benefits that rapidly eliminating petroleum will cause, even though this will impoverish the world

Epstein promotes using more fossil fuels; getting better at “climate mastery”; and establishing “energy freedom”. These are pro-human policies that allow for the development of nuclear and other truly promising energy alternatives

“The world is still a barely livable place for billions of people who lack cost-effective energy”

“If we don’t want to return to the Middle Ages, we must make any and all decisions keeping in mind the context of the fundamental value of fossil fuels to the livability of our world”

In this regard

**Societies like SEAPEX should be petroleum champions**

# Summary of Renewable Energy Matters

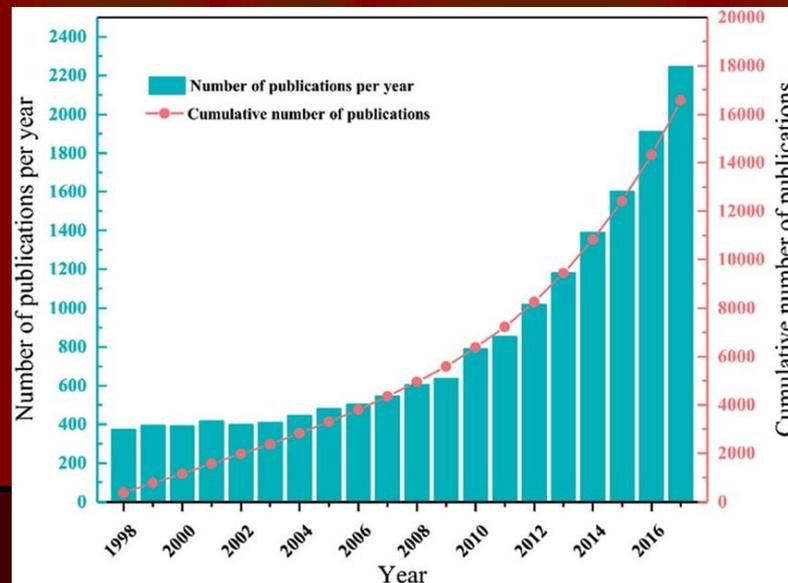
Renewables have become synonymous with being 'unreliable' (especially wind & solar)

However, as Scout Check members stated in 2007, they are mostly irrelevant as far as

SE Asia is concerned

# 5) Other Geoscience and Petroleum-related issues from the last 15 years

## a) Technical & Scientific



# The Petroleum Resource Management System

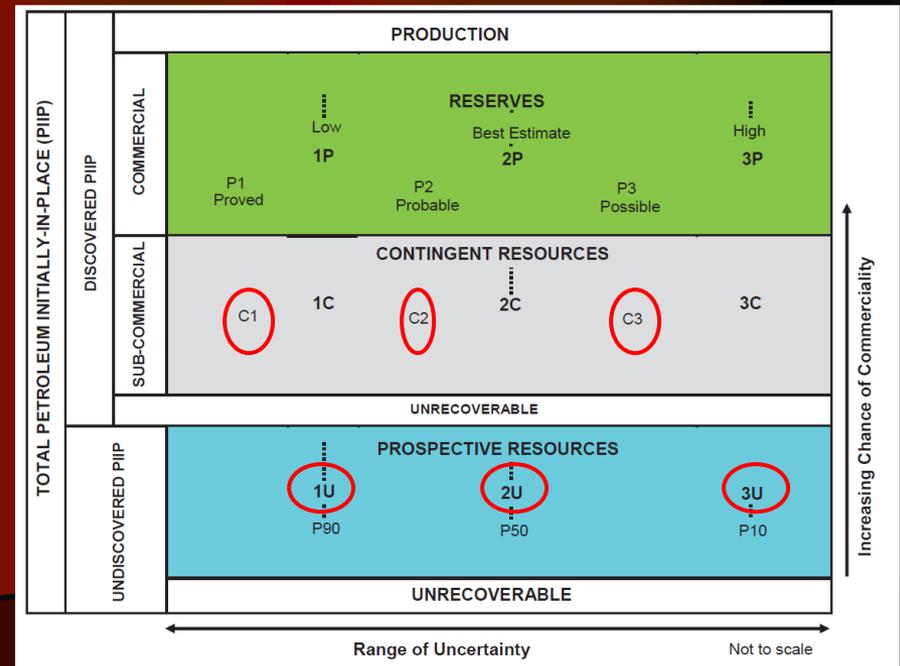
AAPG, SPE, SPEE and WPC led the drive to introduce the Petroleum Resource Management System 2007 (PRMS 2007)

PRMS 2007 - set new tough standards for geoscientists on petroleum reserves, in order to match reserves more closely with future revenues, and to allow for reserve comparisons between companies

Reserves had to be Discovered, Recoverable, Commercial and Remaining, but many 'reserves' did not come close to meeting PRMS 2007 standards - they were 'sub-prime' reserves

For a variety of reasons, reserves are often not what a petroleum geoscientist knows to be recoverable from a particular field or reservoir

PRMS was revised in 2018 with updates such as new Project Maturity subclasses, and new categories C1, C2, C3 and 1U, 2U and 3U were added



# Meanwhile; 'Petroleum Resources'

Unlike 'Reserves', 'Petroleum Resources' now have an extremely broad definition, and this has caused immense confusion. Be careful, as 'Petroleum Resources' now include:-

1) Already **Produced Petroleum**

2) **Discovered Petroleum**: amounts that are estimated to be 'In-Place' - even if they are forever unrecoverable

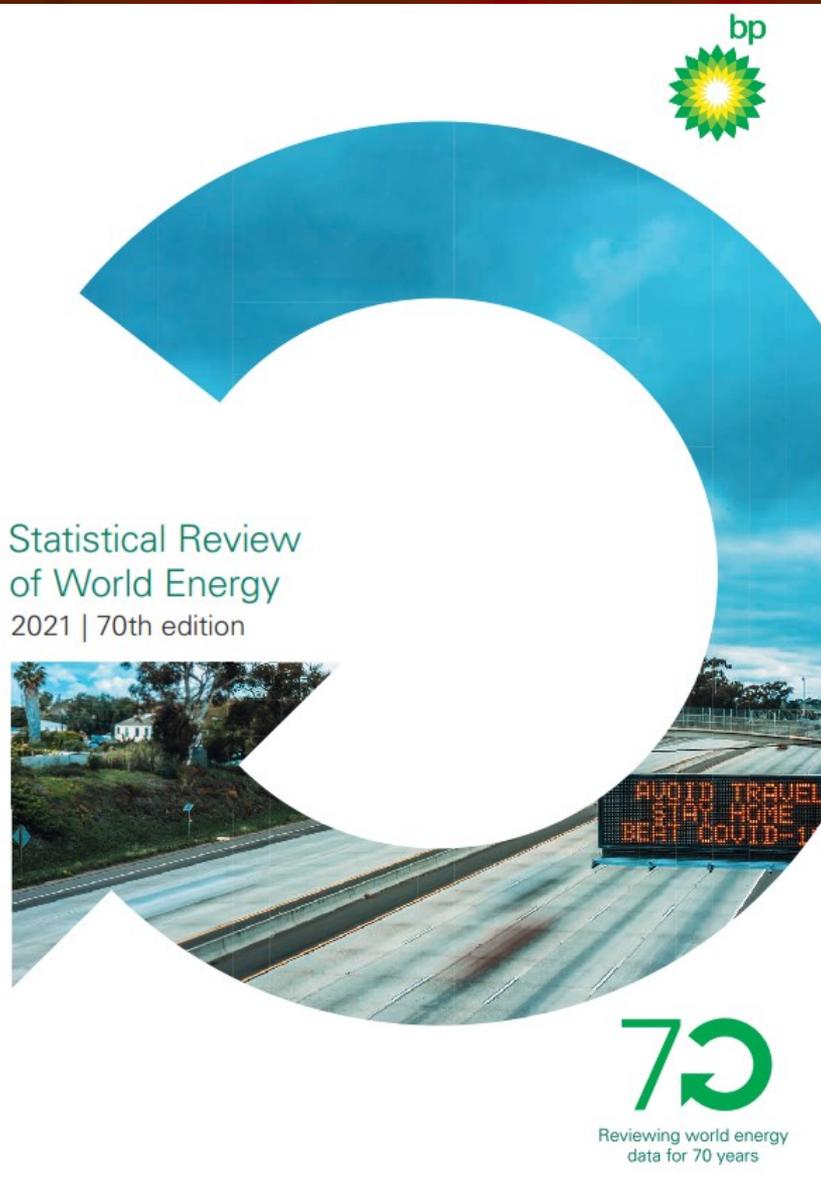
and very significantly, 'Petroleum Resources' also include

3) **Undiscovered Petroleum**: amounts that are 'estimated' to be 'possibly' found in the future; either 'In-place', 'Recoverable' or 'Unrecoverable', and whether it is within 'Prospects', 'Leads', 'Plays' or indeed anywhere

Therefore, 'Resources' now include petroleum that is 'Produced', 'Undiscovered' and 'Unrecoverable'!

A new **Storage Resources Management System (SRMS)** is being developed to standardize volumes to be sequestered (but only for depleted reservoirs)

# BP Yearly Reviews of World Energy



These reports have become the standard source of energy information for analysts and politicians

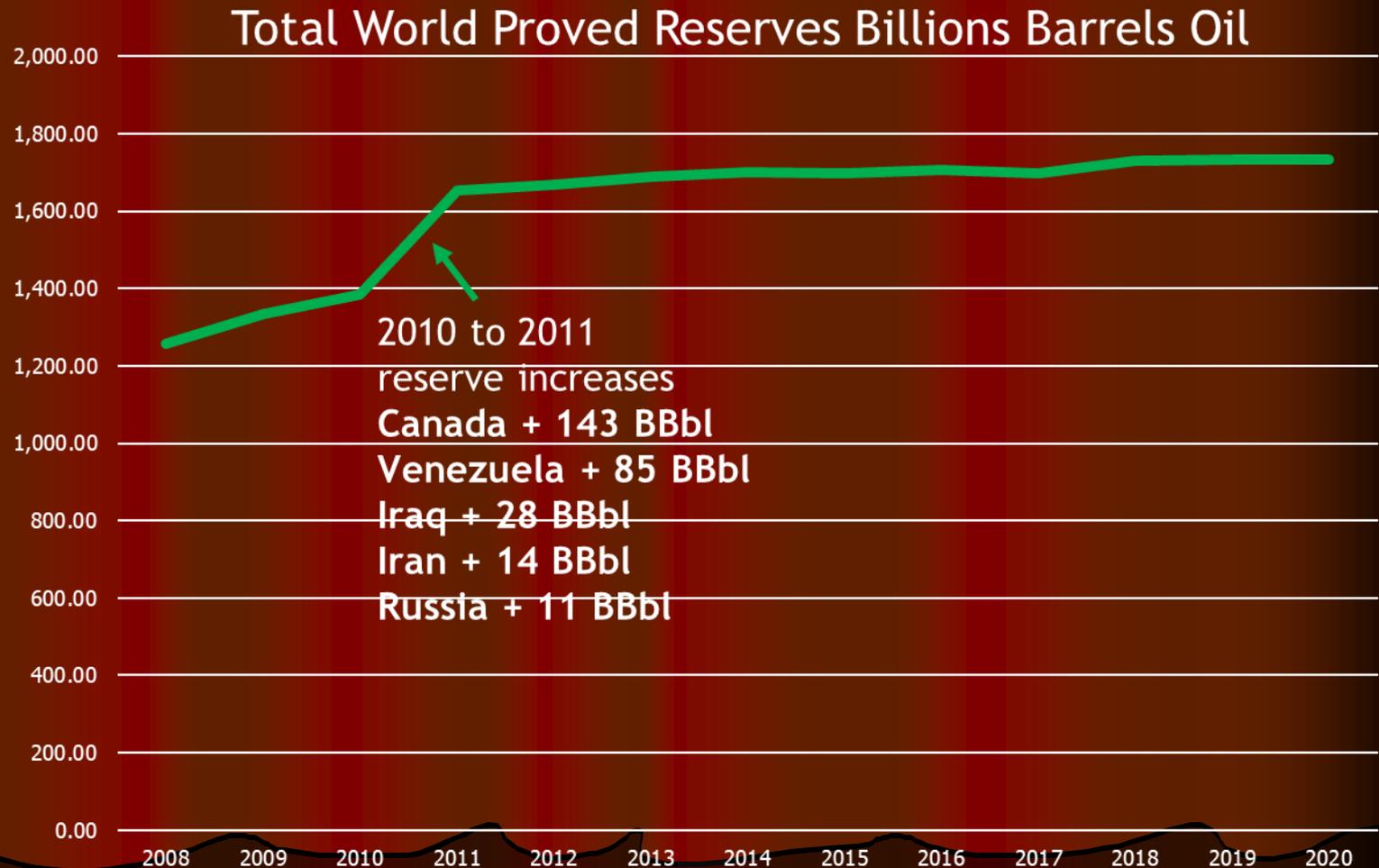
Therefore it is important to understand what they show

BP Statistical Review  
of World Energy  
June 2009



# BP Statistical Reviews of World Energy

BP's so-called 'Proved Reserves' have increased each year, more than replacing global production!



474 BBbl were added, while global oil production was 418 BBbl over the same period

# BP Statistical Reviews of World Energy

## Unchanging Oil Reserves

BP do not use PRMS reserve guidelines. Instead BP state that *“Proved Oil Reserves are quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions”*

In fact, the reserve volumes are taken from government sources and published data, and have no standardisation at all

For example, over this entire 13 year period, 8 countries (Algeria, Azerbaijan, Brunei, Kuwait, Syria, Turkmenistan, UAE, & Uzbekistan) had exactly the same reserve volume, year-in, year-out; and another 11 countries had exactly the same volumes for more than 5 years

These ‘unchanging’ oil reserves were not insignificant volumes, as Kuwait has had 101.5 BBbl (since 2005) and UAE has had 97.8 BBbl (since 1997). Yet together Kuwait and UAE regularly produce more than 2.5 BBbl each year.

**If we are to believe these reserve volumes, countries like Kuwait and UAE exactly replace their oil production each year**

# SE Asian Oil Reserves according to BP

According to BP, from 2008 to 2020 global oil reserves increased by an amazing 38% (and by 71%, if production during this period is included). **This suggests that production rates and supply (not actual reserves) are the only constraint**

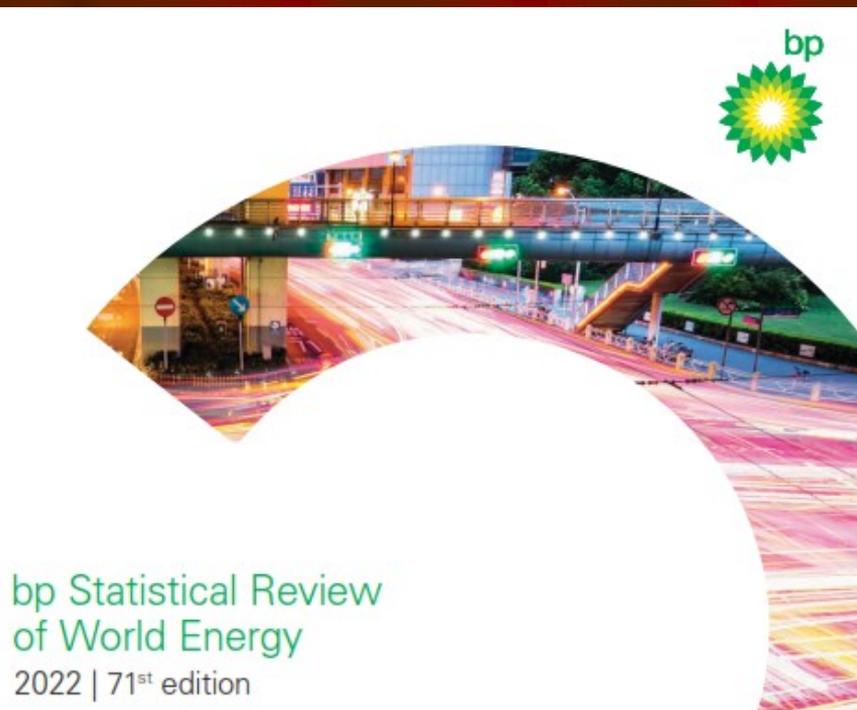
By contrast, the oil reserves of SE Asian countries (mainly Brunei, Indonesia, Malaysia, Philippines, Thailand & Vietnam) decreased by 4.3 billion barrels or 25%, from 16.5 billion barrels at end of 2008 to 12.2 billion barrels at end of 2020

**However, SE Asia produced 13 billion barrels of oil during this period.** If BP's oil reserve figures are to be believed, **then 8.7 billion barrels (or 67%) of SE Asian oil reserves were replaced,** suggesting that even with this moderate rate of replacement, SE Asian oil reserves could last for nearly 40 years or more

**BP data indicate that reserve replacement is generally fine**

Since this talk was first given in May 2022,  
**BP has removed all reserves from their Statistical Review**  
as of the 71<sup>st</sup> Edition - published in July 2022; saying:-

Please note that due to process improvements for the  
*Statistical Review* that these reserves tables have not  
been updated this year.



## Oil

- 15** Production
- 20** Consumption
- 24** Prices
- 25** Refining
- 27** Trade movements

# Scientific Methods

Science (and Geoscience) evolves by the testing and verification of hypotheses and ideas

Those that do not withstand scrutiny are rejected

Testing of others results and theories is fundamental

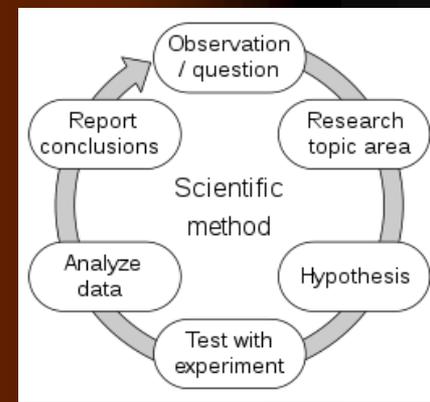
Testing always overturns some prior results and theories, but matters have become so bad in recent years that we are in what is known as the '**Replication Crisis**'

Inductive Reasoning is important (where evidence is carefully used, as opposed to just applying prior ideas)

Peer review is not the answer, as far too much is now published to be able to expect good peer review to operate

"I have long discovered that geologists never read each other's works, and that the only object in writing a book is a proof of earnestness" - Charles Darwin

Science is not done by consensus, but by rigorous testing



# Science in Action (Useful Quotes)

*“In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual” - Galileo*

*“The only way to test a hypothesis is to look for all the information that disagrees with it” and “A hypothesis that is not refutable by any conceivable event is not scientific” - Karl Popper*

*“Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve” - Karl Popper*

*“All significant breakthroughs are break - “withs” old ways of thinking” - Thomas Kuhn*

*“Skepticism is the highest of duties; blind faith the one unpardonable sin” - Thomas Huxley*

# Science Under Attack

Everyday we are deluged with terms and words which mean different things to different people, or are nonsense, e.g.

'energy transition' 'decarbonisation' 'greenhouse' 'ocean acidification'

Some are even ill-intentioned misleading words. This lack of definition is one major area that is undermining the clear thought and logic that is required for good science

**Confucius:** *"One cannot have intelligent discussions until one has precisely defined the terminology"*

**Voltaire** *"If you wish to converse with me, define your terms."*

# As Scientists; You Have a Duty to seek out the Evidence and Combat Psuedo- & Bad Science

There are many good scientific resources to help you, but most of these are hard to find, or actively hidden from view  
Examples:-

<https://clintel.org> - an independent climate intelligence foundation that operates in the fields of climate change and climate policy - founded by Prof Berkhout - of geophysics fame

<http://www.co2science.org> - a site to disseminate factual reports and sound commentary on the scientific quest to determine the climatic and biological consequences of the ongoing rise in the air's CO2 content

<https://everythingclimate.org> - a site that catalogs and evaluates scientific theories on global warming

<https://www.thegwpf.org> - The global warming policy foundation - promoting common sense on climate change, started in 2009 by Lord Lawson & Dr Benny Peiser for the UK House of Lords (includes many distinguished scientists)

<https://judithcurry.com> - a forum for climate researchers, academics and others that engages in a free discourse on topics related to climate science and science policy

<https://www.scienceunderattack.com> - the website of Ralph Alexander, a retired physicist and a science writer who puts science above political correctness

<https://wattsupwiththat.com> - A wide-ranging, widely-read site called "Watts Up With That?" by Anthony Watts covering the latest science on global warming and climate change

# Understand What Models Are

Models help us visualise, understand, test and communicate ideas

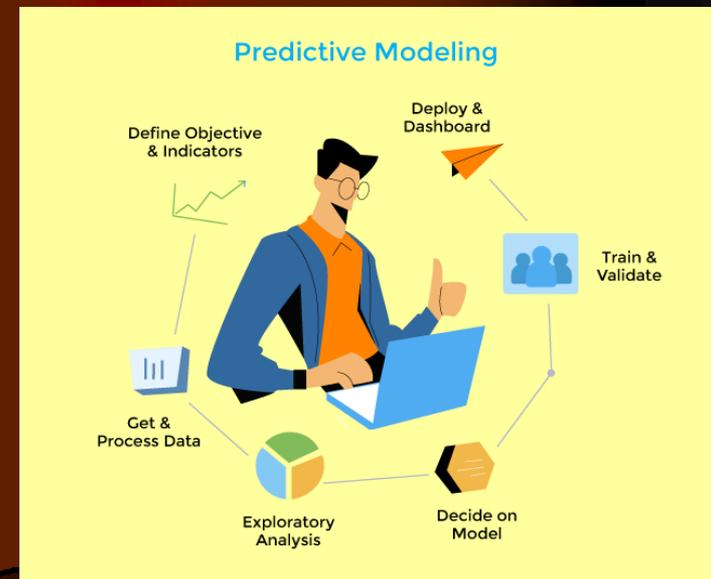
These are normal and useful methods, and have been in use for centuries

However, models to make important predictions are very different

For simple systems, where the variables are known and understood, predictions and forecasts might be possible. But for complex systems, there is growing evidence that 'predictive model methodology' is dangerous and should often be avoided

Even in relatively simple systems, predictive models regularly fail because of unknown variables or unexpected events

Bond Ratings were a recent classic example. Ratings were based on historical data (with only a few variables). It was claimed that these variables would be highly representative of the future. However, leading up to 2008, all 3 main ratings agencies (S&P, Moody's and Fitch) failed to come even close to correctly rating the US\$ 600 Billion of Collateralized Debt Obligations. Almost the entire AAA-rated CDO sector defaulted or was seriously downgraded. In financial circles this has seriously undermined the predictive value of ratings



# Summary of Geoscience Technical & Scientific Issues

The scientific method must remain a key part  
of all good petroleum geoscience

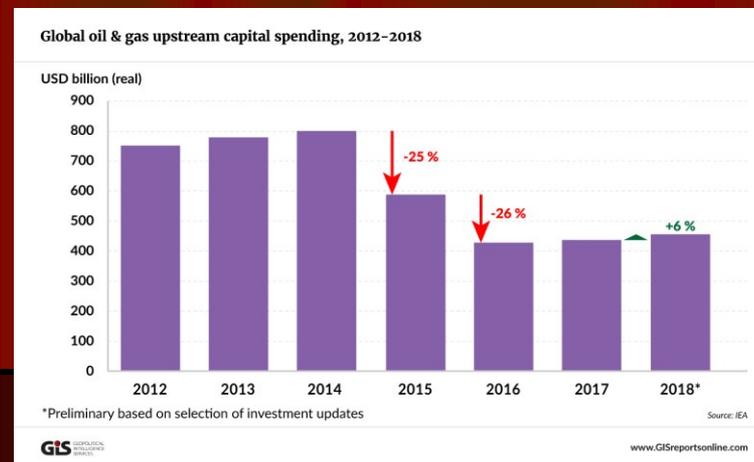
Collect evidence and test all hypotheses

Seek out and find all relevant data

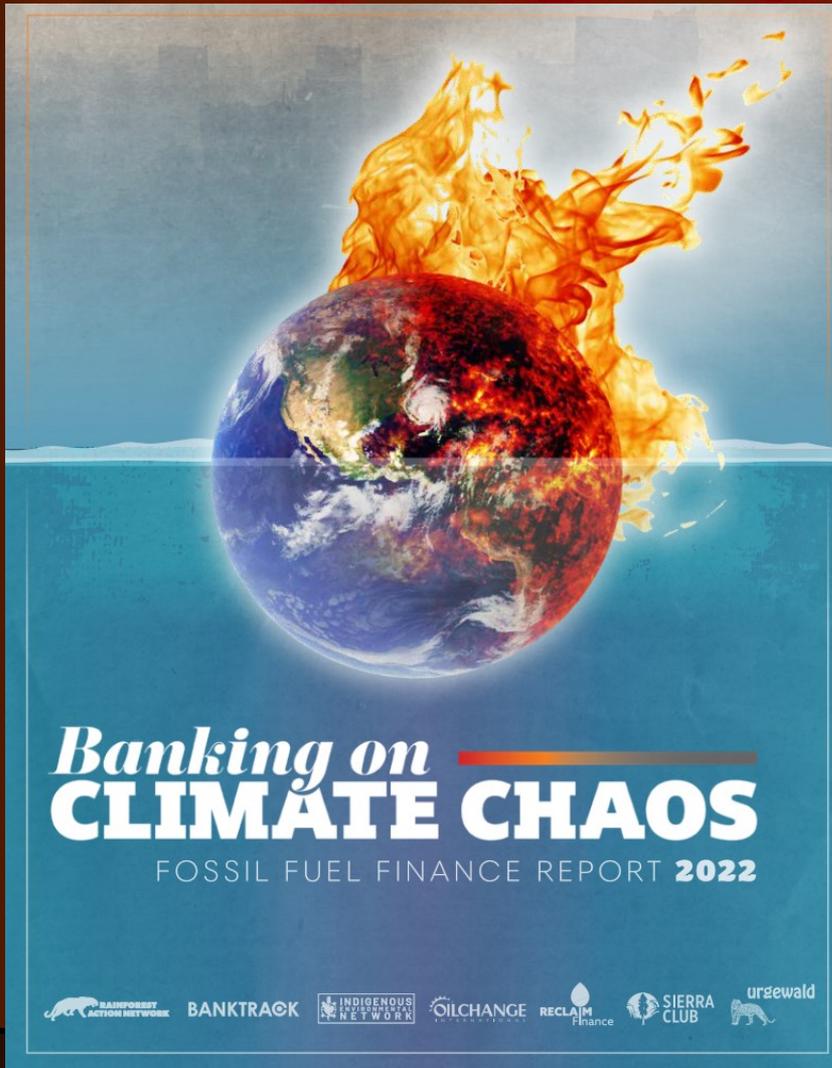
Clearly define your terminology

# 5) Other Geoscience and Petroleum-related issues from the last 15 years

## b) Finance, Investment, & Energy Security



# Banks are under renewed pressure from many sectors not to lend to petroleum companies



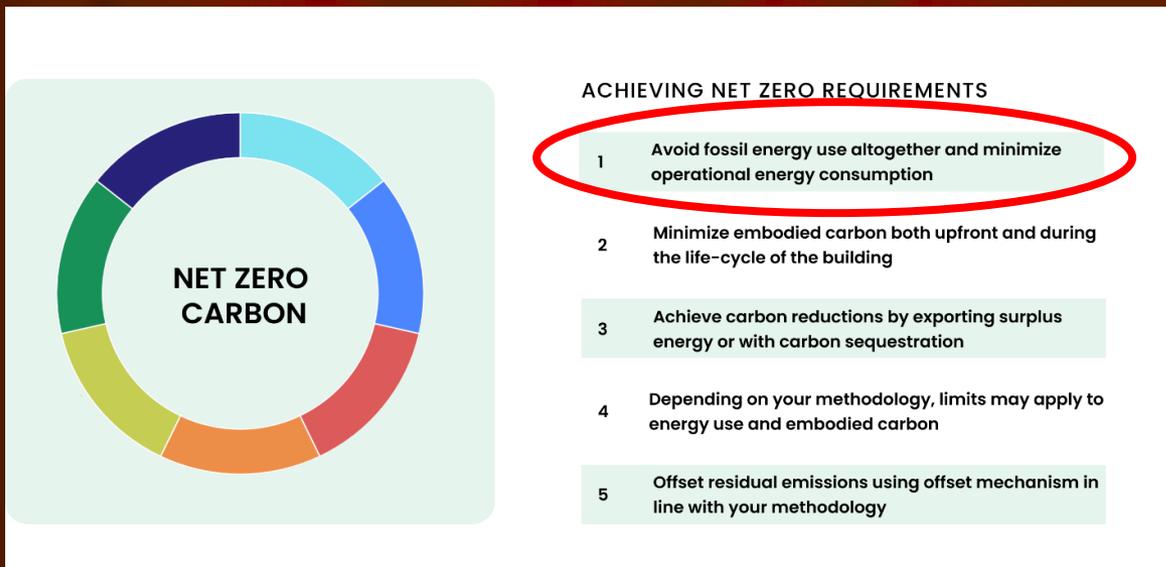
The International Energy Agency in its 'Net Zero by 2050' report has said *"Beyond projects already committed as of 2021, there are no new oil and gas fields approved for development"*

However, this year (2022) - for the sake of energy security - many banks have been instructed to lend to upstream petroleum projects especially for gas

Any bank supporting any company that is **expanding fossil fuels** is **driving climate chaos.**

# Net Zero Attack on Petroleum

Achieving zero 'greenhouse' gas emissions is not a realistic option. However, achieving 'net zero' emissions usually means that emissions not eliminated (usually by 2050) will be compensated for by measures that somehow remove emissions from the atmosphere (sequestration)



**Net Zero has led to an all-out attack on oil & gas**

**Many in the petroleum business do not seem to understand this**

Note: Of the top ten GHG emitters (China 26%; USA 13% etc); only Japan, Canada and the EU (~ 11% in total) have legally binding net zero commitments

# Be Under No Illusion

Oil & Gas is under massive attack

Politicians and Governments in SE Asia need support from geoscience to avoid falling into the same energy insecurity, poverty trap and shut-downs as many other countries



# Even CCS is Under Attack

The recent 2022 IPCC 6<sup>th</sup> Assessment Report; Summary for Policymakers states:-

“Limiting global warming to 2°C or below will leave a substantial amount of fossil fuels unburned and could strand considerable fossil fuel infrastructure (*high confidence*). Depending on its availability, CCS could allow fossil fuels to be used longer, reducing stranded assets (*high confidence*)” C.4.4

This IPCC statement is now seen by many climate alarmists as suggesting that CCS will be used as an excuse to keep fossil fuel usage going for longer, and they oppose it

Alarmists are now redoubling their efforts for the immediate termination of fossil fuel use, and they view this CCS statement by the IPCC as wholly unacceptable

# CCS in SE Asia & Indonesia

“Widespread adoption of carbon capture, utilization and storage technologies in South East Asia remains highly unlikely” 26 April 2022 IEEFA Report

However, plenty is happening:- The Abadi and Tangguh LNG Projects in Indonesia are trying to justify CCS through enhancing gas recovery, and of course to also gain maximum environmental credit

Enhanced Gas Recovery (EGR) for these fields is planned by injecting CO<sub>2</sub> into the producing reservoirs (Note: the EGR concept is excluded from the Storage Resource Management System)

Example - **Abadi** - after years of pain and uncertainty (i.e. changing FLNG concepts, massive delays because of a change to onshore LNG) - there is now a proposal for CO<sub>2</sub> EGR, which threatens to delay the project even further

Carbon Credit and CCS scams are proliferating, and they are an upcoming danger for SE Asia

# Energy Security\*

Energy security is once again being taken seriously after having been given a 'sham' position in the drive to Net Zero

For example, Africa is now developing a new energy policy that is very much reset *away* from unreliable wind and solar and *towards* reliable natural gas

While S E Asia is setting its own oil and gas targets, it has conflicting Net Zero policies that at any moment could interfere with these targets

It is time for SE Asia to clearly set it's own energy policies and targets - without Net Zero interference

\*Widespread and reliable availability of energy at a price which is affordable

# Summary of Petroleum Geoscience Issues

There is an increasing need for Petroleum Geoscience in energy security and to enhance human flourishing

More subsurface data than ever is now available,  
requiring more geoscience work  
to support upstream growth

To achieve this, geoscientists must support and promote petroleum, stay well-informed on energy policies, and counter net-zero policies with science

# And So To Conclude:-

## S E Asia and \$100 Oil

Industry status, emerging trends  
and future challenges as seen by  
Singapore Scout Check Members

**Peter B Woodroof**

Genting Oil & Gas

Singapore Scout Check Chairman

KLEX 30<sup>th</sup> January 2008

**Industry status:** Some benefit from high prices, but most free cash is going to debt reduction and investor returns, not much to E&P investment. Fewer small-to-medium companies active

**Emerging trends:** Increased pressure from climate alarmists and net zero policies, but growing awareness of the need for energy security

**Future challenges:** Much technical knowledge has been lost to automation and lack of skills transfer. We must make up for lost time, try to employ more geoscientists, and do more to upgrade and transfer technical skills

# Stand Firm

Be proud to be in the petroleum business

Petroleum has and still can enhance the world

Promote and defend the petroleum business

Promote the need for more and better geosci



# Petroleum Geoscience Needs You

**Thank You for Listening**

The views expressed are solely those of the author, except where attributed. They are not necessarily the views of any of the companies or societies to which I am associated



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