

Society for Sustainability and Environmental Engineering

Peak Oil, a Positive Planning Tool

Wally Wight- 21 March 2012



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Geological Context

Oil is a finite resource.

- We might think oil lies in great liquid pools,
- But it is entrained in rock
 - of varying porosity, and
 - only released slowly,
- Limited annual rate of extraction = perhaps 6% of remaining reserves,
- As reserves reduce, the extraction volume decreases.



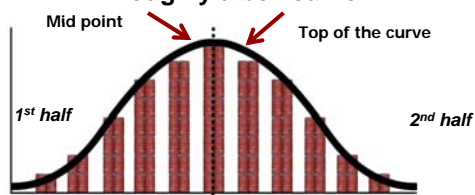
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Oil is finite.

But, what does "Peak Oil" mean?

When you plot the production of an oil field, or an aggregate of fields, over time, you get roughly a bell curve



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Origins of the concept:

- Described by M. (Marion) King Hubbert, Shell Oil Geologist / Petroleum Scientist
- In mid 50's he predicted that U.S. oil would peak about 1970
- Universally criticised at the time
- After 1970 (when his prediction proved uncannily accurate) he suddenly became highly respected.
- In 1984 he predicted conventional oil would peak globally in early 2000s.



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Oil depletion is not new

- Global discovery peaked in 1964
- USA production peaked in 1971
- Canada (*once considered inexhaustible*) peaked in 1973
- Australia peaked in 2000
- I only became aware of peak oil (*though not by that name*) 56 years ago when my first school closed due to a lack of students.
- The Turner Valley Oilfield, Alberta, Canada (*scene of my childhood and a microcosm of the global scene*), had peaked 15 years before.

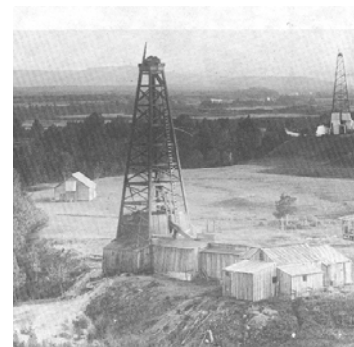


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The Turner Valley Oil Rush

- 14 May 1914, Dingman No 1 blew in:
- It hit pay dirt at 800 metres depth yielding 400 000 cu m/day of natural gas pushing a geyser of oil
- Within 24 hours, promoters had formed more than 500 oil companies!



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Community development



During the “boom”, a string of villages mushroomed:

- Naptha
- Glen Mede (my first school)
- Hartell
- Mercury
- Little Chicago (Royalties) population 1350
- Little New York (Longview)



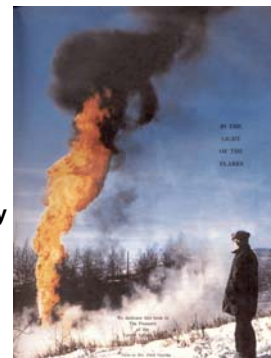
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Use and Abuse: “Hell’s half-acre”

Up to the 1940’s, Turner Valley had been the most productive field in the entire British Empire:

- 25 000 barrels of oil/day
- 20 million Cu M of gas/day
- Gas had little market value and the “excess” (enough to satisfy New York City’s energy needs) was simply burned off in massive flares.

Production peaked in 1940.



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Changing Technologies

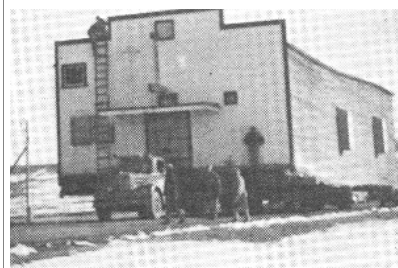
After the peak:

- 1950’s reduced gas pressure meant pumps were required
- Automation reduced labour demand, resulting in job losses and depopulation.
- 1960’s depleted oil levels necessitated water injection.
- 1970’s more wells and pumps introduced to extract from increasingly isolated pockets.
- Current flurry of horizontal drilling and new pumping methodology.
- Production will never regain 1940’s



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Community Undevelopment



“Rural renewal” of townships

- Naptha
- Glen Mede
- Hartell
- Mercury (refinery explosion in 1951)
- Royalties

All reconverted to farmland
Longview the only survivor



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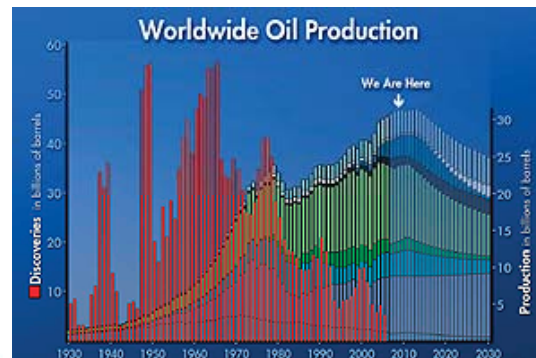
Lessons from this past experience:

- Oil depletion is real, and is already happening.
- We need to recognise that it is happening.
- Wastage and excesses make the impacts orders of magnitude worse.
- We need to curb our wastage and excess early to minimise the impact.
- 70 years on, there is still oil to be had from Turner Valley, but progressively lower in volume, and more difficult and expensive to extract.
- We need to prepare now to respond to the end of cheap oil.



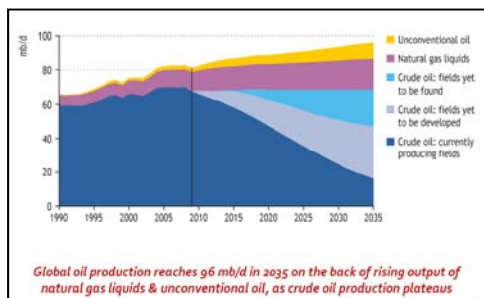
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Current Global Production Rates



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International Energy Agency The world Faces Unprecedented Uncertainty

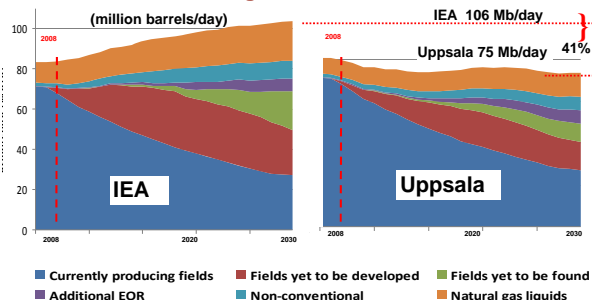


Oil production becomes less crude

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Uppsala Uni Analysis (Kjell)

Forecasts using the same reserve data

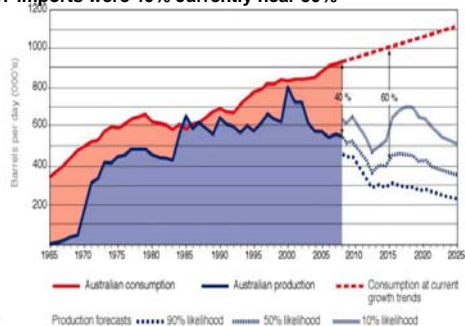


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Source: Kjell Aleklett

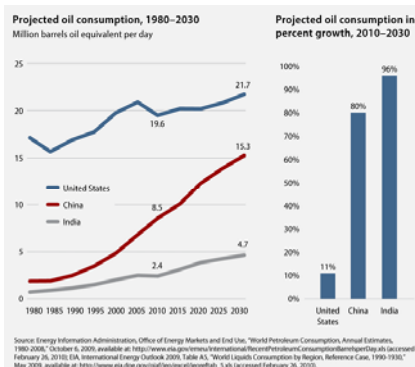
How does Australia fare?

Australian production decline & consumption growth
2007 imports were 40% currently near 50%



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Imports face emerging competition



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Market sources may be fickle

The "export land model":
(models the impact of exporting countries' growing oil use)

The model's concept is very simple:

- Oil exporting countries service their internal markets first, then export their surplus.
- Internal demand continues to grow rapidly, even after they hit their production peak.
- Exports are hit by these two factors, causing *magnified drops in exports!*
- As exports drop, oil available to the import market drops - competition pushes up prices.

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Look at our 2007 top supplier

Vietnam provides a good illustration



Production has peaked
Domestic consumption is still rising rapidly
Exports are trending downwards

**In 2012, Vietnam is no longer our dominant supplier
Malaysia is now our top supplier
Where to next?**

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Risks of Unconventional Oil

Already, we are relying more on **unconventional** sources, and are now facing the **risks and consequences**.



We're bringing oil to American shores.
Actual 1999 BP advertisement



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Transport is dependent on oil

Australia's oil consumption:

- 72% for transport
- 8.5% for mining
- 7.1% for chemicals
 - Oil-based plastics are
 - Highly vulnerable
 - Toxic and non-recyclable
 - Minimal local value capture
- 4.8% for agriculture

Transport is over 90% oil dependent

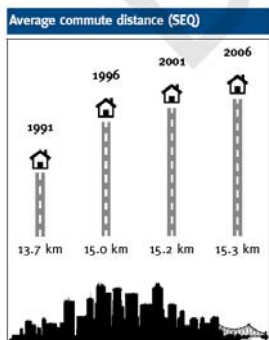


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Qld and SEQ's Transport is at Risk

SEQ's Growing Transport Task:

- Faster than population and productivity
- Faster than efficiencies can be improved
- Freight volume is expected to treble over 20 years
- On trend, SEQ transport trips are predicted to increase from 10m trips per day in 2006 to 15m a day in 2031



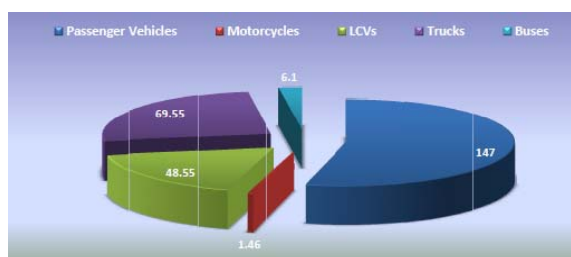
Source: Journey to work - ABS Census 2006-08



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Energy consumed by vehicles (Qld)

- More than half of energy is consumed by private passenger cars
- Trucks and light commercial vehicles share most of the balance



Source: Apelbaum Consulting Group.



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Australia relies disproportionately on road transport

- In spite of increasing vulnerability, the proportion of freight taken on trucks is actually growing.
- Our dispersed population and economic activity makes the flexibility of trucking compelling.
- Transport infrastructure investment tends to favour roads to facilitate increased road freight.



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Can alternative fuels help?

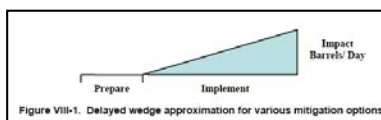


Figure VIII-1. Delayed wedge approximation for various mitigation options

Yes, But...

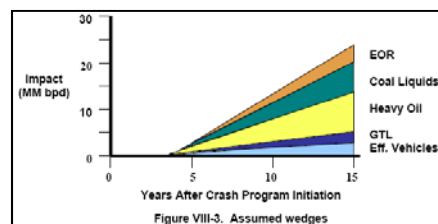


Figure VIII-3. Assumed wedges



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Alternative fuels for road and air are problematic

No other fuel is as energy dense and readily portable as oil-derived fuel

Avgas and jetfuel

- No substitute has been proven to meet standards at quantity

Biofuels

- Compete with food production
- Are energy-intensive in their production
- would take longer to scale up than the time available to respond to oil depletion



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Can we build our way out of trouble? Construction is oil-vulnerable too.

- Reliance on more infrastructure as is problematic.
- Conventional construction of transport infrastructure is very oil intensive in both materials and machinery



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Likely Oil Depletion “Events”

1. Sudden critical supply interruption

- Sharp price rises
- Reduced availability of supply (queueing, rationing) 1970's?

2. Intermittent supply constraints

- Volatile price fluctuations (our experience of the last three years), and/or
- Sharp volatility of demand affected by price (ditto)

3. Progressive supply constraints

- global increase in demand competition
- Increased retention of reserves by exporters, and
- associated price rises (CSIRO models \$8.00/litre)



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When do we have to act?

If a crash program to reduce oil use or to switch from oil to renewable energy had begun:

20 years before Peak Oil (from 1986?):

Possibility of avoiding a world liquid fuels shortfall for the forecast period.
Slight economic disruptions.

10 years before Peak Oil (from 1996?):

Liquid fuels shortfall for roughly a decade after the time that oil would have peaked.
Moderate economic disruptions.

0 years before Peak Oil (from 2006?):

Significant liquid fuel deficit for more than two decades.
Severe economic disruptions (as started in 2008? 2nd dip now?)



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Statutory support is emerging

Towards Q2 2020 Target: Cut by one-third Queenslanders' carbon footprint with reduced car and electricity use

Qld Government has adopted an oil vulnerability report and is preparing an **Oil Vulnerability Strategy**
FNQ and SEQ Regional Plans require oil vulnerability to be addressed

1.5 Responding to oil supply vulnerability

<p>Principle Identify people, economic sectors and areas that are at risk due to oil supply vulnerability and increase their resilience to the effects of oil supply vulnerability.</p> <p>Policies</p> <p>1.5-1 Manage risks and reduce impacts on people, economic sectors and areas from the effects of oil supply vulnerability.</p> <p>1.5-2 Design Development Areas to encourage walking, cycling and public transport use to get to local shopping facilities and employment locations, and early provision of public transport services.</p>	<p>1.5-3 Ensure transport infrastructure and service investment actively reduces oil dependence, particularly for trips that could be undertaken by public or active transport.</p> <p>1.5-4 Reduce the length of trips and dependence on oil by localising access to goods, services and employment opportunities.</p> <p>Programs</p> <p>1.5-5 Identify, monitor and report on the risks to economic sectors of the effects of oil supply vulnerability.</p> <p>1.5-6 Identify the implications of oil supply vulnerability for socially and locationally disadvantaged communities.</p>
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Local Authorities are taking the lead



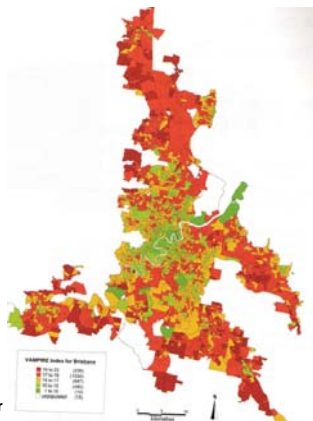
Maribyrnong **Gold Coast** **Sunshine Coast**
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How vulnerable are we?

Communities are at risk

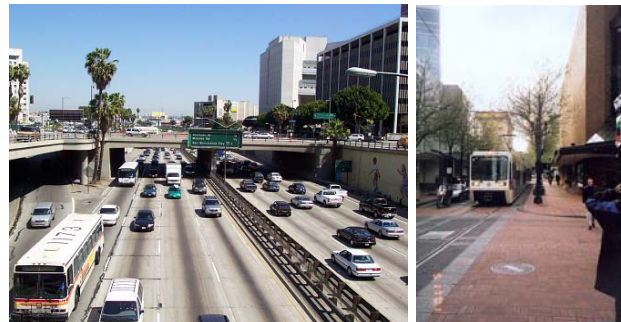
The Griffith University VAMPIRE Index measures vulnerability to oil depletion and to mortgage stress.

Most of SEQ is highly to very highly vulnerable



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Post-Peak, How will the SEQ community access and exchange goods and services?



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Social and Land Use Responses

Transport vulnerability is addressed by non-transport solutions

- TOD: land use Intensification and concentration
- Localisation and self-containment of employment, supply chains, production, and economic activity



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Designing walkable “places”

We must design our “places” to facilitate exchange ...not just to keep the vehicles moving.



- We live in cities to maximise exchange with a minimum of travel.
- Only at the pedestrian scale and at pedestrian pace, is valuable human exchange possible.
- Reducing reliance on vehicles not only reduces oil vulnerability, but will help our cities function.



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Introducing “Transit” into Neighbourhoods

- 15-minute neighbourhoods,
- Centres with focus on 5-minute “Core”,
- Local Plans can combine urban place types,
- Interaction between types make each place live and breathe.



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Choice of transit modes

Walking and cycling are first priority, then...

Buses, trams and trains carry people more efficiently and amenably than cars do...and can share the public realm.



Ferries turn the rivers and the Bay from barrier to connectors ...and make transit an absolute pleasure!



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What can place-based planning do?



- Identify opportunities to reduce vulnerability
- Reinforce land use to minimise travel (the most economical trip is the trip not taken)
 - Provide access to a greater choice of modes,
 - Increase connectivity, permeability and amenity to better serve walking, cycling and public transit
 - Place planning will not find alternative energies or fuels, but can reduce our dependence.



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Creating the places we love



Place Types define the role and purpose of each Local Plan

- intensity,
- character, and
- mix of uses.

Help us appreciate what we can access on foot,
Contribute to greater livability and to resilience.



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Conclusions

- What we must do to respond to peak oil is exactly what must be done for SEQ's desired urban transformation
- Place-planning is an awesome responsibility
- Are we ready?



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Thank you

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