Submission
No 129

THE TRANSPORT NEEDS OF SYDNEY'S NORTH-WEST SECTOR

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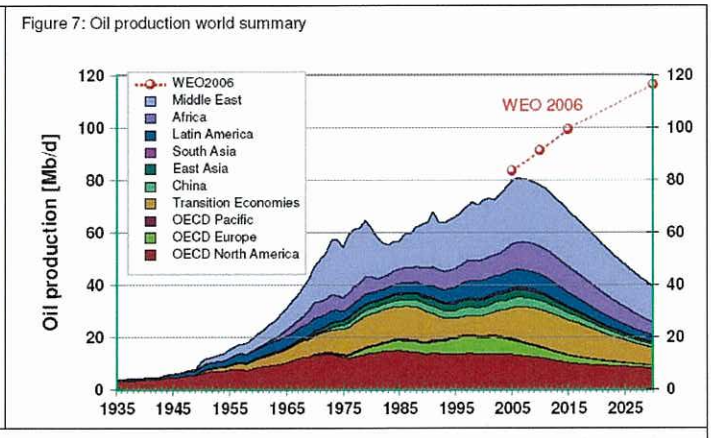
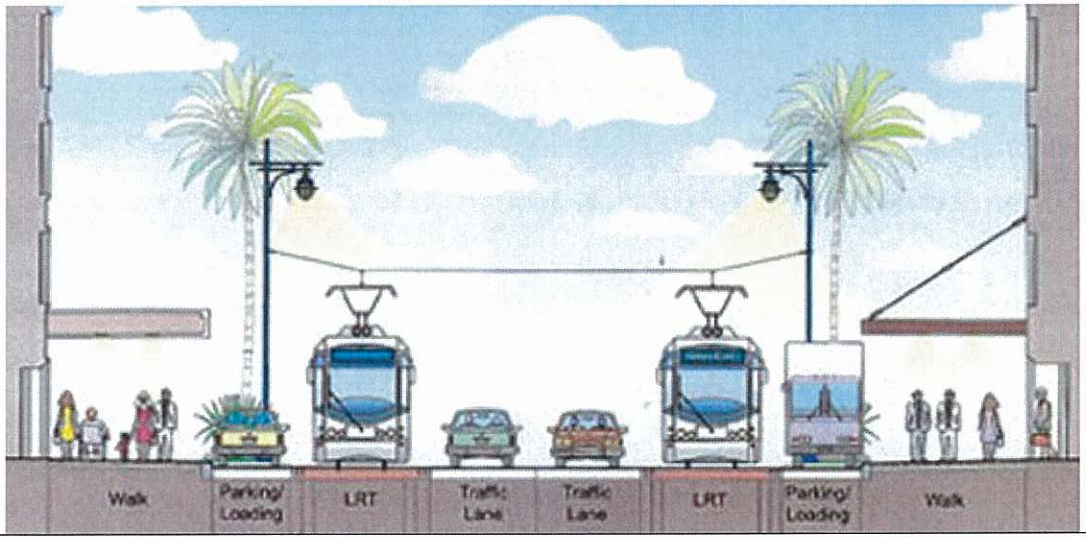
Date received: 16/10/2008

Rail crash program for Sydney's North West Surface Metro Solutions





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Context for this submission

We are no longer living in normal times. The financial crisis, peak oil and global warming are 3 crises which are interconnected and are fundamentally changing our lives, and very fast. We all knew that debt was accumulating. The problem in the US subprime mortgage market – where everything started - was caused by untested assumptions about endless growth in the American suburbia and exurbia. This growth was no longer possible after 2005, when global crude oil production started to peak and when hurricane Katrina hit New Orleans – by many climatologists seen as a sign of what is to come. The resulting high oil prices pushed millions of US households beyond their financial means. The 2008 hurricane season was again a reminder of what climate change may mean, when 2 hurricanes, one after the other, knocked out the electric grid and disrupted fuel supplies for many weeks.

Unfortunately our existing infrastructure is based on oil and coal, both primary energy sources which are either peaking or declining (oil) or cannot be used much longer (coal) as CO2 is irreversibly accumulating in the atmosphere, yet another debt problem. It is generally accepted that a transformation to carbon free sources of energy has to take place but there seems to be an underlying assumption that we have several decades time to accomplish this. This is NOT the case.

In fact, time is not on our side. Australian oil production peaked in 2000, approaches a 2nd and final peak in 2008/09 and will then rapidly decline. The Hirsch report which was commissioned by the US department of energy to investigate into the peak oil issue, found it may take 10-20 years to prepare for this event. On global warming, we are now in CO2 overshoot mode for around 20 years if one takes a preliminary 350 ppm limit. During the interglacial periods of the last 450 K years CO2 concentration in the atmosphere was never higher than 300 ppm.

The debt bubble has burst because credit supply exceeded the physical resource growth potential of the economy. But an even more dangerous **OIL RESERVE BUBBLE** is waiting to pop. Ex Saudi Aramco chief Sadad-al-Husseini, someone who should know about OPEC oil reserves more than anyone else, confirmed in October 2007, ALREADY 1 YEAR AGO, that OPEC reserves are overstated by 300 Gb which is the equivalent of 30 years of OPEC production. The world did not take notice. Another 400 Gb have never been audited, a point the US investment banker Matthew Simmons continues to warn us about.

WA oil production will start declining rapidly in 2010, leading to an oil import crunch and a growing trade deficit problem. It is uncertain where future oil imports will physically come from as traditional oil exporters to Australia have their own problems. Vietnam (now aligning with Venezuela) and Malaysia saw their net oil exports already peak. Indonesia has become a net importer and will end OPEC membership next January.

The financial crisis has complicated matters. With a recession very likely ahead of us, and a Federal budget surplus quickly melting away **it is now high time to start massive public works programs with the objective to mitigate the impact of peak oil and to de-carbonize our economy, while maximizing employment.**

It follows that there is no more time and money for an expensive metro tunnel. This submission proposes an alternative: rail on toll-ways and light rail on major roads.

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Summary

Peak oil is NOT OFF because of lower oil prices. It is a 3-5 year long transition process between growing and declining oil production which has started in 2005 controlled by RAMPANT decline in existing, maturing oil fields. Future decline rates are around 3-4% pa, resulting in a reduction of oil production of 30% by 2020. This may be masked by falling demand in a recession. Nevertheless, fuel available for private cars will be 1/5th to 1/4th of what it is now if other essential services are to continue. OPEC's reserves are overstated by 300 GB equal to 30 years OPEC oil supplies. When this truth comes out some time in the next decade, the Middle East will experience social unrest, causing additional oil supply disruptions. The current global oil market may morph into barter business. Fuel rationing will be unavoidable.

The second set of problems will come from global warming which is a non linear process and is really accelerating now. Planet Earth is already in CO2 overshoot mode for 20 years. The disappearance of the Arctic summer sea ice in the next years will dramatically change the climate on the Northern hemisphere, a process which has already started. The ice sheet on Greenland will be in danger This and the continuing collapse of ice shelves around the highly vulnerable West Antarctic ice sheet will show the world that business as usual is no longer possible and that coal has to be phased out much sooner than previously thought.

The requirements to reduce CO2 emissions will limit the potential for non-conventional fuels which could replace oil. Low energy profit ratios would make them very expensive anyway. Bio fuels are now seen in competition to food production and should only be used in the agricultural sector itself to make food production less dependent on oil.

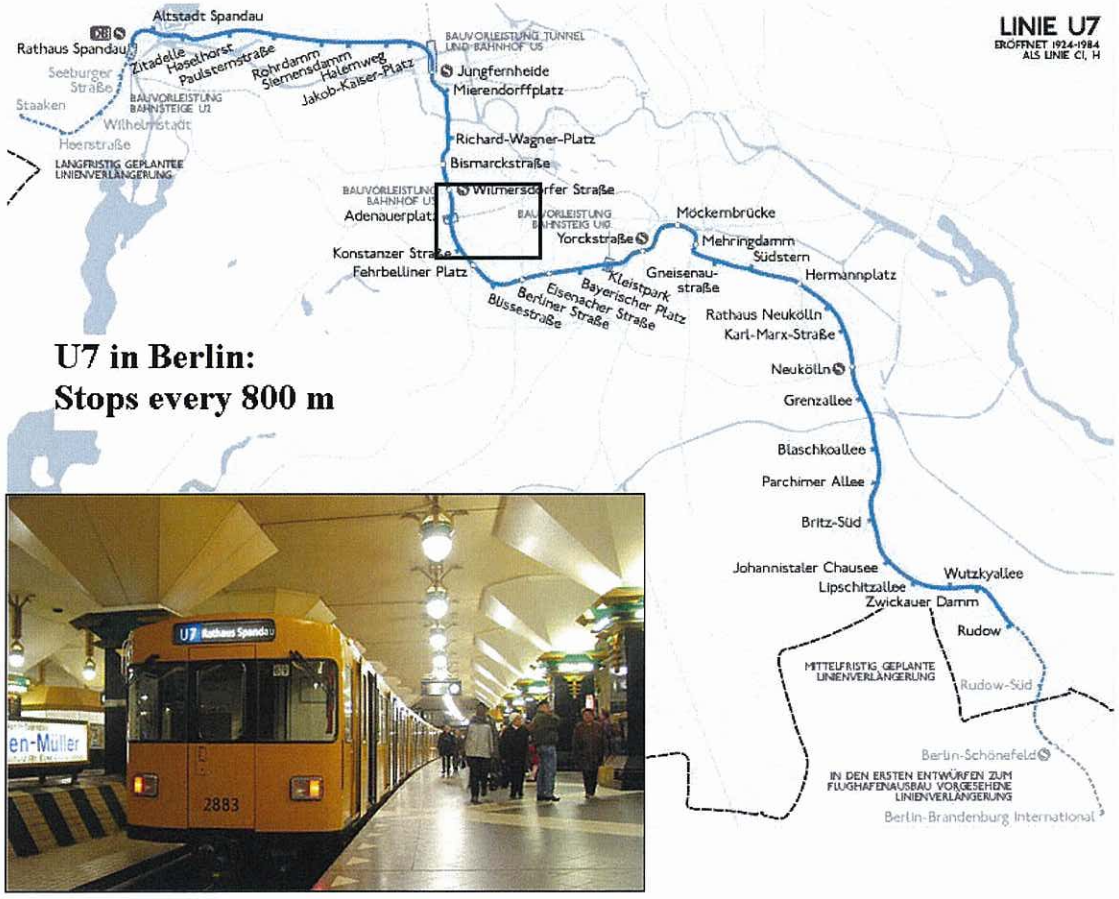
This impasse leaves very little clean primary energy available to drive a future car fleet, whatever the technology. The continuing denial mode of the corporate sector and governments over the oil-geological, thermodynamic and climate limitations of the coming oil, fuel and energy crisis makes a bad situation worse.

For the project at hand this means a total change in strategy which must be to replace long distance car commuting by electric rail in order to rescue the overall functionality of Sydney, that is the connectedness of survivable subcentres and NOT just to provide a fast link from Rouse Hill to the city.
There is no more time for big tunnel projects which will get delayed in diesel shortages. For every km of tunnel 10 km of surface rail can be built. The longer the rail network for a given amount of investment, the better. The existing road corridors can be used because car traffic is going to decrease considerably. Toll-way operators will go out of business and by allowing them to build rail lines on them, they and the superfunds can be rescued.

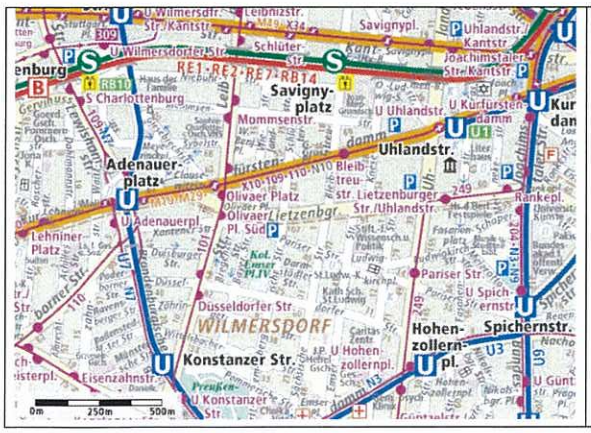
It is assumed that the reader of this submission has studied my submission on DOTAR's F3-M7 Corridor Review entitled "The End of Freeways" which deals with peak oil 101, the energy squeeze, alternative fuels and electric rail solutions.
http://www.dotars.gov.au/roads/F3toM7Review/pdf/SUBMISSION_47-Mr_Matt_Mushalik.pdf

(1) Critique of the proposed NW metro

1.1 The proposed metro to the North West is not a European type metro as claimed. It has far too few stops. A line of similar length in a European city is for example U7 in Berlin (population 3.4 million), a bit shorter at 32 Kms, with 40 stops. That makes 1 stop every 800 m, compared to 38/16=2.4 km for the NW Metro. This particular line U7 connects to 4 heavy rail links and to 7 other metro lines while crossing almost the whole city from West to South East including the CBD. The trip takes 56 minutes. Frequency: every 5 minutes. Apart from a short pre-war section, the line was built between 1963 and 1984.



http://en.wikipedia.org/wiki/U7_(Berlin_U-Bahn)



The average of 800 m results from very short distances in the city (700 m, left, area shown is 5 x 3.5 kms) and longer distances (>1000 m) in lower density areas (down)

1.2 The NW metro seems to be a hybrid between

(a) a metro between the CBD and Top Ryde (but still with too few stops even there),
(b) a connection to Epping and
(c) the originally planned NW rail link, which can be described as a regional underground express line with very few stops and no stop between a long section between Epping and Cherrybrook

1.3 The function of the NW metro appears to be to connect a proposed accumulation of subdivisions at Rouse Hill to the Northern line at Epping and then to the CBD. The number of stops has been minimized to keep the traveling time between Rouse Hill and the city to a minimum. The function of a European metro, however, is to maximize catchments along the line by providing many stops, but not necessarily to minimize traveling time. Very few passengers would in fact travel a long distance of 30 km or more with a metro. This is the function of heavy rail, in Berlin called S Bahn with stops every 2-3 kms.

In a properly designed system, a metro has a feeder function to heavy rail, which would operate all stopper services at the same frequency as a metro so that no time is lost at the interchanges.

1.4 Historic context: originally, the Chatswood – Epping rail line was planned to go up to Parramatta with the objective of diverting Western commuters with destinations North of the Harbour bridge away from the Strathfield – CBD sector which was seen to reach capacity. Treasurer Costa did not like to spend funds from his budget for rail, intervened and thoughtlessly cancelled the Epping - Parramatta part of the link, thereby taking away much of the function of the remaining Epping – Chatswood section.

In the meantime, the Planning Ministry developed the metro strategy with grand plans of increasing Sydney's population by 1 million – whether this would make sense or not -, 60-70% of which was supposed to be settled in existing suburbs, mainly in flats. However, there is considerable resistance in the old suburbs for this type of development. Councils, controlled by Councilors who have to listen to what their electorate does not want, were and still are reluctant to approve high density projects. So the Planning Ministry has now snatched away planning powers from the Councils by declaring every residential high rise as a State significant development.

It appeared to be easier to build green acre developments at the fringes of the city and one of these is at Rouse Hill, a job for big developers. Since the invention of the term "sustainability" it is now modern to include in all plans public transport and rail links so the master plan for Rouse Hill had to include some sort of rail connection. This was the birth of the NW rail link, to connect Rouse Hill to Epping, at the same time giving the truncated Epping – Chatswood link a new function.

But again then treasurer Costa did not want to spend money from his budget for rail and the NW rail link was also abandoned, which resulted in a public outcry. To calm down the general outrage in the planning community over continuing rail cancellations, the idea was a private – public partnership. It has to be separate from heavy rail, after the problems with the Airport link. With the fall of the Iemma government the whole project is in limbo.

1.5 Given the continued love affair of the NSW government for the car, however, it could all be a skillfully orchestrated diversion to attract public attention away from the real pet projects of the roads minister: new road tunnels. The NSW government recently asked the Federal government to help finance the M4 East, but not the NW metro. That says it all. Now also the Federal government does not seem to have much of an interest.

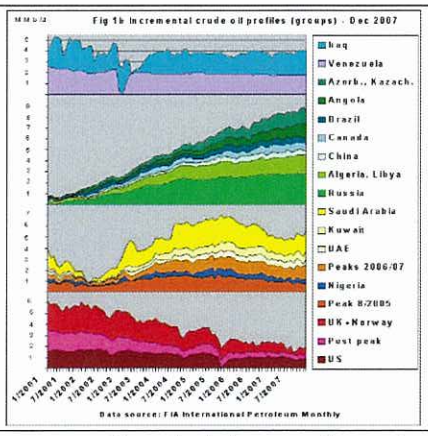
There are also other signs that there is no real intention to build the NW metro soon. The Top Ryde shopping center is just building a 3,000 car park, underground just where a metro station should be. And at Epping, planning was not done to accommodate a metro connection at all. It will add to the ad-hoc, shortsighted planning there with just 3 surface tracks instead of 4 which would be needed when the Strathfield – Hornsby line will have to be quadruplicated. In both cases, new metro stations would have to be built deep down under existing structures, greatly increasing construction and operating costs. The planning chaos could not be greater. Similar problems can be expected for the section running into the CBD.

1.6 It is also unclear whether the operator of the M2 will object to the NW metro as there seem to be secret agreements between the government and Hills motorways to keep away potential competitors. Possible compensation payments will add to the cost of the NW metro.

1.7 When designing the fare structure for the NW metro (as a separate PPP) compared to City Rail fares, there will be competition between Epping – CBD by rail (via Chatswood or Strathfield) and metro (via Top Ryde). It could well be that many Western passengers get off at Epping and then continue by State run rail if that is cheaper. In the CBD, the metro would serve only a small West-East area with 2 stations compared to rail running along the whole North-South length with all other city stations.

(2) Oil supply situation

2.1 The peaking of crude oil production, which is a 3-5 year process, started in 2005 and will change the whole transport world. The following graphs are based on EIA data.

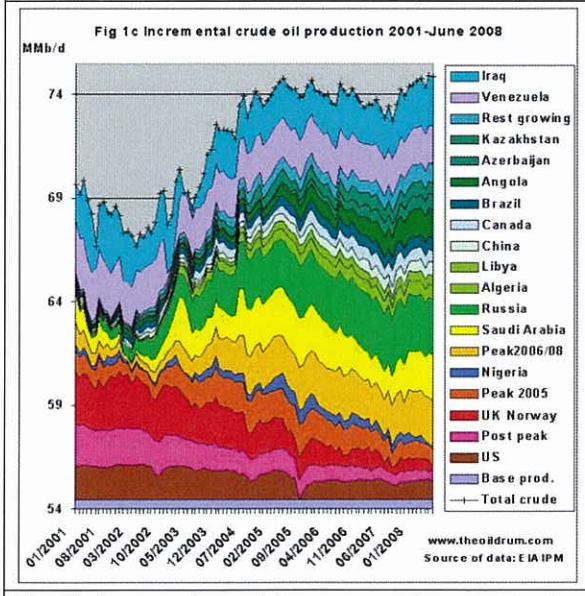


<< stacked, incremental crude oil production profiles in 4 groups of countries, from top

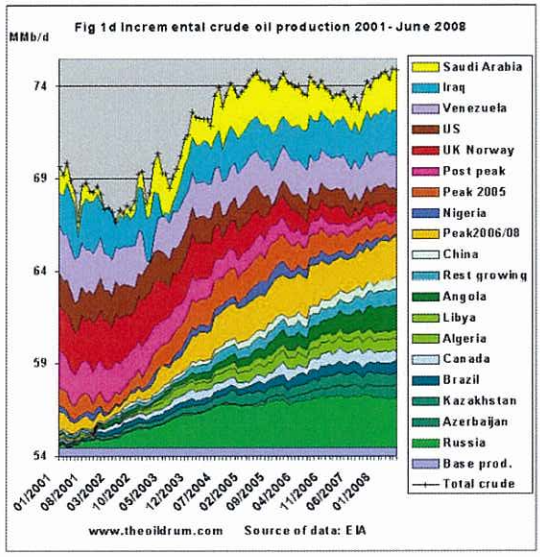
- special cases Iraq and Venezuela
- growing countries
- peaking in 2005
- countries in decline

There are 2 ways of stacking these 4 groups and they give us different insights in what is really happening

2 underlying crude peaks delineate a bumpy crude oil plateau
Same data, but 2 different views



Declining and peaking countries stacked at bottom: 1st peak in May 2005

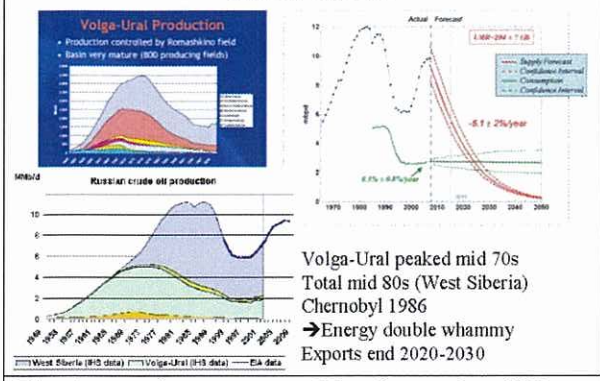


Growing countries stacked at bottom: peak of hitherto growing countries shapes up

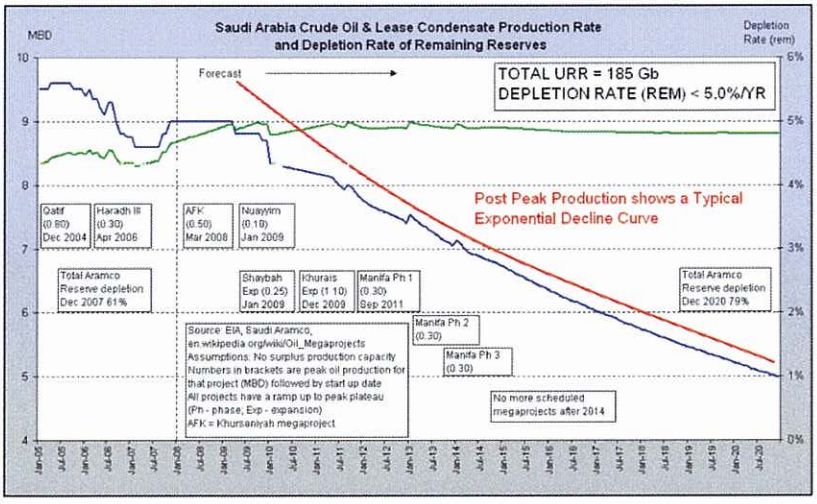
The methodology for the above graphs is described in more detail in this article: "Bumpy Crude Oil Plateau in the Rear View Mirror" http://www.theoildrum.com/node/3793 or here: http://sydneypeakoil.com/matt/Crude_Oil_In_Rear_Mirror.pdf

Once the 2nd peak in the growing group is fully established, followed by a subsequent decline, the whole system will go into decline. Initial decline rates may start with 1-2 million b/d pa, later accelerating, especially when all offshore fields together will peak. Offshore oil now accounts for 40% of all oil. In fact, it was offshore oil which lifted total production up from its level in 1979 (2nd oil crisis triggered by the Iranian revolution).

Of particular interest will be oil production from the giants Russia and Saudi Arabia.

Russian Oil Peak	Oil end game
	
The 1st peak was caused by the peak of West-Siberian giant oil fields and the collapse of the Soviet Union. Russia is now on it's 2nd and final peak.	The war in Georgia has changed the oil strategic situation around the Caspian sea. A new alliance Russia-Syria-Iran seems to shape up.

Saudi Arabia's oil supplies have been described in Matthew Simmons' book "The coming Saudi Oil Shock and the World Economy (http://www.twilightinthedesert.com/) in which Matthew predicted falling, not increasing oil production. One estimate about how production may develop over time is from Tony Erikson (Ace on the oildrum blog)



A full description of this graph can be found here: http://www.theoildrum.com/node/3064

Saudi King says keeping some oil finds for future

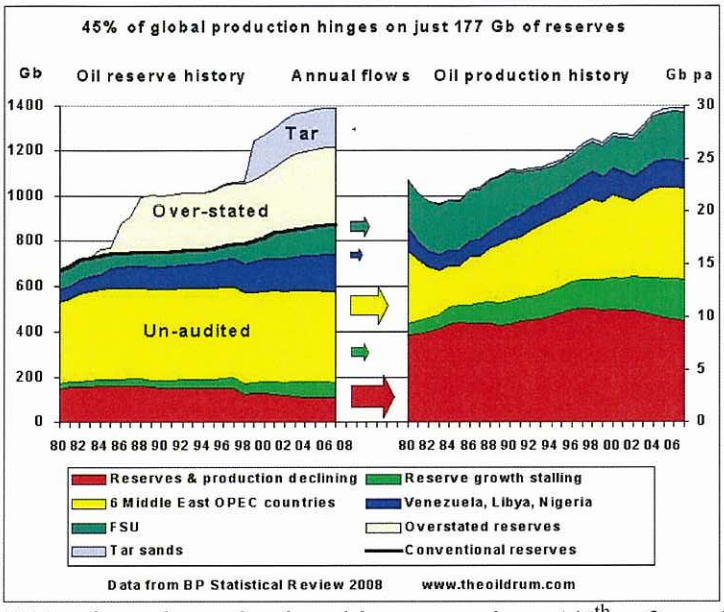
RIYADH, April 13 (Reuters) - Saudi Arabia's King Abdullah said he had ordered some new oil discoveries left untapped to preserve oil wealth in the world's top exporter for future generations, the official Saudi Press Agency (SPA) reported. http://www.forbes.com/reuters/feeds/reuters/2008/04/13/2008-04-13T114657Z_01_L1396877_RTRIDST_0_SAUDI-OIL.html

There were no new discoveries, but this says it all. When will Australia keep its oil for the future?

There is a law in oil depletion: when the giants peak, the total peak is not far, because the smaller producers cannot compensate for the huge declines of their much larger competitors. This is valid in fields, provinces, countries and finally the whole world.

2.2 Imbalances in the global oil supply system

Annual global oil flows are not commensurate with reserves:



45% of total production hinges on just 1/5th of total reserves. This problem alone will lead to supply disruptions in the next decade.

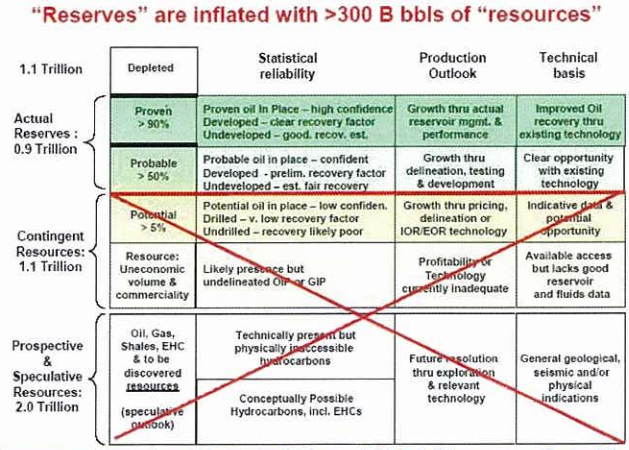
It is commonly believed that oil reserves are growing and that they "last" for 40 years. Canada is claimed to be a new oil bonanza rivaling Saudi Arabia. But in reality, OPEC's oil reserves are over-stated, the rest has never been audited and Canadian tar sands require hydrogen from natural gas to be turned into liquid syn crude.

More information can be obtained here: "The Disconnect Between Oil Reserves and Production" http://www.theoildrum.com/node/3664 or:
http://sydneypeakoil.com/matt/Worlds_Fragile_Oil_Flows_From_Declining_Reserve_Base.pdf

2.3 OPEC's paper barrels

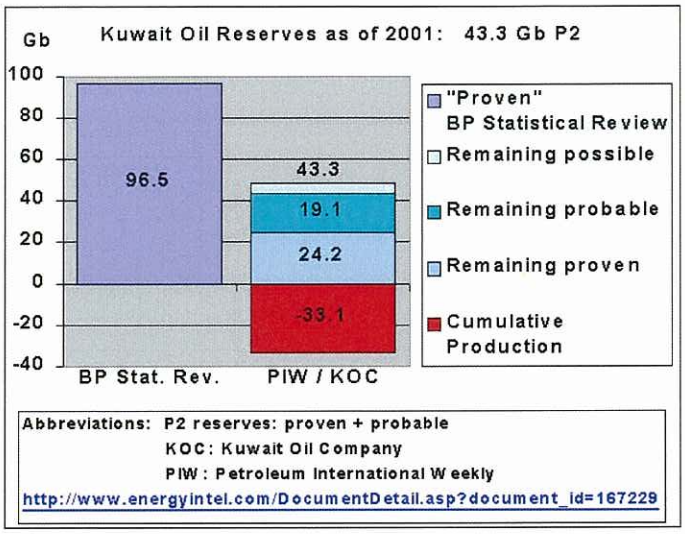
As mentioned in the previous para, OPEC's oil reserves are overstated by around 300 Gb, equivalent to 30 years OPEC oil supplies. This is long known and a good summary of this problem can be found in this submission to the Productivity Commission entitled: "**Next intelligence failure: 300 Gb OPEC oil missing, Dec 2004"**
http://www.pc.gov.au/__data/assets/pdf_file/0005/45644/sub075attachment2.pdf

In an oil & money conference in London last October, Ex-Saudi Aramco Vice President Sadad-al-Husseini indirectly confirmed that OPECs reserves have to be re-classified to much less useful resources by showing following graph:

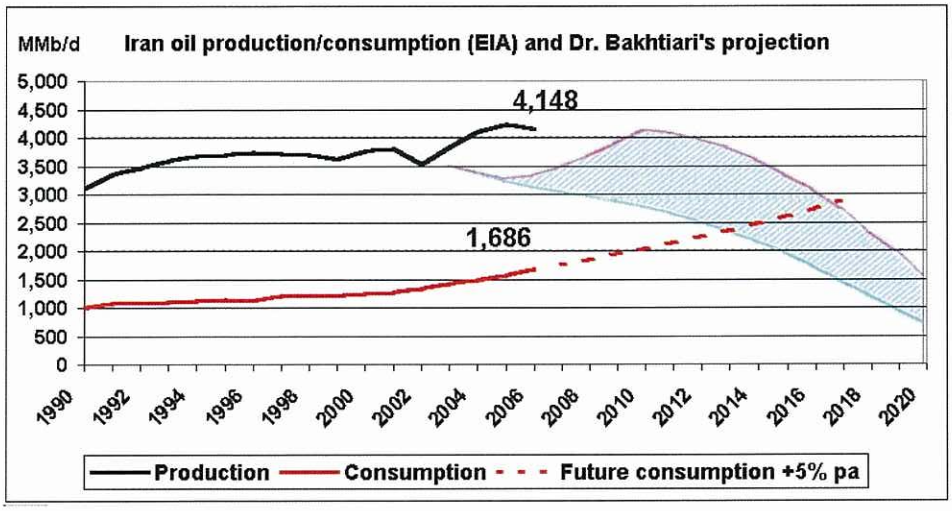


http://www.energyintel.com/om/speakersNew.asp?Year=2007&filename=SadadIbrahimAlHusseini.pdf

In the case of Kuwait, this means for example that actual proven reserves are less than half of what is published in the BP Statistical Review.



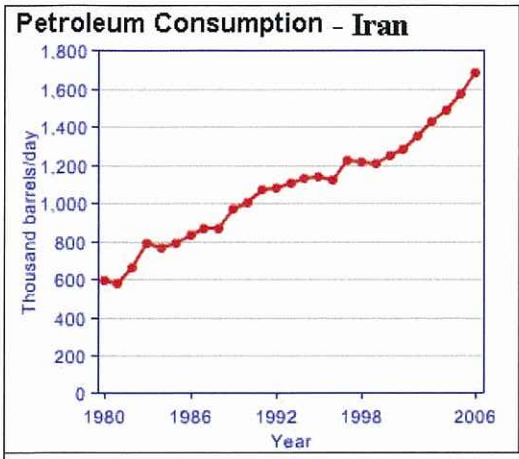
In Iran, population 70 million, net oil exports may end by the middle of next decade.



The above graph shows actual oil production and consumption on the left side and projections to the right. Note that the dashed future consumption curve hits the projected production area (estimated by the late Iranian oil expert Dr. Bakhtiari), leaving no room for exports. http://www.peakoil.net/iwood2003/paper/BakhtiariPaper.doc

The problem of overstated OPEC reserves will lead to social unrest in the Middle East in the next decade. Iran, for example, introduced petrol rationing last year, which led to riots at filling stations.

Iran's inflation rate is already 18%
http://www.freshplaza.com/news_detail.asp?id=19599

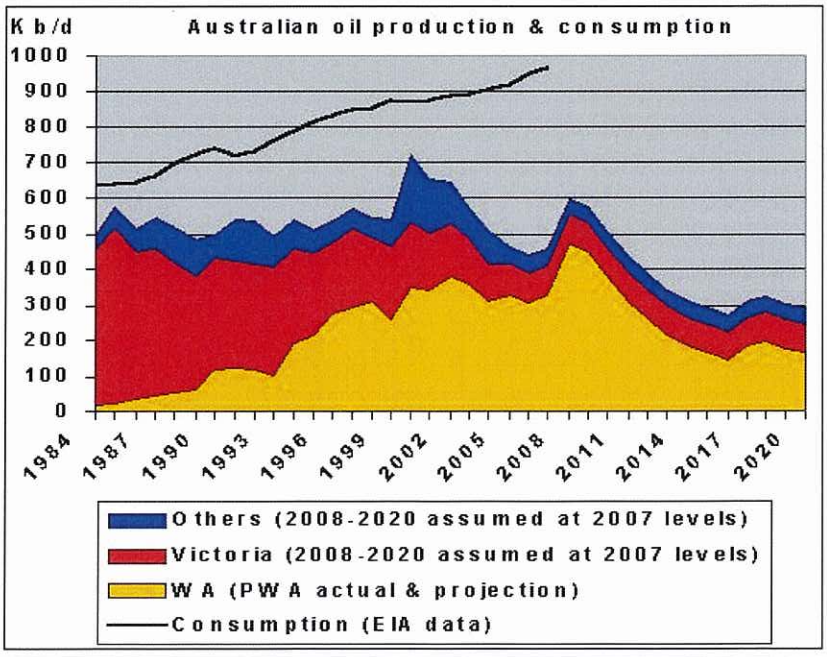


Oil consumption in Iran increased by a whopping 7% in 2006. (left)
http://tonto.eia.doe.gov/country/img/charts/IR_cons_large.png
In order to reduce growth rates, the government had to introduce petrol rationing. Enraged motorists attacked filling stations (right).

Low petrol prices over many decades have resulted in consumption patterns and expectations of cheap fuel forever. Due to limited local refining capacity, increasing quantities of petrol have to be imported and then subsidized, putting heavy strain on the budget.

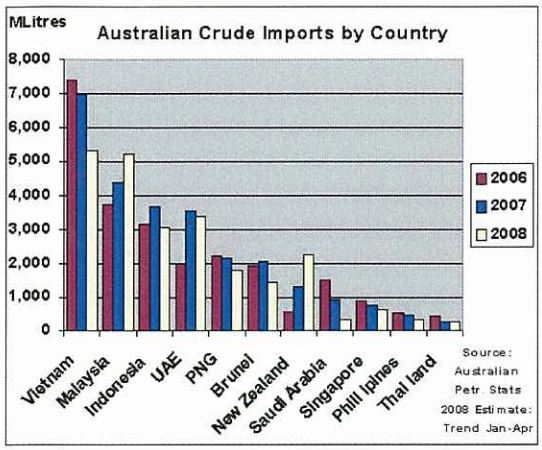
These events are not a sign that Iran is the holder of the 2nd largest oil reserves as claimed.

2.4 Australian oil supply situation



<<< Australian oil production peaked in 2000, then declined and is approaching a 2nd and final peak in 2008/09.

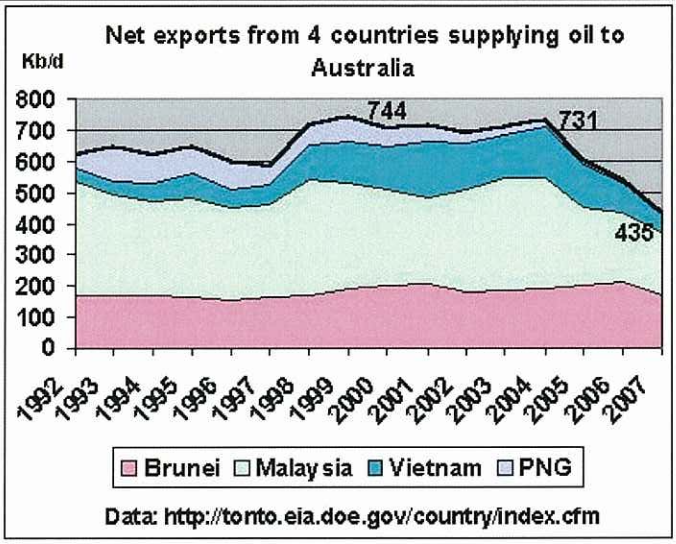
All the while demand has been steadily growing, requiring increasing quantities of imports.



<<< Imports come from a variety of oil supplying countries. There does not seem to be any particular dependency on one supplier or a few suppliers. The Middle East is not dominant (yellow columns) so there is no unusual vulnerability there.

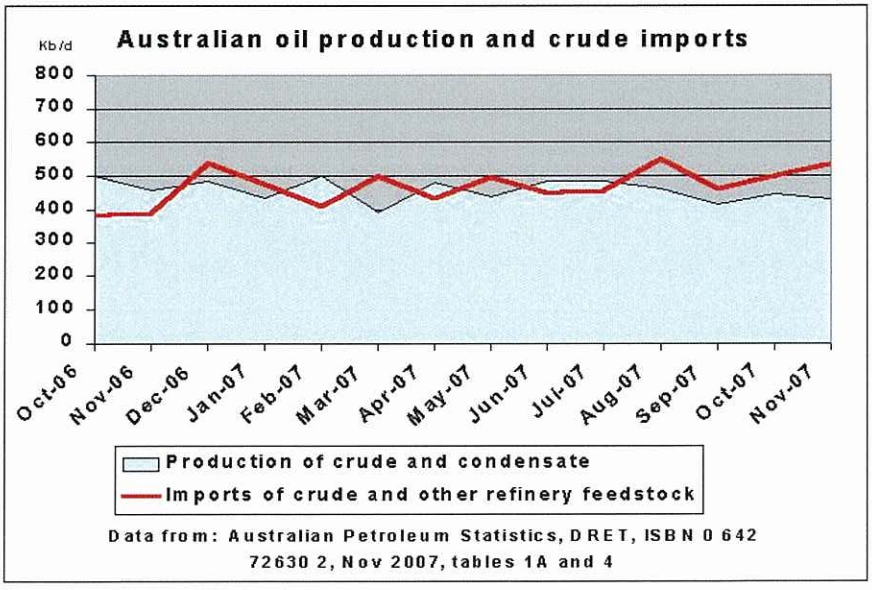
The 4 main suppliers from Asia are Vietnam, PNG, Malaysia and Brunei.

Data from Australian Petroleum Statistics.

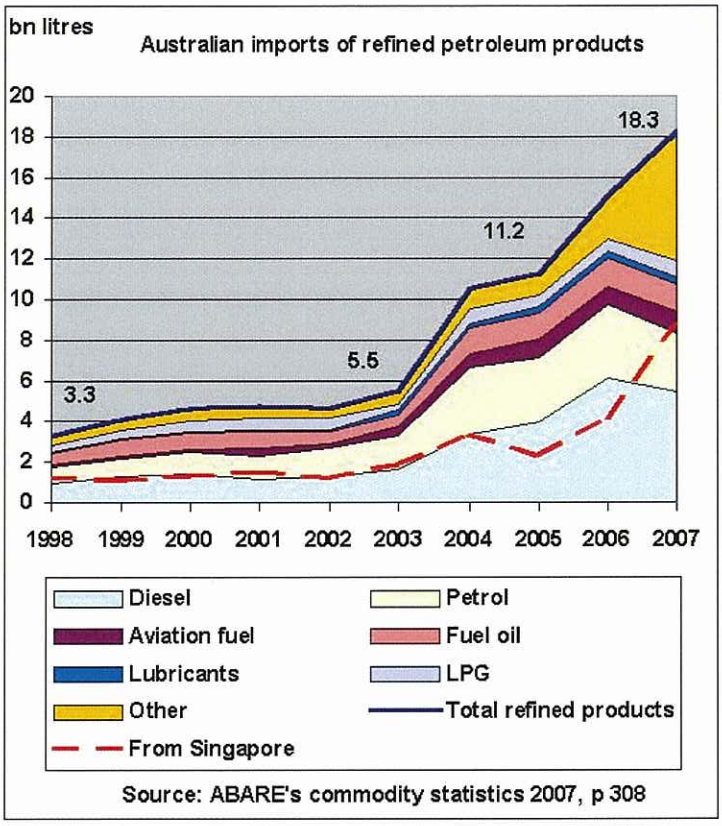


<<< Australia's 4 main oil supplying countries show peaking of net oil exports as a group. Brunei should be a supplier without problems as the population is small and production slightly growing
But Malaysia and Vietnam have young, growing populations and fast developing economies resulting in growing local demand for petroleum products.

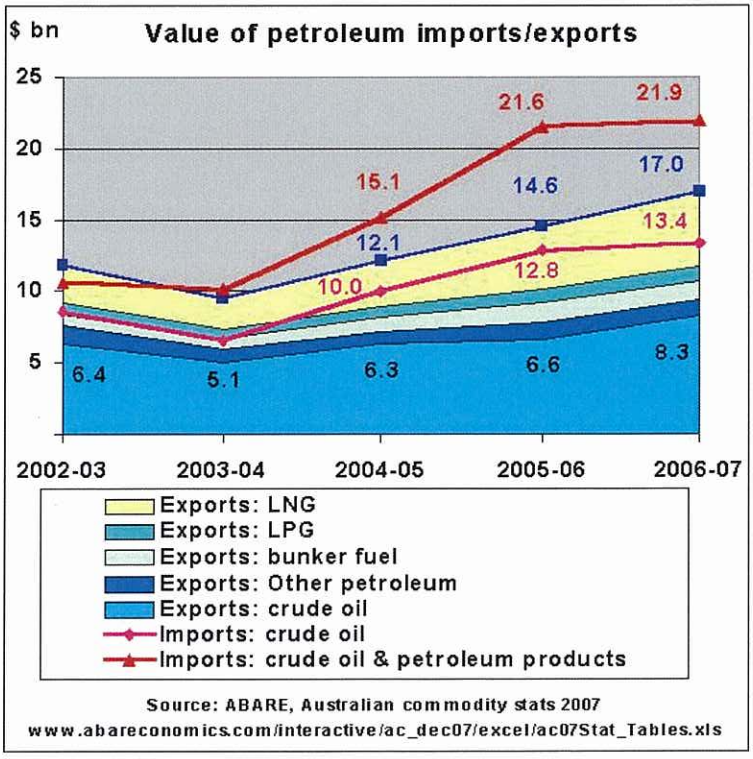
Australia will have to look for new suppliers. But from where?



In 2007, Australian oil production was practically on the same level as crude oil imports



Australian imports of refined petroleum products have been skyrocketing. This growth path cannot continue.



This graph shows that Australia is a net importer of liquids by value, even including LNG exports. This situation is unsustainable.

Australian oil production may only be half by 2020:

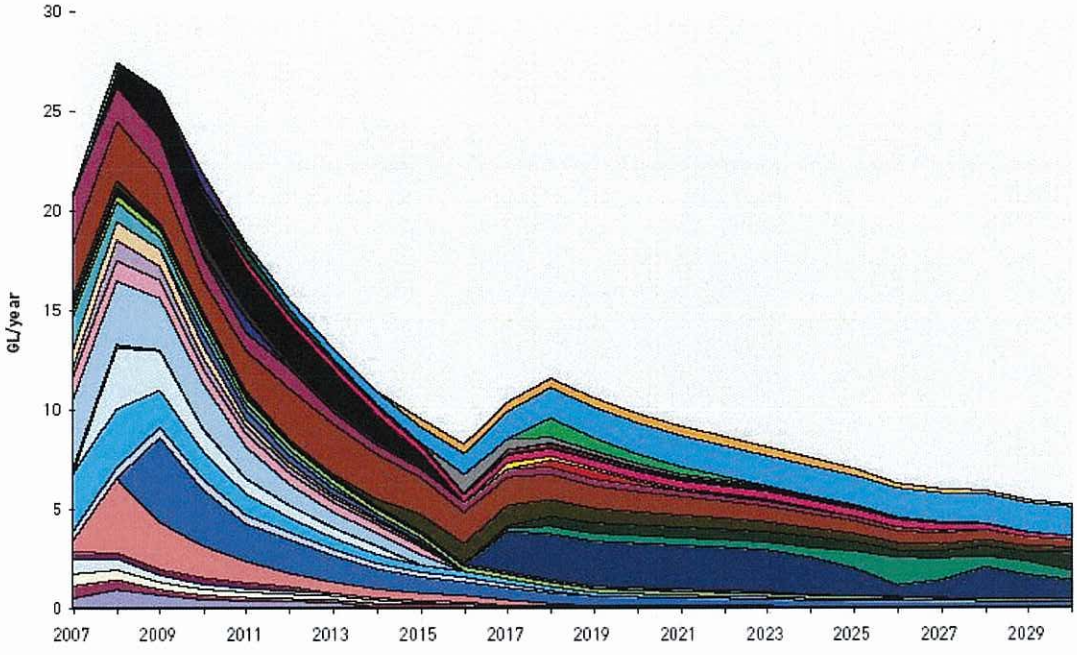
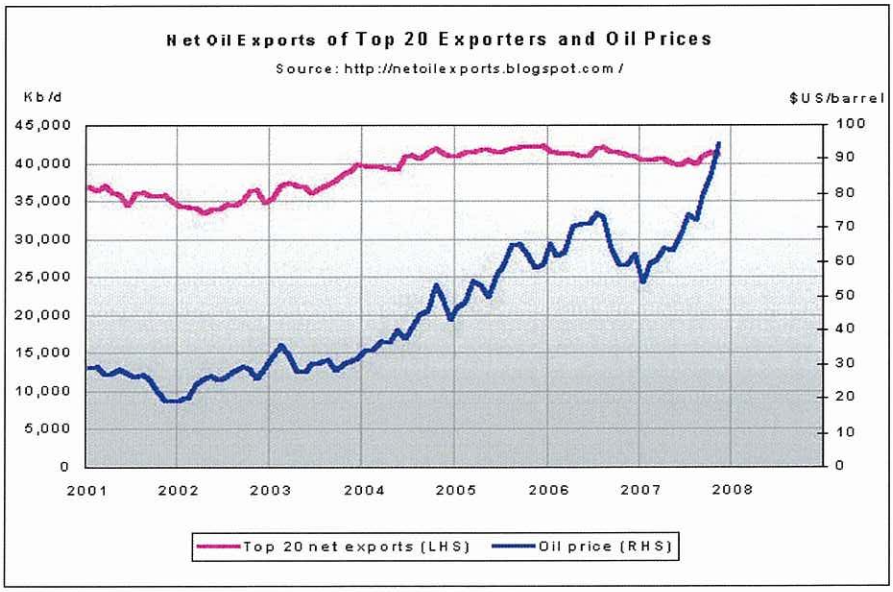


Figure 3 | **CRUDE OIL AND CONDENSATE PRODUCTION FORECAST FOR WESTERN AUSTRALIA, SHOWING THE SLOWER DECLINE FOR CONDENSATE COMPARED TO OIL.**

http://www.doir.wa.gov.au/documents/PWA_September_2008.pdf

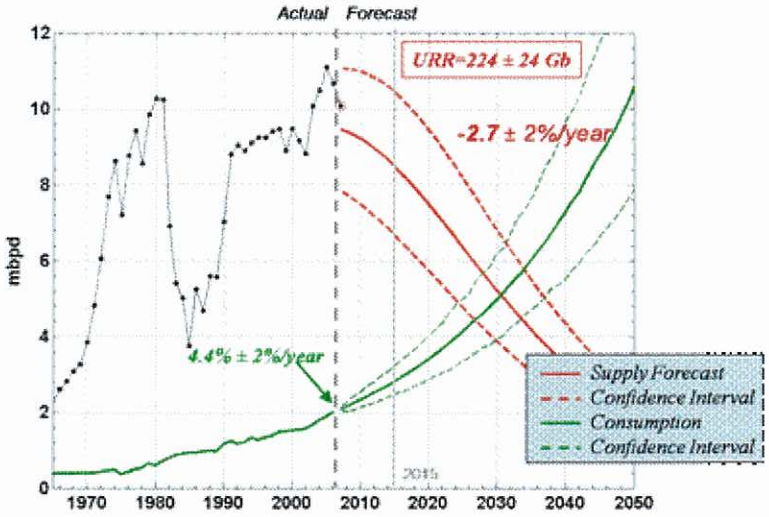
2.5 Global export volumes

But imports from the global oil export market may prove increasingly difficult.

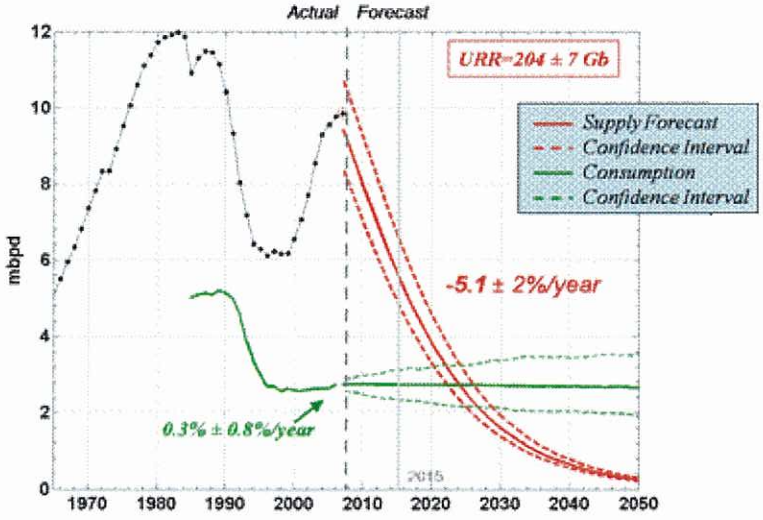


The top 20 oil exporters are on a production plateau for several years now, despite increasing oil prices. In the meantime, oil prices have come down, so there will be less exploration and development in oil fields.

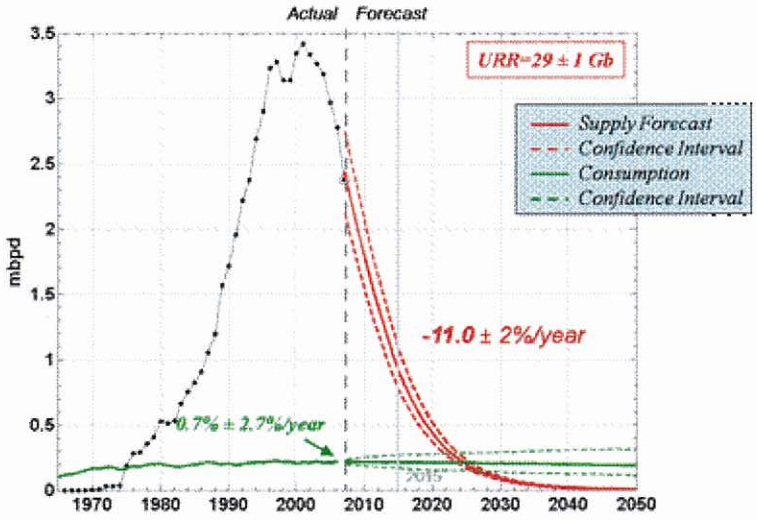
How will this develop in future? The following graphs have been taken from an article titled "A quantitative assessment of future net oil exports by the top five net oil exporters", published by Jeffrey J. Brown and Samuel Foucher in the Energy Bulletin (http://www.energybulletin.net/38948.html) in January 2008. In all graphs, red curves denote declining production and green curves growing consumption.



Saudi Arabia: net exports will decrease to zero sometime after 2025, depending on decline rates of production and growth rates of local consumption



Russia's exports will go towards zero sometime between 2020 and 2030



Norway

In these 3 examples, net exports will cease in about 15 – 20 years time. Long before that there will be extreme competition for ever decreasing quantities of oil on the oil market. In fact it is doubtful whether a free oil market as we know it now will continue at all once the first oil shortages appear. That may happen between 2010 and 2012 as stated in diplomatic language of the International Energy Agency in its 2007 Medium Term Oil Market Report:

"Despite four years of high oil prices, this report sees increasing market tightness beyond 2010, with Opec's spare capacity declining to minimal levels by 2012"
http://www.ft.com/cms/s/2d97d75a-2e0c-11dc-821c-0000779fd2ac.html

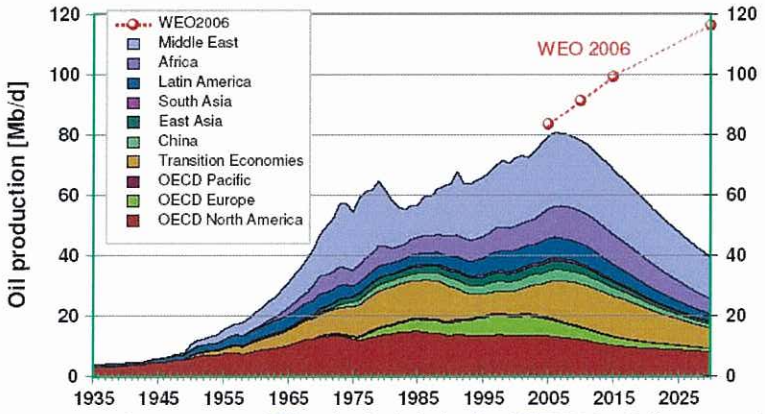
2.6 In a recent interview with Internationale Politik, titled "The sirens are screaming", IEA chief economist Fatih Birol was asked following question:

Q: The WEO 2007 states that the steep decline will be between 3.7% and 4.2 %. Is this correct?

BIROL: Exactly

Q: This is even steeper than predicted by the Energy Watch Group!

Figure 7: Oil production world summary



http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Oilreport_10-2007.pdf

BIROL: I can already inform you now that we will intensively research the outlook for oil and gas production in our WEO 2008, which we will publish in November. We'll look at 350 of the most important oil and gas fields and investigate to which degree they are declining and the consequences of that.

Q: What to you mean?

BIROL: To my knowledge this will be the first public study in which we check and revise our own thinking about how much oil and gas will be available for the market. A lot of people will come to new conclusions.

Q: One of the statements in the WEO 2007 is that the total additional oil production needs to come from OPEC and especially from the Middle East. Salem el-Badri, OPEC's General Secretary, announced in an energy security conference in London in February that OPEC wants to invest $US 200 bn until 2012 to create 5 million b/d new capacity, This quantity is, however, in stark contrast to the WEO 2007 in which it says that by 2020 new capacity of 24 million b/d are necessary to meet growing demand. In fact, Salem el-Badri announces that OPEC will not meet expectations. Does this not mean that we are going to have a serious problem?

BIROL: In deed, this is the reason why for the first time this year we are talking about a supply crunch. There is a gap between the level of global demand and the supply from this region that can actually be provided to the market. We are of the opinion that oil suppliers must increase their production considerably, but we are not sure whether they will or want to do it.

Q: Because they do not want to?

BIROL: When looking at the figures up to 2015, there is a gap between our expectations and capacity increases oil producers are able or prepared to deliver. This gap shows the serious, actual situation in the oil market. This could mean a supply crunch and escalating prices.

The end of Saudi oil growth

Saudi Arabia's King Abdullah said he had ordered some new oil discoveries left untapped to preserve oil wealth in the world's top exporter for future generations, the official Saudi Press Agency (SPA) reported.
http://www.energybulletin.net/42700.html

No Need for Further Saudi Oil Capacity Expansion — Al-Naimi
http://www.arabnews.com/?page=6&section=0&article=109119&d=20&m=4&y=2008

Birol summarizes we should leave oil before oil leaves us.
http://www.internationalepolitik.de/archiv/jahrgang-2008/april/--die-sirenen-schrillen--.html

2.7 In conclusion, a serious oil crisis is ahead of us. It is complicated by the financial crisis. There is very little time left to prepare Sydney for permanently declining oil production. And the time frame in which this has to be done is up to 2015. By that time, all regions of Sydney without rail need to have access to rail, not just the NW sector. So great care has to be taken to use available funds to maximize the length of rail links which can be built.

(3) What global warming means for society's car dreams

3.1 Transition dreams for private cars

Many believe there will be a transition from the current car fleet to whatever comes next and that market forces will ensure this will happen with a kind of invisible hand. Hybrid cars, electric cars, hydrogen cars, fuel cell cars, nano cars you name it.

Four Billion Cars in 2050?
Posted by **Stuart Staniford** on February 19, 2008 - 1:00am
Topic: Environment/Sustainability
Tags: 2050, car, civilization, hybrids, peak oil, PHEV [list all tags]

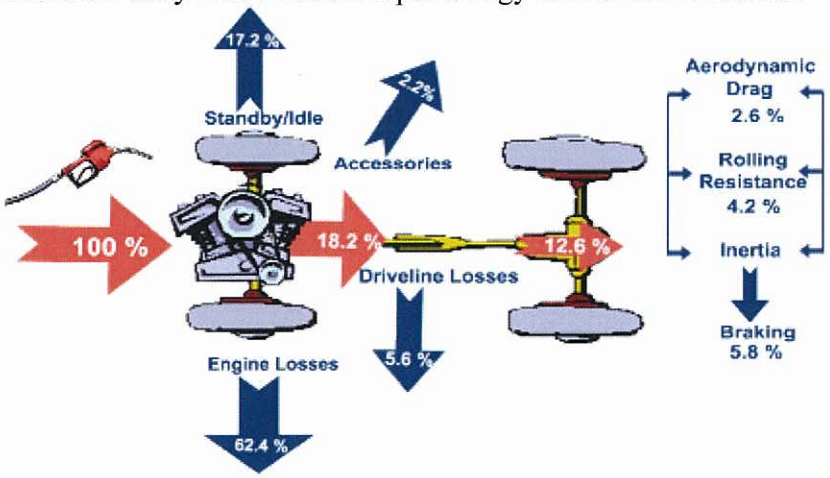
*The Tata Nano will sell for about $2500 (US) in the base model, and get about 51 mpg (US). Source: **Wikipedia**.*

<<< Society's eternal car dreams.

In a recent posting on the peak oil blog Theoildrum, editor Stuart Staniford wasted time to write an article about 4 billion Nano cars from India without even thinking about the resource constraints which will make this scheme impossible to implement. Not to mention that the absorption capacity of our atmosphere for CO2 has already been exceeded 20 years ago.

http://www.theoildrum.com/node/3636

Peak oil may well trigger the demise of the internal combustion engine in urban areas. It is just too inefficient. Only 12.6 % of the input energy arrives at the wheels:



http://www.fueleconomy.gov/feg/atv.shtml

Hydrogen car dreams……

Reality

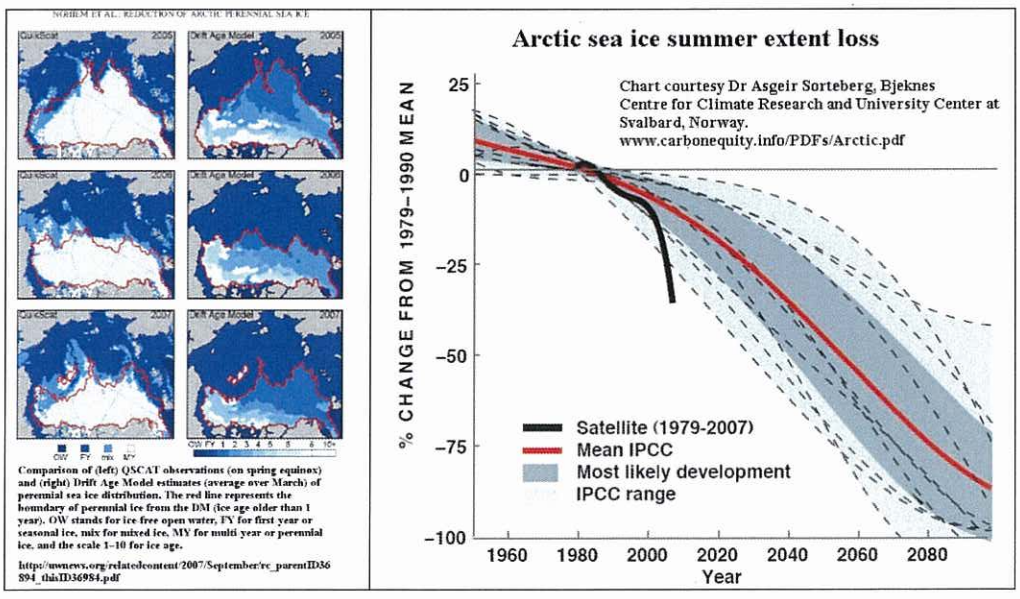
The time horizon for such a transition is always thought to be decades, and indeed it would take 15-20 years to turn over our entire car fleet. And even that only under favourable economic conditions and sufficient credit to finance new car sales.

All these ideas are what can be called untested assumptions. Unless there is a concrete replacement and phasing-in plan in place, not much will happen. Not least because of the denial mode over peak oil, both in the corporate world and governments. Since it is generally believed there are 40 years sufficient oil supplies, the problem seems to be far away and a wide spread faith in technology provides a false sense of confidence that solutions will come up more or less automatically. Constant improvements in consumer electronics suggest it will be similarly easy to develop new engine and car technologies, new fuels, new energy sources etc. What is not seen is that all current successes are basically in miniaturization while this cannot be duplicated when moving people and bulky freight and generating electricity/energy which has to do with massive amounts of coal, gas and oil. Alternative and even nuclear energies also require large quantities of materials to be assembled and installed.

3.2 Global warming makes peak oil worse (and vice versa)

So we are in a situation where various car companies are working on all kind of detailed technological solutions without having in mind the proximity of peak oil and the following steep declines of oil production. A decline rate of 1% would be manageable but a continuous 3-5% not. Nor is the primary clean energy challenge seen which is caused by the simultaneous arrival of peak oil and global warming. **This is because society's primary task is now to replace all coal fired power plants with clean energy, whatever that is, and in general to de-carbonize our economy**. The time frame for this replacement program becomes ever more urgent as climate research advances rapidly.

Climate events many researchers thought just a year or two ago would happen in decades are actually already happening right in front of our eyes, for example the disappearance of the Arctic summer sea ice, with incalculable consequences on the climate in the Northern hemisphere and subsequently on the rest of the world and the Greenland ice sheet in particular.

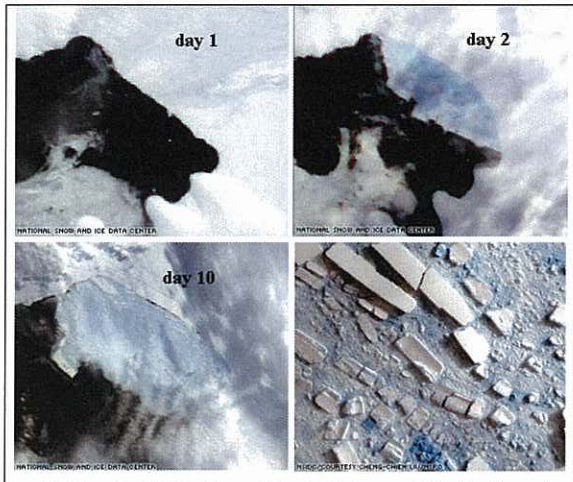


Comparison of (left) QSCAT observations (on spring equinox) and (right) Drift Age Model estimates (average over March) of perennial sea ice distribution. The red line represents the boundary of perennial ice from the DM (ice age older than 1 year). OW stands for ice free open water, FY for first year or seasonal ice, mix for mixed ice, MY for multi year or perennial ice, and the scale 1–10 for ice age.

http://uwnews.org/relatedcontent/2007/September/rc_parentID36894_thisID36984.pdf

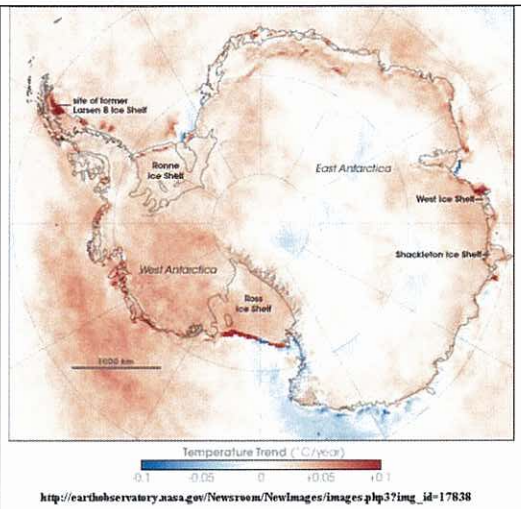
Westantarctica has also become a worry with several ice shelves starting to disintegrate in the last years. A continuation of our carbon based consumer society means that we are going to flood our coastal areas sooner or later. Desperate attempts to replace oil by coal based energy will fail because nature will throw some nasty climate change events at us, possibly already in the next years, which will convince us we have to abandon coal without geosequestration of CO2. That, however, may not be available soon:

JOHN BOSHIER: We shouldn't kid ourselves it's going to be available in the near term. We think that 2020 is the earliest it can really be commercialised.
http://www.abc.net.au/7.30/content/2007/s2210205.htm



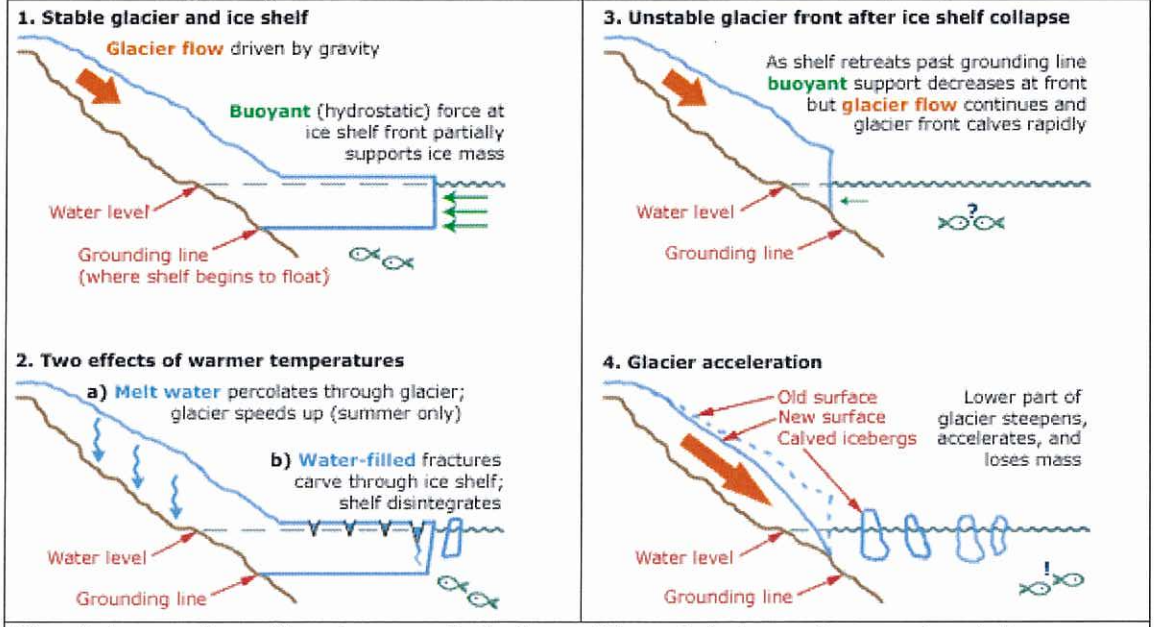
Wilkins Ice Shelf collapse March 2008 http://nsidc.org/

Wilkins ice shelf starts to disintegrate. No sea level rises, but white, reflective ice cover is replaced by dark ocean water, absorbing more sunlight and leading to more warming along a new coastline.



http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17838

Antarctica is warming up to 0.1 degree per year = 1 degree per decade! Red spots indicate areas where ice shelves have collapsed. The West Antarctic ice sheet sits on rock below sea level, very vulnerable.



The disintegration of ice sheets and glaciers will result in immediate sea level rises.

Sea level rises will be a total disaster for our coastal cities. These are images from flood prone Bangladesh which give us a foretaste of what is to come if we do not abandon coal.

Bangladeshi climate change refugees will make their way to Australia in the millions.

Salt water has encroached on what was previously a rice field. This farmer starts a prawn farm now but for how long until the area is completely flooded?

<<< Streets in Dhaka during monsoon rains, worsened by increased run-off from melting glaciers in the Himalayas. Higher sea levels will make drainage impossible. The first thing which will happen with sea level rises in coastal cities is that sewers will no longer work, an absolutely dirty business.

<<< "Environment" Minister Garrett just approved a new coal terminal at Gladstone for an additional 24 million tons of coal pa. It will help to flood Gladstone itself (left) as well as his own electorate including Sydney Airport.

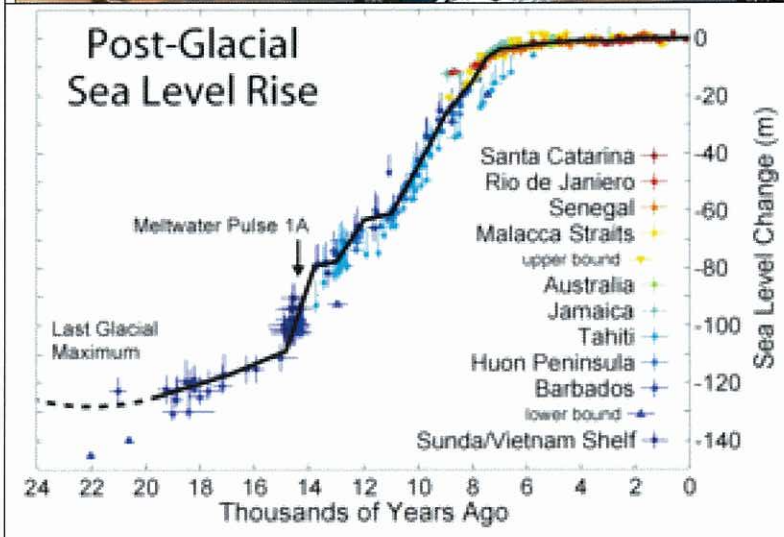
In Sydney, metro tunnels are some of the first structures to be filled from rising sea waters

November 2007: Hamburg flooding + 2.4 m above NN from a storm surge.

The UTS did this modeling for the Narrabeen beach.

Why is this important for transport planning? Because this part of Sydney, the North Shore, also needs a rail connection. Look how close the Pittwater Rd is to the beach.

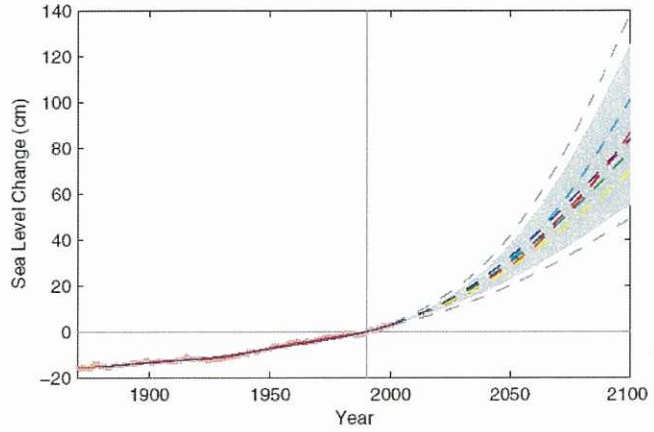
Where would one build a rail line or even a metro?



<<< sea levels can rise fast. During an event called meltwater pulse 1A, sea levels rose 1 m every 20 years.

Future meltwater pulses will be different as boundary conditions will differ.

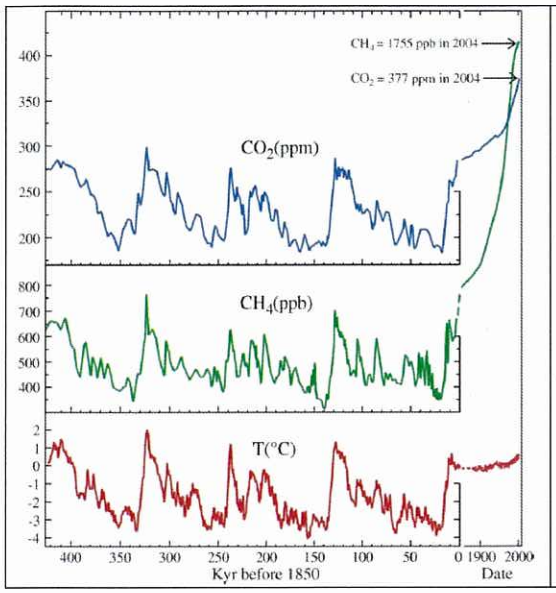
The important thing is they can happen. And they will be caused by burning more coal.



http://www.pik-potsdam.de/~stefan/Publications/Nature/rahmstorf_science_2007.pdf

<<< Assuming that sea level rises are proportional to temperature increases, Prof. Rahmstorf from the Potsdam Institute for Climate Impact Research has calculated that sea levels can rise by between 0.5 m and 1.4 m by the end of the century. Disintegration of ice sheets NOT included.

3.3 Stabilization of climate



<<< In the last 400 K years, CO2 concentrations in the atmosphere never exceeded 280-300 ppm.

Natural climate change was caused by orbital changes (Milankowitch cycles) which triggered changes in CO2 concentrations. These in turn kicked off positive or negative feed back loops leading to a further increase or decrease in CO2 concentrations and temperatures.

We are now at 385 ppm and rising. This is enough to kick us back in time by 2-3 million years into a different planet Earth

We are now in CO2 overshoot mode for at least 20 years and living on borrowed time.

This period must be kept as brief as possible

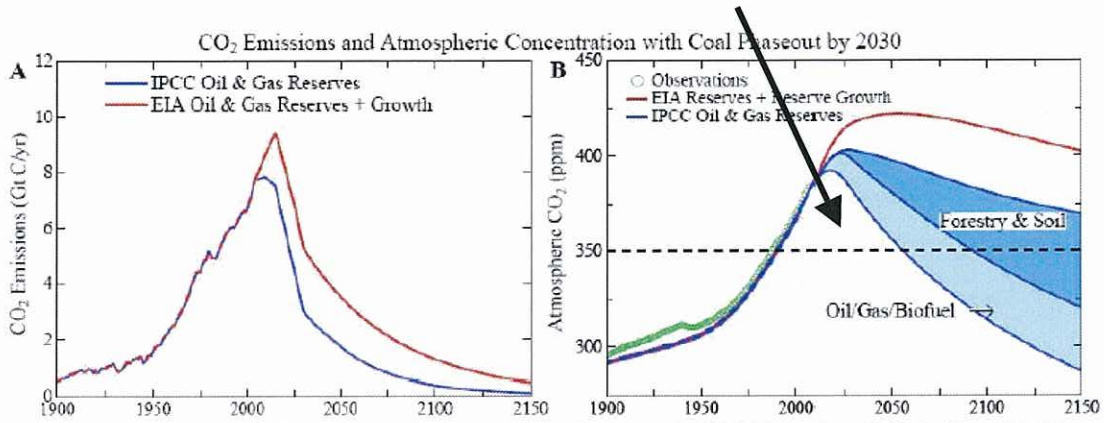


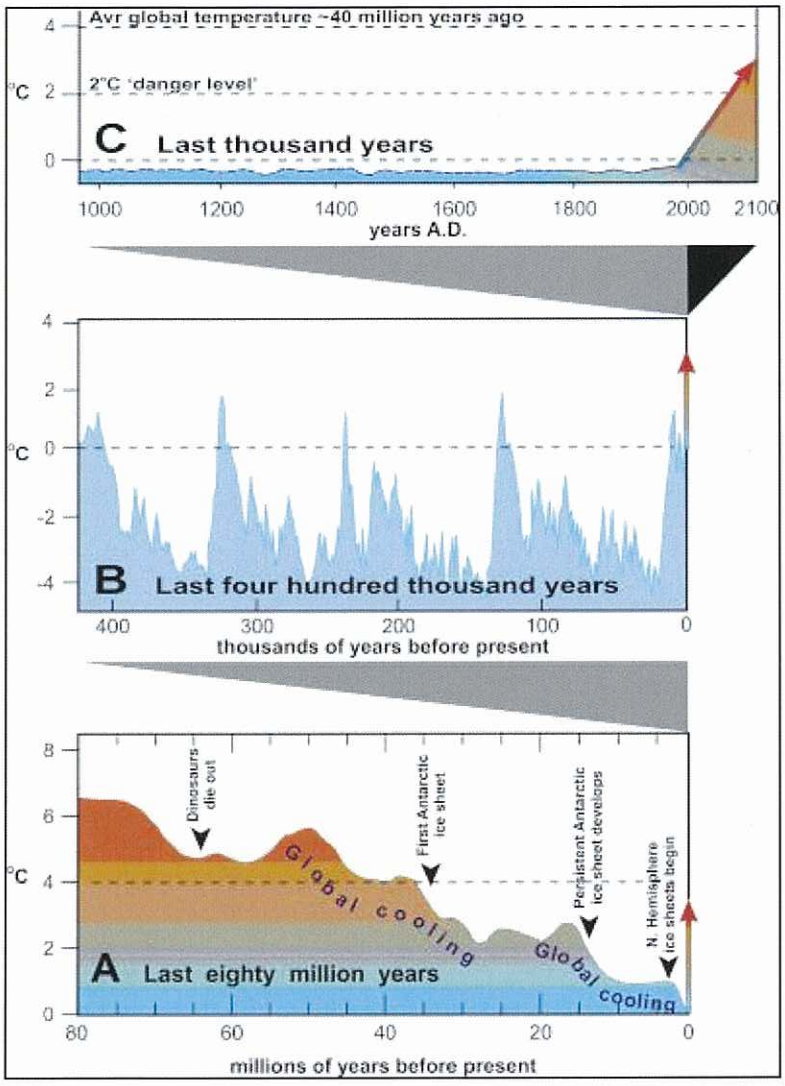
Fig. 6. (A) Fossil fuel CO_2 emissions with coal phase-out by 2030 based on IPCC (2) and EIA (58b) estimated fossil fuel reserves. (B) Resulting atmospheric CO_2 based on use of a dynamic-sink pulse response function representation of the Bern carbon cycle model (57, 58).

http://www.columbia.edu/~jeh1/2008/TargetCO2_20080317.pdf

NASA climatologist James Hansen writes:
Target atmospheric CO2: Where should humanity aim? http://arxiv.org/abs/0804.1126

"Paleoclimate data show that climate sensitivity is ~3 deg-C for doubled CO2, including only fast feedback processes. Equilibrium sensitivity, including slower surface albedo feedbacks, is ~6 deg-C for doubled CO2 for the range of climate states between glacial conditions and ice-free Antarctica. Decreasing CO2 was the main cause of a cooling trend that began 50 million years ago, large scale glaciation occurring when CO2 fell to 425 +/- 75 ppm, a level that will be exceeded within decades, barring prompt policy changes. If humanity wishes to preserve a planet similar to that on which civilization

developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO2 will need to be reduced from its current 385 ppm to at most 350 ppm. The largest uncertainty in the target arises from possible changes of non-CO2 forcings. An initial 350 ppm CO2 target may be achievable by phasing out coal use except where CO2 is captured and adopting agricultural and forestry practices that sequester carbon. If the present overshoot of this target CO2 is not brief, there is a possibility of seeding irreversible catastrophic effects."

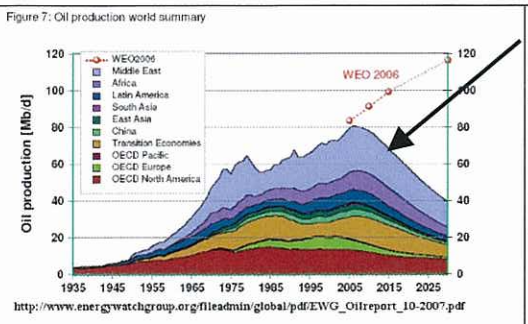


Conclusion: Both peak oil and global warming will physically impose themselves on us in the next decade. Peak oil will result in oil shortages and climate change events will force us to abandon coal and to get absolutely serious with reducing emissions, leading to an electricity and clean primary energy crisis of the 1st order. There will simply not be enough energy available to replace oil.

The denial mode of governments over these interdependencies will unnecessarily sharpen the crisis. With every month business as usual both peak oil and global warming problems will get worse.

3.4 Long distance commuting by private car will be history by 2020

Availability of fuels in 2020
http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Oilreport_10-2007.pdf



Past and future oil production from the Energy Watch Group. Peak in 2006

Assume a 30% reduction in annual oil production by 2020.

Not everyone can save 30%. Many important transports (e.g. for food supplies) and other essential services must be maintained. Rural areas and regional towns have no alternative transport.

So who will have to save? And who can save? It's the motorists in capital cities which have to organize public transport.

Assume technical feasibility to adjust petrol/diesel mix at refineries

	2006	Changes	2020
	mill. litres		mill. litres
Passenger vehicles in Capital cities	10,699	**Remaining for Capital cities** >>	**2,031**
Passenger vehicles other areas	7,131	Cannot save >>	7,131
Other vehicles	11,067	Cannot save >>	11,067
Total	28,898	70% x 28,898 >>	20,229

Annual consumption data from: ABS 9208.0 Survey of Motor Vehicle Use, October 2006
http://www.abs.gov.au/ausstats/abs@.nsf/mf/9208.0?OpenDocument

Sector	2005-06 PJ
Transport subtotal	1,302
Road transport subtotal	1,019
Passenger vehicles subtotal	639
Personal	339
Commuting	163
Business	137
Motor cycles	3
Light commercials subtotal	158
Personal	31
Commuting	25
Business	102
Rigid trucks	81
Articulated trucks	117
Non-freight trucks	2
Buses	19
Railway transport	27
Water transport	54
Air transport	202
Industry	244
Mining	147
Agriculture	86
Lubes, bitumen, solvents	63
Commerce & services	25
Residential, mainly LPG	12
Totals	**1,879**

By 2020, assume there will be 30% less = 564 PJ. All essential uses in business, commerce, agriculture, mining etc. should be maintained. Efficiency improvements business, trucks, air, industry, mining 20-25% 220

Rest to be saved by personal and commuting use 564 – 220 = 344

Passenger Vehicles 2006	532
Efficiency gains 10%	53
Enforced saving	344
Remaining	135

Reduction to 135/532 = **25% of current levels** for all passenger vehicle use personal and commuting, city and rural

Sources: ABARE 2008 Road transport vehicle type allocations of fuel usage from DEWHA 2006 Passenger and Light commercial fuel usage allocations from ABS 2007; Modelling by Anawhata Associates
http://anz.theoildrum.com/node/3867

Read: Cars now no more efficient than '60s http://www.smh.com.au/news/national/cars-now-no-more-efficient-than-60s/2008/04/27/1209234655207.html

The above examples show:

(1) It will be almost impossible to maintain the current personal use of private cars, no matter what technology will be developed
(2) All efforts to rescue the status quo usage of private cars will contribute only marginally; but the battle will be lost
(3) There are too many other important uses for fuels which require priority allocations
(4) An alternative transport system with much higher efficiency than private cars must be built up immediately together with a renewable energy supply system
(5) Energy calculations in PJ do not differentiate between petrol and diesel. The output of refineries at certain ratios of petrol/diesel will impose additional constraints

(4) Objectives to rescue Sydney's functionality

4.1 Review of transport related plans

Transport planning is integrated with following NSW plans

(a) Metro Strategy
(b) State Infrastructure Strategy
(c) State Plan
(d) Urban Transport Statement
(e) Port Botany
(f) Airport

On the Federal side, Infrastructure Australia has been established by the Rudd government.

All plans (a) – (f) are blissfully unaware of the double challenge of peak oil and global warming and will therefore fail. **What's worse, they will actually damage the economy because the proposed investments will not generate the expected returns due to lack of oil resources and clean energy in general.** Not even the water supply is secure. In a very favourable La Nina year, the Warragamba dam has hardly filled to 60% levels. The capacity of the desalination plant would be used up by the planned growth of just 10 years. It simply makes no sense.

All these plans have in common a growth strategy which is unsustainable. An additional population of 1 million in a situation where there will be fuel and water shortages is near impossible and not desirable. It will be tough enough to cater for natural population growth. One of the recommendations here is to reduce immigration accordingly.

In particular, to plan for a population for 200-300,000 in Rouse Hill is phantasy. Rising oil prices as a result of peak oil will push inflation higher and will make lending in the housing market extremely difficult, especially since banks have become very careful after having lost a lot of money in the subprime mortgage crisis.

All the above plans must be reviewed, starting with a proper resource analysis: How much water, oil, gas, coal and renewable energies are needed for the construction AND

operation of the proposed buildings and infrastructure. Where will these primary energy resources come from? Which projects are planned and when? Without energy, no plan can be implemented. In relation to coal, the absorption capacity of the atmosphere is to be considered as a resource (on the sink side). As pointed out above, this resource is actually already depleted.

Such a resource analysis will reveal that perpetual growth cannot take place.

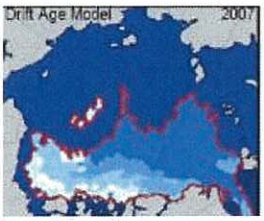
4.2 Realistic Objectives

From the previous chapters it should be clear that the objective is not future growth but to maintain the functionality of the whole metro area.

These are the objectives in detail:

(a) connect all survivable sub centers in the metro area by electric rail
(b) replace long distance car commuting by electric rail
(c) use transport solutions which minimize diesel consumption per km of track length during construction
(d) use transport solutions which minimize energy consumption per passenger km, including power consumption of stations and other facilities necessary to operate services
(e) complete projects in stages and immediately open them to traffic even if temporary solutions are necessary
(f) solve the problem of toll-way companies going out of business after peak oil
(g) the time limit is 10 years for a basic program covering the whole metro area
(h) The NW must be integral part in this plan

Focus on period up to 2020 rather than 2050



- 2010 oil shortages
- 2012 peaking of offshore fields
- 2012 Peak oil in China
- 2013 Arctic summer sea ice gone
  dramatic climate change on Northern hemisphere
- Glacial melt 7% pa in Himalayas will impact on rivers in India and China
- Truth about OPEC's paper barrels comes out; different Middle East
- 2014 Mexico's net oil exports zero
- 2015 Iran can no longer export oil
- 2016 Saudi Arabia runs out of fossil water; Saudi agriculture ends

4.3 No time for big metro tunnel projects

It took European cities decades to build up their metro systems. It is virtually impossible for Sydney to catch up, especially now that oil production will decline. Sydney decided to go for a freeway system (which is of little use in future) and must now make the best use of it to serve as rail corridors.

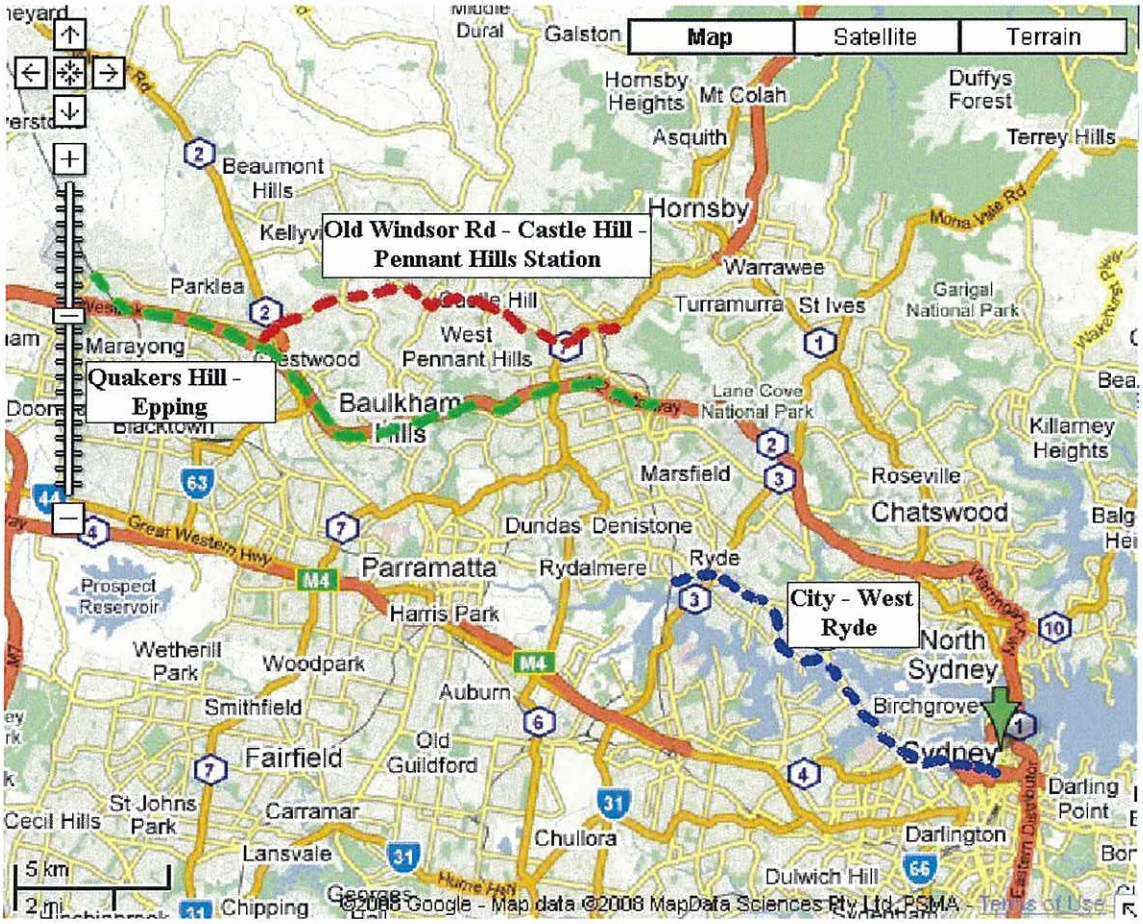
(5) Proposal for a surface metro

5.1 Overview

2 solutions are adopted here:

(1) rail on toll-ways (M2 and M7)
(2) surface metro on major roads (Victoria Rd and Castle Hill Rd)

These will meet the objectives outlined in the previous chapter



This sketch shows 3 different projects: (a) surface metro City – West Ryde with a short tunnel at Top Ryde; (b) rail from Quakers Hill using the M7 and M2 to Epping; (c) surface metro from Old Windsor Rd (Bella Vista) – Baulkham Hills – Castle Hill – Pennant Hills Station with a short tunnel Carrington Rd – Norwest Blvd.

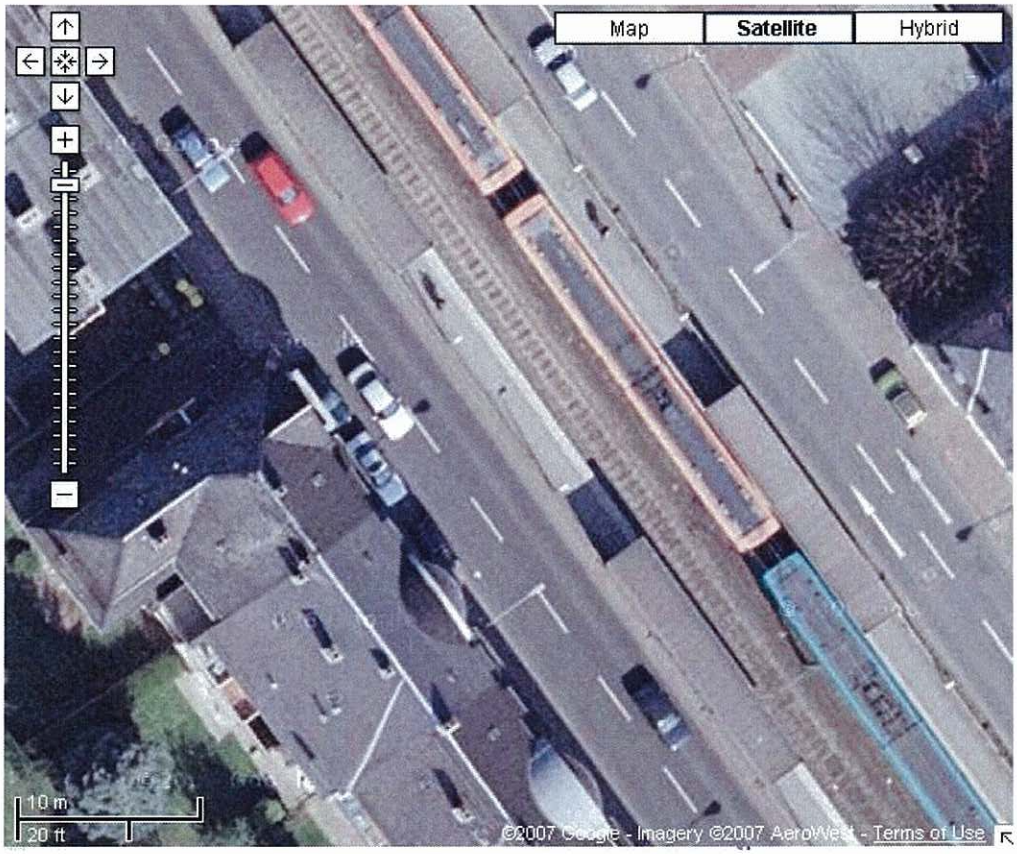
5.2 Victoria Rd

On the city side, investigation should be done in how far the Cross City tunnel can be used. Well designed rail cars can climb steep ramps and can negotiate sharp bends

Rail construction work on main road. Car lanes are replaced as they will no longer be needed when car usage is drastically reduced in the coming oil crisis.

"Light rail" experiences a revival in the US. These are not trams (Costa: "romantic"). They are proper mass transit trains. In Sydney, this is not well understood. There are many systems around the world and they can be adapted to local requirements.

Steep, bendy and narrow section in hilly Stuttgart. Car traffic is stopped by traffic lights to allow train to use roadway for a couple of 100 metres.

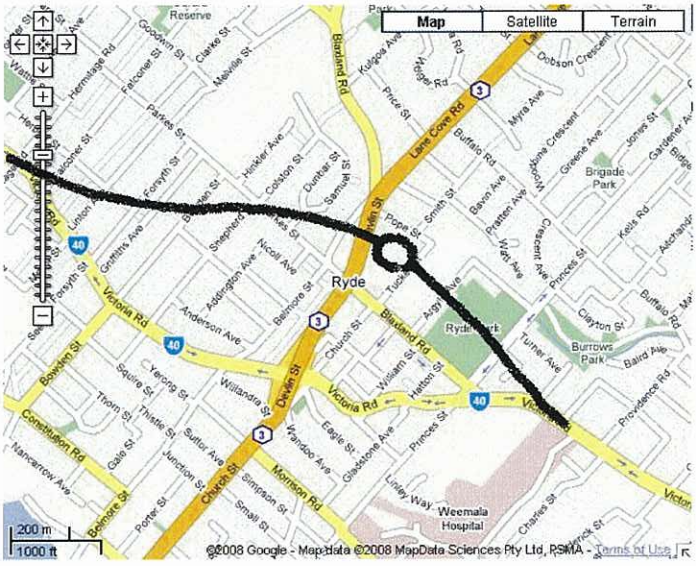


100 m long urban train on major road in Frankfurt, Germany

Arrangement of 2x2 car lanes and platforms along a main road in Frankfurt. 100 m long trains in peak hr. Access to platforms is by pedestrian tunnels. The same train uses a tunnel under the CBD built in the 1960s. This was exactly the time when Sydney closed down its last trams. Frankfurt, in contrast, moved its trams underground in the CBD and later developed the system into what can be called a surface metro.

Top Ryde Shopping centre

The author of this submission warned in a hearing in the Council building seen on this picture NOT to pull down the old shopping center (but to renovate it) and NOT to build 3,000 car spaces (which is an unprofitable investment after peak oil). Instead of the superfluous car park, there should have been a metro station with a short tunnel alignment according to the following sketch.



This alignment allows a continuation along the Victoria Rd towards Parramatta, along a route where the main traffic flows are, and NOT towards Denistone which has already a rail station on the Northern line (duplication of services cannot be afforded in the short time now available)

5.3 Quakers Hill – Epping on M7 – M2

This is the Perth model: rail on freeways

Motorists on this Perth freeway are blissfully unaware that petrol shortages will soon force them to take this train of which many may now think it was a waste of government funds. Perth is the only Australian city preparing for peak oil. Prof. Newman pushed it through. He was Sustainability Commissioner here in NSW. No-one wanted to take his advice. This will be bitterly regretted.

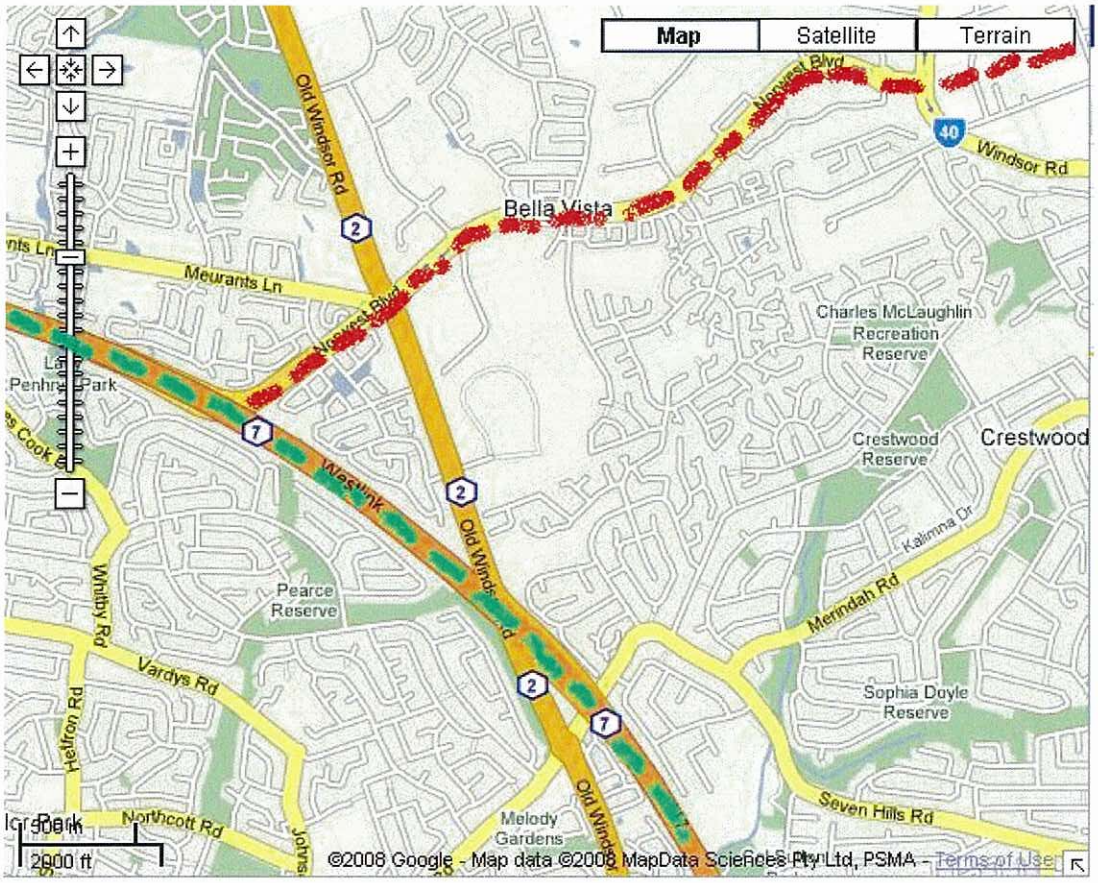
Picture book design at Whitfords station. Bus terminus on top of station, kiss&ride loop, park&ride nearby. Ideal for car-pooling and a train trip to the city

5.4 Old Windsor Rd – Baulkham Hills – Castle Hill – Pennant Hills Station

One of the main problems with the NW metro proposal is that there is no stop between Epping and Cherrybrook. This means that the whole West Pennant Hills area will have no proper rail access.

This problem is partially solved by the rail line on the M2 proposed above but for the area further North and for Castle Hill a rail access is needed. This could be served by a surface metro starting at Old Windsor Rd (connecting to the bus transitway and the rail line on the M7) and ending at Pennant Hills station, providing a much needed tangential rail link.

The only tricky bit is the detailed design at Old Windsor Rd. There is currently a lonely bus stop under the M7 bridge, in nowhere land. That could change if the area of the old Brickworks is developed into an industrial park which will be needed when it has finally dawned on governments that renewable energy projects have to replace coal related business.



The same trains can be used on both the M7-M2 and the Pennant Hills link. A short tunnel may be needed in the Victoria Rd industrial area. The train depot could be in Nirimba.

The financial crisis will now force us to be very economic with our transport solutions. We have to abandon perfectionist solutions like metros in tunnels.

5.5 10 point program, the context for any investment in transport infrastructure

Peak oil and global warming: What to do until 2020 and beyond	
Events/impacts/problems	10 point program
Global oil shortages around 2010. OPEC's paper barrels may lead to social unrest in the Middle East in the next decade. Iran (introduced petrol rationing last year) will no longer export oil by 2015-2017 due to high local demand	(1) Immediate moratorium on new freeways, airport expansions, car-dependent shopping centers and subdivisions, multi-level car parks and other oil dependent infrastructure. No more business as usual.
Catch 22: Diesel shortages will delay implementation of essential rail and clean energy projects	(2) Set aside – by legislation – oil and gas fields for diesel, petrol and CNG supplies to civil works needed to mitigate the impact of peak oil and to de-carbonize our economy
Oil crisis will start with intermittent supply disruptions	(3) Build up Strategic Oil Reserve; prepare fuel rationing plans
Globalization built on cheap oil will go backwards; bunker oil shortages will limit import/export volumes. Peak oil, together with global warming, will trigger clean primary energy crisis. End of internal combustion engine which wastes 90% of energy as heat.	(4) Re-industrialization on the basis of renewable energies; abandon unrealistic car dreams; electrification of land transport system is required which must be more efficient by an order of magnitude; urban rail on all free-ways (Transperth) and major roads; all genuinely renewable energies produce electricity, not fuels; time is now running out for these solutions; too late for large scale rail tunnel projects
Bio fuels in competition with food production, limited by global warming	(5) Bio fuels to run farming machinery, trucks and other vehicles to transport agricultural produce and implements
Other alternative fuels	(6) Develop compressed natural gas (CNG) for buses, trucks, construction and mining machinery
Disappearance of Arctic summer sea ice (abrupt climate change on Northern hemisphere ??) and collapse of ice shelves and ice sheets in West Antarctica in the next years will force us to abandon coal without geo-sequestration of CO2	(7) Replacement program for all coal fired power plants; re-tool car factories and suppliers (BEFORE they go out of business after peak oil) to mass-produce components for wind farms, solar power plants, solar water heaters. A 1,000 MW coal fired power plant requires the continuous sequestration 150 Kb/d of liquid CO2. NSW alone has 12,500 MW installed. Australian oil handling capacity around 500 Kb/d. 1,000s of km of CO2 pipelines needed. Huge challenge. May come too late.
Power shortages unavoidable	(8) Drastic power down and energy efficiency. Permanent Earth Hour.
Airlines will come into financial problems	(9) Interstate rail development and electrification; both passenger and freight; replace domestic flights with night trains; coastal shipping for freight
Public largely unaware of the physics of the coming oil and energy crisis. Political system and corporate sector in denial mode and unable to grasp magnitude and urgency of problem. Society lives on too many untested assumptions about future.	(10) Public education program; participation of public is absolutely essential. Nation needs to be put on a war footing; change of value system is needed. Prepare motorists for car-pooling as this is the only "solution" if a physical oil crisis were to hit tomorrow