RESILIENT CITIES
Responding to the Crash, Peak Oil and Climate Change

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PB-CUSP Alliance
Greetings from Perth
- the Swan River Colony, home of the Black Swan
A black swan is something that cannot be predicted (the past will be no help to us as a guide to the future).
Black Swans can be signs of fear or hope.

Nassim Nicholas Taleb
"The Black Swan: The Impact of the Highly Improbable."
The three unwanted Black Swans that could have been seen:

- Climate Change
- Peak Oil
- The Crash

And how we can respond in our cities....
Global Average Temperature at Earth's Surface (Land-Ocean Index), 1880-2003

Source: GISS

Degrees Celsius
Arctic sea ice extent 1978-2007
in millions of km²
(National Snow and Ice Data Center)
Climate change threatens cities and regions.
Global governance seeks 50-80% less ghg by 2050...

• Undermines confidence in the economic system which has been based on growth in fossil fuels.

• No alternative and early action is economically sensible – Nicholas Stern.

• Australia now has joined the world....
‘The world is approaching a practical limit to the number of barrels of crude oil that can be pumped every day.’

Russell Gold and Ann Davis

Production cycle of an oil field

Brent Field Production

Forties Field Production
US oil now 87% depleted.
The Hubbert Peak
Sci Amer 1971
Figure 4

VOLUME OF OIL DISCOVERED EVERY 5 YEARS IS DECREASING

Modified from Campbell and Laherrere, 1998
More and more countries are past their peak.
Fig 2.3 How we use oil and natural gas & how this may change as they peak in production
Long term oil prices

Crude oil prices since 1861
US dollars per barrel
World events

Pennsylvanian oil boom
Russian oil exports began
Sumatra production began
Discovery of Spindletop, Texas
Growth of Venezuelan production
Fears of shortage in USA
East Texas field discovered
Loss of Iranian supplies
Suez crisis
Post-war reconstruction
Netback pricing introduced
Iranian revolution
Iraq invaded Kuwait
Invasion of Iraq

Recent Movements

Era of Cheap Oil

UK Industry Taskforce on Peak Oil and Energy, November 2008

• the five Mega Major oil companies are in decline in oil production; they peaked in 2004.
• Extremely volatile prices are characteristic of this peak period.
• The underlying trend in the price of oil is 6% growth per year;
• oil supplies go into permanent decline after 2013.
• the CEPA Index which measures exploration and development costs has doubled since 2005.

• Output is declining faster than previously thought.

• Natural annual rate of decline is **9.1%** per year from 2009.

• With investment of $360b/yr until 2030 the rate of decline drops to **6.4%**.

• Have to find a Saudi Arabia every two years.

**UNCERTAINTY ON OIL IS NOW RAMPANT**
Economically Peak oil has happened....

- Global crash caused by **car dependent sub prime mortgages** vulnerable to tripling in fuel price.
- Banks loaned excessively on belief that car-based growth would always happen. Fuel tipped us over...
- CONFIDENCE IN OIL-BASED FUTURE UNDERMINED by sudden *rise*.
- CONFIDENCE IN OIL-BASED ALTERNATIVES UNDERMINED by sudden *fall*.
Toxic loans are linked to toxic urban scatter...
The CRASH.... Oil-based economic confidence undermined. Deservedly.
Fear abounds.... Are we RESILIENT?
Declines in all fuel intensive transport are beginning.
How do we Respond?

Four scenarios...

• Collapse
• Ruralised city
• Divided city
• Resilient City
1. Collapse

• ‘When the oil peaks the economic and social dislocation will be unprecedented.’ Michael Meacher, UK Minister for Environment, 1997-2003.

• ‘The unforeseen consequences are devastating.’ Matthew Simmons, Houston Oil Banker.

• ‘Civilization as we know it will end soon.’ Republican Congressman Roscoe Bartlett

Collapse can happen...and has...
Ephesus, 2\textsuperscript{nd} biggest city in Roman empire, abandoned in 1000AD.
Babylon the greatest city of the ancient world for 2300 years – collapsed in 140 BC.
But...

- Awareness is increasing exponentially.
- If ‘Only white swans exist...’ is the response then that city can go into severe decline.
- Some cities will do better than others.
2. Ruralised city
(cities are for permaculture – only.
All food and produce is from your
garden or locality)

‘What should we do? Start growing your own
food....’ Mathew Simmons

Havanna example... 40% of its own food
produced locally after oil cut off.

Urban scatter is good for permaculture.....
• Localized food production will increase. Food miles and slow food...

• But cities will remain as cities... The great urban experiment is to create opportunity.

• Green urbanism means cities are more urban and more green....
3. Divided city

- Wealthy eco-enclaves surrounded by Mad Max suburbs...
- Highly probable as it is the ‘market’ solution.
- Eventually undermines the city which is based on collective responses providing opportunities for everyone.
All of these responses are based on fear.

Cities of fear are not resilient.
4. Resilient City

• Building a new economy in our cities which is more resilient...

• Positive Black Swans have happened before as new economies were created out of cities where the old confidence was replaced with the new.

• The City of Hope.
Resilient City includes...

- Renewable Energy City
- Carbon Neutral City
- Distributed City
- Photosynthetic City
- Eco-Efficient City
- Place-Based City
- Sustainable Transport City

All combine the digital, smart technologies with the new technologies of sustainability.
The new Resilient City economy and Sustainable Transport....

• STOP building extra urban road capacity and urban scatter. The US and the world cannot afford to consume the resources it takes. BLUE economics....save money.

• START building electric renewable cities with much greater localism in the economy and infrastructure. GREEN economics....spend money.
Who has to change the most?
Barcelona
Urban scatter areas are vulnerable to peak oil and climate change economics.

• Wealthy eco-enclaves surrounded by Mad Max suburbs…

• Highly probable.
Annual Vehicle Km per Household, 2004

Outer suburbs residents, particularly those away from rail lines, drive much more than inner suburbs residents.
What has to stop most....
Impact of Road Building on Delay – America’s 20 Biggest Cities – ZERO!

Freeway Miles

Delay

Miles of Freeway and Arterial road lanes per 1000 pop
The freeway is a failed technology...

- Cities adapt to the one-hour travel time budget no matter what infrastructure is provided.
- Freeways fail as public spaces.
- They are dinosaurs in a post Peak Oil world.
- Will save billions which is needed for the new economy.
Its impact on cities is not good for economies or people ‘agglomeration diseconomies’
Can these spaces be reclaimed and rehabilitated...?
ONE LANE - people per hr
Freeway 2,500
Busway 5000
LRT 10-20,000
Train 50,000

240 Persons travel to work:
-- in 177 Cars
-- in 3 Busses
-- in 1 Tram
Land use follows transport...
Urban scatter.... is expensive and unhealthy....

PB-CUSP paper on costs of urban development shows in Australian cities *each new block* on the *fringe of redevelopment*:
1. Is subsidised by $85,000 in infrastructure.
2. Costs $250,000 extra in transport costs over 50 years.
3. Produces 4.4 tonnes/yr more in greenhouse gases, and health savings....

www.sustainability.curtin.edu.au
Multiple issues of car dependence...

‘Battery hen’ kids
or
‘Free range’ kids
Mayer Hillman, Policy Institute, London

Children who walk to school develop a sense of belonging, a sense of place, that gives them a freedom to relate to people in their community without fear. Children who are driven everywhere are suspicious of local community and become much more rigid and contained.
The Resilient City future is more green and more urban...
What do we have to do?

- TOD
- POD
- BOD
- GOD
- PHEV
- EcoV
- TDM
1. Transit Oriented Development

• Build **electric transit** faster than the traffic, into and across the city.

• Build it with **land development partnerships**.
Ratio of Public to Private Transport Speed, 1995

Cities

American
Australia/New Zealand
Canadian
Western European
High Income Asian
Eastern European
Middle Eastern
African
Low Income Asian
Latin American
Chinese
- Brookings report shows VMT decline since 2004.
- Dramatic increases in transit in US & Australian cities.
- Infrastructure Australia set up to fund major capacity increases.
Pass Kms on Australian city Transit

1997-2007 25.4%
2002-2007 13.1%

Population growth
1997-2007 13.9%
2002-2007 7.0%

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Perth’s rail revival began as a political movement in 1979
Opening of new Southern Railway
90% approval ratings and already paid off.
Carrying 50,000 per day cf 14,000 on buses.
Perth Southern Rail runs down freeway and other road reserves to outer suburbs, 80kms. $30 mill per km.
Car dependent cities can begin to reclaim freeways through transit...
Houston, like many US cities, has a network of 180 miles of HOVs...

- Can they be converted to rail and increase their capacity by over ten times?
- Potentially cheap transit solution.
- Can build around and over freeway for a TOD.
- Reclaiming freeways as public space...
Political leadership is everything...
Perth $5 : $1 on roads : rail reversed
Transit is driving move to TODs...
• People living in TODs have 50% less car use and save 20% of their household income due to one less car.

• Value retained in down times and good in up times.

PB PLACEMAKING...
Tysons Corner – three TODs replacing an Edge City car-based development
Perth 20 TODs... eg Esplanade Station
New TOD for central Perth...
Or is it Dubai.
Subiaco TOD – value of land increased 5 times cf to non-rail areas.
Lifestyle Complex Coming Soon.
Register your interest today.
Call 9419 6222 or visit www.thevillageatwellard.com.au
Chatswood in Sydney built new station as part of a ‘Value Transfer PPP’...

- Similarly Portland streetcar partnership
City of Vancouver in the 90’s

31,000 fewer car trips per day.

107,000 more walk/bike trips per day.

By 2006 30% of trips by walking (and cycling) - doubled in 15 years....

How did they do it?
Not by transport but by land use...
Mostly by high rise residential estates attractive to families.
How is this done?

• High quality design requirements
• Requiring 15% social housing (either public or co-op housing)
• Requiring 5% of the value of a development to be social infrastructure....landscaped open space, public art, community centres, schools, arts facilities...
An example Coal Harbour
New urban fabric for the post oil city – tough life in Coal Harbour....
New lifestyle for the peak oil city
- tough life on the ‘100 mile’ menu...
2. Pedestrian Oriented Development and Bicycle Oriented Development

- Walkability makes cities competitive and sustainable.
- Bike schemes proliferating.
- Need to extend to every centre.
Jan Gehl the walkability magician...
⑤-1  Cheonggyecheon Area before Restoration

(http://www.metro.seoul.kr/kor2000/chungaehome/en/seoul/2sub.htm/)
6-1 Cheonggyecheon Area after Restoration

(http://www.metro.seoul.kr/kor2000/chungaehome/en/seoul/2sub.htm/)
The re-opening of Aarhus River 1996 - 1998
‘Naked Streets’...
‘Complete Streets’...can remove freeways and create mobility corridors

- Milwaukee - helped revive city center.
- San Francisco - Embarcadero now a tree lined boulevard suitable for all modes.
Imagine the Possibilities

Transformation of a city…

Photo Series: UrbanAdvantage
Velib Paris
20,000 bikes at 1450 locations,
370 kms cycle lanes.
Boulder - Vision of 30% sust modes – so took 30% of transport budget.

Bicycle routes lace the town
Boulder now a ‘healthy’ city
Copenhagen
30 year campaign to create people-oriented streets. Reduced car parking 2%/year
Copenhagen’s contribution to the world....

- Wealthy and resilient...

2003 data shows j to wk:

- *bicycles* 36%,
- *cars* 27%,
- *transit* 33%,
- *walking* 5%.

Bikes up from 32% in 2001.
3. Green Oriented Development

• Ensure every new building and development is green.
The ‘Governator’ is demanding sustainability...
200 green roofs in Chicago to reduce urban heat island effect, reduce energy and recycle water...
New York City - Green buildings and renewed transit with a Sustainability Plan to reduce 30% ghg by 2030

From The Skyscraper Museum, NYC, at http://www.skyscraper.org/EXHIBITIONS/GREEN_TOWERS/gt_main.htm
No, its Seattle...
Rizhao Solar City, China
Dongtan

• 100% renewable
• Localised energy and water systems
• Bioregional food and water.
Masdar City

130MW Solar
20MW Wind
Geothermal heat pumps for cooling
Vauban
Car free; exports renewable power
Power Production as Urban Design

Vastra Hamnen, Malmö
Beddington Zero-Energy Development, London
30 The Bond, Australia’s first 5 star green building
CH2 the first 6 star building... Melbourne City Council, government leadership at its best...

Carbon neutral, mining the sewer for water recycling, healthy natural lighting, local materials...
4. ELECTRIC VEHICLES
How to adapt to the other 50% of car use and move to 100% renewables - at the same time.

• V2G and **PHEV** with a Smart Grid...
• Better Place project.
PV Solar growing at 40% per year
Roof mounted wind systems eg Windpods
How do you store renewables?
Link renewables into a Smart Grid and store in electric vehicles (Li-Ion batteries)
Can now make 100% renewable city...
Two way flow with electric vehicles provides the breakthrough for a resilient renewably-powered grid.
Israel, Denmark and three Australian cities starting.

‘Renewable Transport’
www.sustainability.curtin.edu.au
North Port Quay - Perth
Carbon-free development based on renewables, Smart Grid and electric vehicles.
What about the fringe and the dying middle suburbs?
5. Eco-villages colonising the fringe.
Ecovillages can be....

• Built with own water, power, sewerage infrastructure,
• Be relatively self sufficient in economy and transport
• Provide the social support in a village context many are looking for.
7. Travel demand management
Telepresence...live HD
TravelSmart
TRAVEL SMART
- Creating a more resilient transport culture....

• Developed from German Werner Brog, applied first in Perth, then UK now US.....
• Individualised marketing based on direct intervention with householders receiving educational materials on alternatives to the car.
• Bikers and bus drivers become eco-coaches... 15% reductions found.
‘Free range kids...’ over 200 walking school buses in Auckland.
Vauban freedom...
What do we need?

- **Imagination** – Black Swans for sustainability.
- **Post Oil Strategies** for each area and region.
- **Partnerships**...and investment in Post Oil demonstrations. RC and GUDU stories...
- **HOPE in our cities**

www.resilientcitiesbook.org