

What cities of the future will look like...

By

Peter Newman

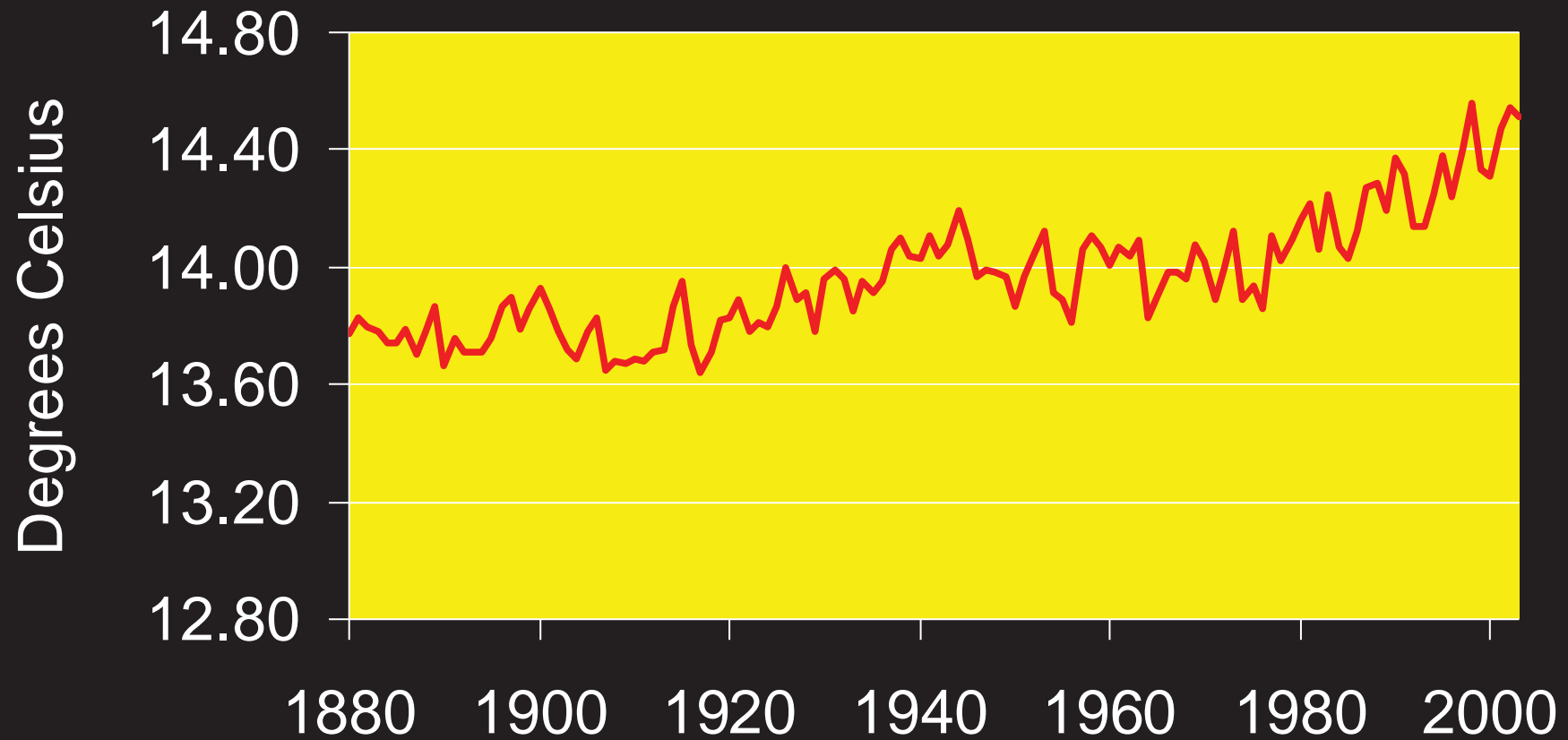
Curtin University, CUSP, Fremantle

The three shaping forces....

1. Climate change-driven decarbonising
2. Peak oil-driven sustainable transport
3. Biodiversity-driven regeneration

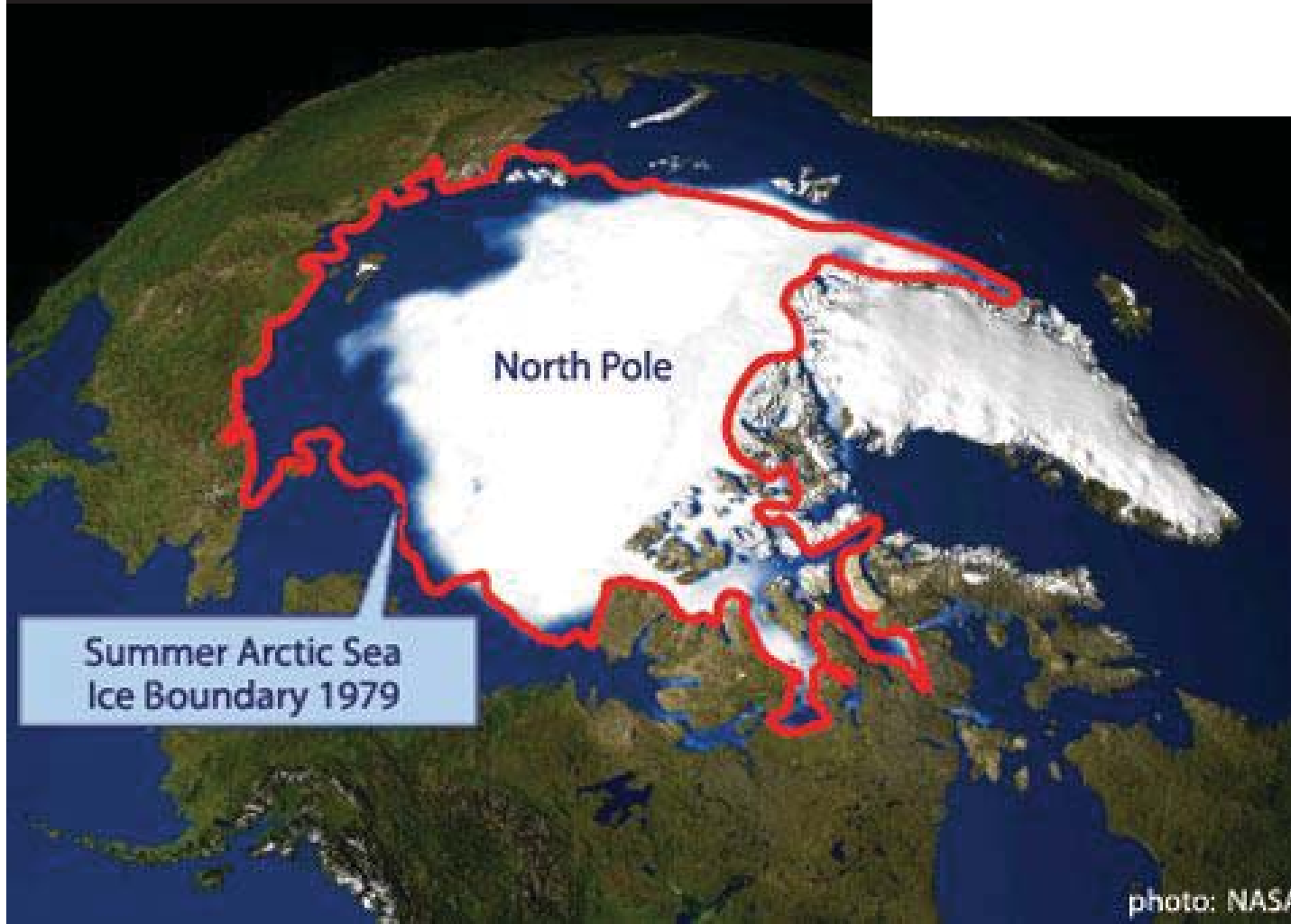
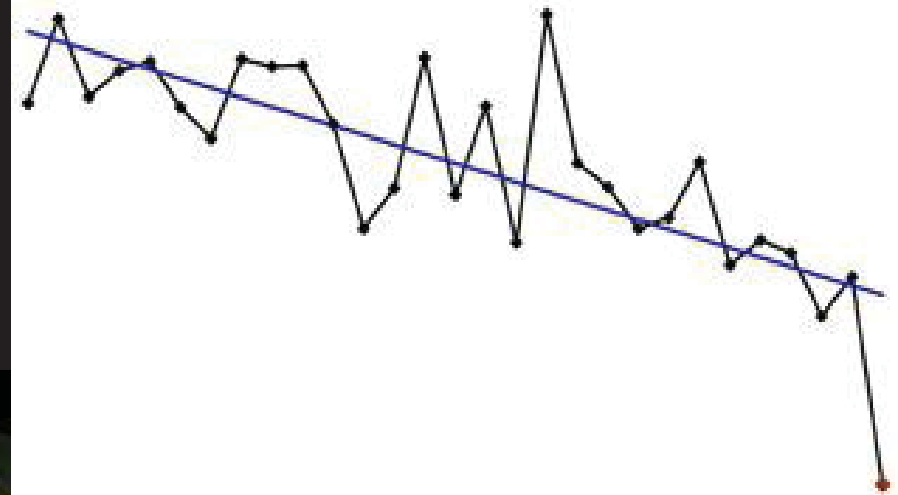
And the need for liveable cities that provide opportunities not possible without cities.

Global Average Temperature at Earth's Surface (Land-Ocean Index), 1880-2003

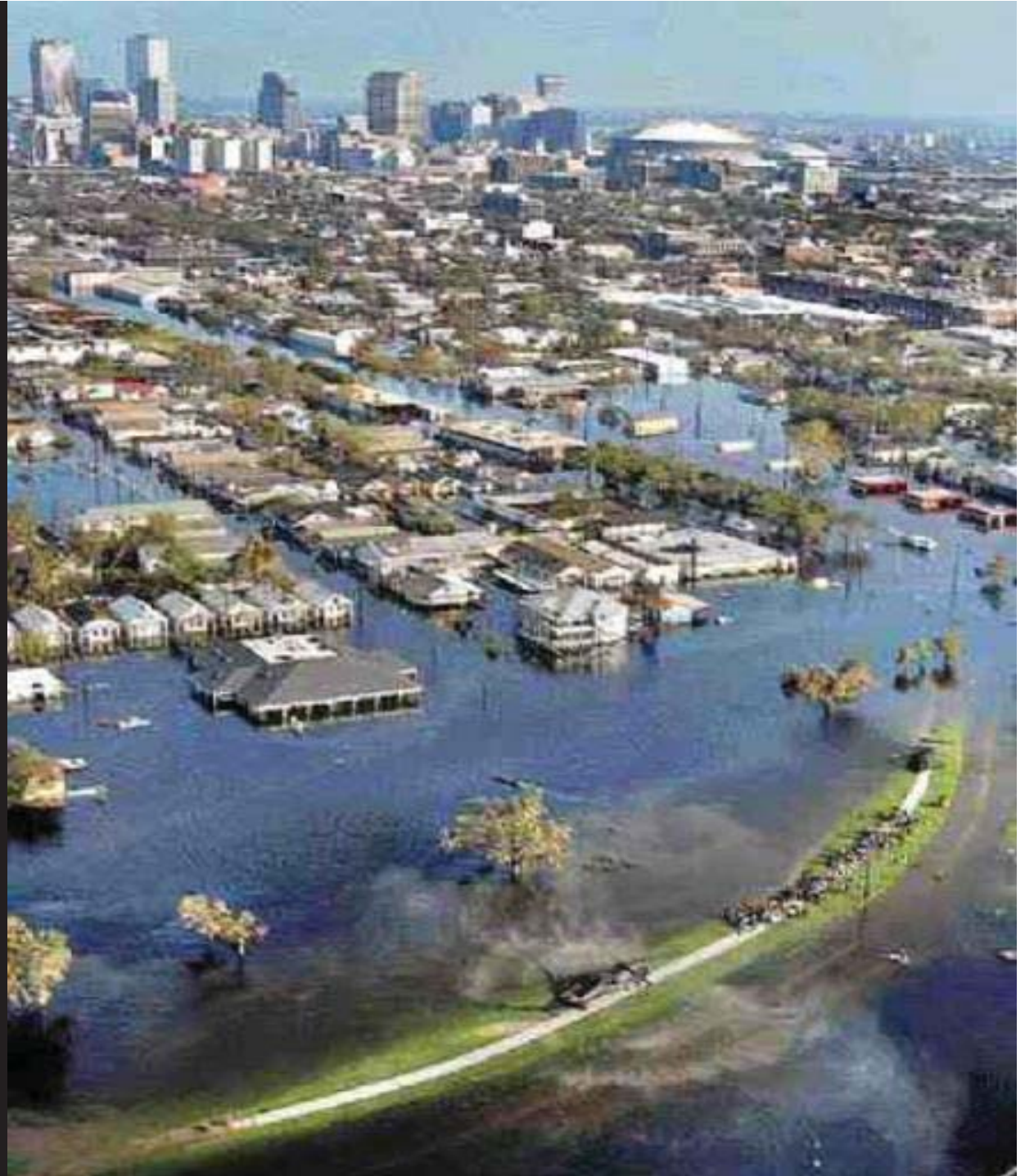


Source: GISS

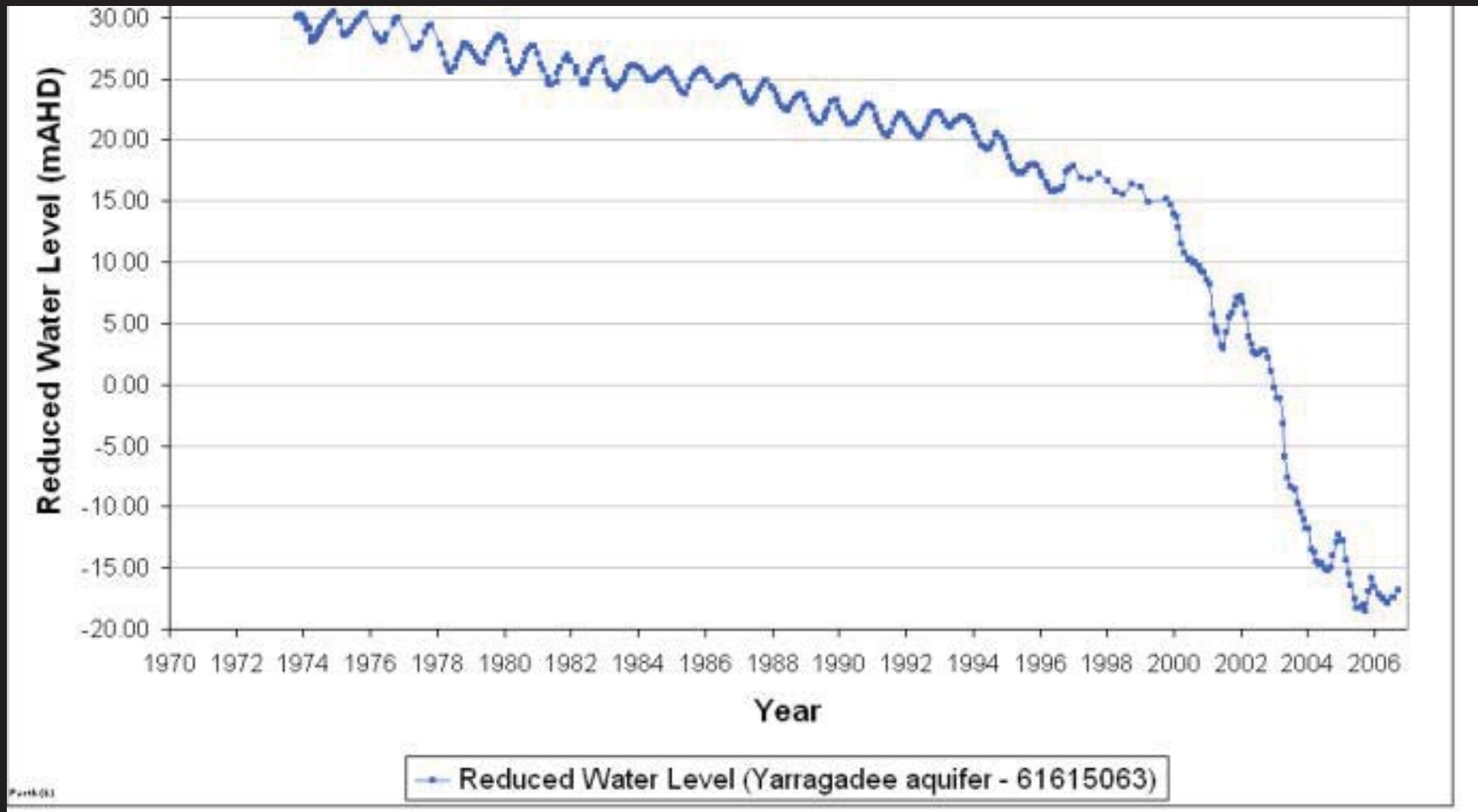
Arctic sea ice extent 1978-2007
in millions of km²
(National Snow and Ice Data Center)

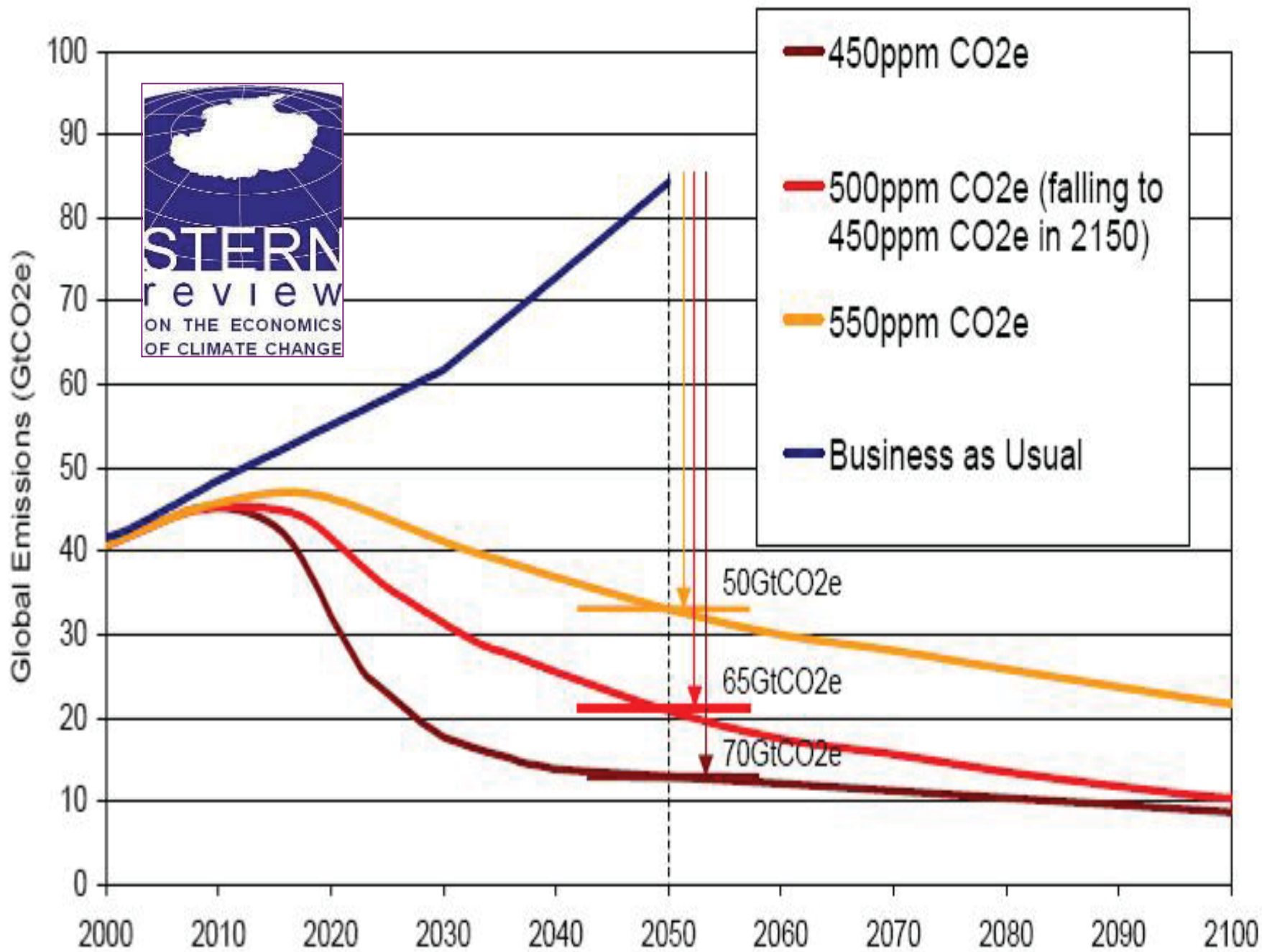


**Climate
change
threatens
cities
and
regions**



SWest...reduced rainfall, groundwater retreating.... multiple costs.





By 2012, there will be no Australian child living in carbon

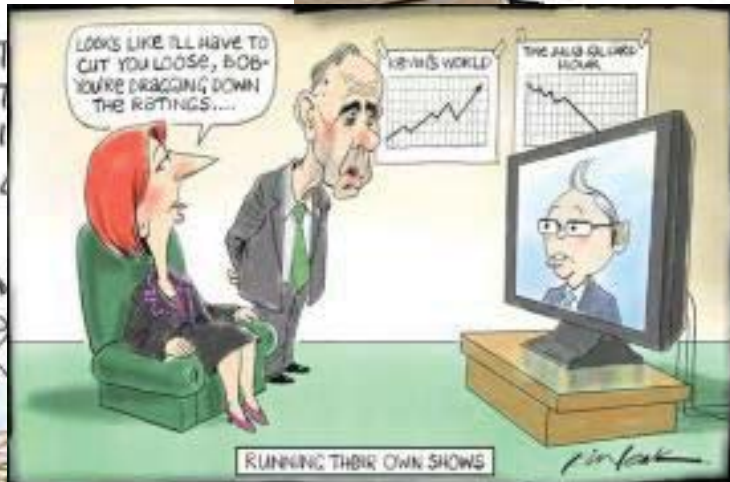


Wickhamson SMARII



"Nobody knows any of the details, so let me fill you in..."

TRUST ME I'M A POLITICIAN



ZDN on BusinessandMedia.Org

CAP and TRADE is DEAD END



CARBON TAX

Australia has joined the world....
80% less ghg by 2050; \$10b package



Fuel and electricity prices will rise as carbon is priced... Now 50 nations with a carbon price.

What will happen to cities?

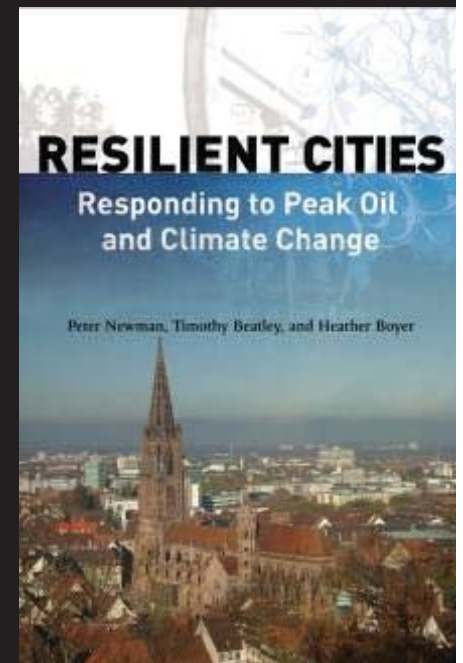
Peak oil?

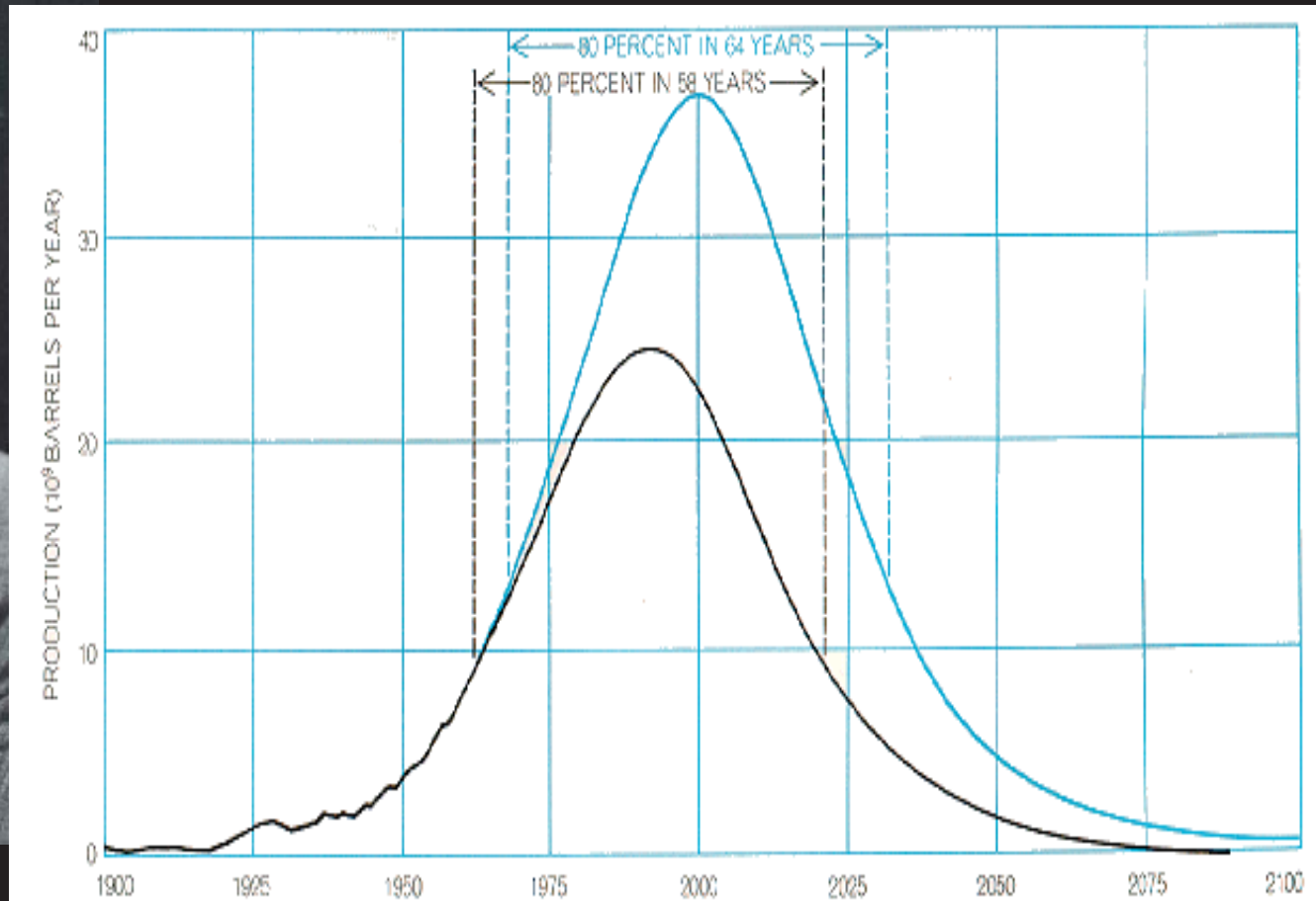
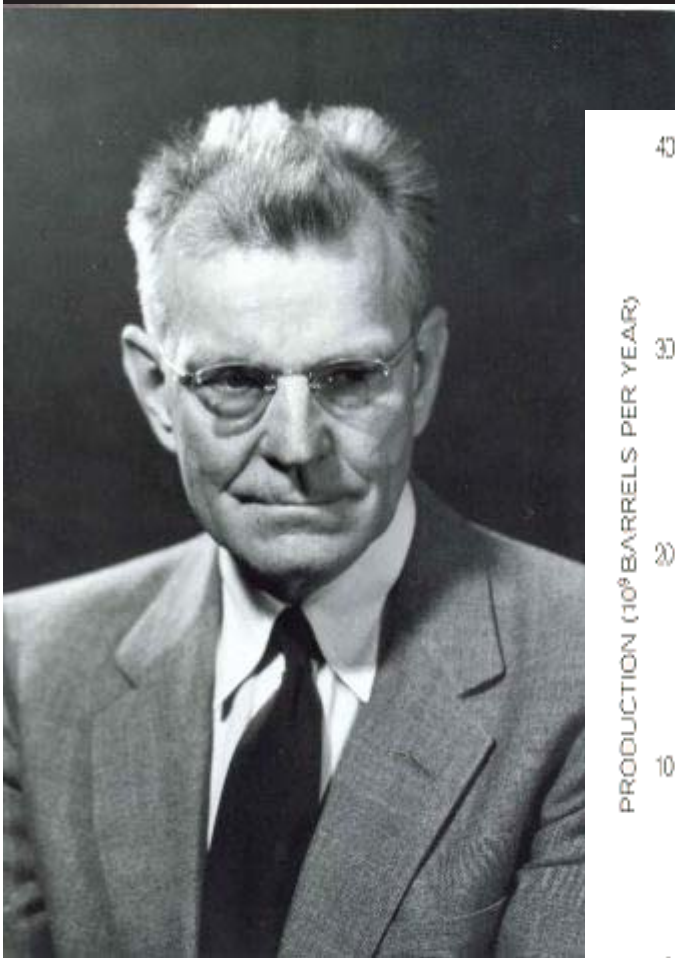
‘A growing number of oil-industry chieftains are endorsing an idea long deemed fringe: The world is approaching a practical limit to the number of barrels of crude oil that can be pumped every day.’

Russell Gold and Ann Davis

Wall Street Journal,

November 19th, 2007



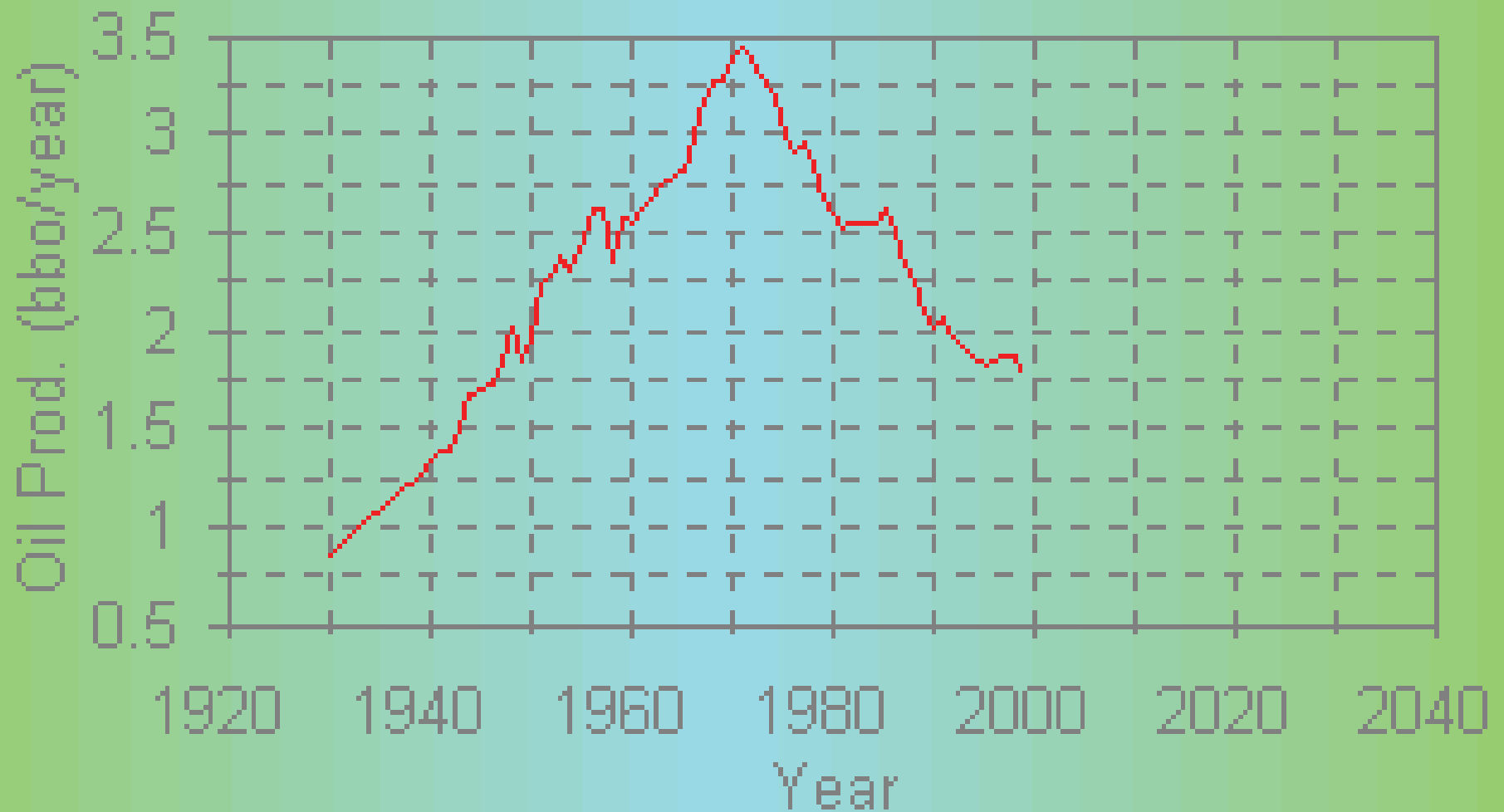


CYCLE OF WORLD OIL PRODUCTION is plotted on the basis of two estimates of the amount of oil that will ultimately be produced.

The colored curve reflects Ryman's estimate of $2,100 \times 10^9$ barrels and the black curve represents an estimate of $1,350 \times 10^9$ barrels.

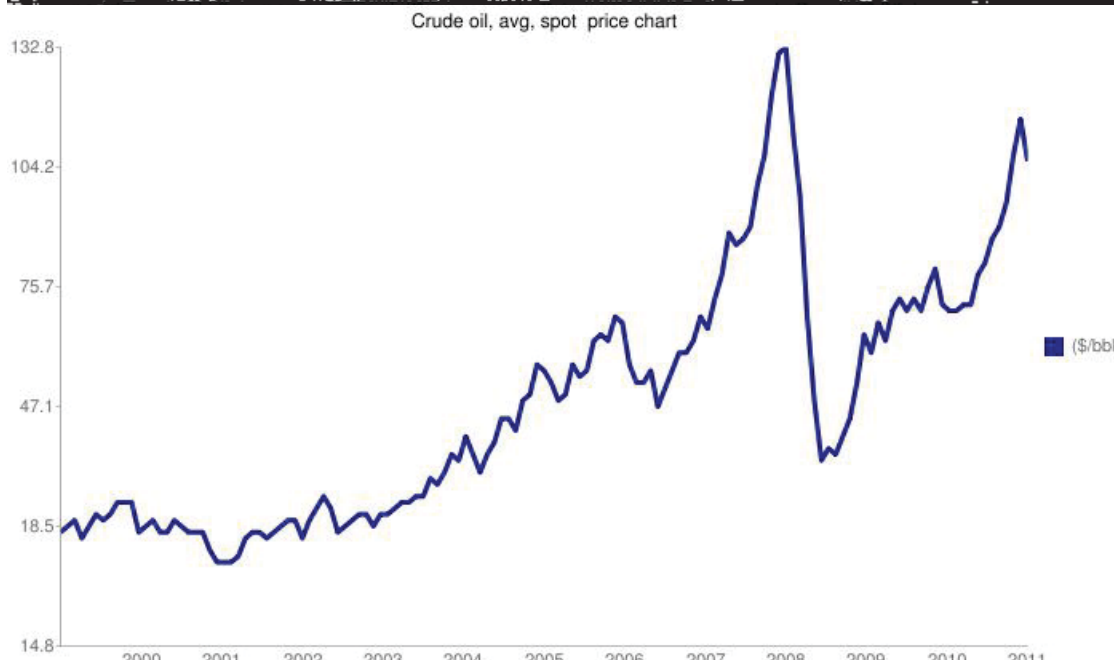
The Hubbert Peak Sci Amer 1971

U.S. Lower 48 States



Global oil production has not risen for 5 years...

- Inexorable rise in oil price of 5% per year.
- Dramatic rise in 2008 revealing vulnerabilities of car dependent cities.
- Car use beginning to decline...

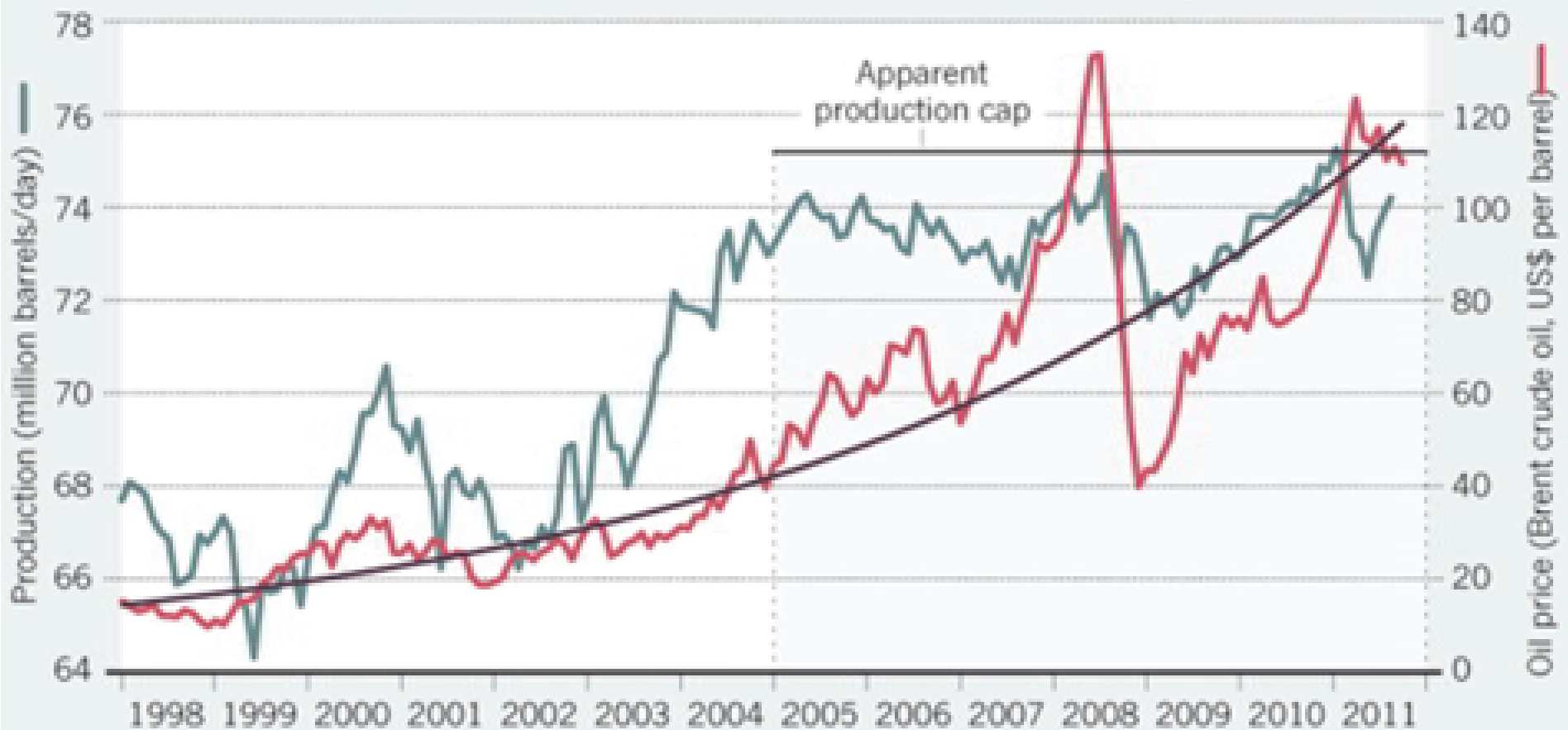


Climate policy: Oil's tipping point has passed

Nature 481,433–435 26 January 2012

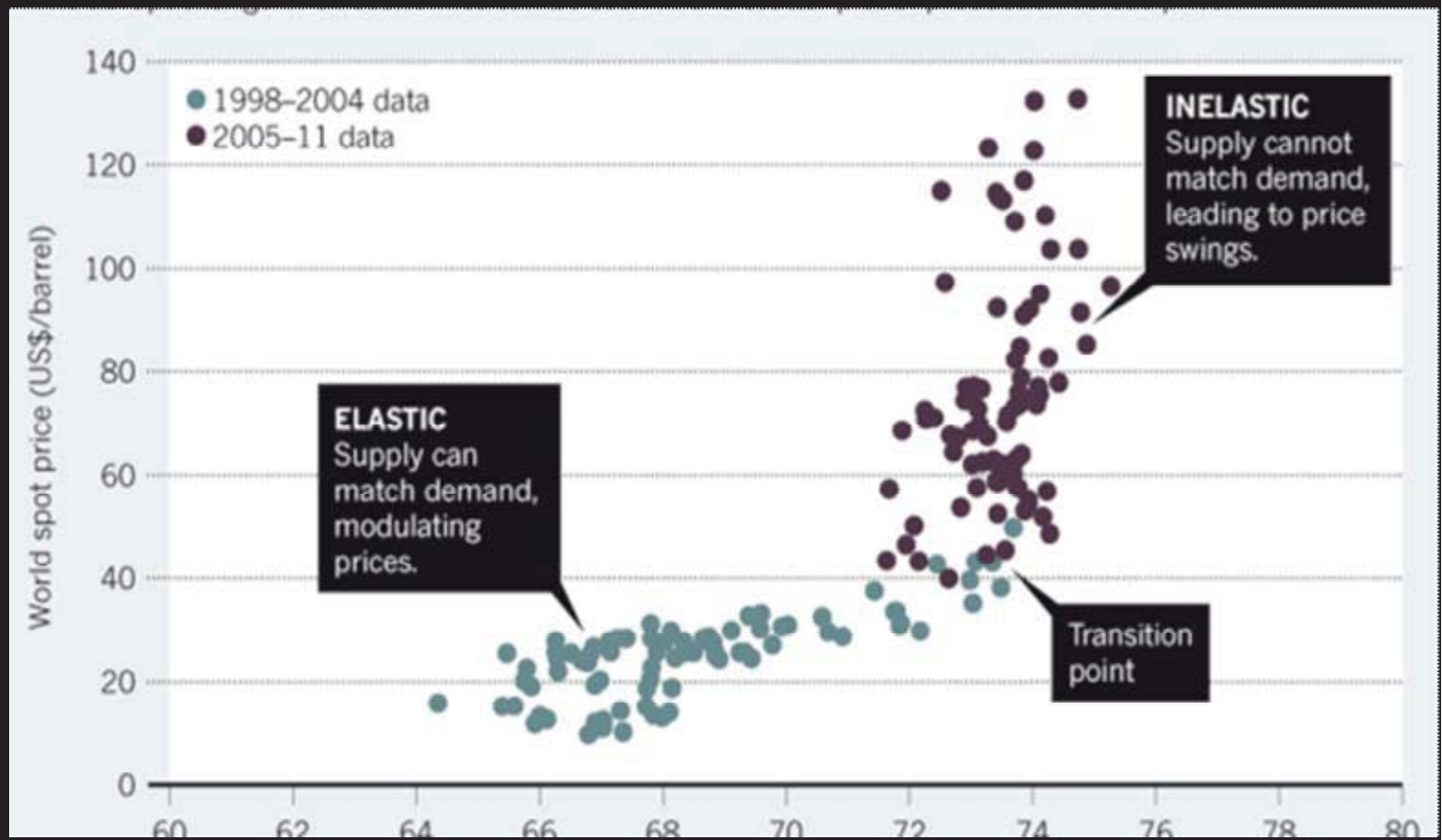
OIL PRODUCTION HITS A CEILING

Production followed demand until 2005, when it levelled off despite continued price increases. There seems to be a production 'cap' at about 75 million barrels per day.



‘The economic pain of a flattening supply will trump the environment as a reason to curb the use of fossil fuels’

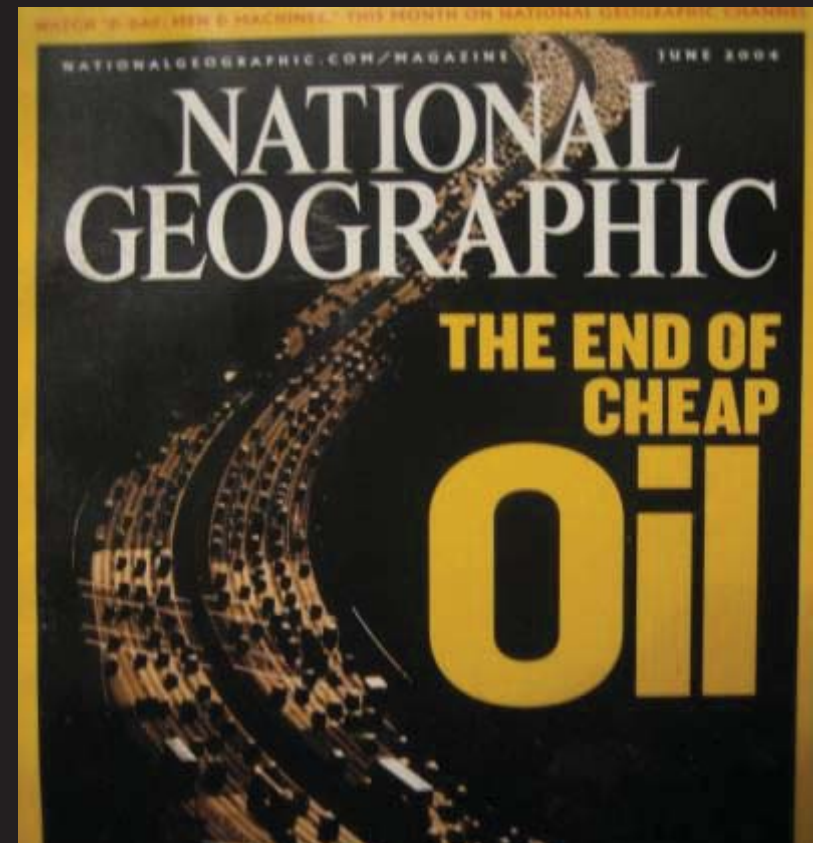
James Murray and David King.



**Peak oil: Global tipping point
already**

**passed [http://www.youtube.com/
watch?v=xl-q9PXukCo](http://www.youtube.com/watch?v=xl-q9PXukCo)**

**Can only solve if the
technological is integrated into
the design of cities...**





ECOSYSTEMS AND HUMAN WELL-BEING

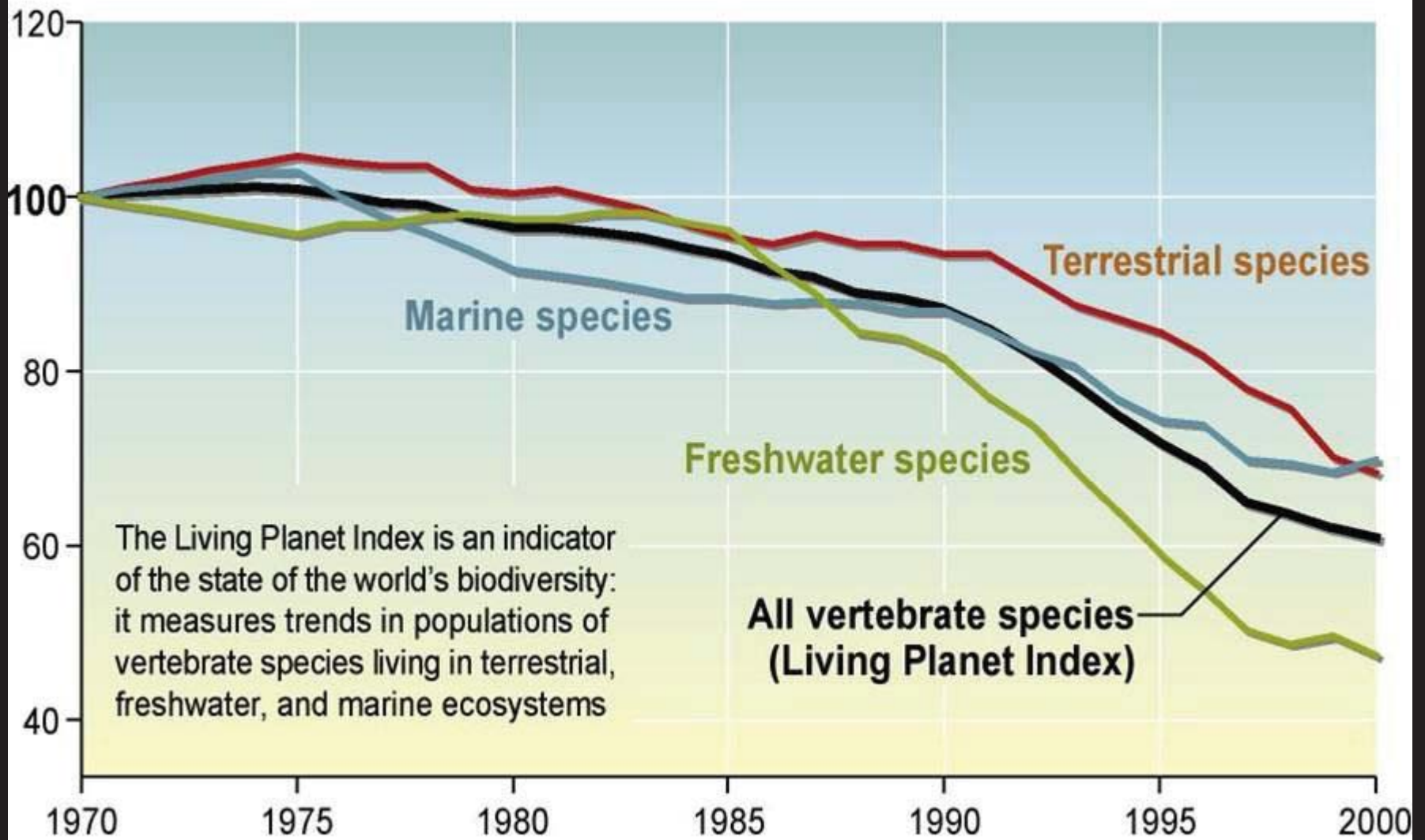
Synthesis



MILLENNIUM ECOSYSTEM ASSESSMENT

The Millennium Ecosystem Assessment

Population Index = 100 in 1970



The Living Planet Index is an indicator of the state of the world's biodiversity: it measures trends in populations of vertebrate species living in terrestrial, freshwater, and marine ecosystems

**All vertebrate species
(Living Planet Index)**

Collapse?

- Jared Diamond's 'Collapse' is when cities do not adapt to a deep threat to their future.
- 'Peakers' sites on the web are apocalyptic...eg lifeafterthecrash.net; dieoff.com

Ephesus, 2nd biggest city in Roman empire,
abandoned in 1000AD..



Babylon the greatest city of the ancient world
for 2300 years – collapsed in 140 BC.



RESILIENT CITIES

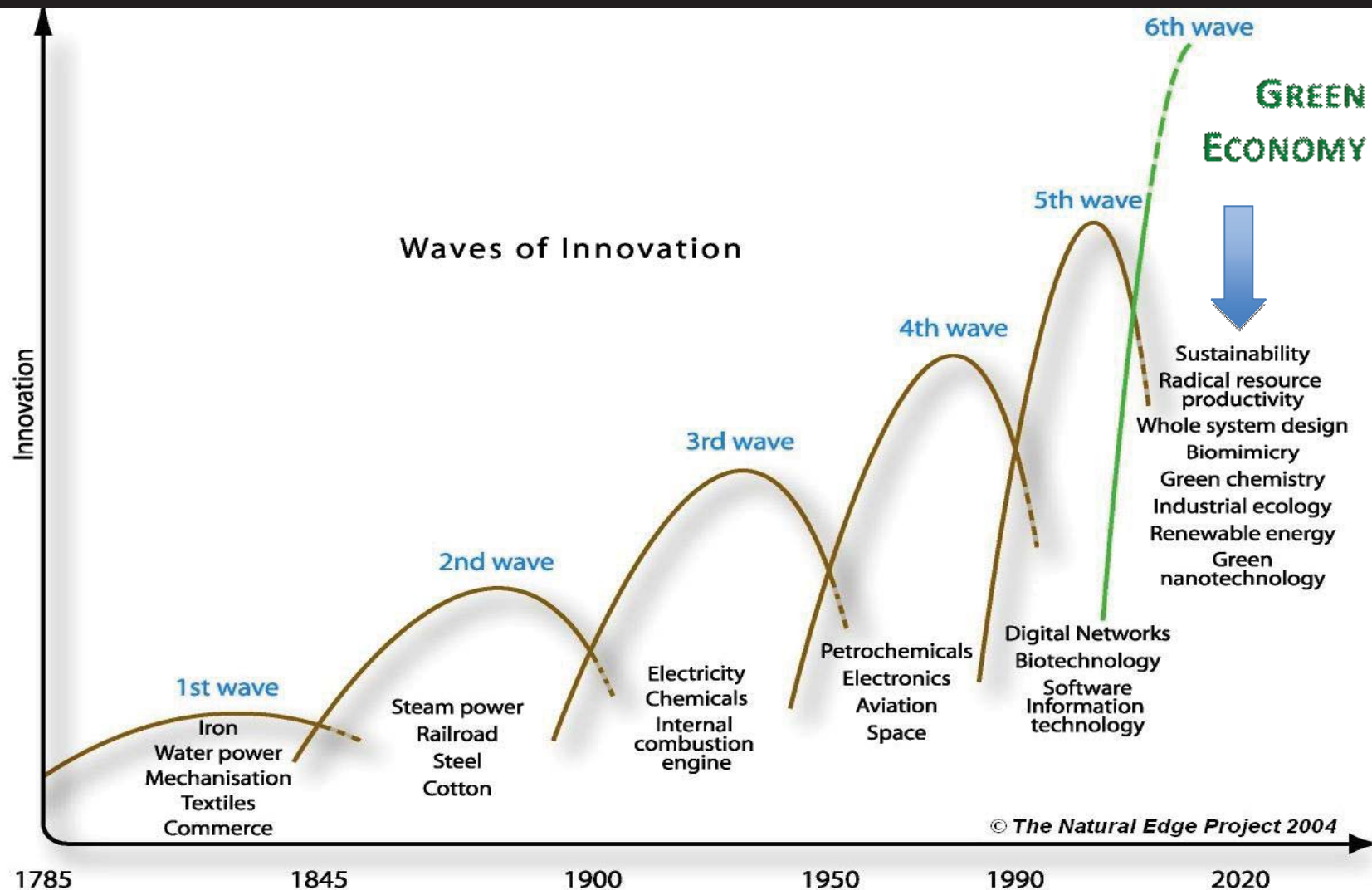
Responding to Peak Oil
and Climate Change

Peter Newman, Timothy Beatley, and Heather Boyer

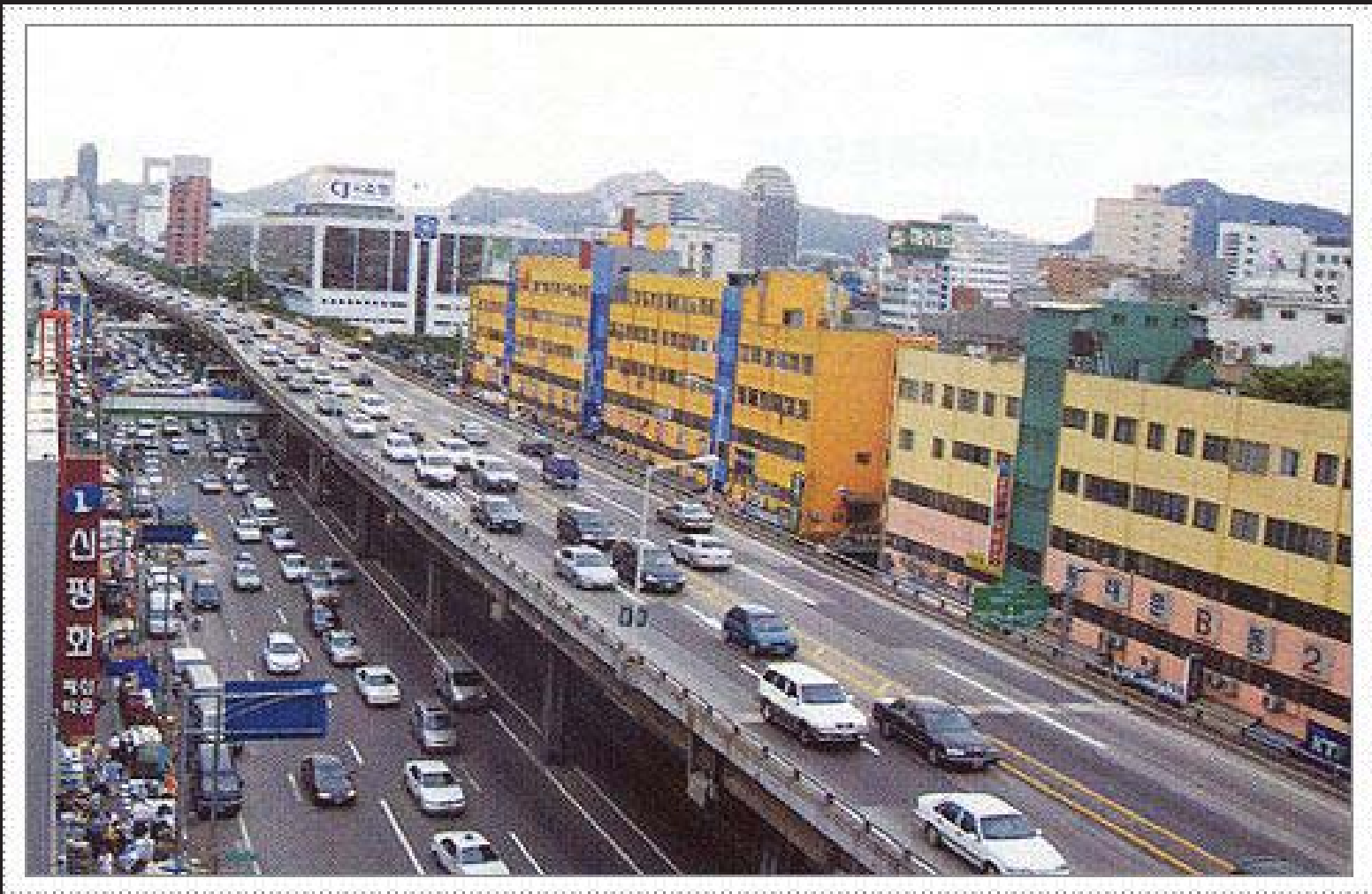


Economic waves

The next era of innovation...the Green Economy



Green economy symbol,
Cheonggyecheon River in Seoul,
buried under freeway



Cheonggyecheon Area after Restoration

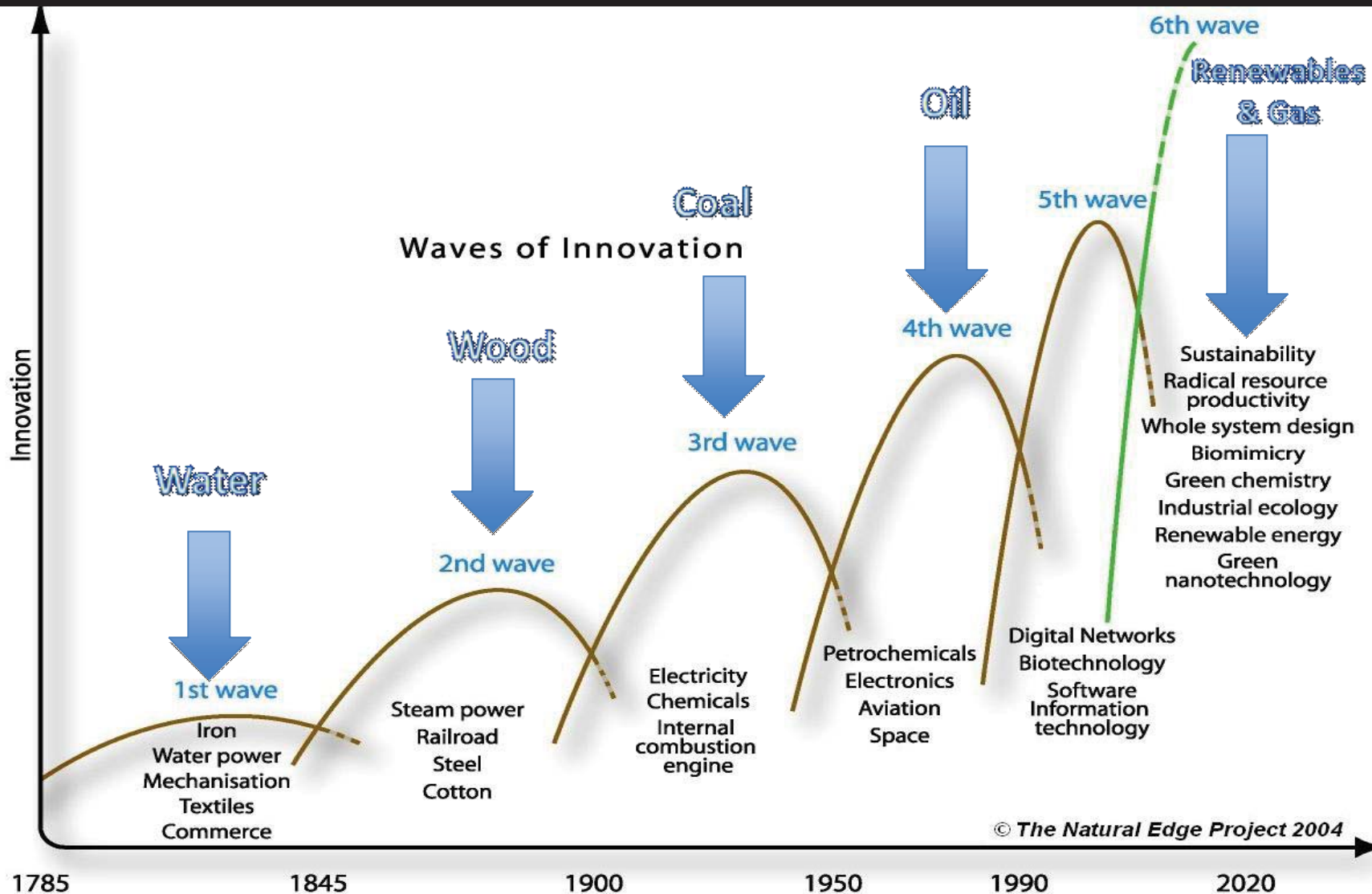
<http://www.metro.seoul.kr/kor2000/chungaehome/en/seoul/2sub.htm/>





History of innovation and energy....

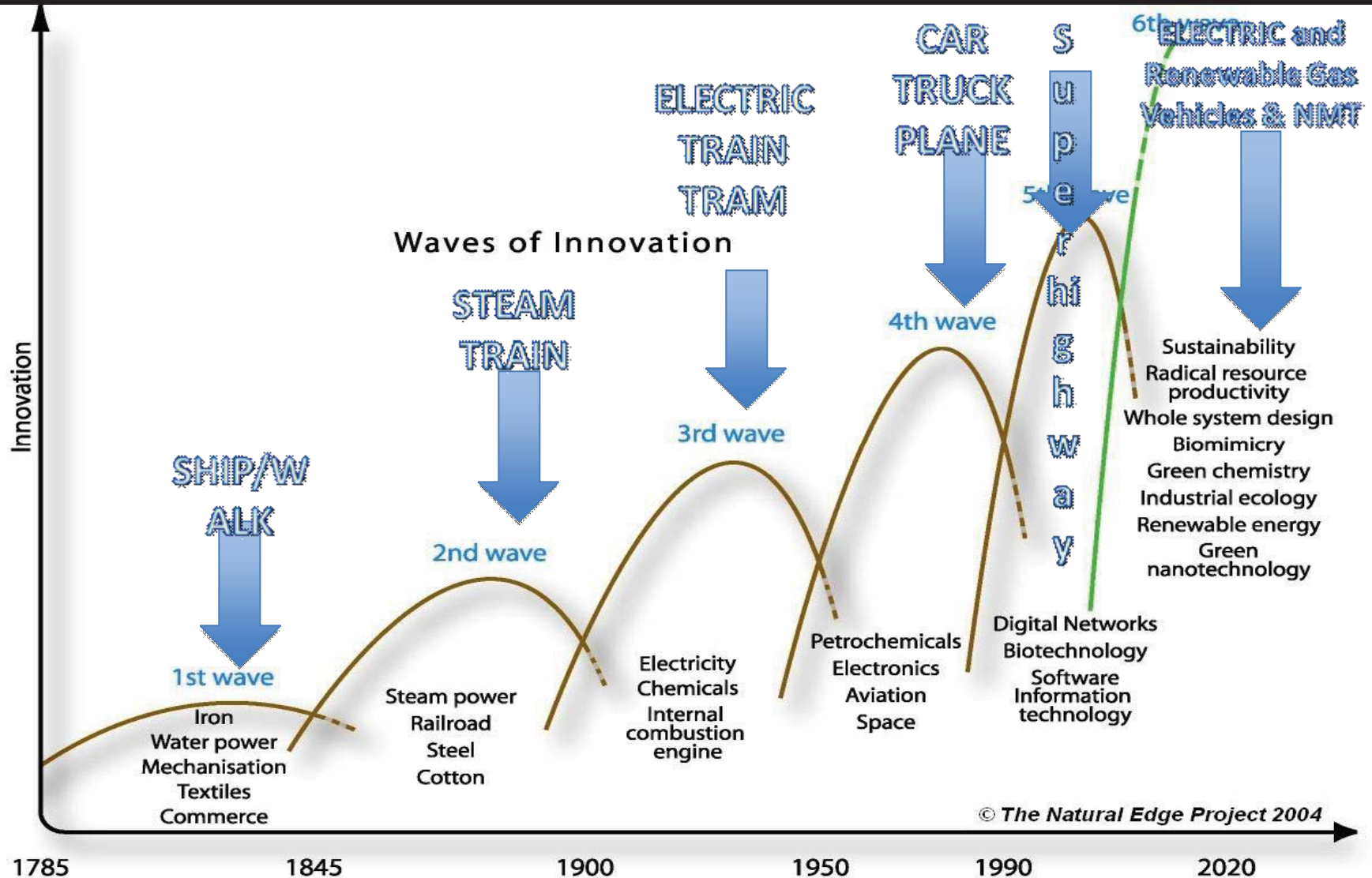
Next era of city building is REDUCED CARBON – green economy.



History of innovation and cities....

Transport shapes

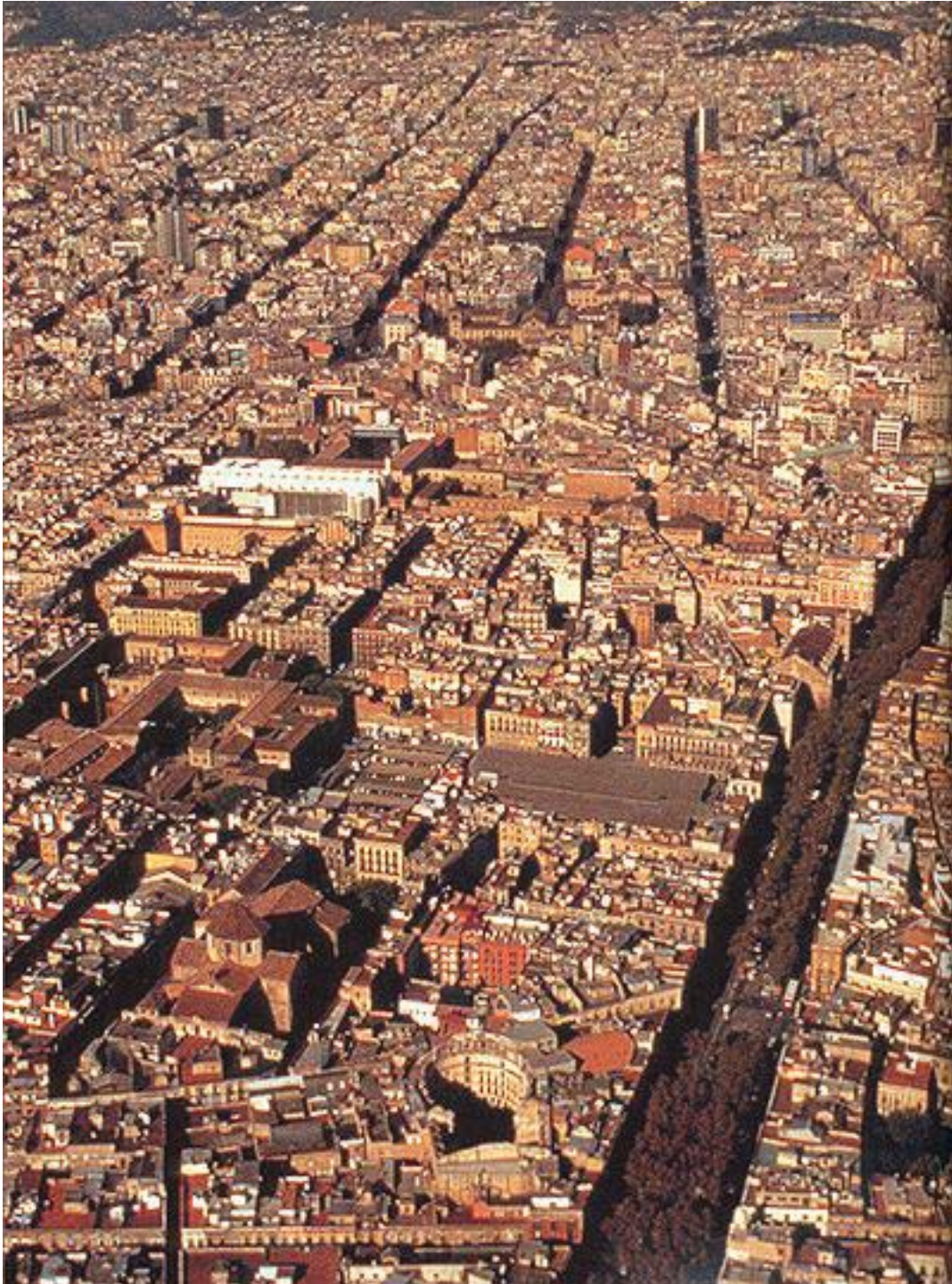
Each era changes the city form. Cities keep the best of that era and move on.
Next era of city building ...



Some cities will struggle...

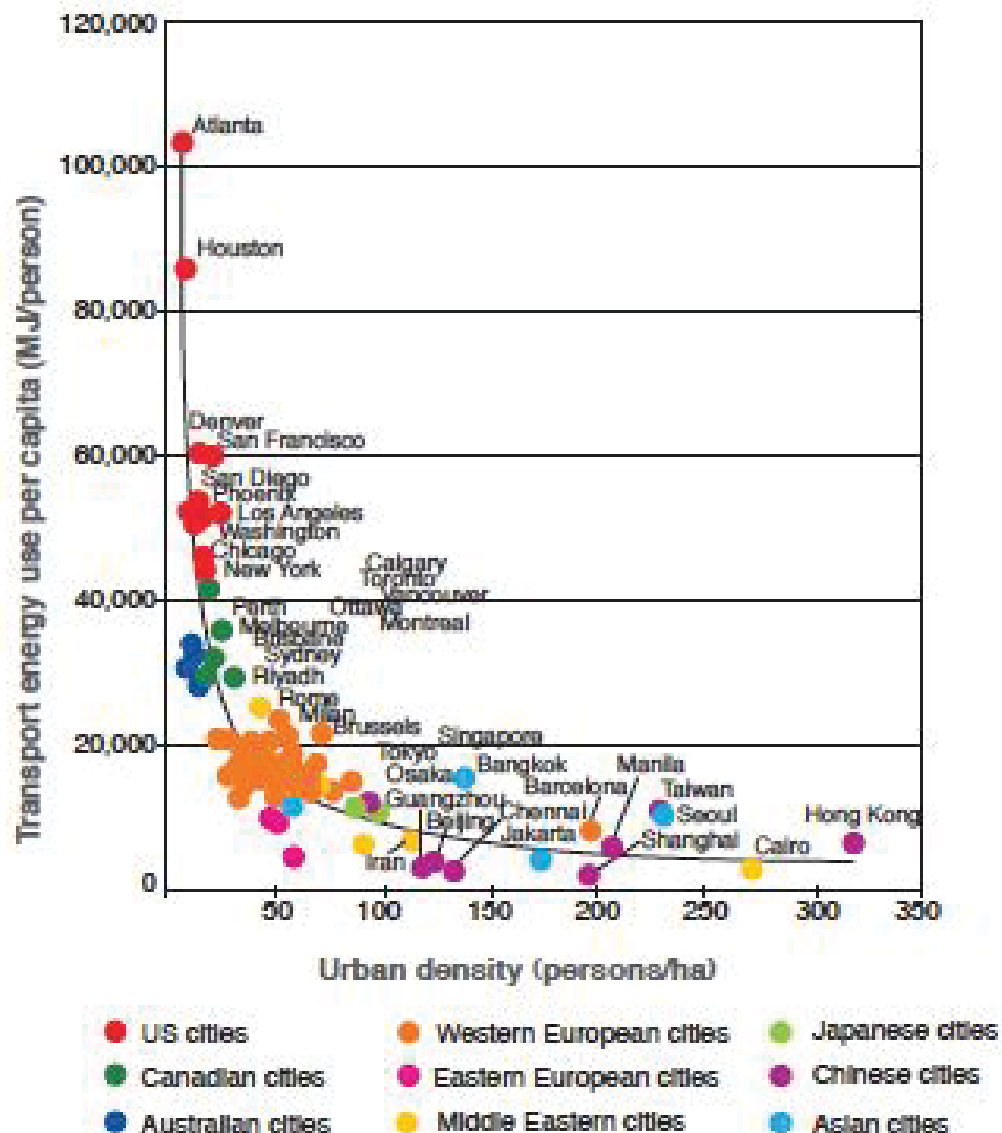
Atlanta – 18 counties of sprawl with no transit.



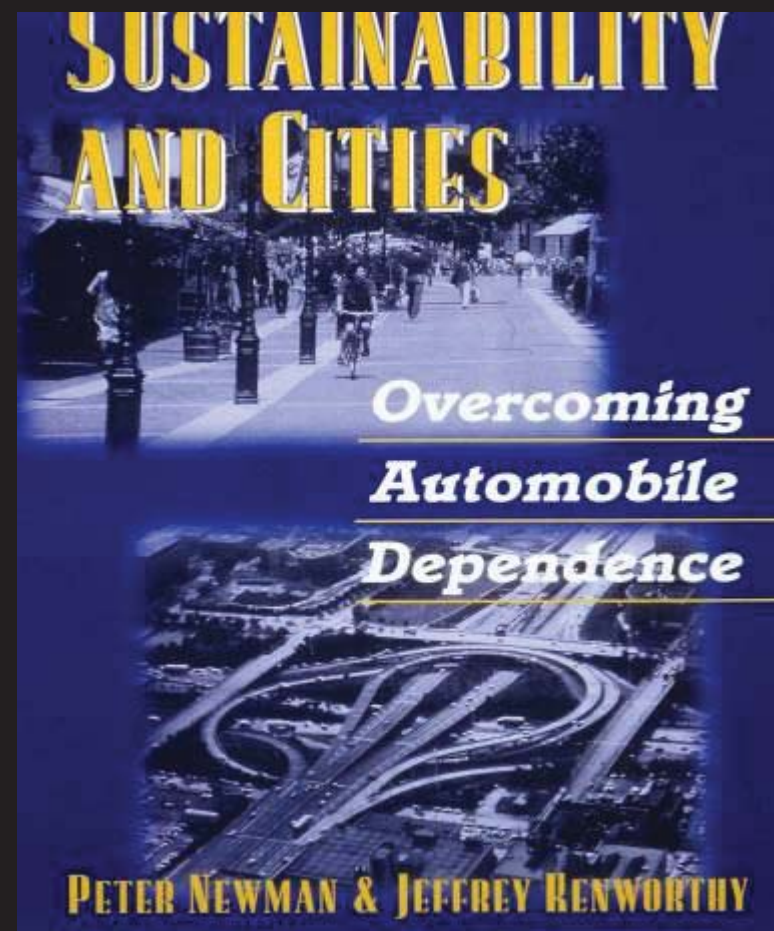


Barcelona

Fuel Use Decreases as Density Increases



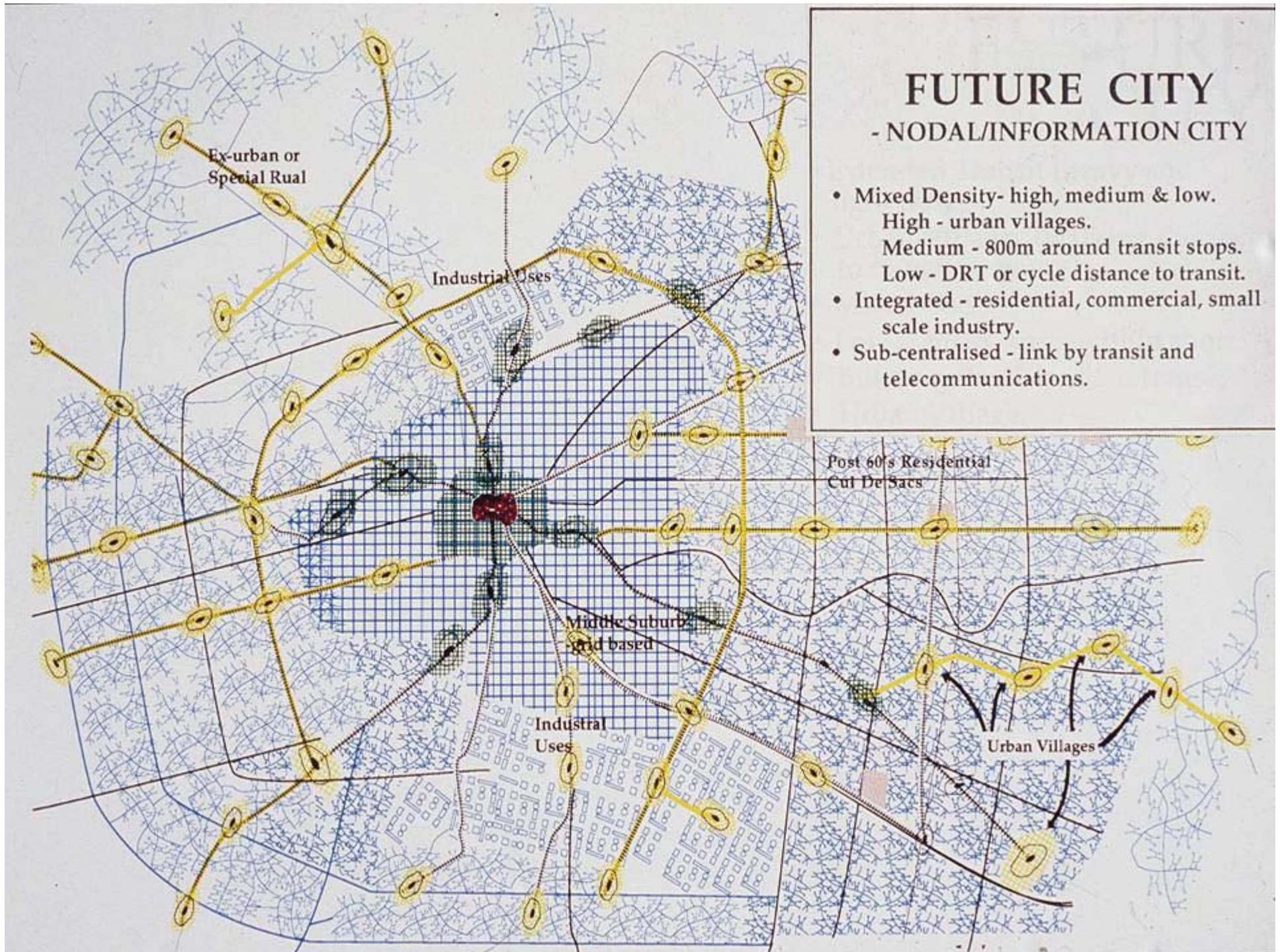
Source: Kenworthy, J. R., 2010, *Cities Data Base for 2005*, CUSP,



FUTURE CITY

- NODAL/INFORMATION CITY

- Mixed Density- high, medium & low.
High - urban villages.
Medium - 800m around transit stops.
Low - DRT or cycle distance to transit.
- Integrated - residential, commercial, small scale industry.
- Sub-centralised - link by transit and telecommunications.

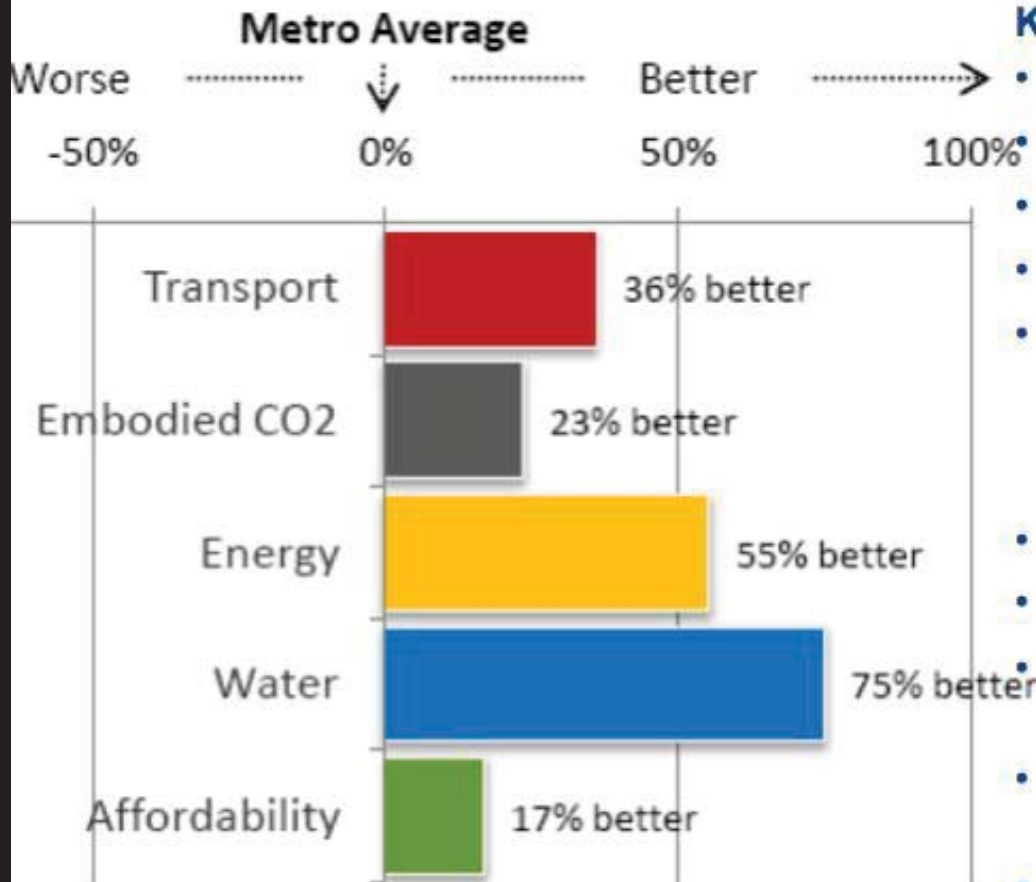




Future city will be built around green TODs...

55% less Carbon for \$5600 per dwelling

Key performance indicator results High performance scenario



Key strategies

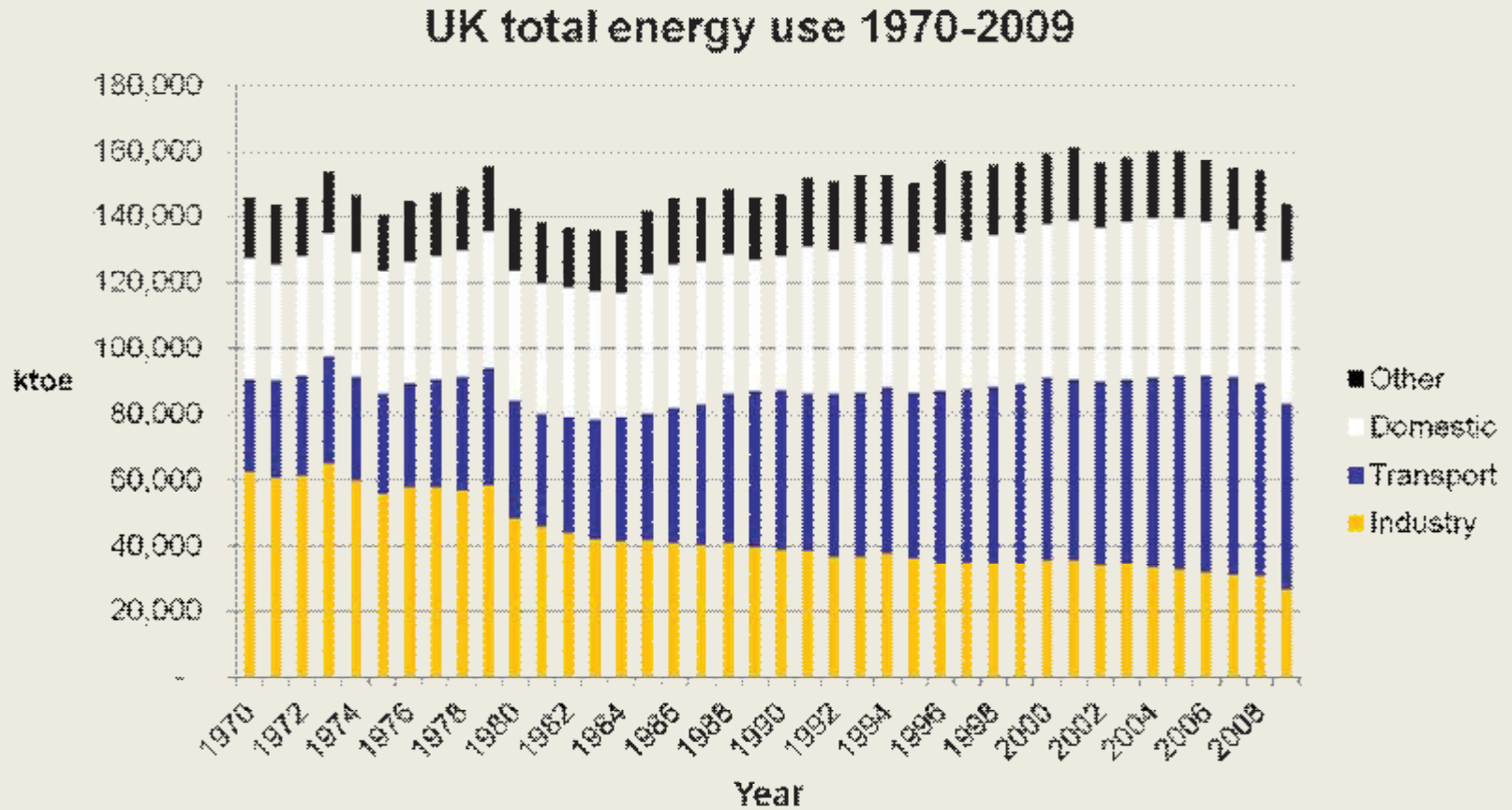
- high frequency LRT
- reduced car parking supply
- 7 star energy efficient buildings
- 4.5 star water efficient fixtures
- third pipe non potable water supply for irrigation and toilet flushing (wastewater and groundwater)
- solar photovoltaic systems
- solar hot water systems
- best practice appliances (4.5 star energy; 4.5 star water)
- tri-generation (for multi-story residential and non-residential)
- 22% recycled content in concrete.

Is it going to happen?

Some surprising trends...

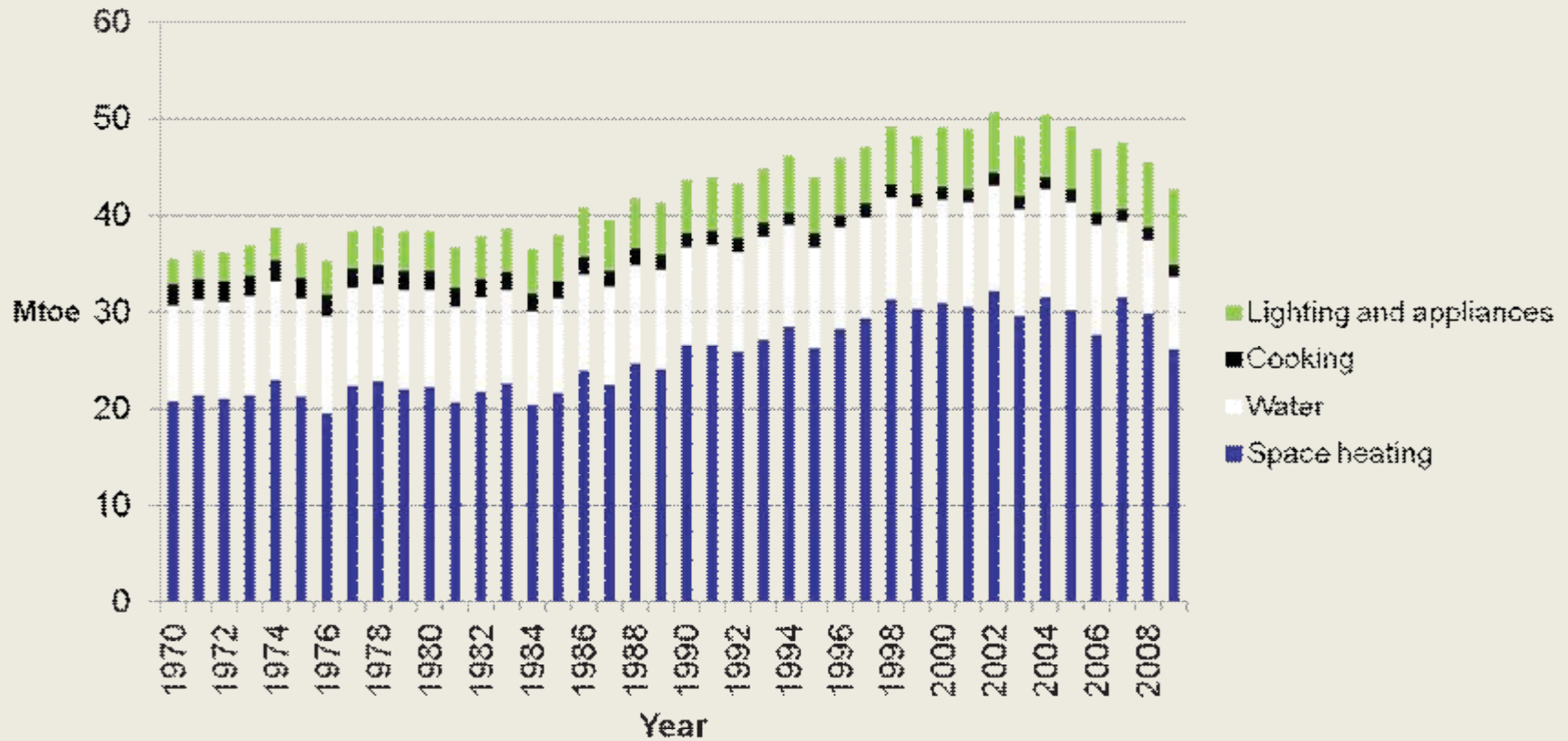
- 1 In 2008 '**peak fossil fuel power investment**' occurred: global renewable power investment *higher* than fossil fuel power investment for first time. Now 2:1...
- 2 In 2004 industrial cities began to show '**peak car use**' with dramatic increases in sustainable transport...
- 3 In 2008 '**peak power consumption**' happened
 - *Driving the competitive options for cities of the future.*

UK Energy demand trends



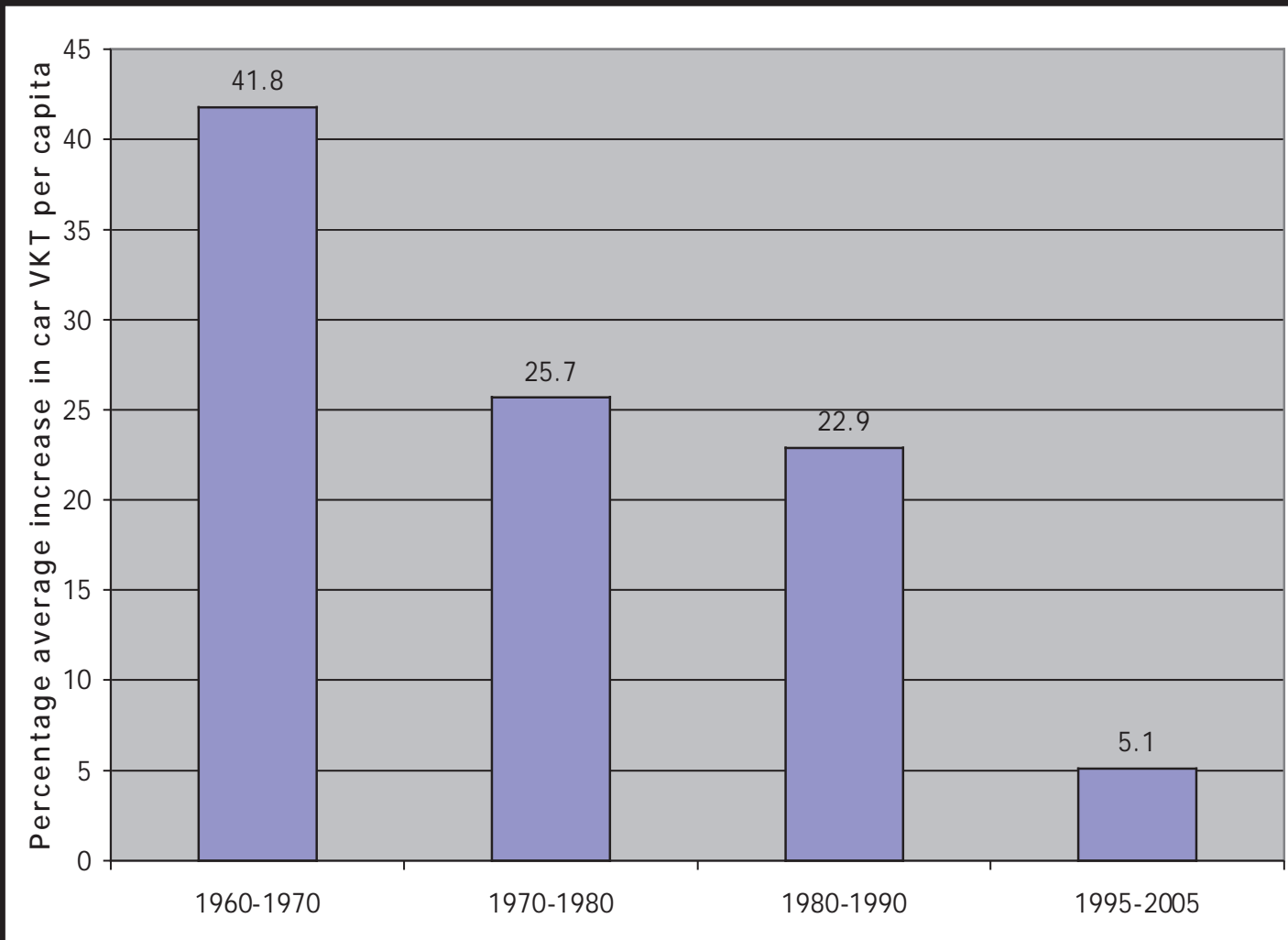
UK Household energy use trends

UK Household Energy Use 1970-2009

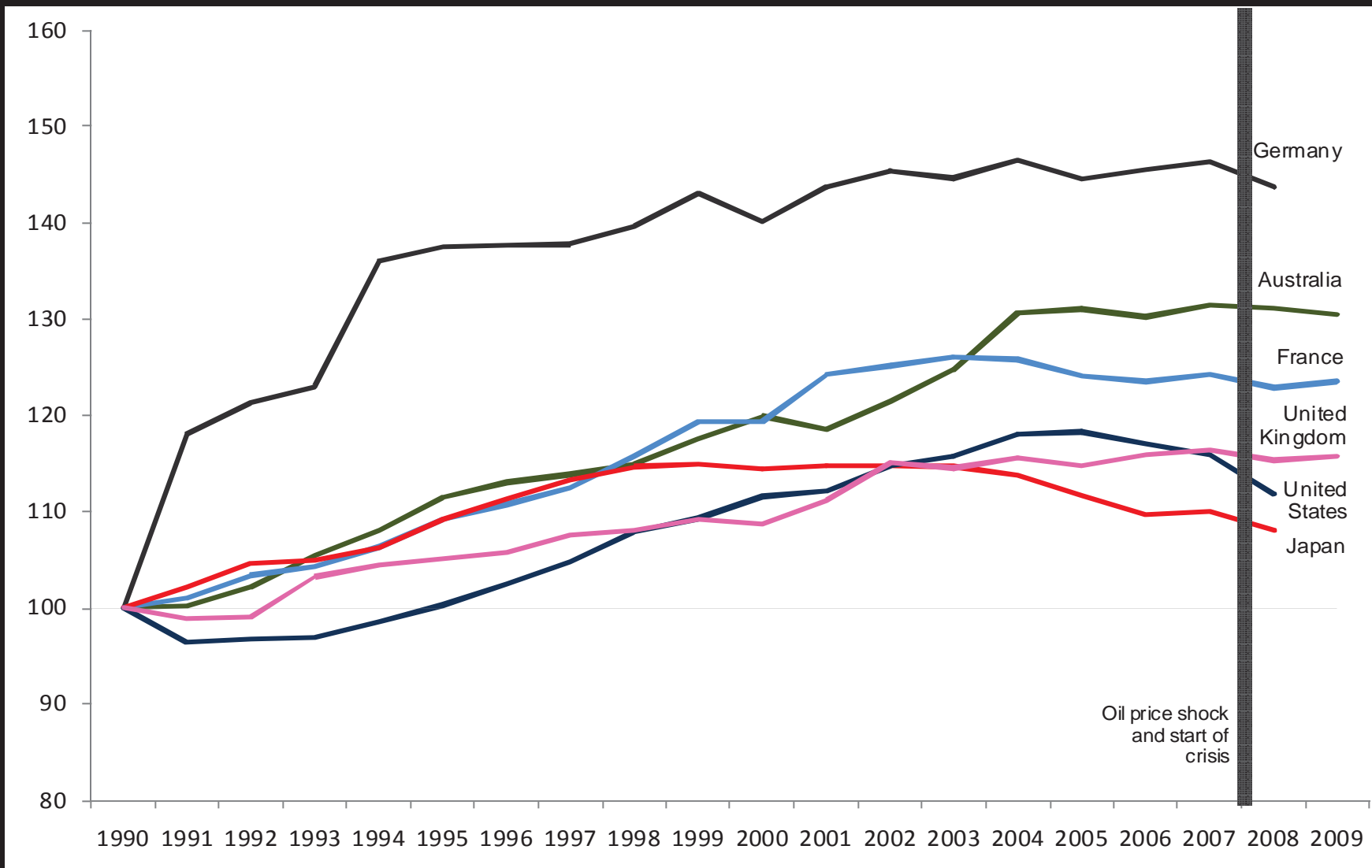


Temperature corrected, based on DECC 2010

Car use growth trends in developed cities from 1960 to 2005 using Global Cities Database.



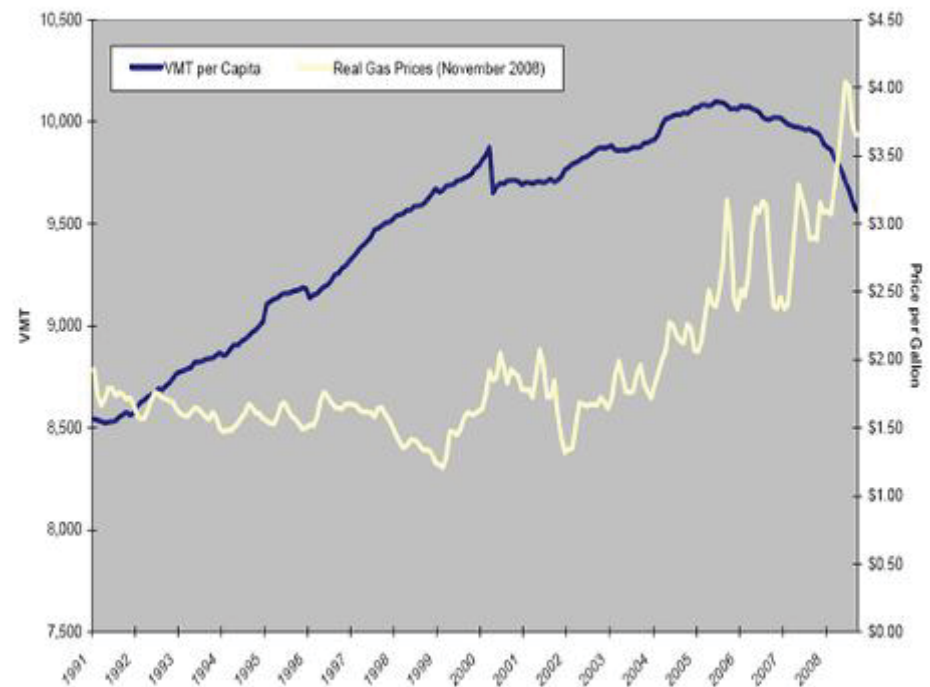
Passenger-kilometres by private car and light trucks, 1990 – 2009,



Peak Car Use - US cities...

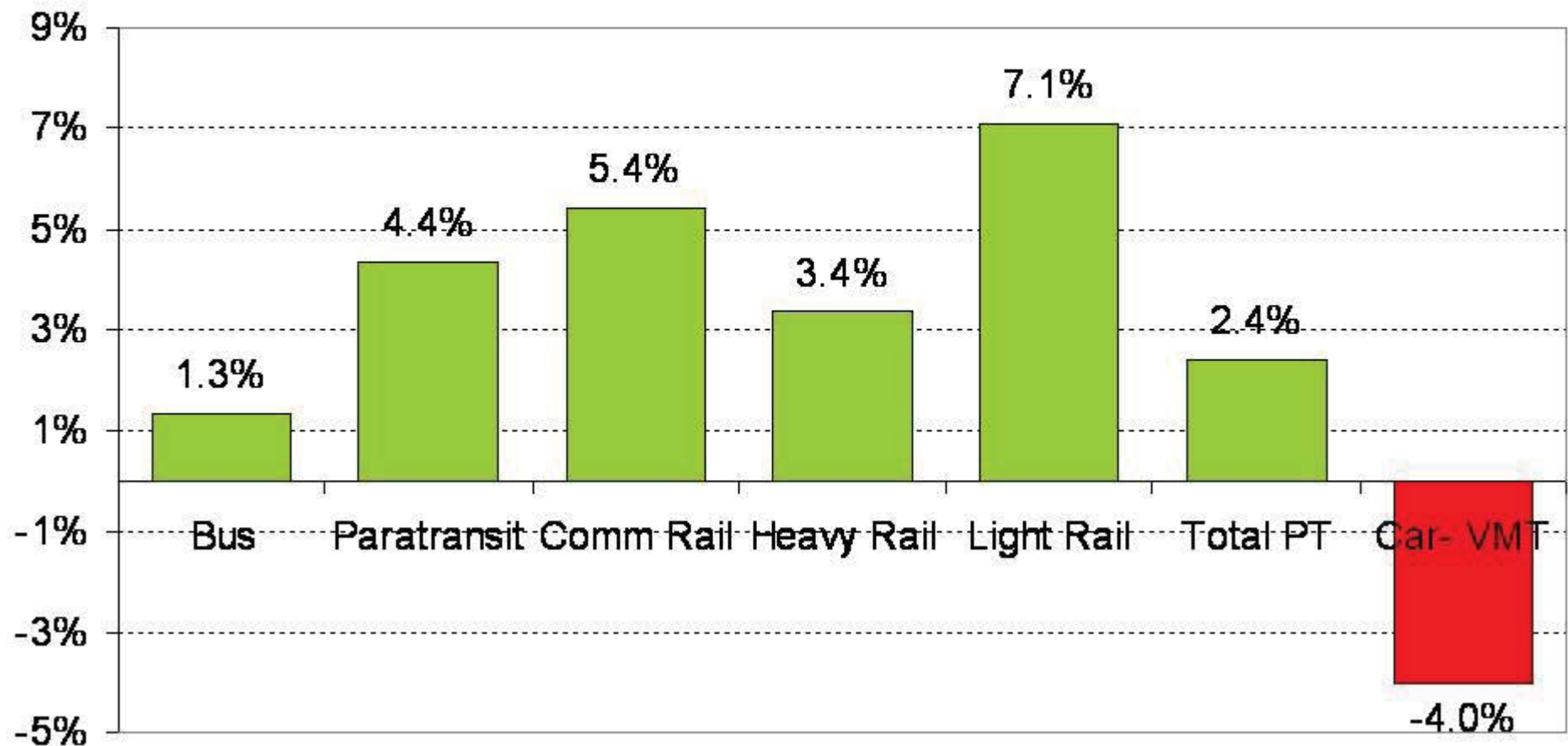
- Declining in **car use** – 4.3% in past year, plateau over the past 5 years.
- Increasing **transit use** – 6.5% in past year.
- Cities coming back in.

U.S. Vehicle Miles Traveled Per Capita, Annualized and Real Gasoline Pump Prices
January 1991–September 2008

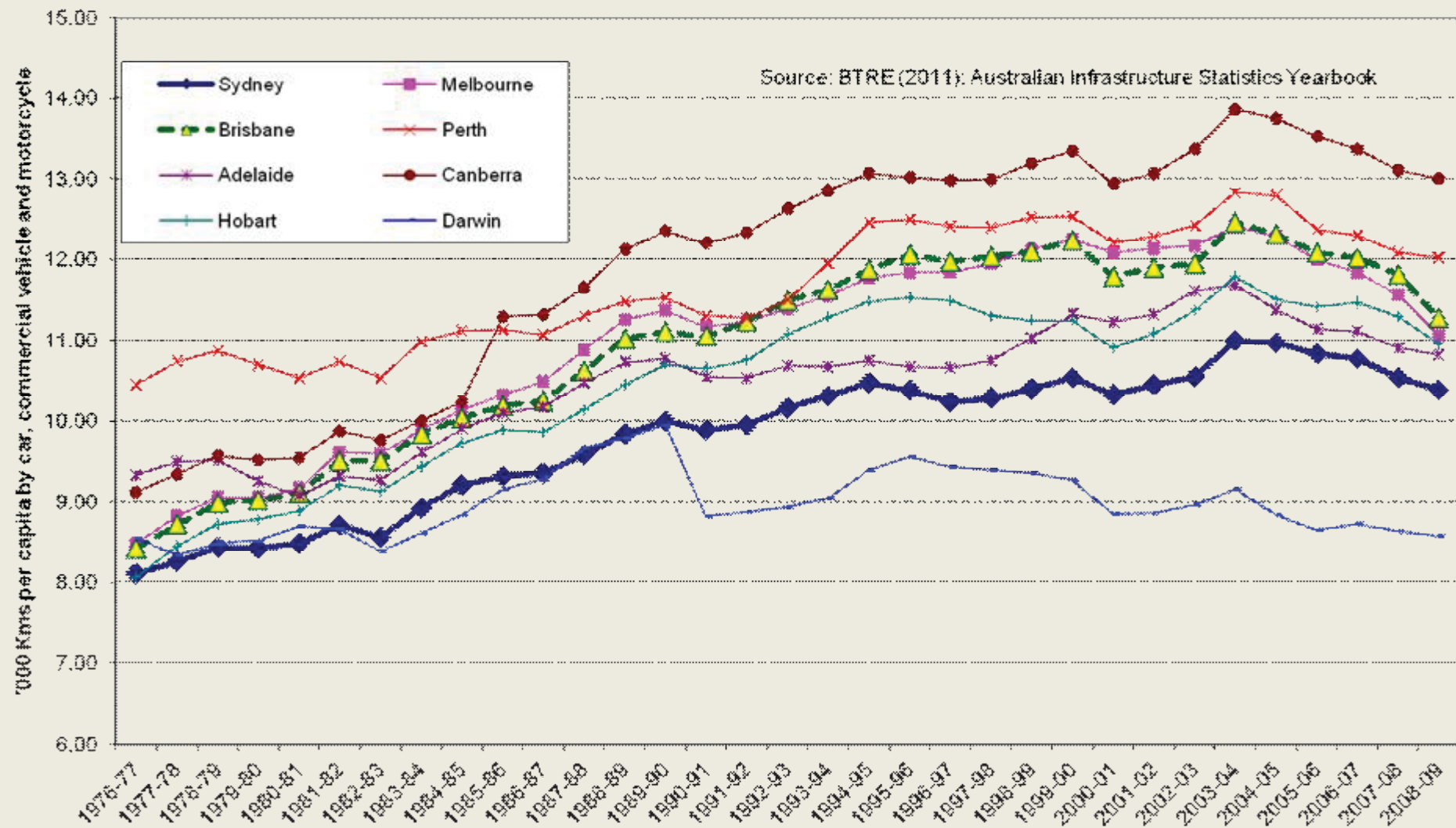


Source: Traffic Volume Trends and Energy Information Administration

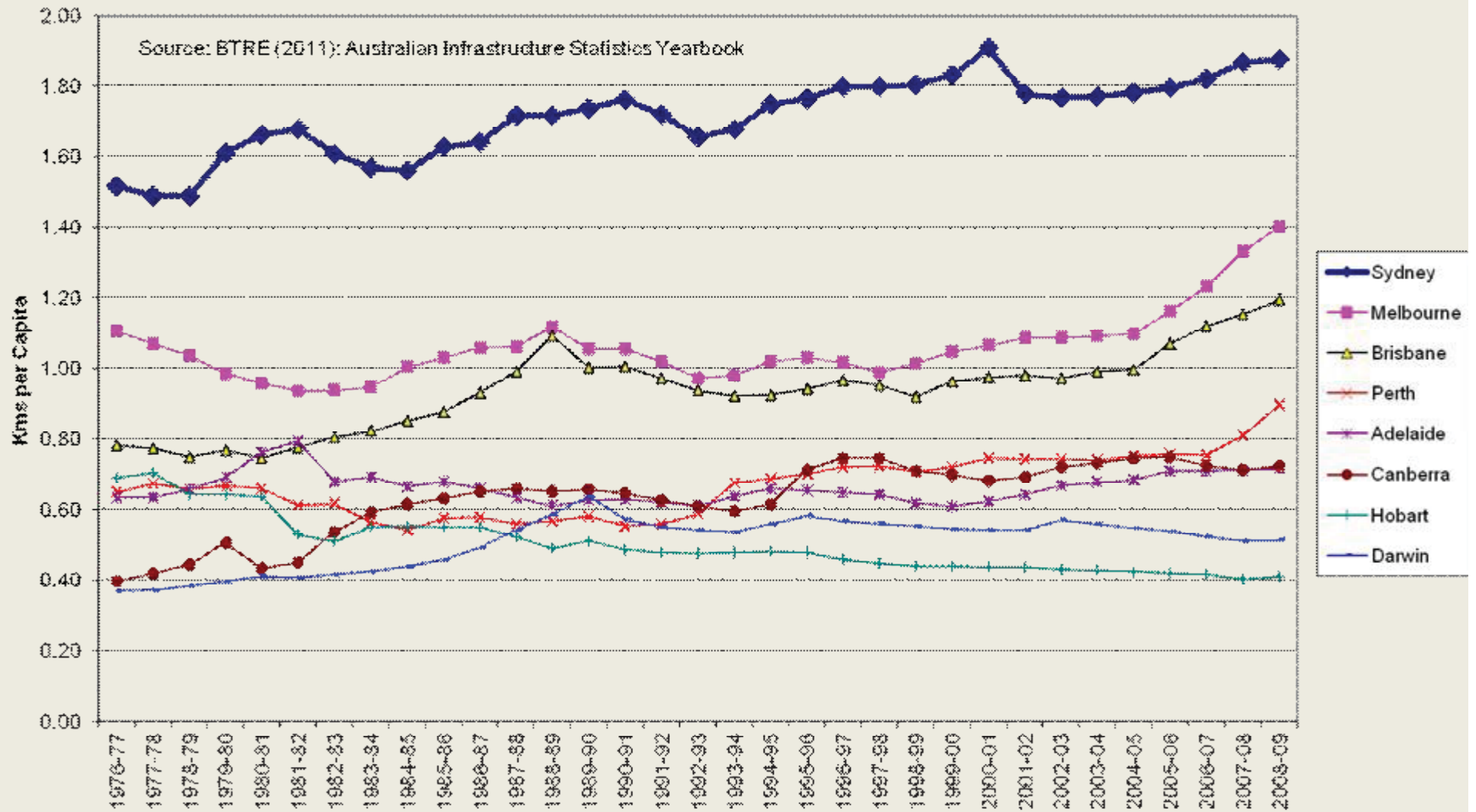
Public Transit Boardings and Vehicle Miles Travelled in US: March Quarter 2008 vs March Quarter 2007



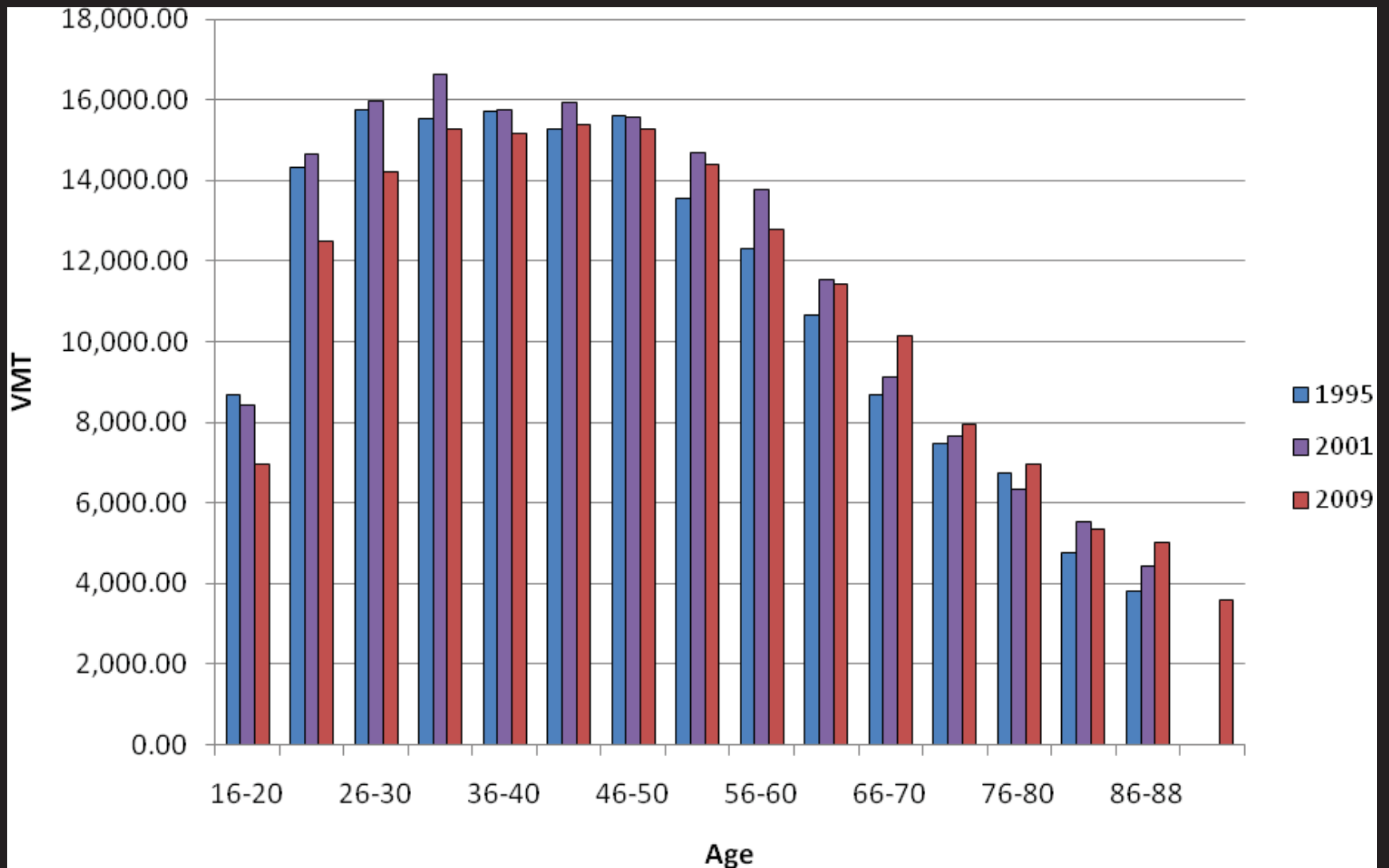
Per Capita Private Travel by City



Per Capita Public Transport Travel by City



Annual vehicle miles per driver by age, USA, 1995, 2001, 2009





종로 3가

VEEX의 포인트는 어디서든 쓴 만큼 정직하게 쌓인다는 진실

VEEX의 포인트는 100% 내맘대로 쓸수 있다는 진실

VEEX의 포인트는 적립만도 없이 쌓인다는 진실



롯데카드
VEEX의 진실

전세계 어디서나 적립만도 없이 최대2%가
재휴사에서 100% 현금처럼 쓰는 진정한 포인트

TRUE POINTCARD
VEEX



'Cars are so yesterday: young and rich leave guzzlers behind'



From 2001 to 2009, young people (16- to 34-year-olds) who lived in households with annual incomes of over \$70,000 increased their use of public transit by 100 per cent, biking by 122 per cent, and walking by 37 percent.”

From 2001 to 2009, the average annual number of vehicle-miles travelled by young people (16 to 34 year olds) decreased from 10,300 miles to 7900 miles per capita – a drop of 23 per cent.

Shanghai 1990 and 2010



1990's - Flirting with the American model...

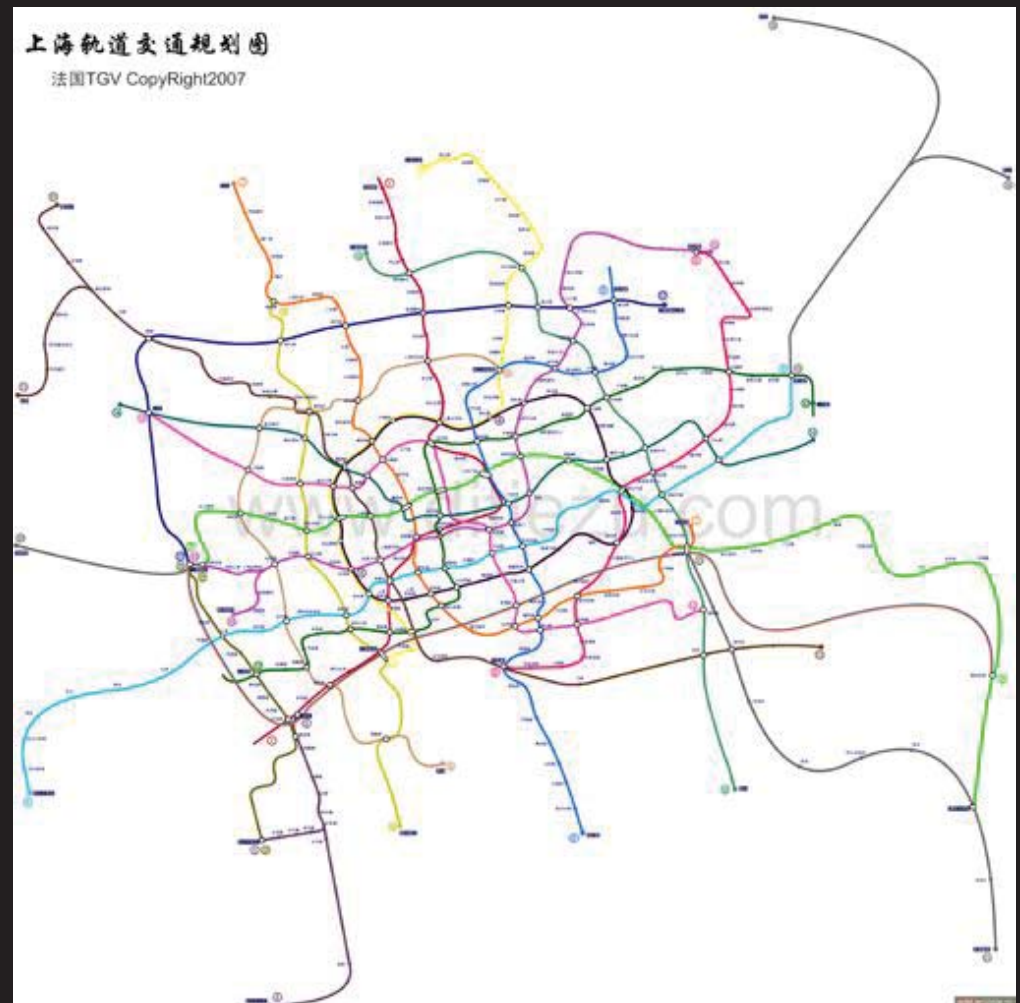


Rapidly filled...

So what can be done?



Shanghai Metro...12 lines, 273 stations,
420km covering 80% of metro area...
Built mostly since 2000; carries 8 million per day



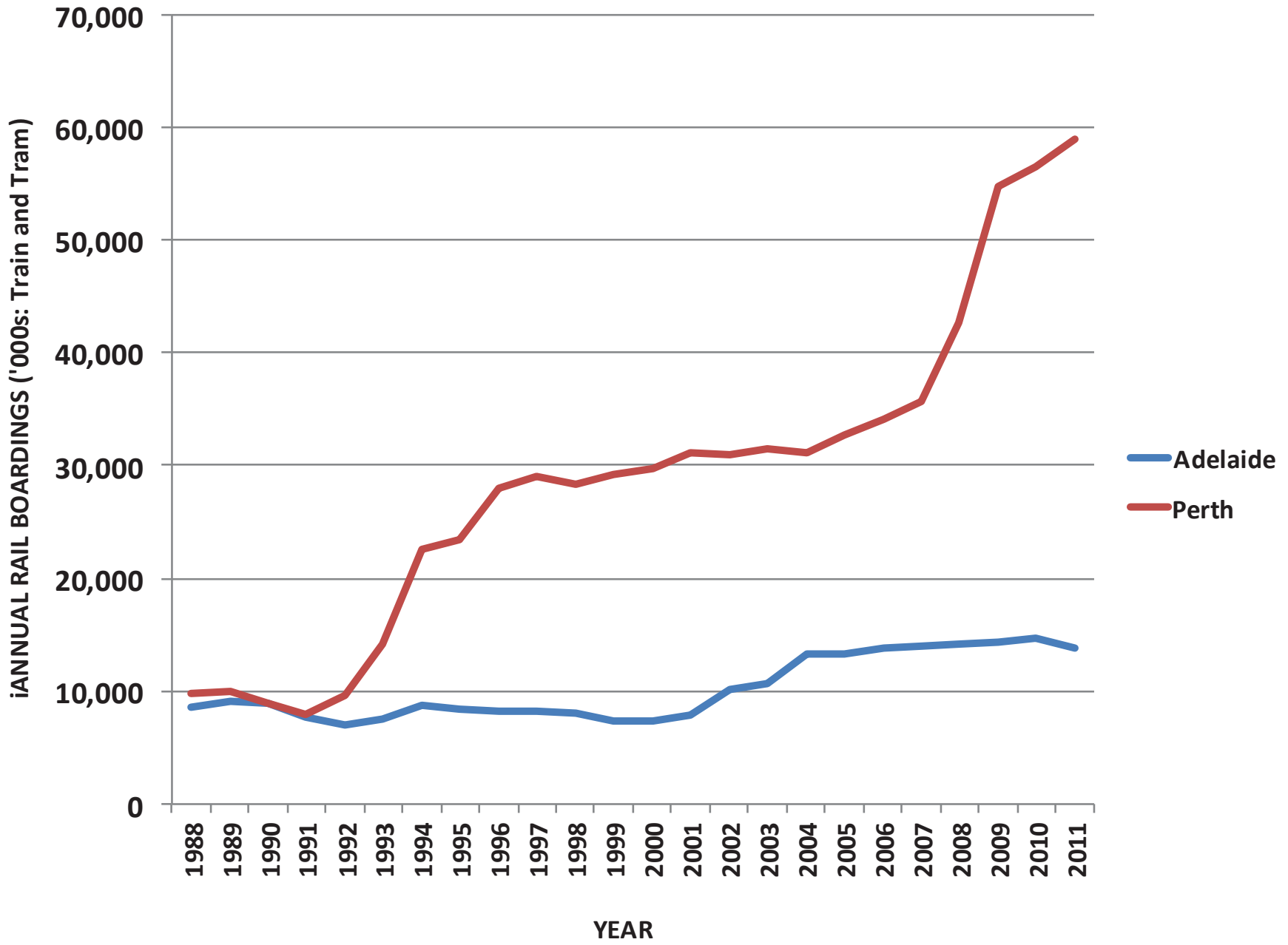
Global growth now in rail and first signs of declines in car use...

- 82 Chinese cities building metros and high speed rail between cities
- 14 Indian cities building metros
- Middle east cities building rail for first time



Opening of new Southern Railway
90% approval ratings and already paid off.
Carrying 65,000 per day cf 14,000 on buses.





Zero carbon buildings are happening

e.g. Pixel Building in Melbourne

- Captures, uses and treats all water onsite
- Vacuum toilet technology
- Anaerobic digester
- 100% Fresh Air
- Gas Fired Absorption Chiller
- PV's
- Wind Turbines
- Pixel environmental concrete



Highest BREEAM, LEED and Green
Start rating

'Zero carbon' *precincts* are happening

e.g. BedZed - UK, Vauban (Freiburg) – Germany



'Zero carbon cities' are happening



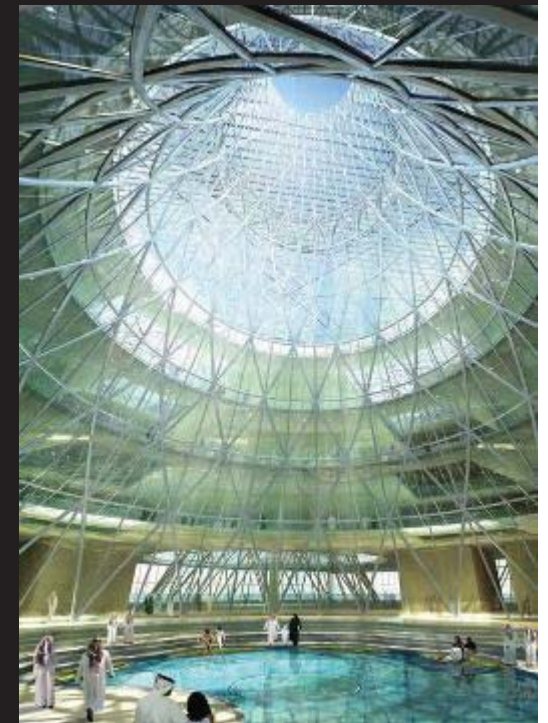
**Masdar City:
the first built
from scratch**



MASDAR



- Carbon Neutral City
- Car free city
- Zero Carbon Renewable – PV's
- Smart grid
- Ecologically designed buildings and infrastructure



Traditional narrow streets
and tall
buildings
provide
shade

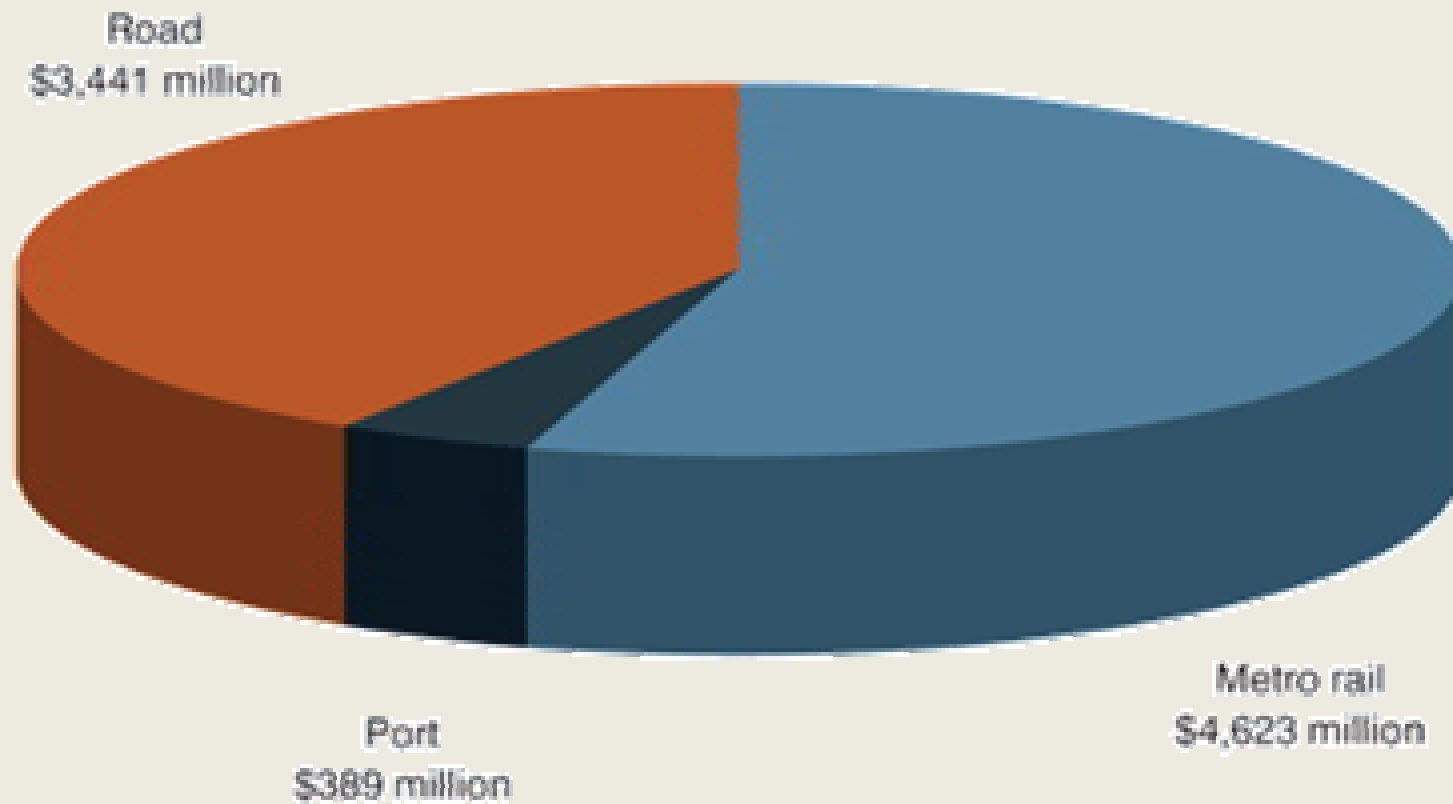




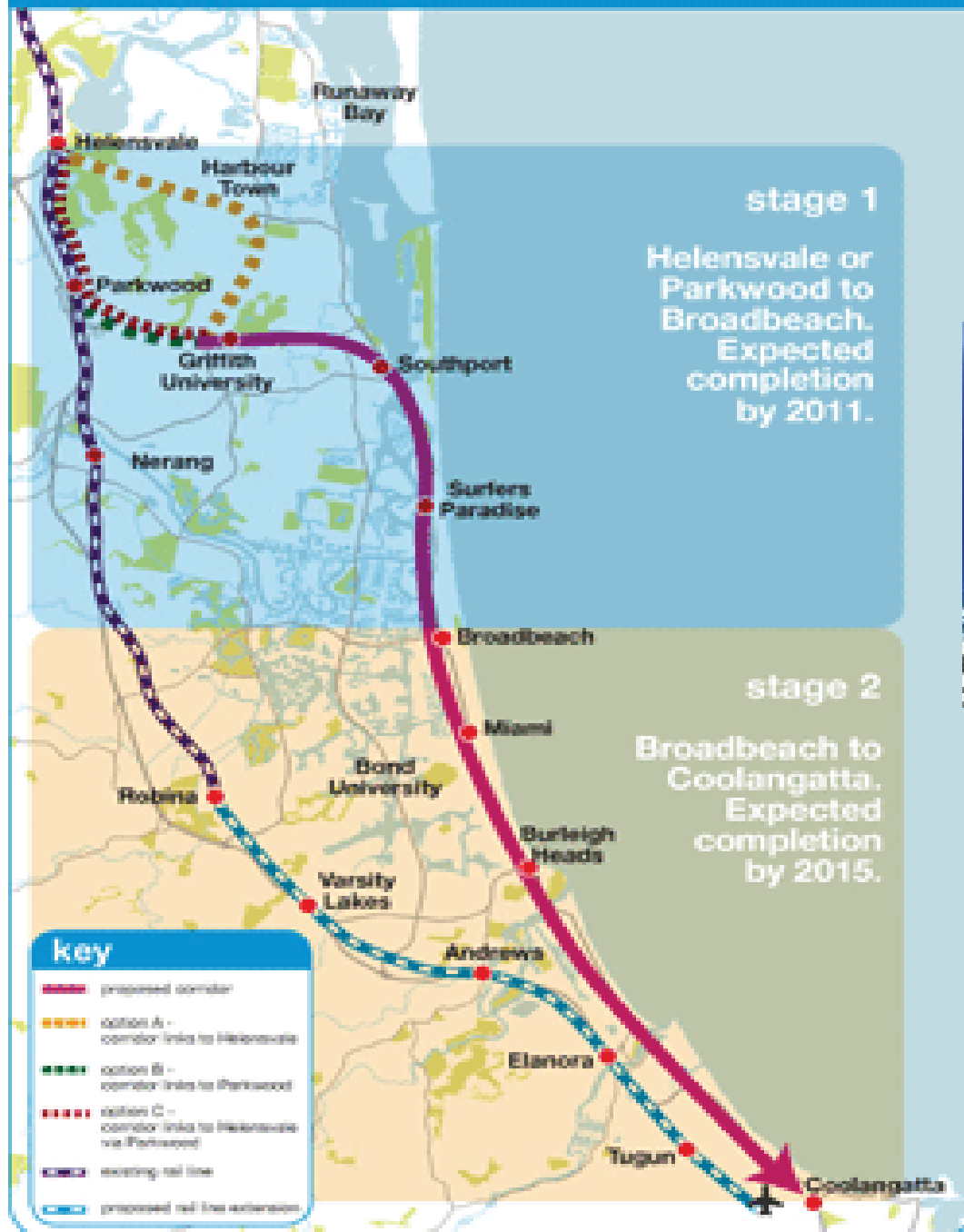
Dezhou solar city



Infrastructure Australia— 55% urban rail...historic!



proposed alignment for Gold Coast Rapid Transit



**The Gold Coast –
Small town light rail..
New funding model**



Next phase for small towns....





Renewables can be stored in Li-ion batteries

Al Gore's moon shot:

Smart Grid + Plug-in EVs + Renewables



Electric Vehicle batteries providing the storage – renewable transport



Curtin University Sustainability Policy (CUSP) Institute
www.sustainability.curtin.edu.au/renewabletransport

Public transport vehicles can be PEVs too



Tindo solar-electric bus in Adelaide

Alstom battery-powered light rail in Bordeaux



Biophilic urbanism – cities regenerating biodiversity

Singapore first Biophillic City in Asia



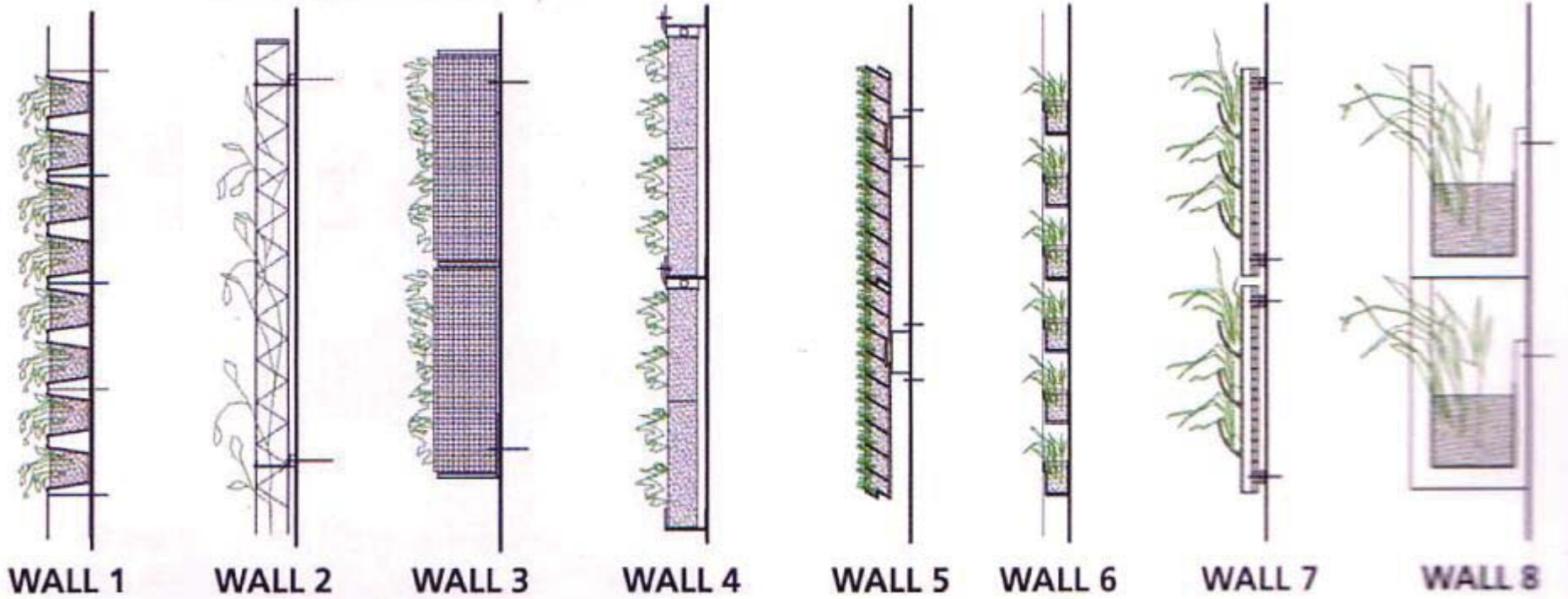
Singapore
Skyrise
Greenery
subsidies
and Hort Park
R&D area

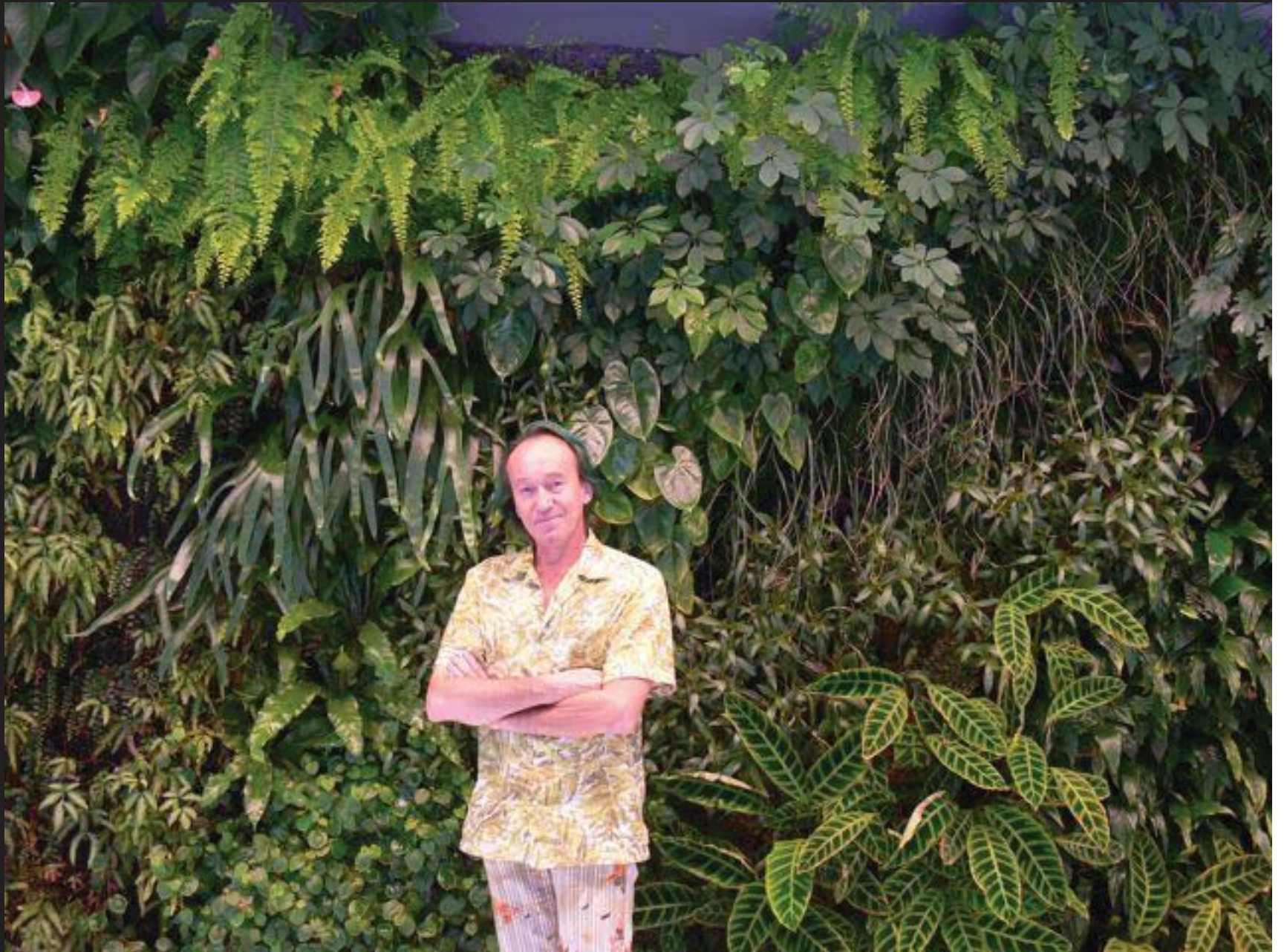




Construction approaches









Greening every nook and cranny...





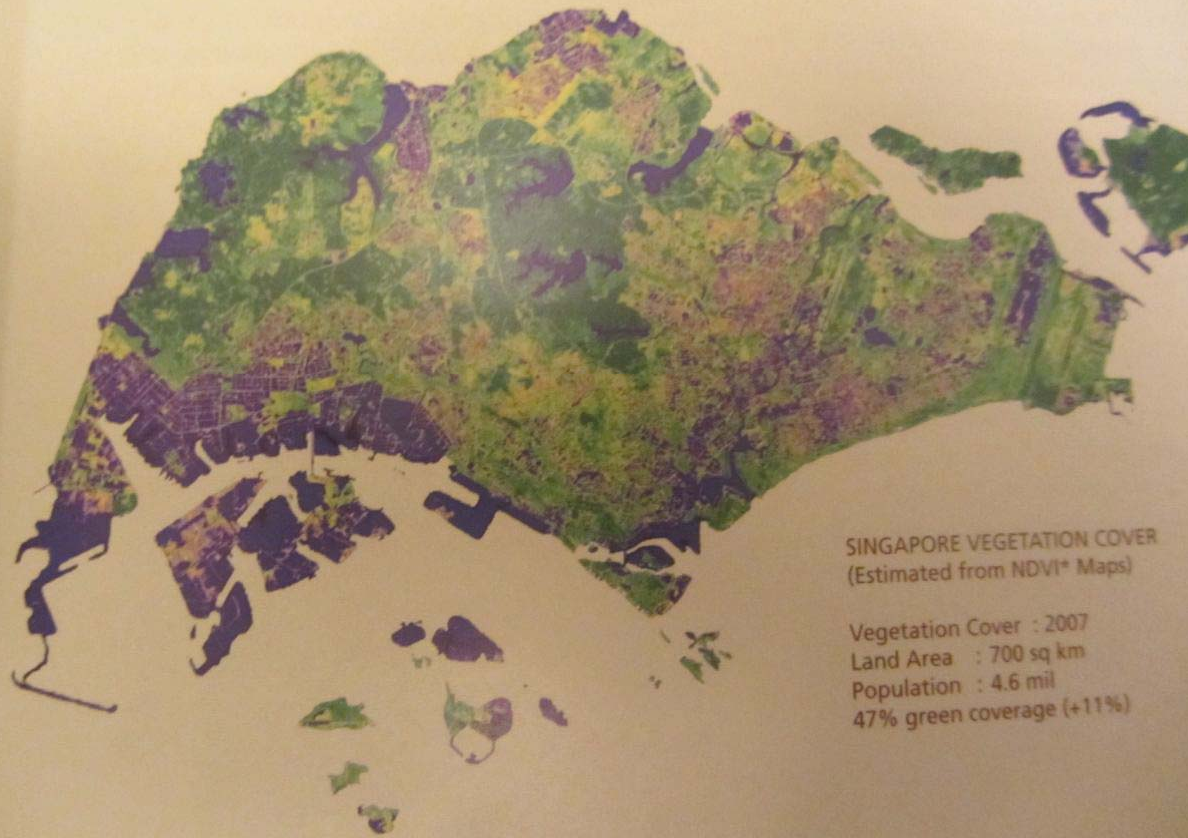


Canopy cover on roads and public spaces



Urban canopy cover in 20 years





SINGAPORE VEGETATION COVER
(Estimated from NDVI* Maps)

Vegetation Cover : 2007
Land Area : 700 sq km
Population : 4.6 mil
47% green coverage (+11%)























Butterflies Sighted In Khoo Teck Puat Hospital



Danae genoveva (Pieris) (10/10/10)



Danae chrysippus (Pieris) (10/10/10)



Phaenocarpa pallescens (Pieris) (10/10/10)



Phaenocarpa pallescens (Pieris) (10/10/10)



Danae genoveva (Pieris) (10/10/10)



Danae genoveva (Pieris) (10/10/10)



Phaenocarpa pallescens (Pieris) (10/10/10)



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Phaenocarpa pallescens (Pieris) (10/10/10)



Danae genoveva (Pieris) (10/10/10)



Phaenocarpa pallescens (Pieris) (10/10/10)

Photographs Courtesy of Mr Richard Ong

Hougang Primary School....









Will people want a green city?

Christchurch
22nd February 2011, 12.50pm





What do they want when they rebuild?

‘Green, low-dense, compact, diverse
with an accessible central city....’



No 1 priority: Light Rail

