



# BREAK THROUGH

National Climate  
Restoration  
Forum 2014

## PLENARY 3 – TRANSFORMING THE ECONOMY FOR A SAFE CLIMATE

### **The Economics of a Safe Climate Recovery**

Dr Brett Parris

# Outline

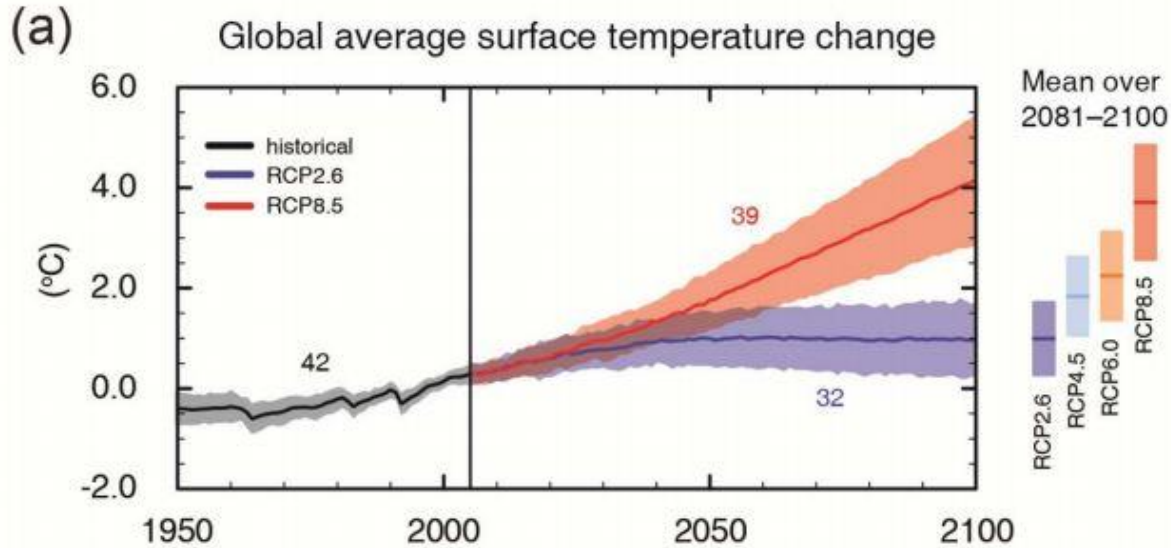
- Where are we now? Confusion, denial, panic & hubris.
- Some building blocks of economics for a safe climate economy:
  - 1. Understanding the Climate-Economy-Society nexus as a complex system
  - 2. Full cost-benefit economics
  - 3. Reassessing the role of government in rapid transition
  - 4. Behavioural economics & social psychology
  - 5. Mapping a viable transition path

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# Temperature projections

Figure SPM.7 [FIGURE SUBJECT TO FINAL COPYEDIT]



Notes: Representative Concentration Pathways (RCPs) are identified by their approximate total radiative forcing in year 2100 relative to 1750:

- 2.6 W m<sup>-2</sup> for RCP2.6,
- 4.5 W m<sup>-2</sup> for RCP4.5,
- 6.0 W m<sup>-2</sup> for RCP6.0 and
- 8.5 W m<sup>-2</sup> for RCP8.5.

Most of the CMIP5 and Earth System Model (ESM) simulations were performed with prescribed CO<sub>2</sub> concentrations reaching:

- 421 ppm (RCP2.6),
- 538 ppm (RCP4.5),
- 670 ppm (RCP6.0), and
- 936 ppm (RCP 8.5) by 2100.

Including also CH<sub>4</sub> and N<sub>2</sub>O, the combined CO<sub>2</sub>-equivalent concentrations are:

- 475 ppm (RCP2.6),
- 630 ppm (RCP4.5),
- 800 ppm (RCP6.0), and
- 1313 ppm (RCP8.5)

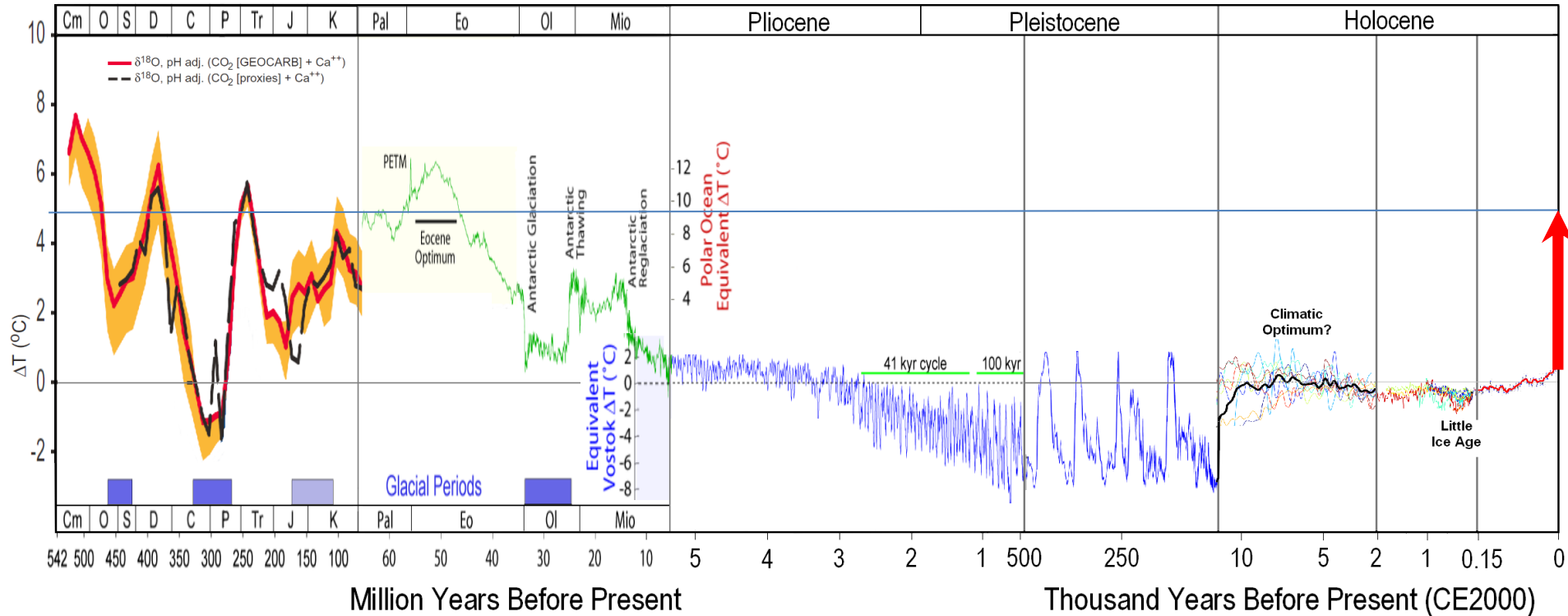
(Source: IPCC 2013, AR5, SPM1, p. 22)

- Temperature increases are relative to the 1986-2005 average
- Temperature increase from 1850-1900 average to 1986-2000 average was around 0.61°C [0.55-0.67°C]

# No historical precedent for 100 year projection

(Composite from various studies)

Temperature of Planet Earth

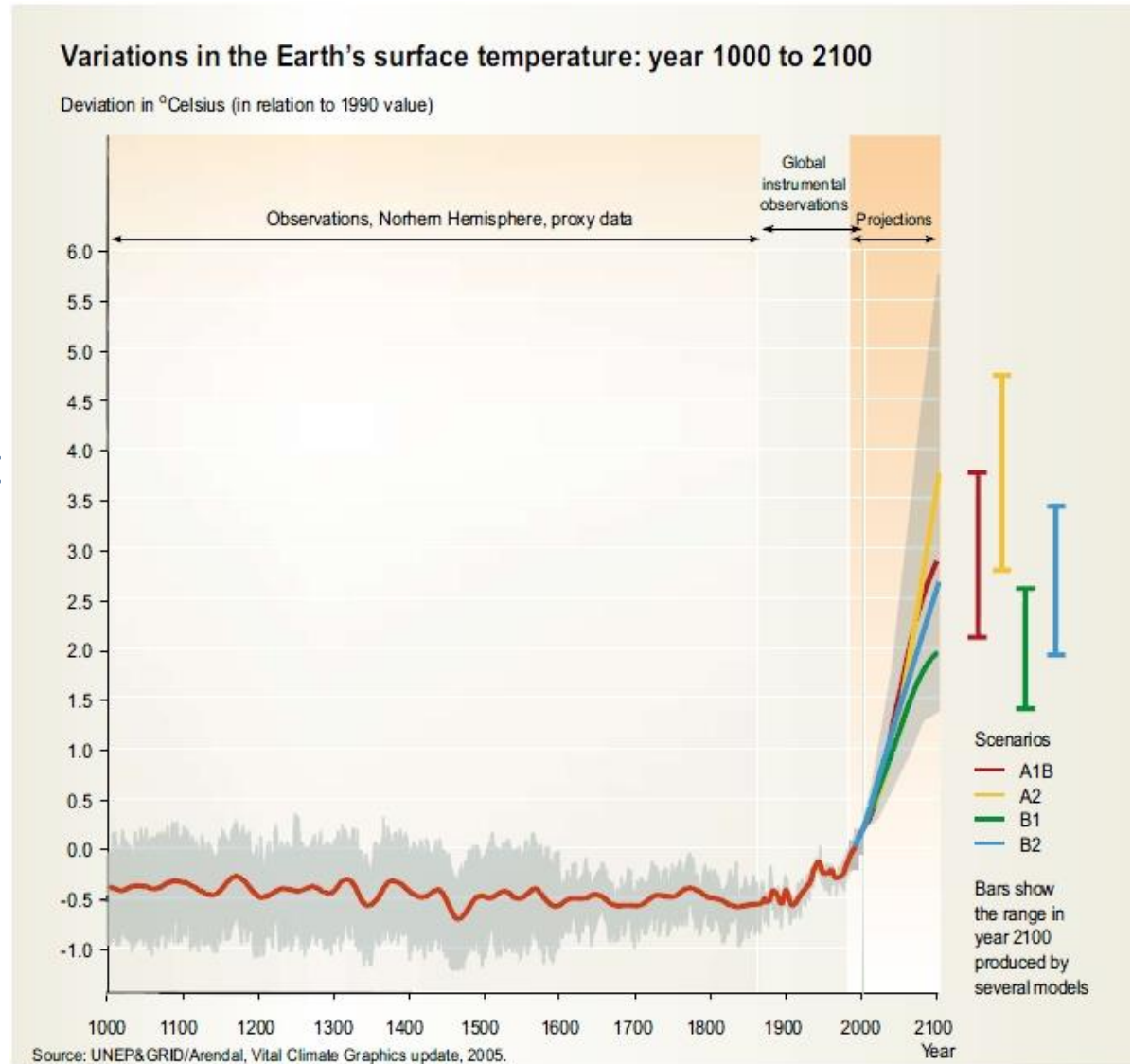


Source: [http://en.wikipedia.org/wiki/File:All\\_palaeotemps.png](http://en.wikipedia.org/wiki/File:All_palaeotemps.png)

# Temperature Projections 1000-2100

Two separate considerations for risk management:

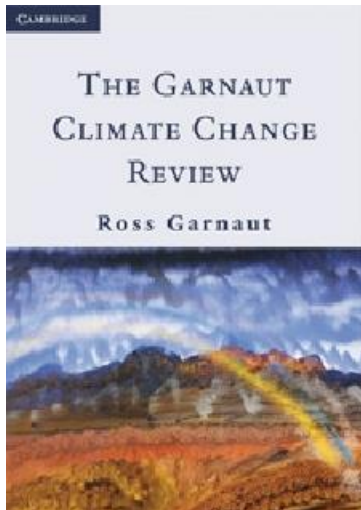
1. **Scale of the threat**
  2. **Urgency of the threat**
- *Earlier: Window of opportunity to prevent impacts.*
  - *Later: Actual impacts*



# Australia's Garnaut Report



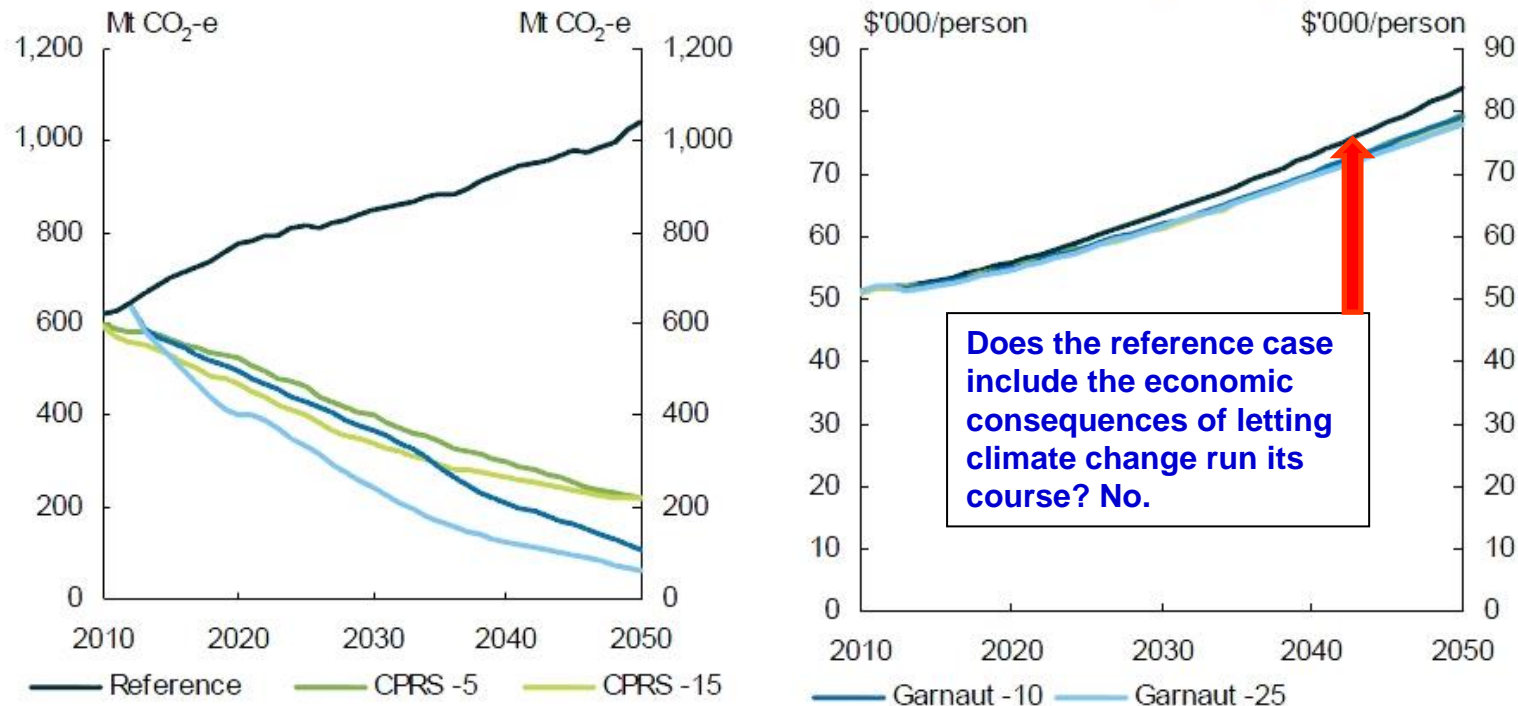
**“On a balance of probabilities, the failure of our generation on climate change mitigation would lead to consequences that would haunt humanity until the end of time.”**



# Old Economics:

## How to guarantee mitigation looks like a net cost

Chart 1: Five pathways for Australian emissions and GNP  
Emissions Real GNP per capita



“The Treasury work did not include the impacts of climate change or the benefits of mitigation”

White Paper, p. 4-9.

Note: Units are in Australian dollars, 2005 prices. The reference scenario shows modelled emissions, while the policy scenarios show allocations (policy targets). Actual emissions differ from allocations due to banking of permits and international permit trade.

Source: Treasury estimates from MMRF.

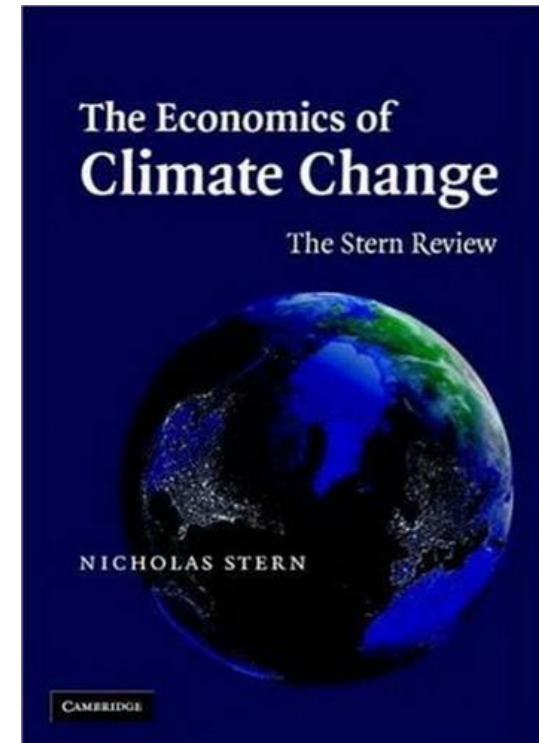


# Stern's Change of Heart: 2006 to 2008



“We underestimated the risks ... we underestimated the damage associated with temperature increases ... and we underestimated the probabilities of temperature increases. ... The damage risks are bigger than I would have argued. Things like the damage associated with a 5 degree temperature increase are enormous.”

Sir Nicholas Stern, 16 April 2008, *The Financial Times*, London.



# 2013: Damage estimates are *very* conservative

*Journal of Economic Literature* 2013, 51(3), 838–859  
<http://dx.doi.org/10.1257/jel.51.3.838>

## The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models†

NICHOLAS STERN\*

*Scientists describe the scale of the risks from unmanaged climate change as potentially immense. However, the scientific models, because they omit key factors that are hard to capture precisely, appear to substantially underestimate these risks. Many economic models add further gross underassessment of risk because the assumptions built into the economic modeling on growth, damages and risks, come close to assuming directly that the impacts and costs will be modest and close to excluding the possibility of catastrophic outcomes. A new generation of models is needed in all three of climate science, impact and economics with a still stronger focus on lives and livelihoods, including the risks of large-scale migration and conflicts. ( JEL C51, Q54, Q58)*

# 2014: Economic models 'grossly underestimate' costs of warming

The Sydney Morning Herald

Environment

## Models 'grossly underestimate' costs of global warming, Nicholas Stern says

June 16, 2014

Endogenous growth, convexity of damages and climate risk: how Nordhaus' framework supports deep cuts in carbon emissions

Simon Dietz<sup>1,2</sup> and Nicholas Stern<sup>1,3</sup>

June 5, 2014

Forthcoming in the 125th anniversary issue of  
*The Economic Journal*



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POLITICAL SCIENCE

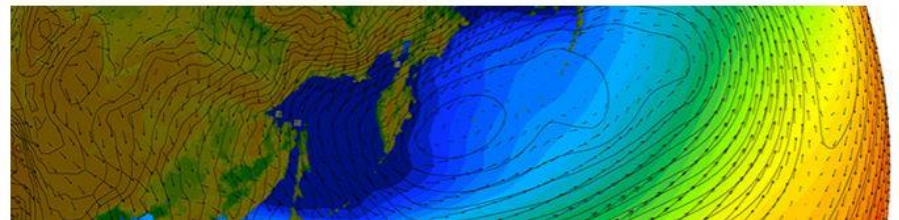


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## New economic model shows risks from climate change are bigger than previously estimated



# Meanwhile ...



*Rex Tillerson, CEO Exxon-Mobil*

**“We have spent our entire existence adapting. We'll adapt ... It's an engineering problem and there will be an engineering solution.”**

Source: Associated Press (2012) “Climate change fears overblown, says ExxonMobil boss”  
*The Guardian*, London, 28 June 2012  
<http://www.guardian.co.uk/environment/2012/jun/28/exxonmobil-climate-change-rex-tillerson>

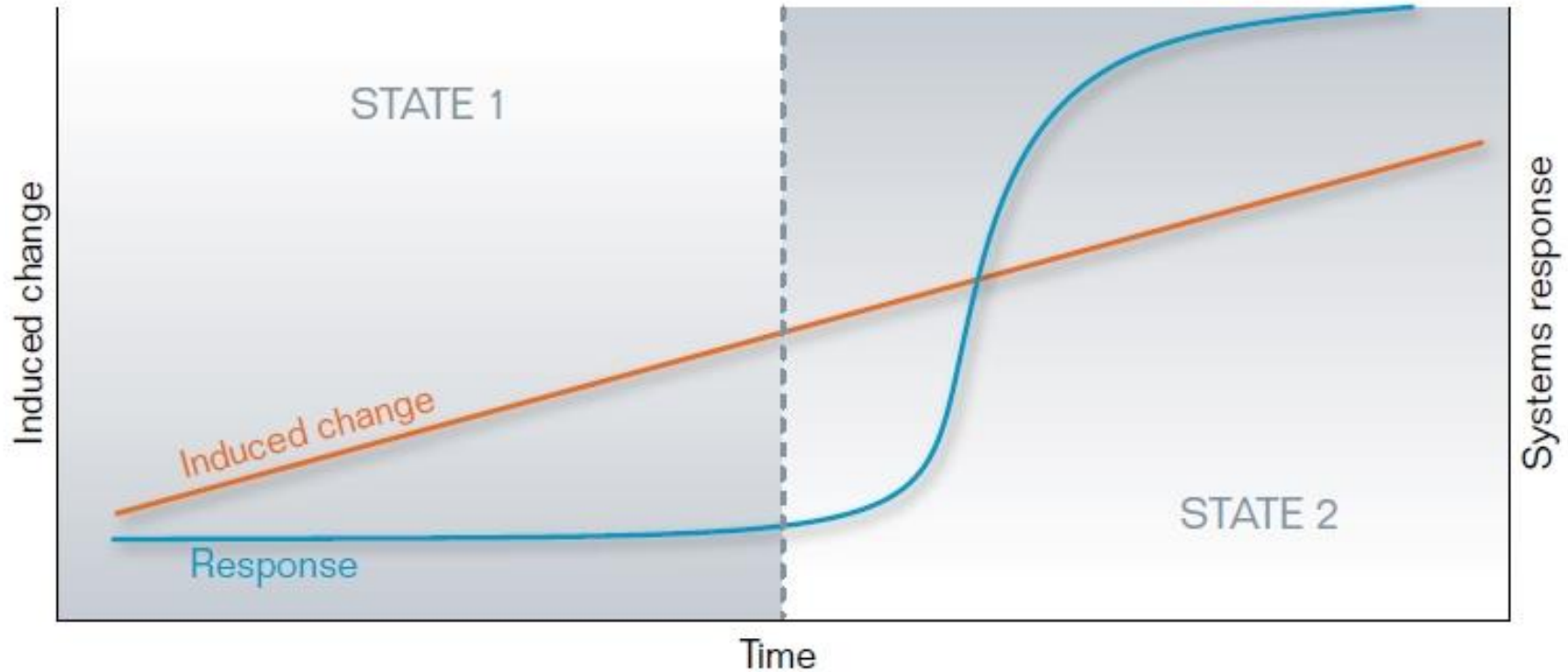
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# Nonlinear systems: Lags & thresholds

Figure 4.8 Abrupt or rapid climate change showing the lack of response until a threshold is reached

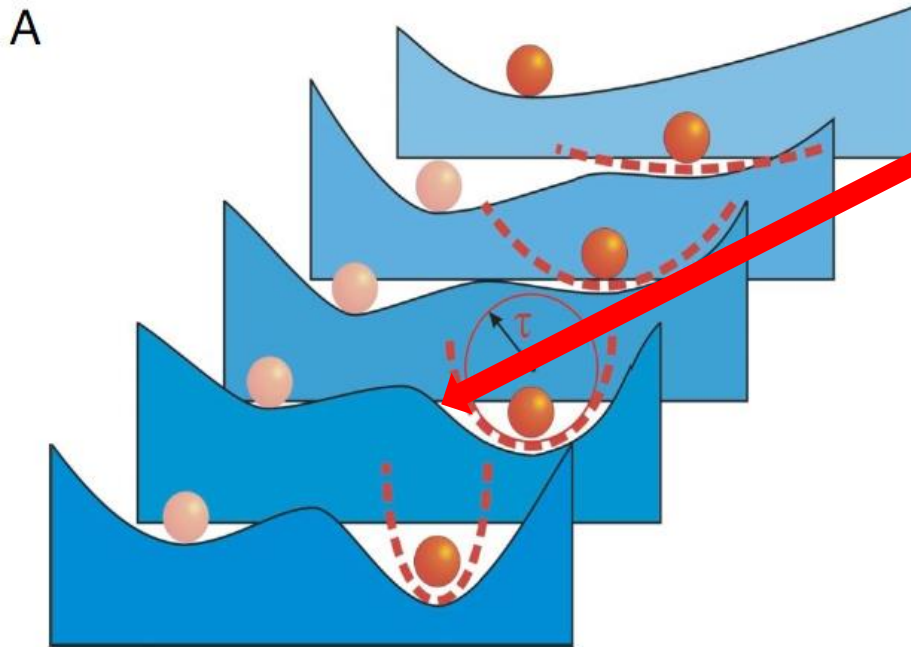


Source: Based on Steffen et al. (2004).

Source: Garnaut, R., (2008) *The Garnaut Climate Change Review: Final Report*, Cambridge University Press, Melbourne, xlv + 616 pp.

# Tipping points

➤ **Thresholds & tipping points:** Points beyond which the system begins to behave very differently from previously.

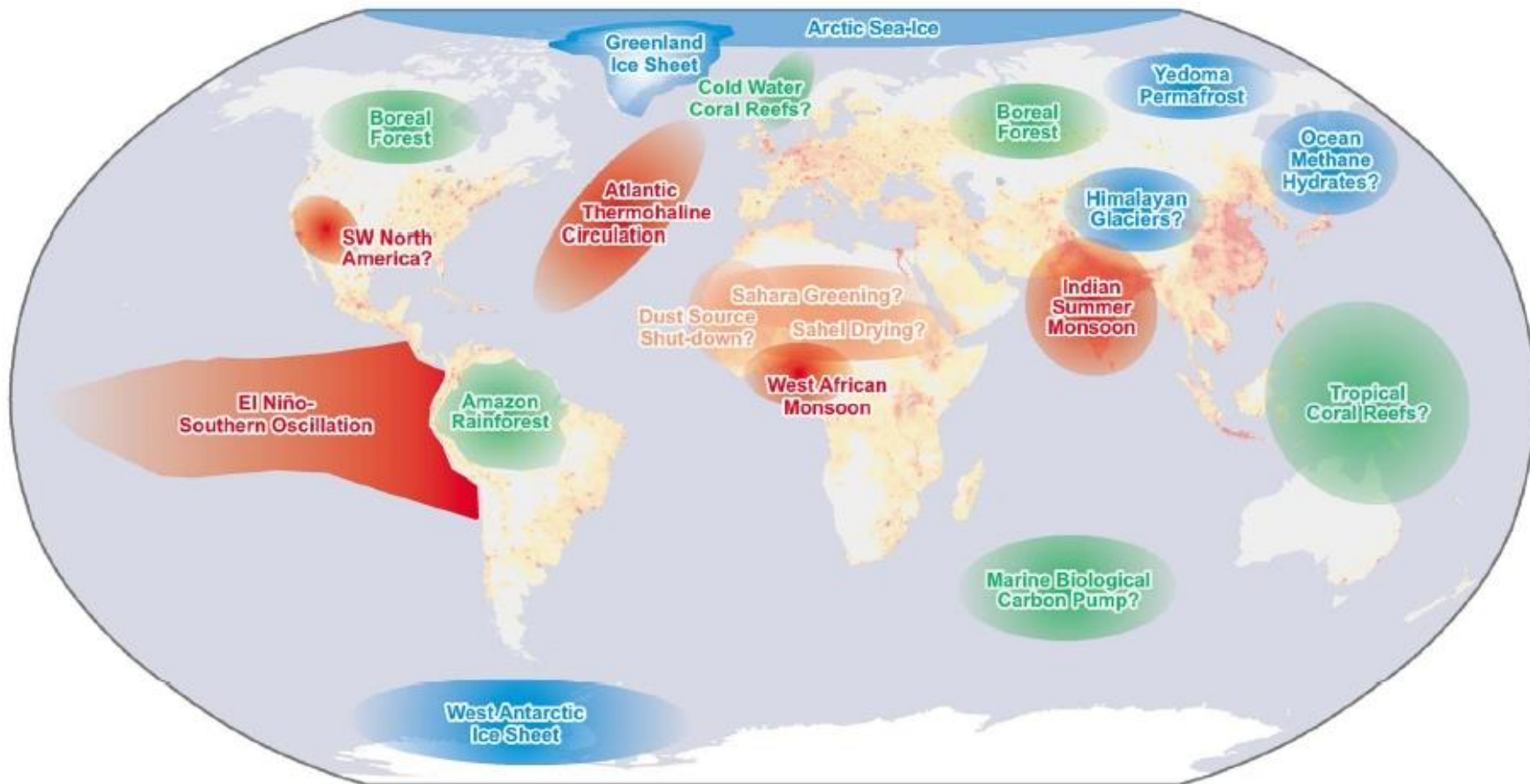


**NOTE: No equilibrium point between basins of attraction.**

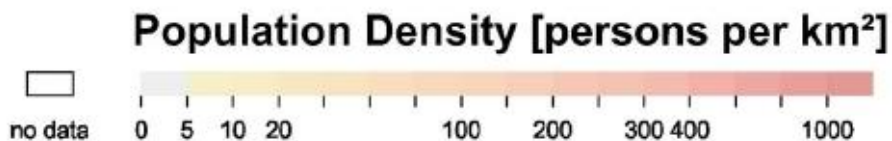
**Q: What if there is no natural 'rest point' for the climate between 2 & 6 degrees?**



# Tipping Points in the Climate System - Updated

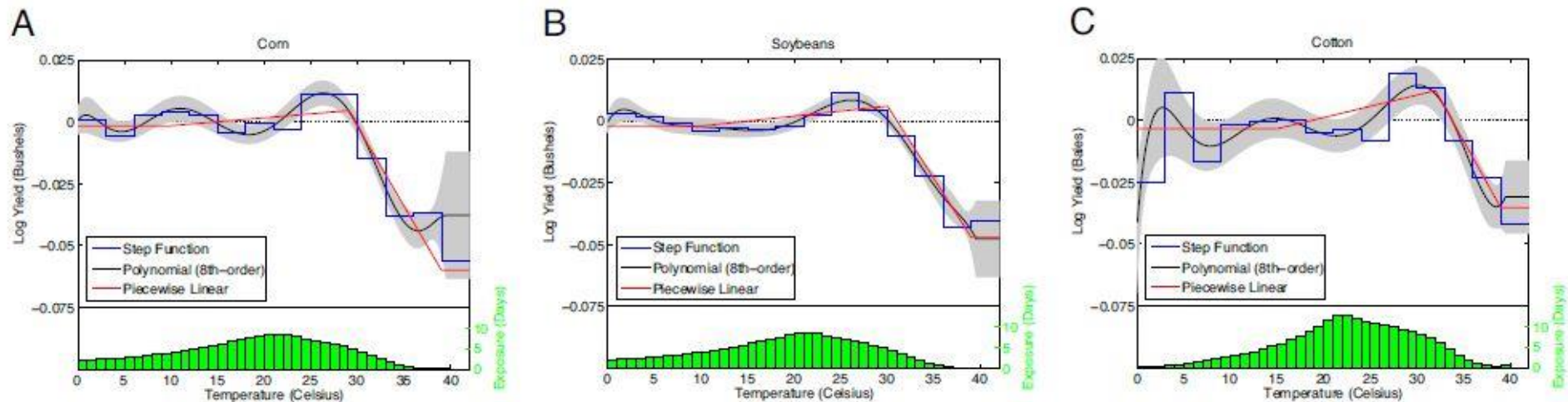


- Melting
- Circulation Change
- Biome Loss



# Nonlinearity: Temps & Crop Yields

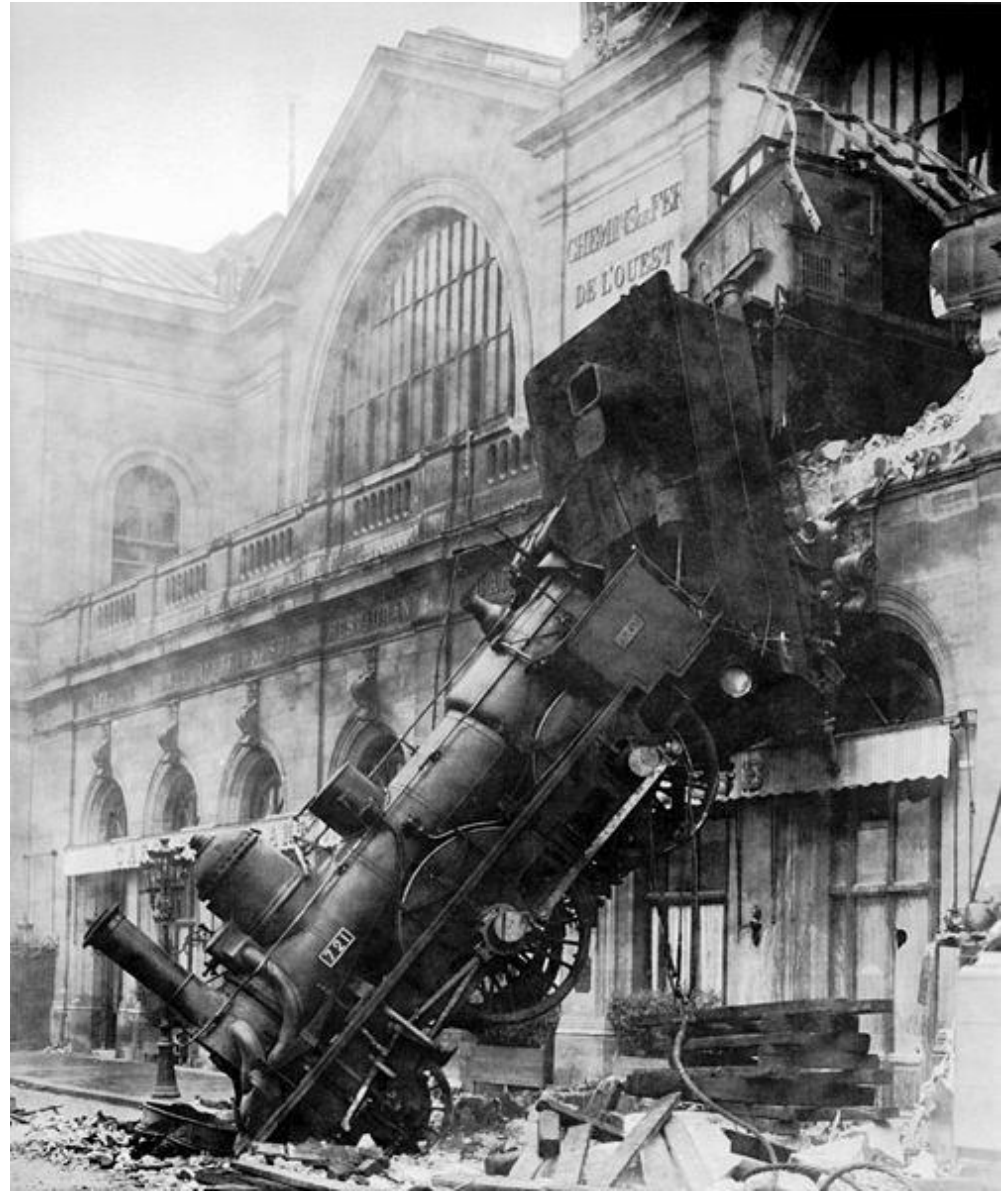
“We find that yields increase with temperature up to 29° C for corn, 30° C for soybeans, and 32° C for cotton but that temperatures above these **thresholds** are very harmful. ... Holding current growing regions fixed, area-weighted **average yields are predicted to decrease by 30–46%** before the end of the century under the **slowest (B1) warming scenario** and **decrease by 63–82%** under the **most rapid warming scenario (A1FI)** .



**Fig. 1.** Nonlinear relation between temperature and yields. Graphs at the top of each frame display changes in log yield if the crop is exposed for one day to a particular 1° C temperature interval where we sum the fraction of a day during which temperatures fall within each interval. The 95% confidence band, after adjusting for spatial correlation, is added as gray area for the polynomial regression. Curves are centered so that the exposure-weighted impact is zero. Histograms at the bottom of each frame display the average temperature exposure among all counties in the data.

# System momentum

➤ **System momentum:**  
Can carry us beyond a  
critical threshold well  
after we've tried to stop.



21 October 1895, La  
Gare Montparnasse,  
Paris

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# How can we ensure prices reflect full environmental & social costs?

- **All prices in economies should reflect full costs**
  - Otherwise we get misleading signals, perverse incentive structures, and a distorted and unsustainable economy
  - We need strong regulatory boundaries for economies in order to protect ecosystems and manage biophysical throughput
  - Normal 'market prices' don't reflect full costs
  - Conventional economics focuses on marginal cost pricing (the price of producing one extra widget) – it is not good at understanding value within a complex network. Eg. Keystone species in an ecosystem, vital ecosystem services in an economy.

# How can we ensure prices reflect full environmental & social costs?

- **All prices in economies should reflect full costs (cont.)**
  - The *value* of a system is not simply the sum of the value of individual components E.g. Value of eggs in a cake? No eggs, no cake. What then is the value of the eggs?
  - Implication: some aspects of environment are priceless [Technically: non-substitutability of natural capital – saying a given ‘ecosystem service’ is worth \$10 billion to economy DOES NOT mean that service could simply be replaced by \$10 billion cash.]

# The Social Cost of Carbon: U.S. Government

**Technical Support Document: -  
Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis -  
Under Executive Order 12866 -**

Interagency Working Group on Social Cost of Carbon, United States Government

With participation by

Council of Economic Advisers  
Council on Environmental Quality  
Department of Agriculture  
Department of Commerce  
Department of Energy  
Department of Transportation  
Environmental Protection Agency  
National Economic Council  
Office of Management and Budget  
Office of Science and Technology Policy  
Department of the Treasury

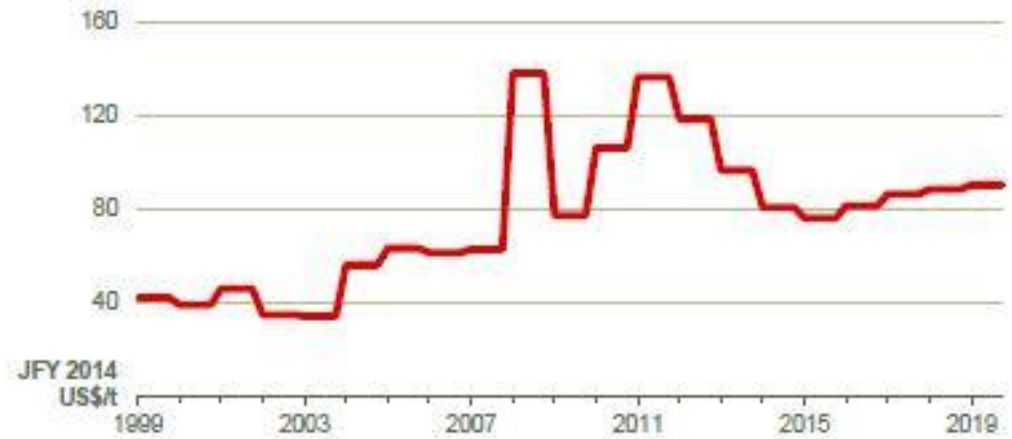
May 2013

# Coal prices & coal damage to climate

## Global damage per tonne of coal (US Govt)

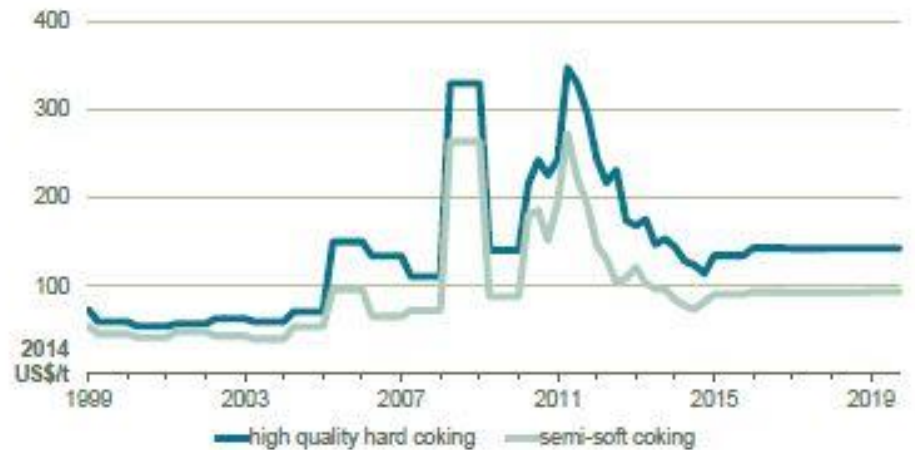
<b>Discount rate:</b>	<b>Damage:</b>
5%	A\$32
3%	A\$107
2%	A\$165
3%(95 <sup>th</sup> pctile)	A\$307

Figure 1: JFY thermal coal prices



Source: BREE.

Figure 5: Metallurgical coal benchmark prices, FOB Australia



Source: BREE.

Source: United States Government, (2013) "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866", Washington DC, Interagency Working Group on Social Cost of Carbon, May, 21 pp; p. 18. [http://www.whitehouse.gov/sites/default/files/omb/infocost\\_of\\_carbon\\_for\\_ria\\_2013\\_update.pdf](http://www.whitehouse.gov/sites/default/files/omb/infocost_of_carbon_for_ria_2013_update.pdf)

Source: : BREE, (2014) "Resources and Energy Quarterly: March Quarter 2014", Canberra, Australian Government: Bureau of Resources and Energy Economics, March, iv + 206 pp. <http://www.bree.gov.au/publications/resources-and-energy-quarterly>; pp. 37 & 65.



# Global Damage from Australian Coal

THE CONVERSATION

AU

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Business + Economy Environment + Energy Health + Medicine Politics + Society Science + Technology

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13 September 2013, 6:51am AEST

## Expanding coal exports is bad news for Australia and the world



We need to look at the economic and social cost of our coal. Beyond Coal and Gas.

Australia's black coal exports in FY2013-14 will be 372 million tonnes (Mt). Combustion will release around 889 Mt CO<sub>2</sub>-e. (Germany's CO<sub>2</sub> emissions in 2011 were just 807 Mt). Based on conservative US Government estimates, **our current coal exports are causing between A\$12 billion and A\$110 billion of damage globally each year** (in 2014 dollars).

By 2018-19 BREE predicts our coal exports will rise to 438 Mt, producing around 1045 Mt CO<sub>2</sub>-e, which will cause **between A\$15 and A\$153 billion in damage** (in 2014 dollars) for expected revenues of only \$49 billion (profits much less).

**This damage is not included in the coal export price.**

Sources: <http://theconversation.com/expanding-coal-exports-is-bad-news-for-australia-and-the-world-17937>

BREE, (2014) "Resources and Energy Quarterly: March Quarter 2014", Canberra, Australian Government: Bureau of Resources and Energy Economics, March, iv + 206 pp. <http://www.bree.gov.au/publications/resources-and-energy-quarterly>, pp. 48 & 70.

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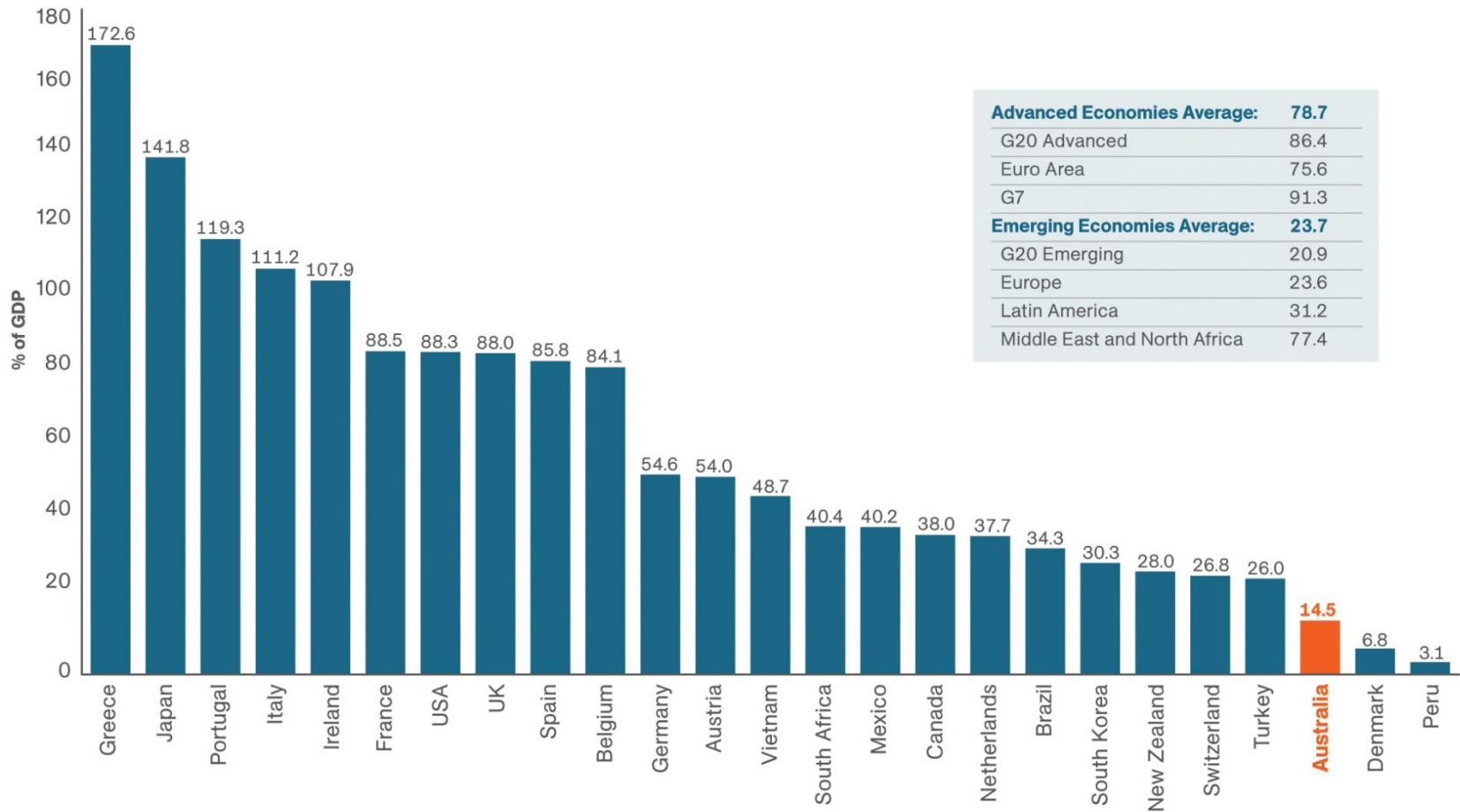
[http://www.whitehouse.gov/sites/default/files/omb/inforg/social\\_cost\\_of\\_carbon\\_for\\_ria\\_2013\\_update.pdf](http://www.whitehouse.gov/sites/default/files/omb/inforg/social_cost_of_carbon_for_ria_2013_update.pdf)

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# Australian government debt

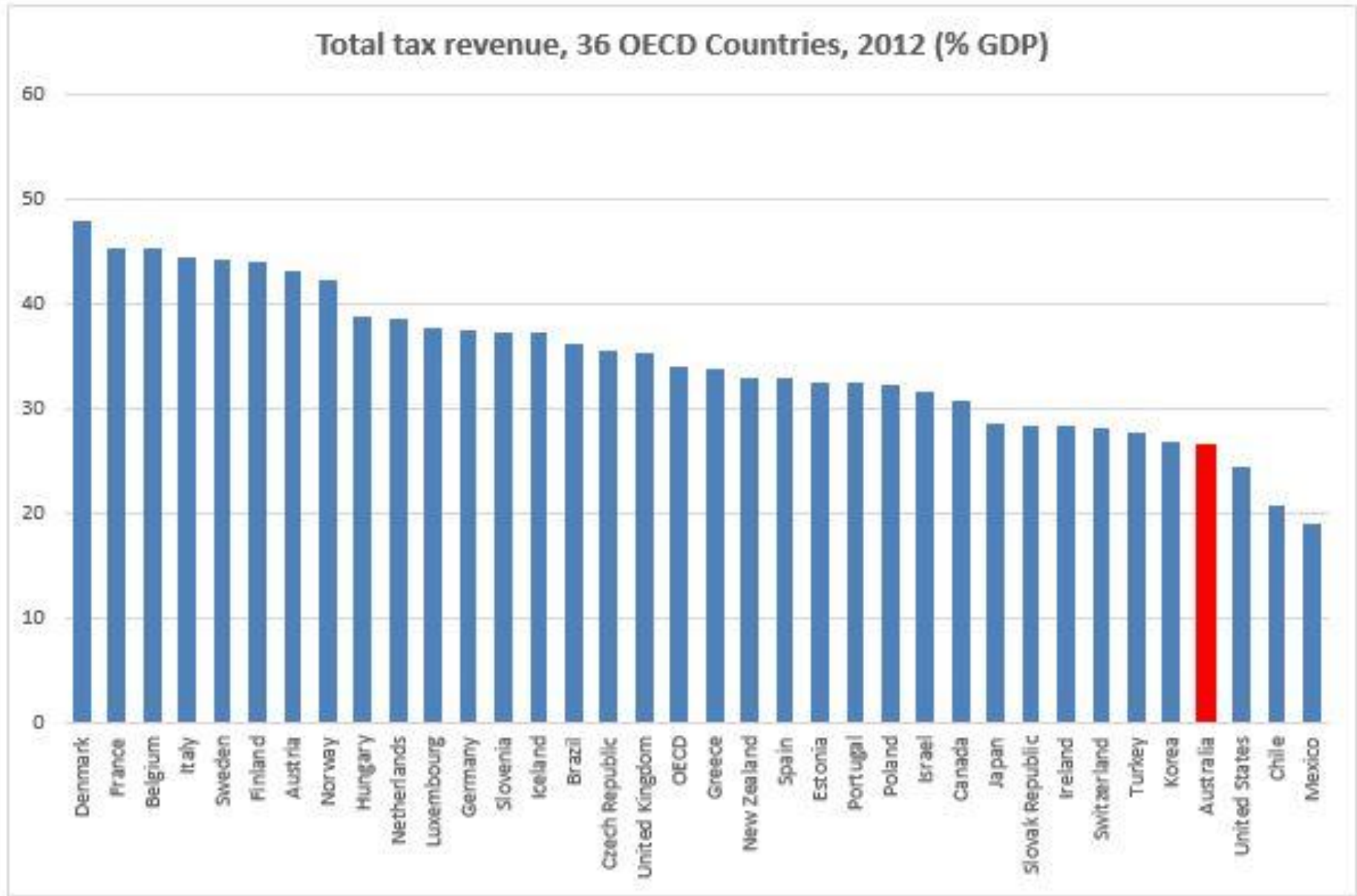
## GENERAL GOVERNMENT NET DEBT<sup>1</sup> – 2014



1. International Monetary Fund (IMF) staff estimates and projections. Projections are based on staff assessment of current policies

Source: International Monetary Fund (IMF) Fiscal Monitor Database, October 2013, Statistical Tables 4 and 8; Austrade

# Australian taxation levels



Source: OECD Factbook 2014. <http://dx.doi.org/10.1787/888933026734>

# Wartime Mobilisation

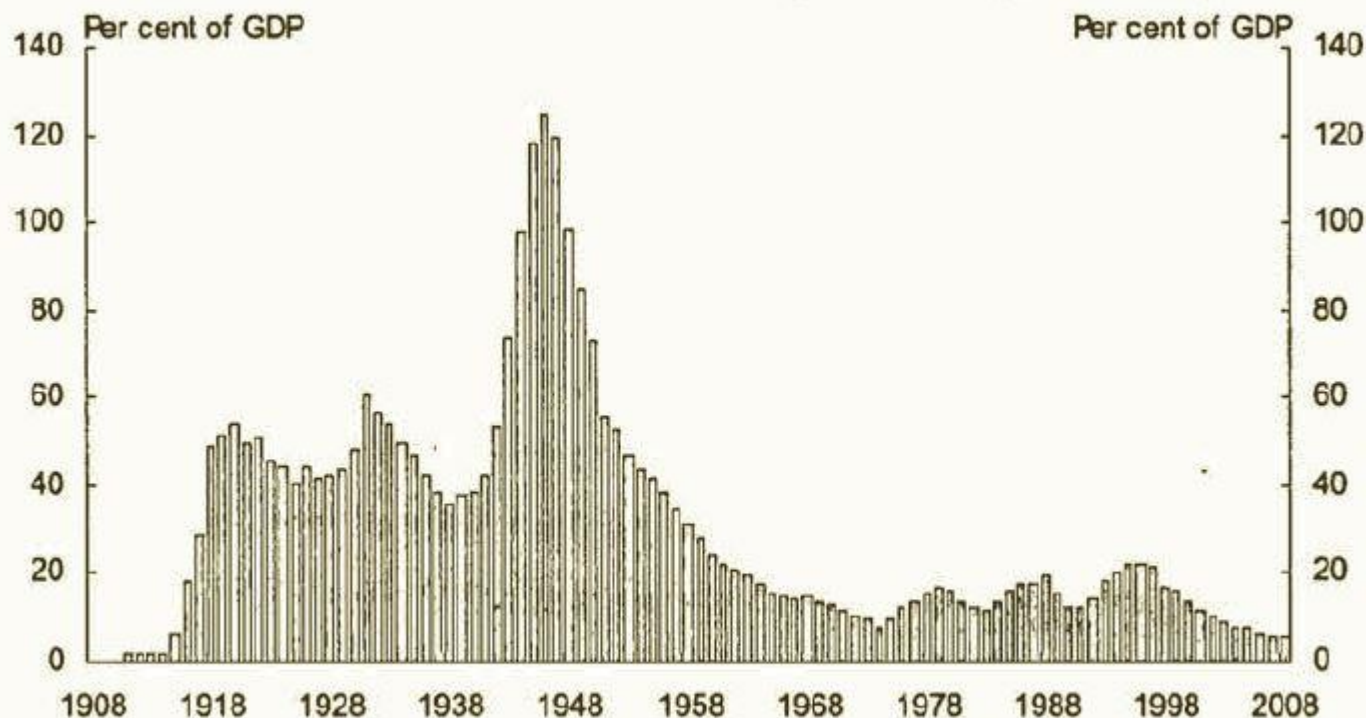


- In 1942-43, a previous generation was spending equivalent to 40% of national income fighting World War II.
- Our leaders are still treating climate change like a moderately significant economic reform, not a national and global emergency.

# Australian government debt

A history of public debt in Australia

**Chart 5: Australian Government public debt (at 30 June)<sup>6</sup>**

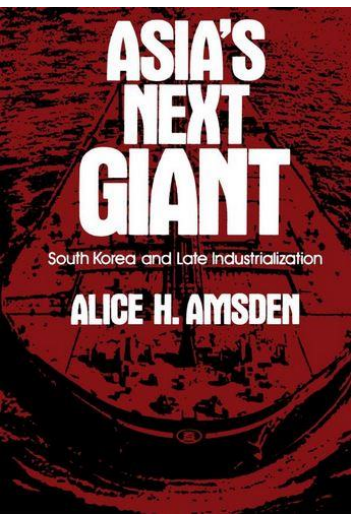


Source: Data from 1908 to 1982 are from Barnard *Source Papers in Economic History* 1986. Commonwealth Government Securities on issue is used for the period 1983-2008. For consistency reasons, GDP data for 1908 to 1982 are derived from *Source Papers in Economic History* 1986. GDP data for the period 1983 to 2008 are from the ABS *National Accounts*, cat. no. 5206.0.



# South Korean Development

- 1910 Japan annexes Korea
- 1948 Korea partitioned
- 1950-53 Korean war
- 1955-60 Economic basket case
- 1961 Coup - Park Chung Hee President
- 1963 Economic drive begins
- 1970s Heavy industry drive
- 1980s Partial liberalisations
- 1996 Korea joins OECD
- 2013 Korea's GDP per capita *higher* than Spain & Italy, just below France.



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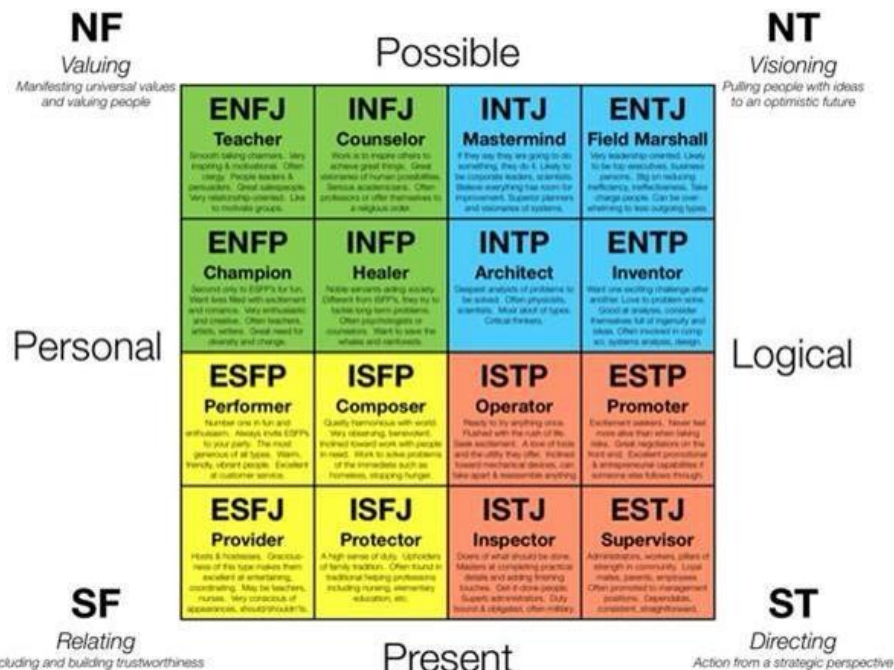
# Behavioural economics & social psychology

- Different personality types
- Different degrees of empathy
- Different tribes

- Identity
- Sources of information and authority - echo chambers & media fragmentation

- Libertarian / communitarian spectrum
- Dominant myths / worldviews
- Spirituality & meaning making

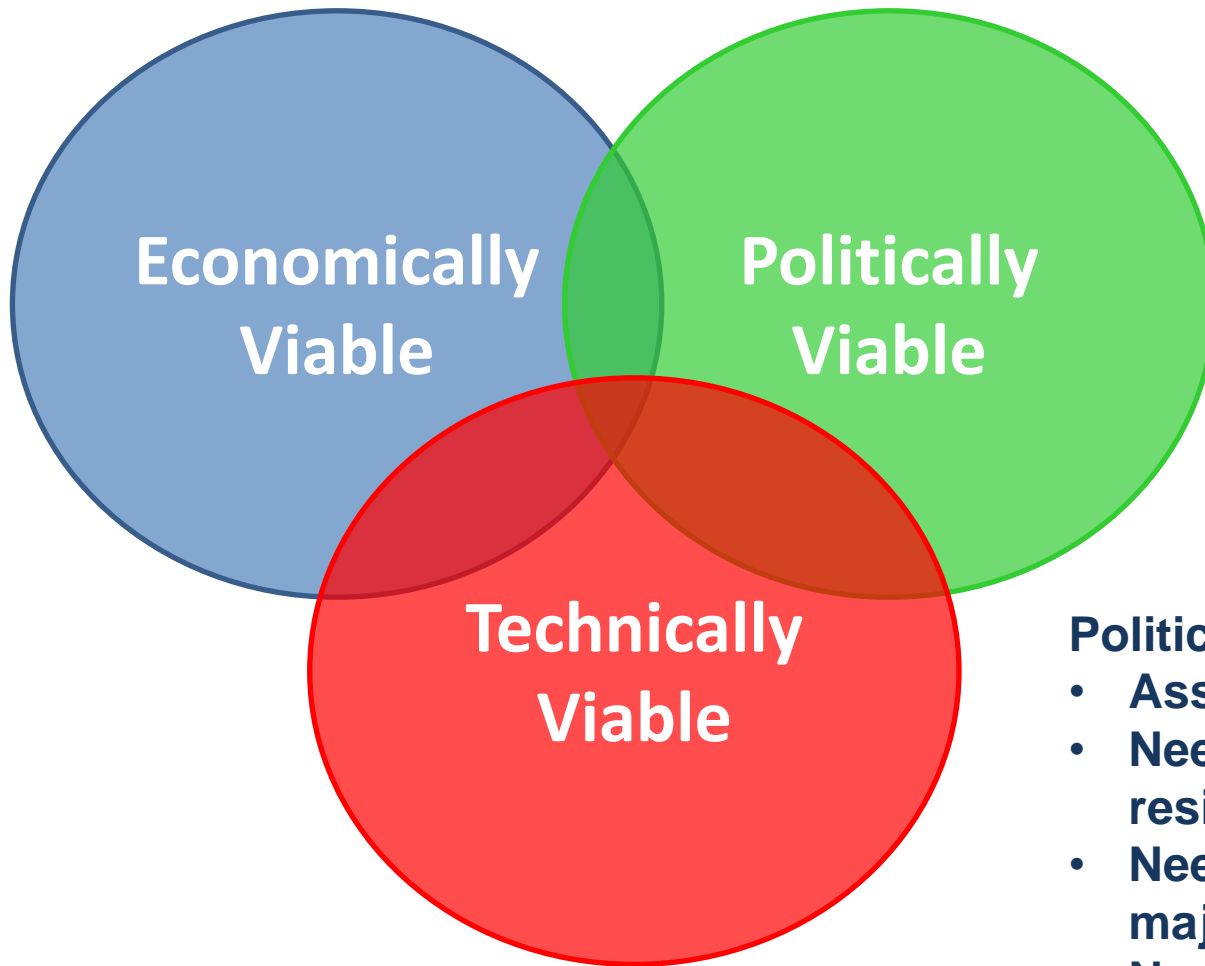
- Need to change incentives people face – e.g. carbon price. Strategy *cannot* just be to try to convince people to become more like us.



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# Mapping a viable transition path



## Politically viable:

- Assumes social viability
- Need a 'supermajority' (?) for resilience
- Need face-saving exit for major opponents
- Need to delink transition path from 'culture wars'

# Resilience of transition campaigns

- Resilience in framing: dangers of “all or nothing”
- Resilience of campaigners – mental health, burnout, depression, apathy, need for shadow work.
- Sacred activism: fusion of spiritual practice & activism – e.g. Gandhi, Martin Luther King, Desmond Tutu, the Dalai Lama.

[www.meetup.com/sacred-activism-melbourne](http://www.meetup.com/sacred-activism-melbourne)

Cowardice asks the question: Is it safe?  
Expediency asks the question: Is it politic?  
Vanity asks the question: Is it popular?

But conscience asks the question: Is it right?

And there comes a time one must take a position that is neither safe, nor politic nor popular -- but one must take it simply because it is right.

-- Martin Luther King

