

# Transforming Australia's Export Profile for Ecological Sustainability

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with thanks to



**AUSTRALIAN  
CONSERVATION  
FOUNDATION**



# Outline

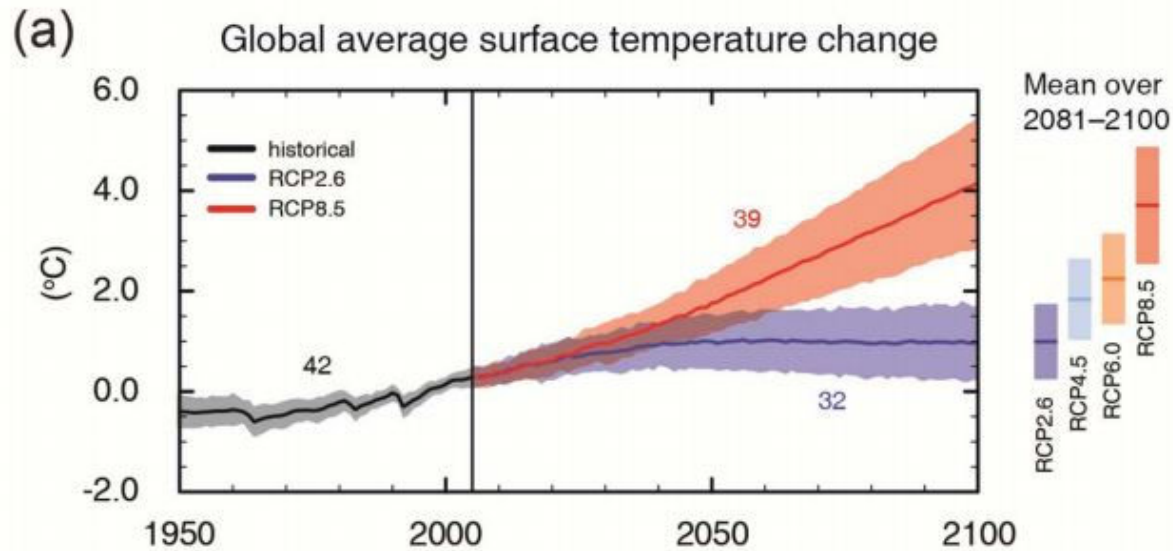
- The context: Temperature projections & carbon budgets
- Australia's contribution to the problem
- Transforming Australia's export profile
- Conclusions

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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)

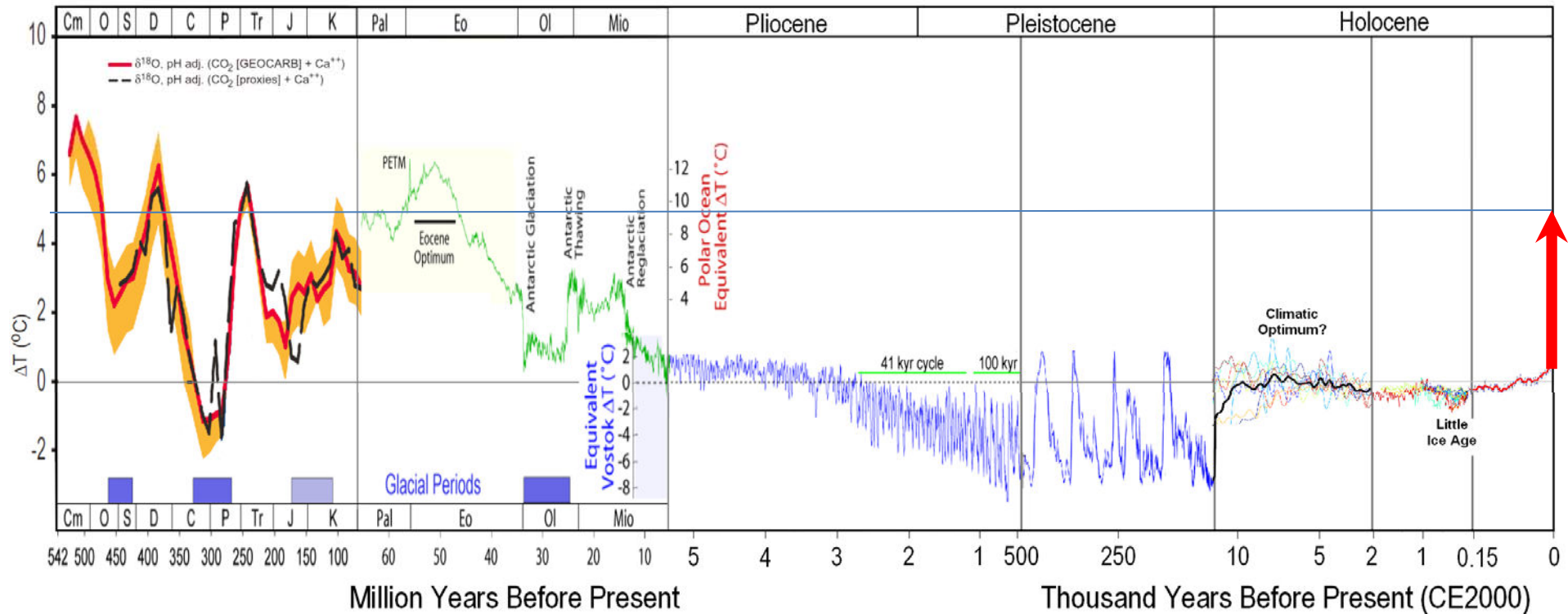
(Source: IPCC 2013, AR5, SPM1, p. 22)

- 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)

# Three numbers

## Global Warming's Terrifying New Math

Three simple numbers that add up to global catastrophe - and that make clear who the real enemy is

By **BILL MCKIBBEN**

JULY 19, 2012 9:35 AM ET

### 1. 2°C

Most conservative estimate of 'dangerous' climate change

### 2. 565 Gigatonnes

Amount of CO<sub>2</sub> that can be released into atmosphere by 2050 to still have 'reasonable' (80%) chance of staying under 2°C. At current rate, we will use up this budget entirely by 2028.

### 3. 2,795 Gigatonnes

Amount of CO<sub>2</sub> that would be released by combustion of *current* fossil fuel reserves. Value: \$27 trillion

“We have five times as much oil and coal and gas on the books as climate scientists think is safe to burn. We'd have to keep 80 percent of those reserves locked away underground to avoid that fate.”



## Latest IPCC Report Confirms Problem

Probability of staying less than 2°C	Max budget from 1850: CO <sub>2</sub> emissions alone (GT CO <sub>2</sub> )	Max budget from 1850: CO <sub>2</sub> emissions + other GHGs (GT CO <sub>2</sub> )
>33%	5760	3300
>50%	4440	3010
>66%	3670	2900

But: 1890 GtCO<sub>2</sub>, had already been emitted by 2011 (IPCC 2013, AR5, SPM1, p. 25)

So:

Probability of staying less than 2°C	Max remaining CO <sub>2</sub> emissions alone	% of existing fossil fuel reserves	Max remaining CO <sub>2</sub> + other GHGs	% of existing fossil fuel reserves
>33%	3870	138%	1410	50%
>50%	2550	91%	1120	40%
>66%	1780	67%	1010	36%

Source: IPCC, (2013) "Summary for Policymakers", In *Climate Change 2013: The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* ed. Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M.M.B., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V. and Midgley, P.M.; Cambridge University Press, Cambridge & New York, pp. 1-27. [http://www.climatechange2013.org/images/uploads/WGI\\_AR5\\_SPM\\_brochure.pdf](http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf)

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# Australia's Contribution in 2010

Australia's total  
contribution: 686 + 588 =  
**1274 Mt CO<sub>2</sub>-e (approx)**

**Aus coal exports: 288 Mt**

Source: GHG data for 2010:

<http://cait2.wri.org>

**Assumes** 2.388 tonnes of CO<sub>2</sub>-e for 1 tonne of coal burnt. Based on DCCEE, (2012) "Australian National Greenhouse Accounts: National Greenhouse Accounts Factors", Canberra, Commonwealth of Australia, Department of Climate Change and Energy Efficiency, July, 80 pp. [http://www.climatechange.gov.au/sites/climatechange/files/documents/03\\_2013/nga-factors.pdf](http://www.climatechange.gov.au/sites/climatechange/files/documents/03_2013/nga-factors.pdf)

Rank	Country	Total GHG Emissions Excluding LUCF (MtCO <sub>2</sub> e)	% of world's emissions
1	China	10,385.54	23.32
2	United States	6,866.92	15.42
3	India	2,326.19	5.22
4	Russian Federation	2,326.10	5.22
5	Japan	1,298.89	2.92
6	Brazil	1,162.62	2.61
7	Germany	926.67	2.08
8	Indonesia	823.41	1.85
9	Iran	727.00	1.63
10	Canada	726.63	1.63
11	Mexico	688.25	1.55
<b>12</b>	<b>Australian coal exports</b>	<b>686.44</b>	<b>1.54</b>
13	Korea, Rep. (South)	678.32	1.52
14	United Kingdom	627.46	1.41
<b>15</b>	<b>Australia</b>	<b>587.53</b>	<b>1.32</b>
16	South Africa	559.65	1.26
17	France	545.19	1.22
18	Saudi Arabia	542.10	1.22
19	Italy	514.62	1.16
20	Spain	407.97	0.92

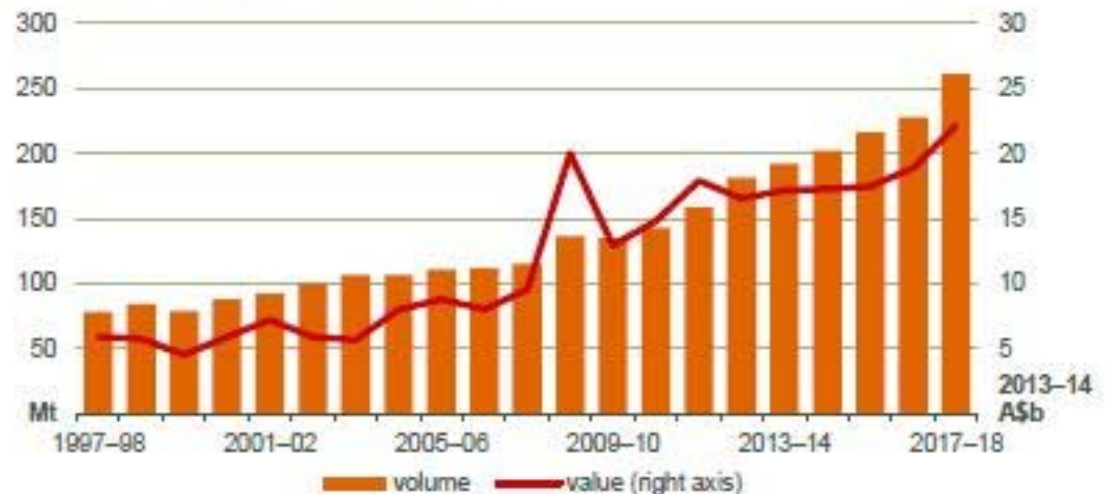
# Australia's Coal Export Projections

Figure 7: Australia's metallurgical coal exports



Sources: BREE; ABS.

Figure 4: Australia's thermal coal exports



Sources: BREE; ABS.

Source: BREE, (2013) "Resources and Energy Quarterly: September Quarter 2013", Canberra, Australian Government: Bureau of Resources and Energy Economics, September, iv + 164 pp.

<http://www.bree.gov.au/publications/req.html>, pp. 37, 58.

# 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

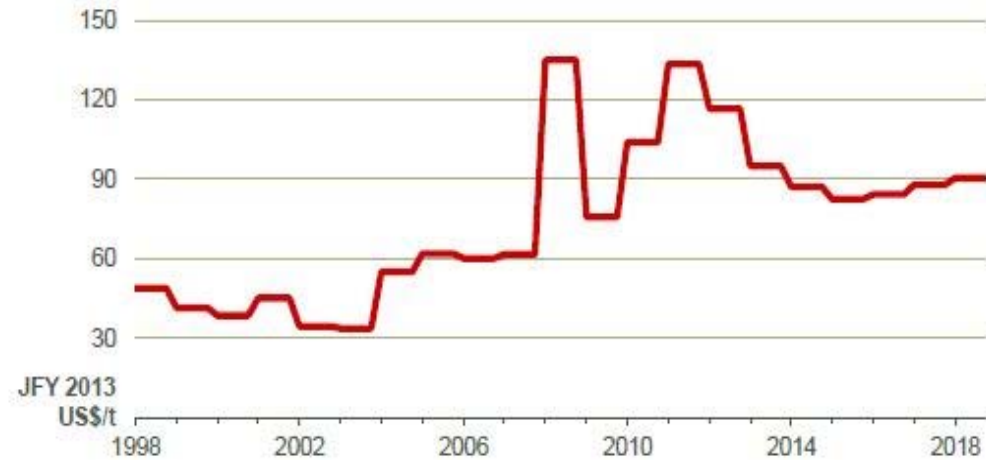
Source: United States Government, (2013) "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866", Washington DC, Interagency Working Group on Social Cost of Carbon, May, 21 pp. [http://www.whitehouse.gov/sites/default/files/omb/inforeg/social\\_cost\\_of\\_carbon\\_for\\_ria\\_2013\\_update.pdf](http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf)

# Coal prices

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

Discount rate:	Damage:
5%	A\$31
3%	A\$102
2%	A\$159
3%(95 <sup>th</sup> pctile)	A\$289

Figure 1: JFY thermal coal prices



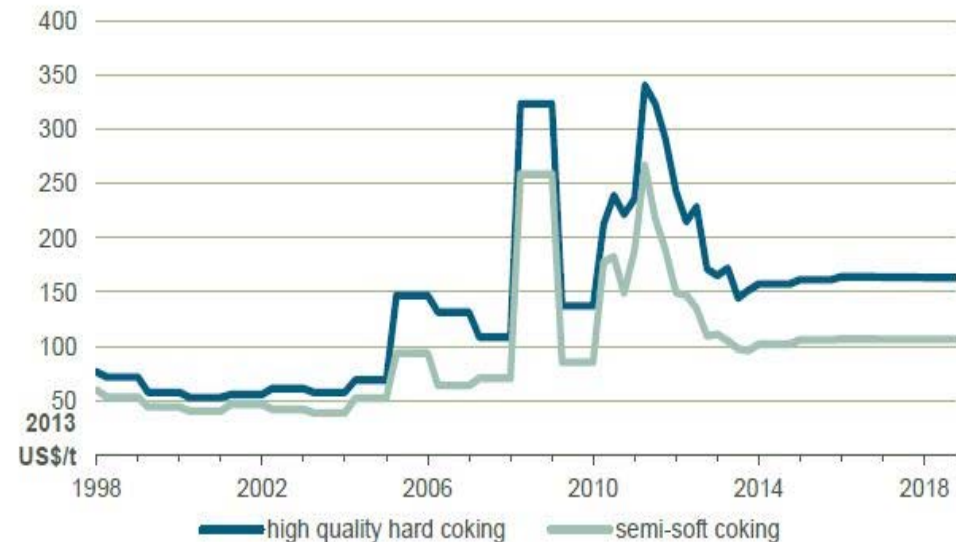
Source: BREE.

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

Source: Shael, T., (2013) "Energy Outlook: Thermal Coal", *Resources and Energy Quarterly*, Vol. 3, No. 1, September, p. 30. <http://www.bree.gov.au/documents/publications/req/REQ-2013-09.pdf>

Source: Shael, T., (2013) "Resources Outlook: Steel and Steel-Making Raw Materials", *Resources and Energy Quarterly*, Vol. 3, No. 1, September, p. 54. <http://www.bree.gov.au/documents/publications/req/REQ-2013-09.pdf>

Figure 4: Metallurgical coal benchmark prices, FOB Australia



# Global Damage from Australian Coal

THE CONVERSATION

Academic rigour, journalistic flair

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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 350 million tonnes (Mt). Combustion will release around 836 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\$11 billion and A\$103 billion of damage globally each year** (in 2013 dollars).

By 2017-18 BREE predicts our coal exports will rise to 455 Mt, producing around 1086 Mt CO<sub>2</sub>-e, which will cause **between A\$15.5 and A\$156 billion in damage** (in 2013 dollars) for expected revenues of only \$59 billion (profits much less).

**The 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, (2013) "Resources and Energy Quarterly: September Quarter 2013", Canberra, Australian Government: Bureau of Resources and Energy Economics, September, p. 12. <http://www.bree.gov.au/publications/req.html>

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



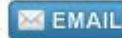
## Australian Coal Undermining Clean Energy for the Poor



**Chaitanya Kumar**

South Asia campaigns coordinator,  
350.org

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### Australian Coal Is Not the Poverty-fighting Saviour for India

Posted: 08/13/2013 5:53 pm



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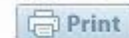
[http://www.huffingtonpost.com/chaitanya-kumar/australian-coal\\_b\\_3750589.html](http://www.huffingtonpost.com/chaitanya-kumar/australian-coal_b_3750589.html)

### Wind at parity with new coal in India, solar to join by 2018: HSBC

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By Sophie Vorrath on 11 July 2013

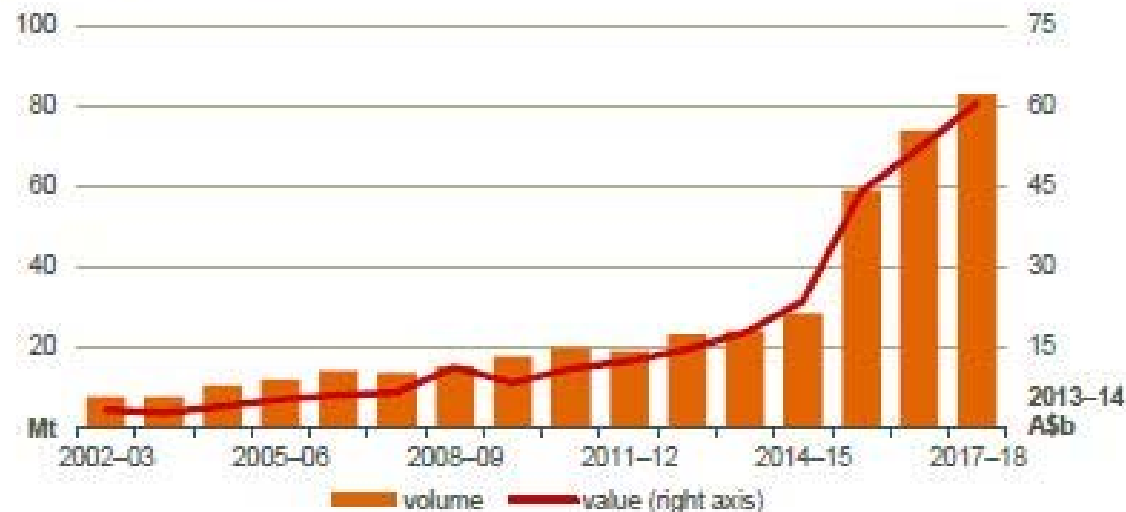
Wind energy is now cost competitive with new-build coal capacity in India, and solar is likely to follow suit sometime between 2016-18, according to a report by HSBC.



<http://reneweconomy.com.au/2013/wind-at-parity-with-new-coal-in-india-solar-to-join-by-2018-hsbc-14836>

# Australia's LNG Export Projections

Figure 5: Australia's LNG exports



Sources: BREE; ABS.

Table 1: Gas outlook

	unit	2010	2011	2012	2013	2014	2015	2016	2017
Australia		-11	-12	-13	-14 <sup>f</sup>	-15 <sup>z</sup>	-16 <sup>z</sup>	-17 <sup>z</sup>	-18 <sup>z</sup>
Production	Gm <sup>3</sup>	53.1	55.8	59.0	73.8	113.2	132.3	154.6	159.4
LNG export volume	Mt	20.0	19.3	24.3	24.3	31.1	57.0	69.6	83.0
LNG export value									
- nominal	A\$m	10 437	11 949	14 314	17 801	24 281	46 192	55 857	66 268
- real <sup>b</sup>	A\$m	11 077	12 491	14 657	17 801	23 712	44 138	52 224	60 625

<sup>b</sup> In 2013-14 Australian dollars. <sup>f</sup> BREE forecast. <sup>z</sup> BREE projection.

Sources: BREE; Australian Bureau of Statistics; EnergyQuest; Argus LNG.

Source: BREE, (2013) "Resources and Energy Quarterly: September Quarter 2013", Canberra, Australian Government: Bureau of Resources and Energy Economics, September, iv + 164 pp. <http://www.bree.gov.au/publications/req.html>, p. 29.



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## Australia's Exports in 2012

- Total goods and services: \$300.1 billion
  - Coal, anthracite & bituminous: \$41.273 billion
  - Tourism: \$25.547 billion
  - Education: \$15.042 billion
- } Mining boom strengthened \$A, & dampened demand

### Employment (May 2013, ABS):

	FT workers (thousands)	% total
Coal mining	49.5	0.43
Total mining	261.8	2.25
Manufacturing	938.8	8.07
Accommodation & food services	806.8	6.93
Education & training	922.3	7.92
<b>Total workers</b>	<b>11,640.4</b>	

# Transforming Australia's Exports

1. Ensure that coal and LNG export prices better reflect the environmental and social damages caused by the resulting emissions. E.g. Export tax.
2. Initiatives to expand more sustainable service-oriented industries such as:
  - *Tourism*, including eco-tourism, indigenous tourism, arts exhibitions, music & cultural festivals, and sporting events
  - *Higher education* including specific initiatives to expand higher education around sustainable futures: agriculture, energy, transport, urban design, governance, green manufacturing etc.
  - *Renewable energy* - e.g solar energy via high voltage DC cables to Indonesia and PNG (Blakers *et al.* 2013) and renewable jet-fuel and heavy logistics fuels (Godfrey *et al.* 2013).
  - *Sustainable agriculture*
  - *Sustainable manufacturing*
  - *Eco-design services*

Andrew Blakers\*, Joachim Luther and Anna Nadolny

## Asia Pacific Super Grid – Solar electricity generation, storage and distribution

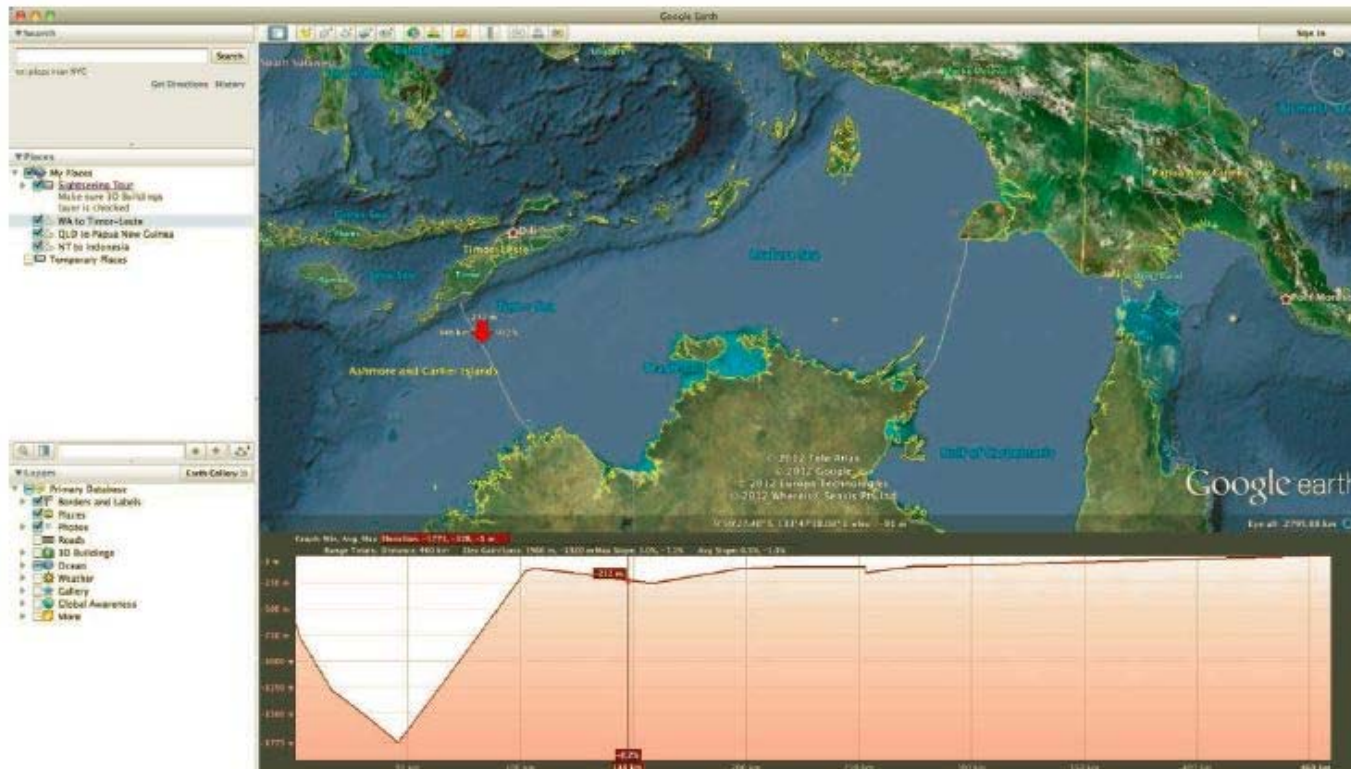
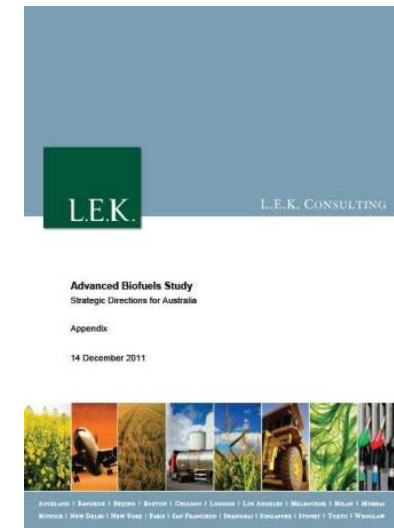


Fig.6: Potential pathway for HVDC line modelled in Google Earth.

# Tourism & Advanced Biofuels

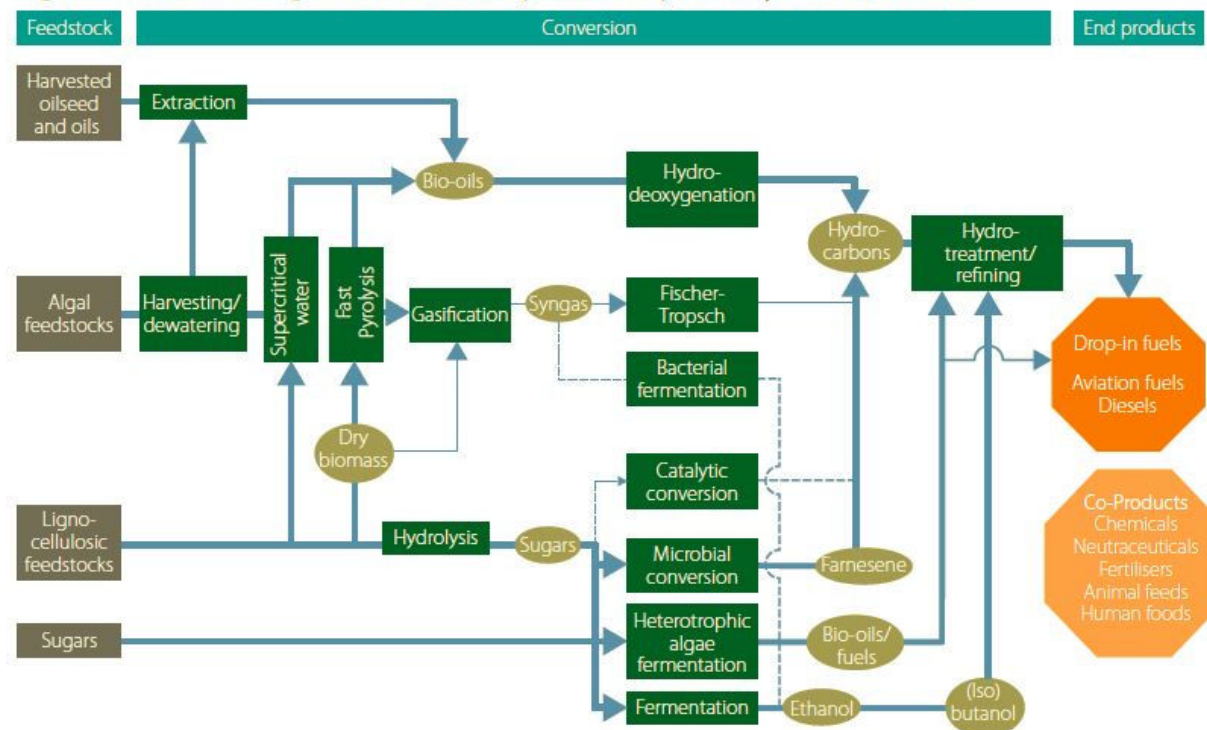


**“If price-point competitiveness and reliable high-volume supply can be achieved, sustainable liquid aviation fuel production represents a tangible and major Green Growth opportunity for Australia”**



Godfrey, B., Sargent, M. and Pond, S., (2013) "Green Growth - Energy: Industry Opportunities for Australia", A Report of a Study by the Australian Academy of Technological Sciences and Engineering (ATSE), Australian Research Council, Australian Government, April, xiv + 66 pp. [http://www.atse.org.au/atse/activity/energy/reports/atse\\_green\\_growth\\_report\\_2013/content/activity/energy-content/atse\\_green\\_growth\\_energy\\_report\\_2013.aspx](http://www.atse.org.au/atse/activity/energy/reports/atse_green_growth_report_2013/content/activity/energy-content/atse_green_growth_energy_report_2013.aspx)

Figure 10 Promising biomass to drop-in fuels pathways for Australia<sup>69</sup>



# Key mechanisms

- **Finance: Elimination of fossil fuel subsidies** estimated at \$10.1 billion annually and a **coal and LNG export tax**, proportional to emissions from combustion, used to help fund:
  - Australia's climate finance obligations and the UN's 'Energy for All' initiative
  - Weather-related disaster recovery costs (cyclones, bushfires, floods, etc)
  - Assistance to the poor with clean energy and incentives to landlords to insulate rental properties.
  - National parks expansion, operation and maintenance to ensure continental-scale connectivity which will help open up species migration routes to assist with climate change adaptation.
  - Research and pilot projects on renewable aviation and heavy logistics fuels and renewable electricity.
- **Major investments in:**
  - **Public transport infrastructure**, such as inter-city high speed rail, rail links to airports, to enable expansion of tourism without causing increases in congestion
  - **Tourism infrastructure**, especially with regard to eco-tourism, indigenous tourism, Asian language training, information & signage
  - **Higher education** facilities



# Political economy

Fossil fuel lobby is enormously powerful in Australia, BUT numerous other sectors of the economy which employ significantly more people, would benefit:

- **The university sector** – universities are major exporters of education services, and have been hit hard by funding cuts and the high dollar
- **The tourism industry** – a major creator of labour-intensive, dispersed jobs, also hit hard by the high dollar
- **Airlines** – which are seeking renewable jet-fuel and more tourist traffic
- **The clean energy sector** – especially solar thermal, wind and biofuel (e.g. algae & alcohol to jet fuel)
- **Farmers groups opposed to coal seam gas** mining and which are wanting the protection of aquifers and more off-farm employment opportunities in rural communities
- **Aid agencies** – wanting to see funding for Australia's international climate finance obligations
- **Welfare agencies** – wanting to see the poor of Australia given more job opportunities, assistance with disaster recovery and climate adaptation.



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# Conclusions

- Through its fossil fuel exports, Australia is making a major contribution to climate change out of all proportion to its population size
- Our current coal exports are causing damage of the order of A\$11-103 billion which is not included in the coal export price.
- We need to reorient our exports towards less emissions-intensive goods and services.
- Australia is well placed to expand exports in:
  - Higher education
  - Tourism
  - Renewable energy
- Shared interests of diverse groups could overcome power of fossil fuel lobby.