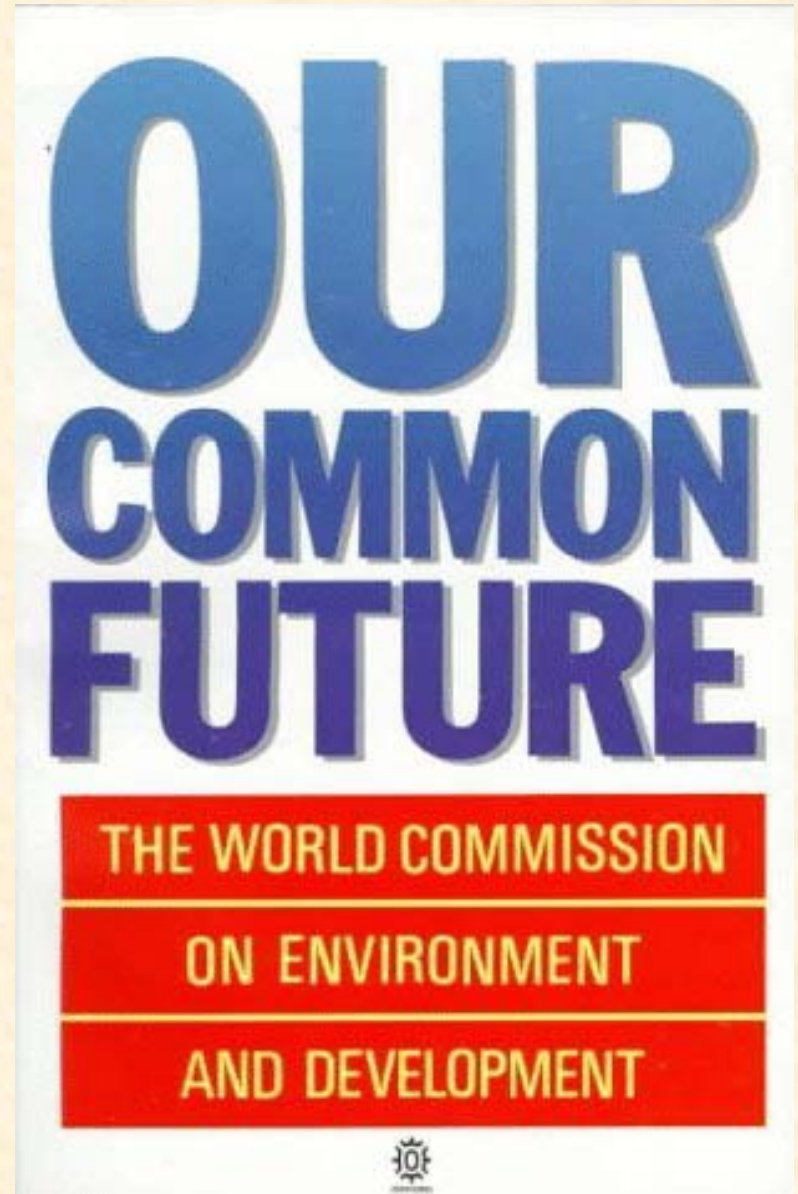


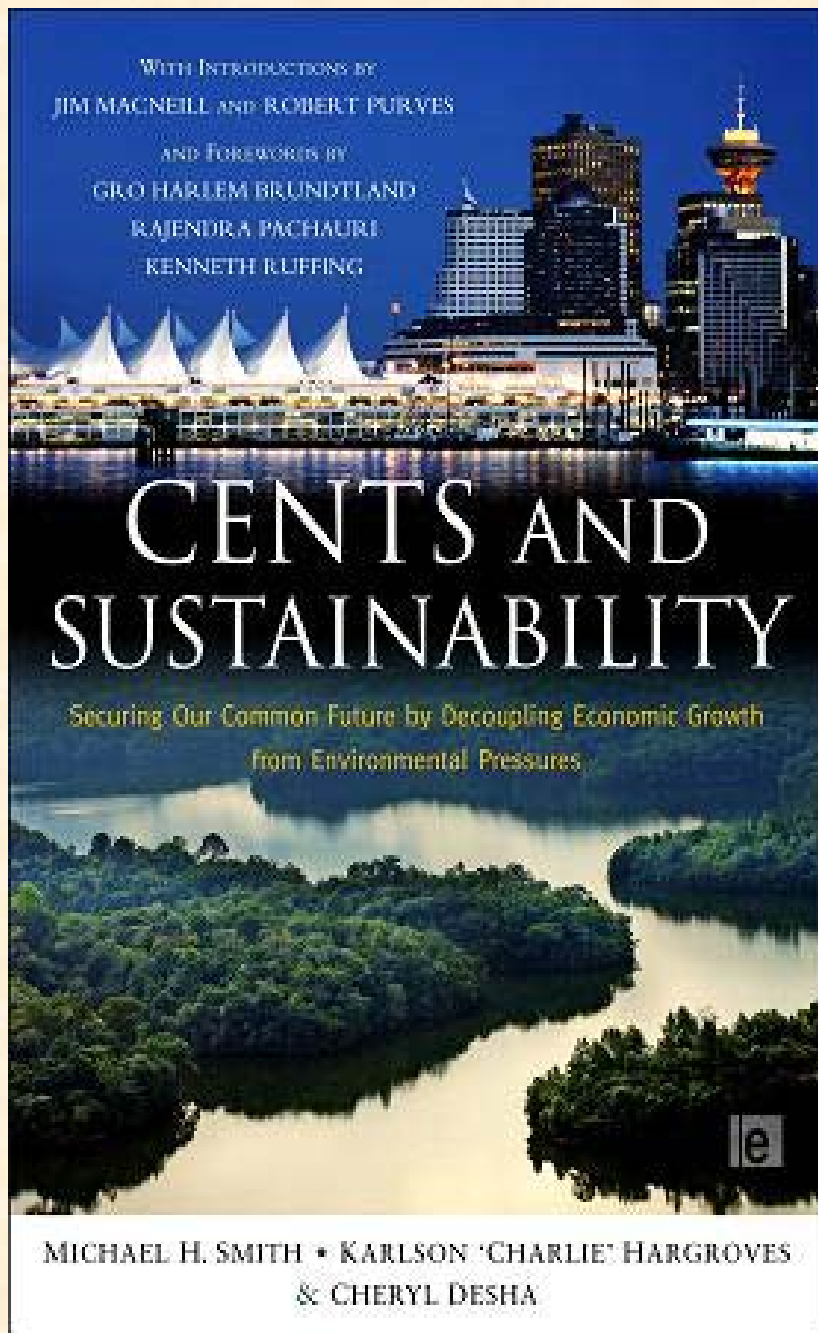


**'Sustainable development, resource scarcity,
poverty reduction, and the future of the planet'**

**Dr Michael Smith,
ANU Fenner School of Environment and Society,
michaelh.smith@anu.edu.au**

Our Common Future:



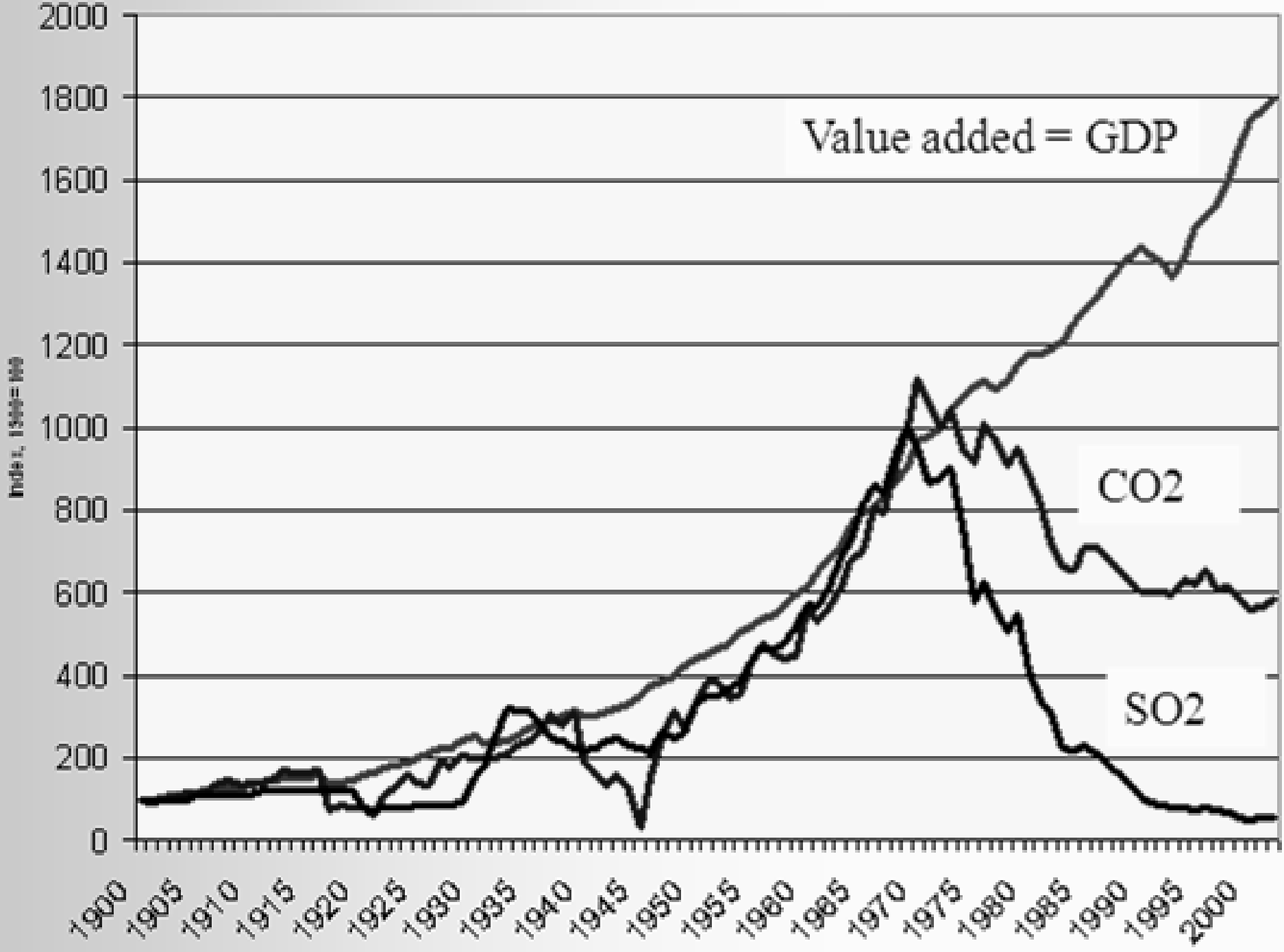


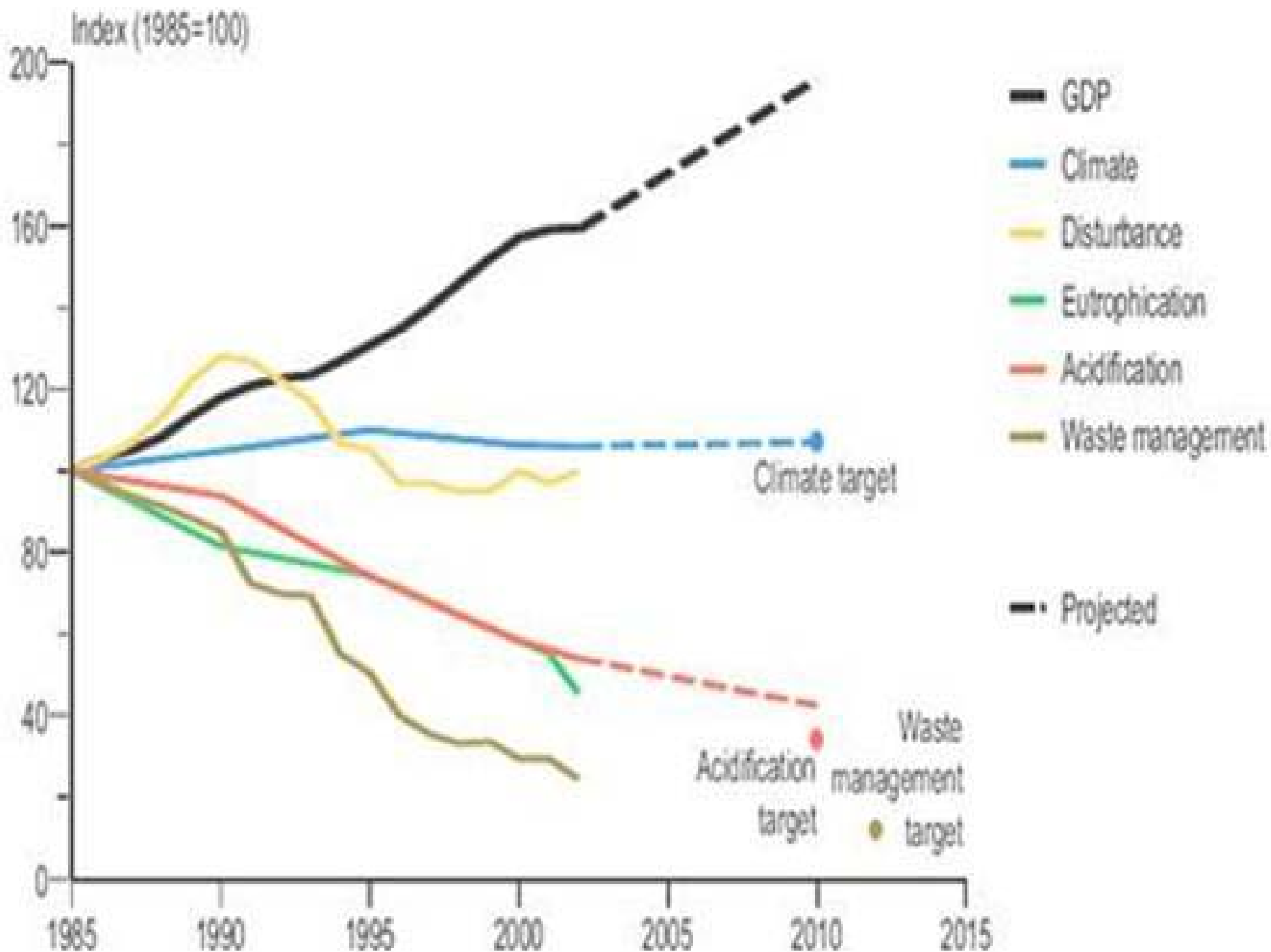
‘Since the Brundtland Report we have long awaited a book that tackles the formidable analytic task of developing a framework & realistic strategy to simultaneously achieve environmental sustainability, economic and jobs growth, and poverty reduction. Now with *Cents and Sustainability* that wait is over. ’

Professor Norman Myers, Oxford Uni

UNEP Green Economy – trying to debunk two myths.

- *“Perhaps the most prevalent myth is that there is an inescapable trade-off between environmental sustainability and economic progress. There is now substantial evidence that the greening of economies neither inhibits wealth creation nor employment opportunities. To the contrary, many green sectors provide significant opportunities for investment, growth, and jobs.”*
- *“Still many believe that decoupling economic decoupling from resource consumption and environmental pressures is a luxury only wealthy countries can afford, or worse, a developed-world imposition to restrain development and perpetuate poverty in “low income” countries.”*





Green Economic Transformation.

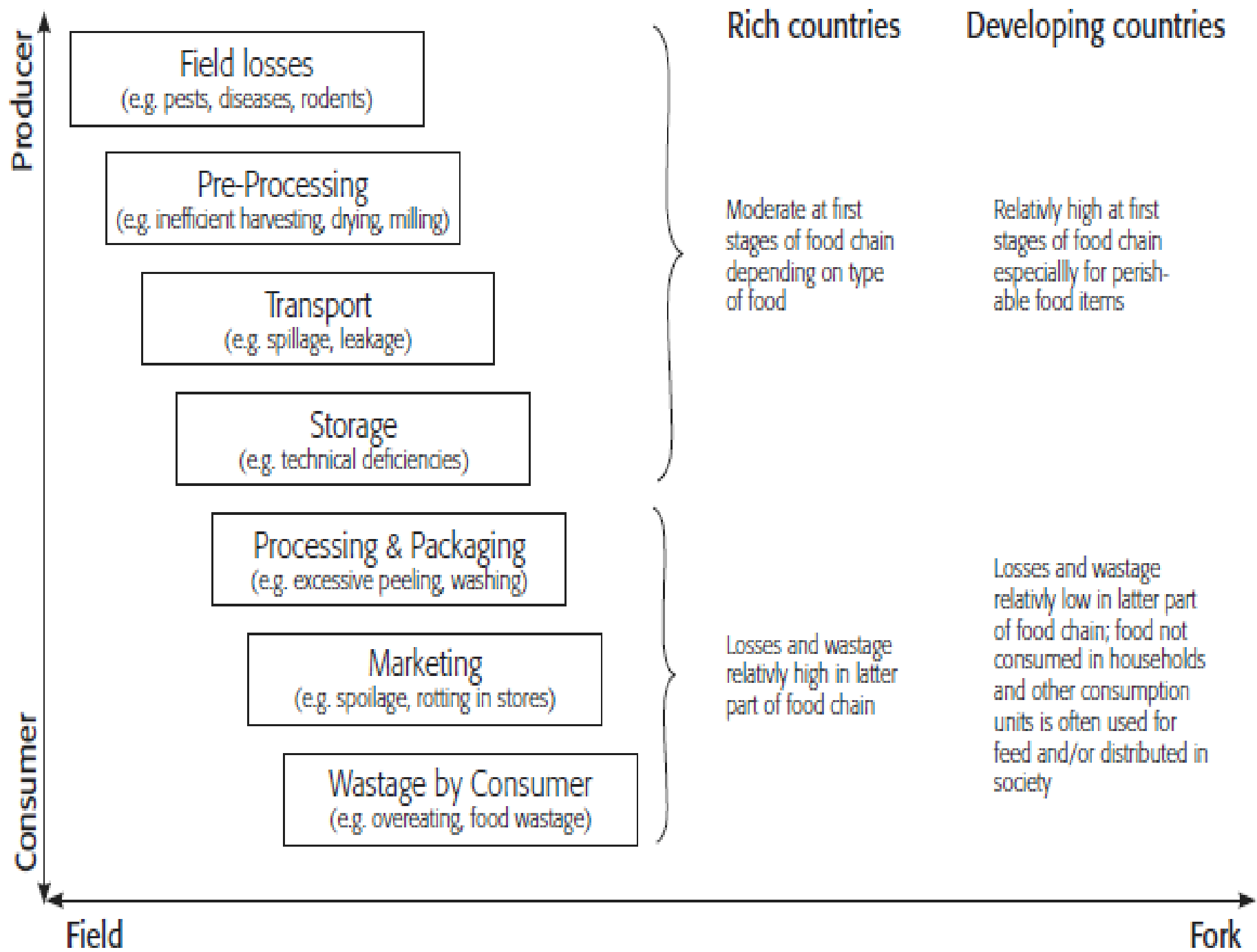
- Massachusetts, USA decoupled GDP from toxic chemical usage by 40%, toxic chemical by product waste (Hazardous) by 72% and toxic chemical emissions down by over 90% in less than 15 years without harming business profits.
- Portugal has increased the share of renewables (including hydroelectric power) in total energy supply from 17 to 45 per cent in just five years, between 2005 and 2010.
- Poland rolled out energy efficient lighting to most homes within 3 years.
- Uganda has achieved an increase of 359 per cent in terms of number of certified organic farmers and 60 per cent in terms of certified organic acreage, respectively, from 2002 to 2007.
- China eliminated leaded petrol in three years.
- Recycling rates and reducing waste to landfill by over 80% Eg: Switzerland, Germany, Japan.
- Germany – 80% recycling of construction and demolition
- Norway lifted glass recycling rates from 20-65% in three years between 1991-1993.

Green Transformation - Water.

Stockholm Statement on Water

The targets to be achieved by the year 2020 include:

- •20% increase in total food supply-chain efficiency
 - •20% increase in water efficiency in agriculture
 - •20% increase in water use efficiency in energy production
 - •20% increase in the quantity of water reused
 - •20% decrease in water pollution.
 - (adding 20% decrease in food waste)
-
- Supported by UN-Water, the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Federal Ministry for Economic Cooperation and Development and endorsed by a number of international organisations.



Water Efficiency/Demand Management –Economic Stimulus

- *“The economic output benefits of investments in water efficiency range between US\$2.5 and 2.8 million per million dollars of direct investment.*
- *GDP benefits range between US\$1.3 and 1.5 million per million dollars of direct investment.*
- *Employment potential ranges between 15 and 22 jobs per million dollars of direct investment.*
- *Direct investment in the order of US\$10 billion in water/energy efficiency could save between 20 and 40 trillion litres of water, with resulting energy reductions as well.”.*

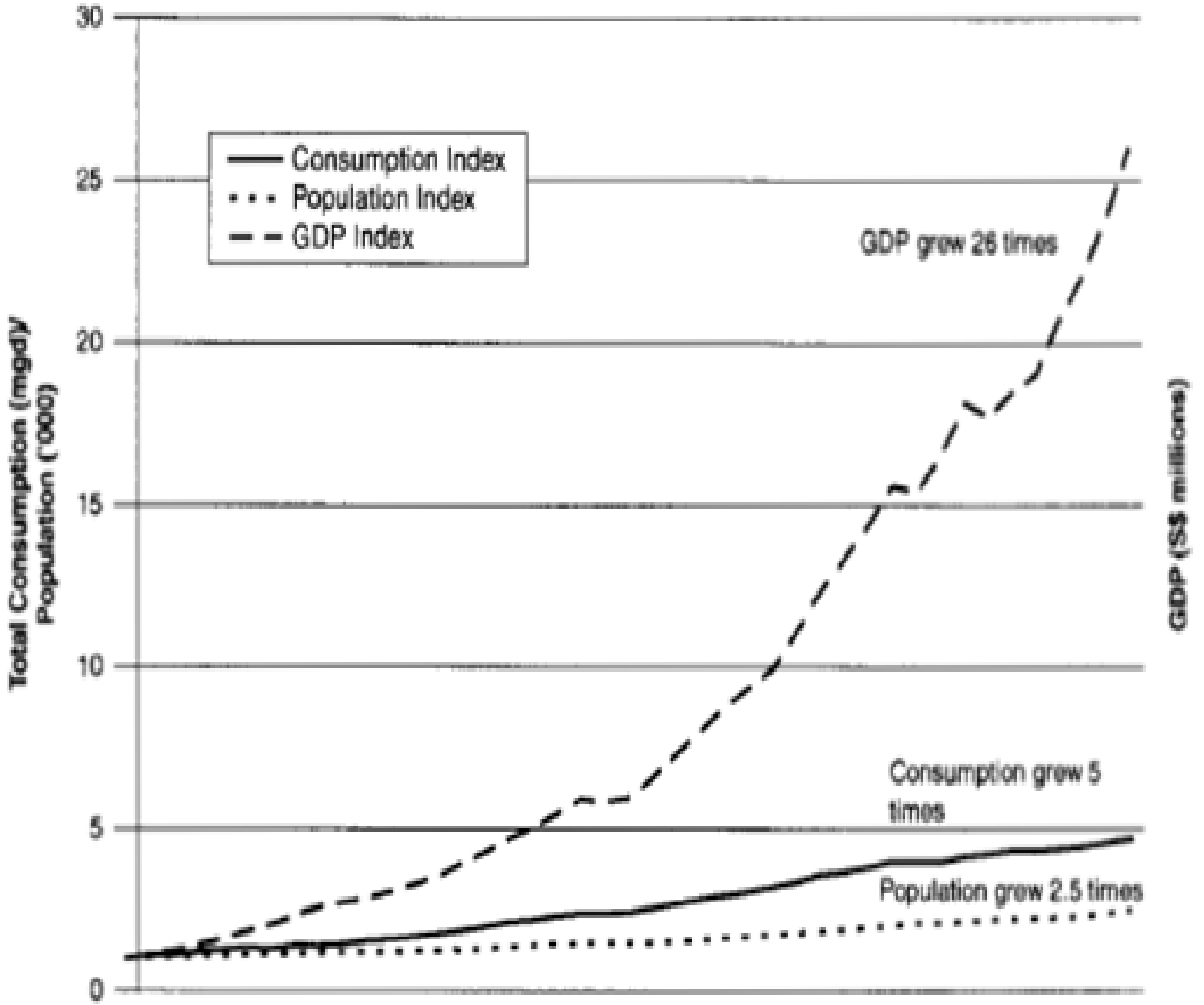
**Mithcell, D., Beecher, J., Chesnutt, T. and Pekelney, D. (2008)
Transforming Water: Water Efficiency as Stimulus and Long-Term Investment, Alliance of Water Efficiency, Chicago, IL**

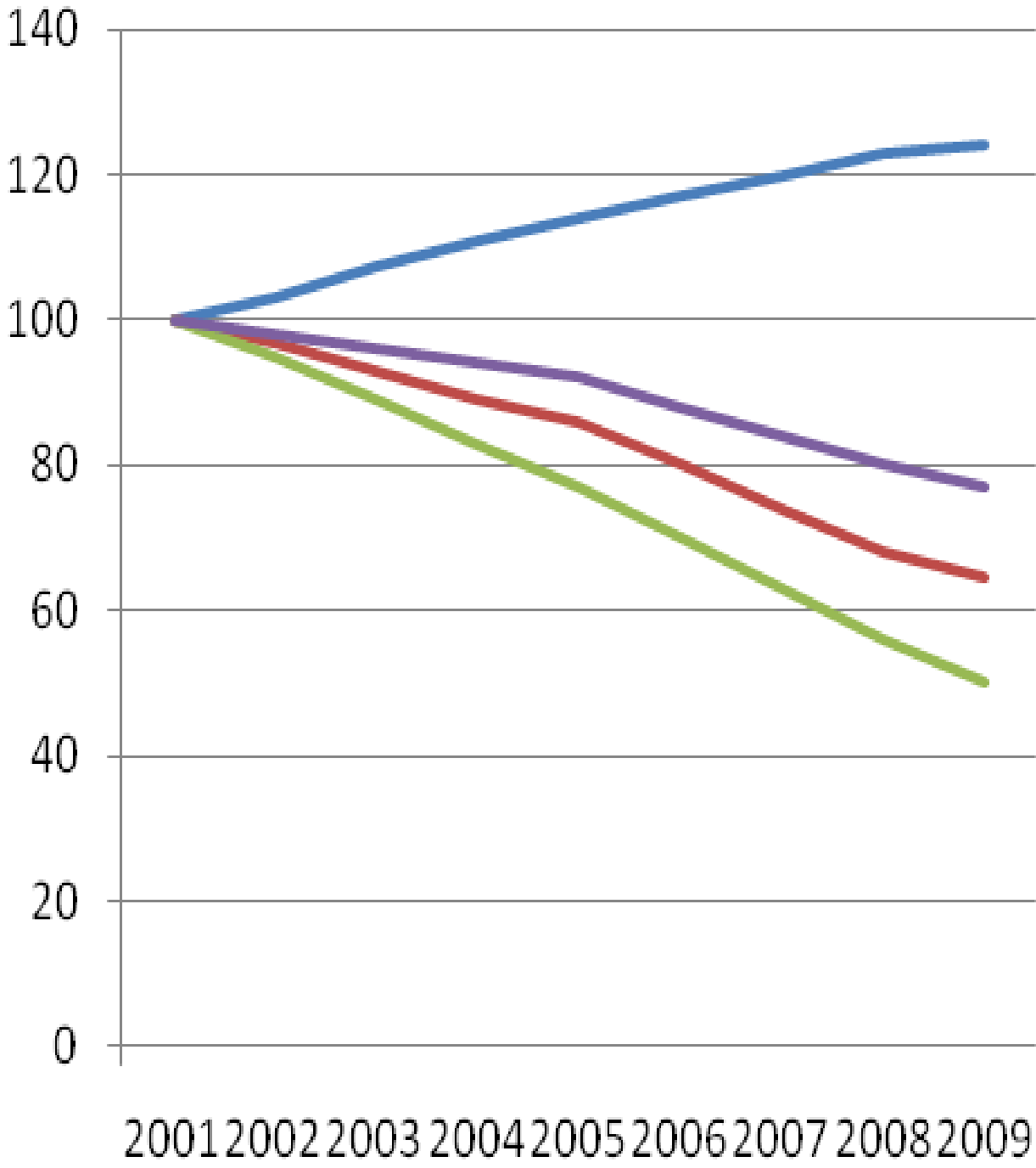
Water Efficiency - Economic Benefits Are Significant

"The annual cost of ensuring all globally have access to clean water through investing in more large-scale centralized dams and treatment plants would cost around **US\$180 billion per annum to at least 2025**. However, this figure can be reduced to an **annual cost of US\$10–25 billion**, if the emphasis is on investing in water efficiency, demand management, rain and stormwater harvesting and water recycling at appropriate scale."

Dr Peter Gleick, 2003, Science journal paper '*Global freshwater resources: Soft-path solutions for the 21st century*'.

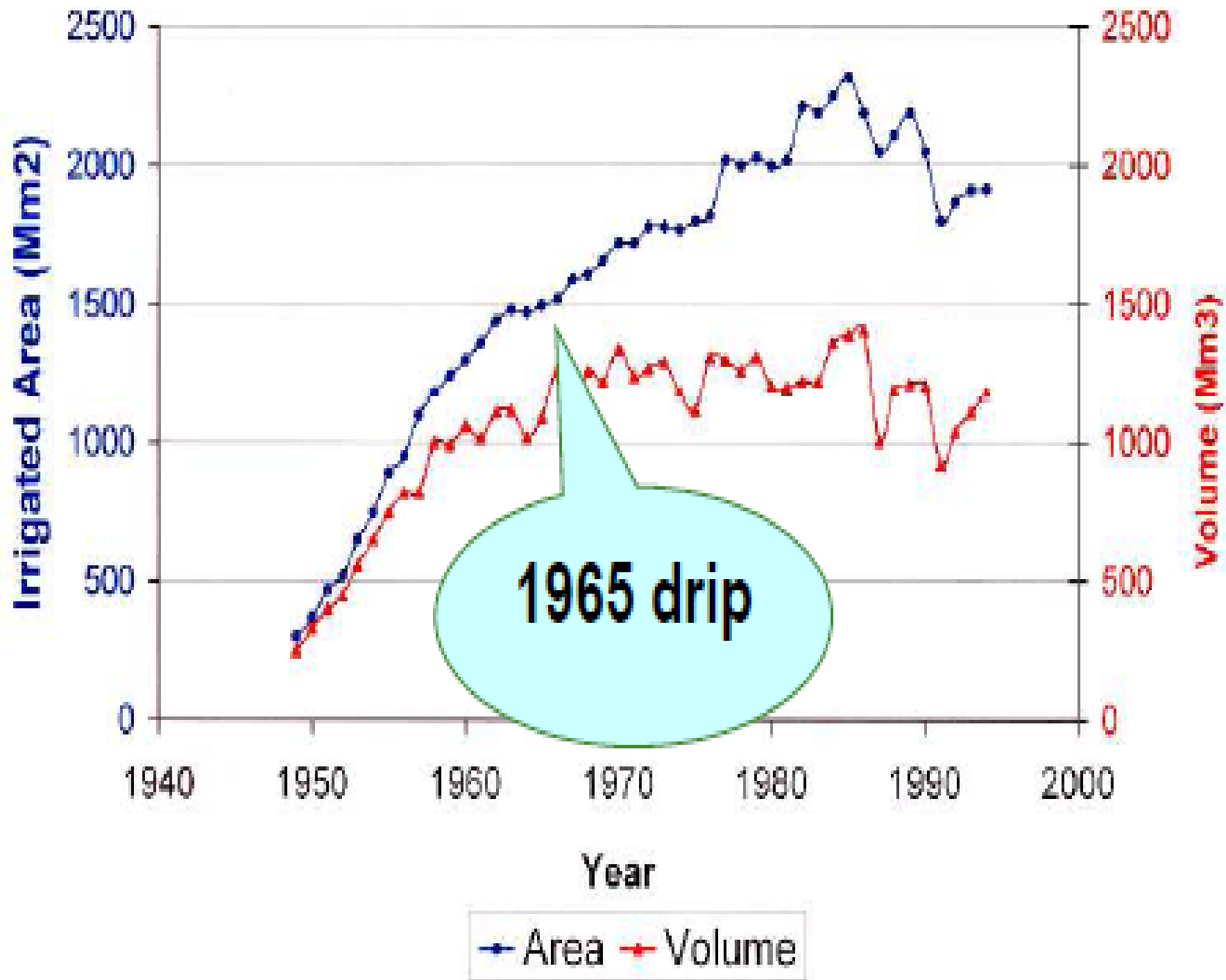
www.sciencemag.org/cgi/content/full/302/5650/1524

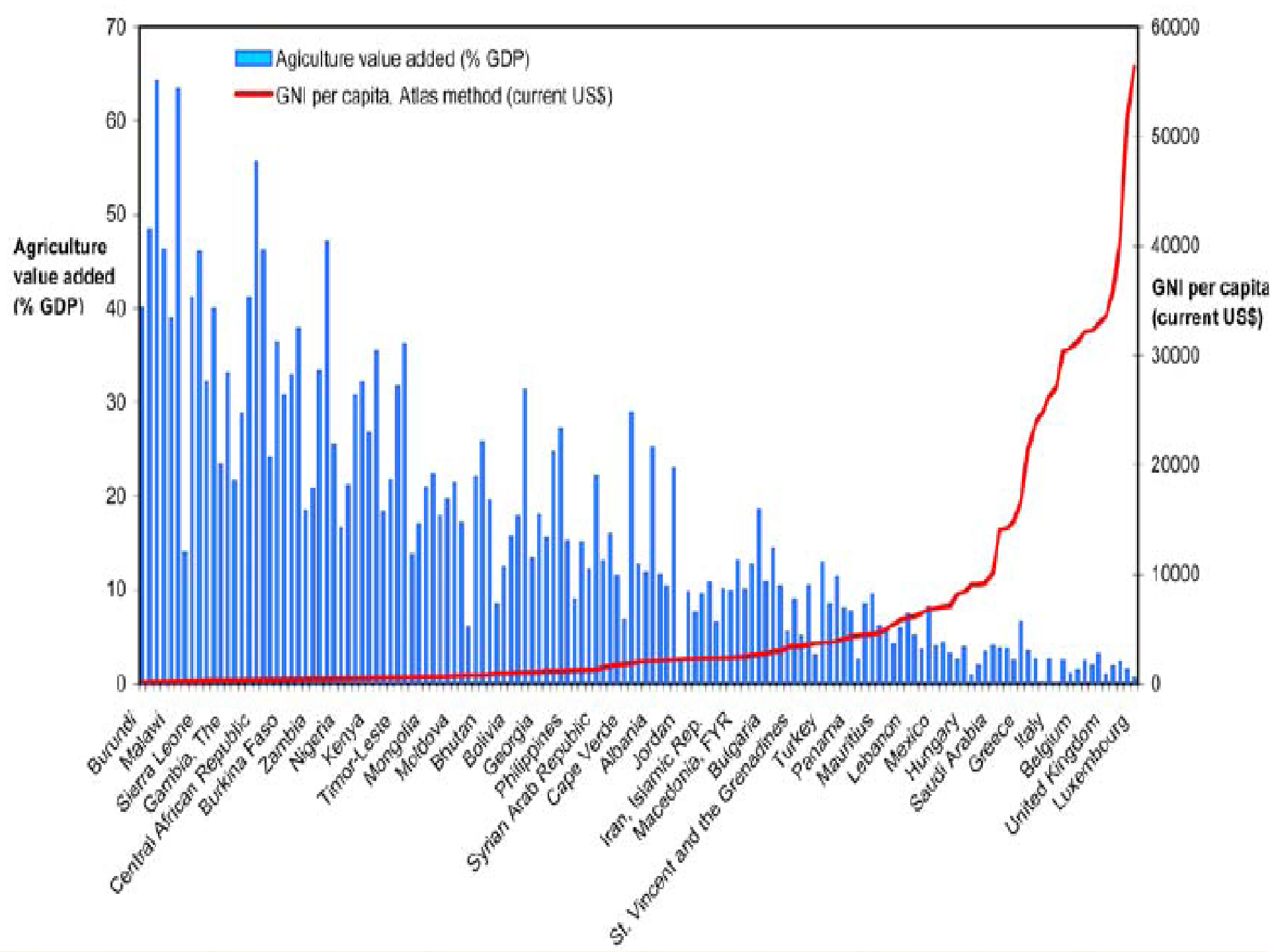




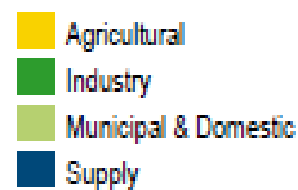
- Australian GDP
- Total Water Consumption
- Agricultural Water Consumption
- Household Water Consumption

	2004-2005 (GL)	Industry gross value added (\$millions) (2004-2005)	Industry gross value Added (\$mill) per GL of water Consumed (2004-5)	2008-2009 (GL)	Industry gross value Added (\$mill) (2008-2009)	Industry gross value added per GL of water Consumed (2008-9)
Agriculture	12 191	27153	2	6 996	27739	4
Mining	413	39945	97	508	114580	226
Manufacturing	589	97769	166	677	111044	164
Other Industries	1,106	711667	672	1,327	897496	709
Electricity & Gas	271	14933	55	328	16097	49
Water Supply	2, 083	5101	2	2,396	6288	3
Total	18,767	896568	54	14,101	1173244	95





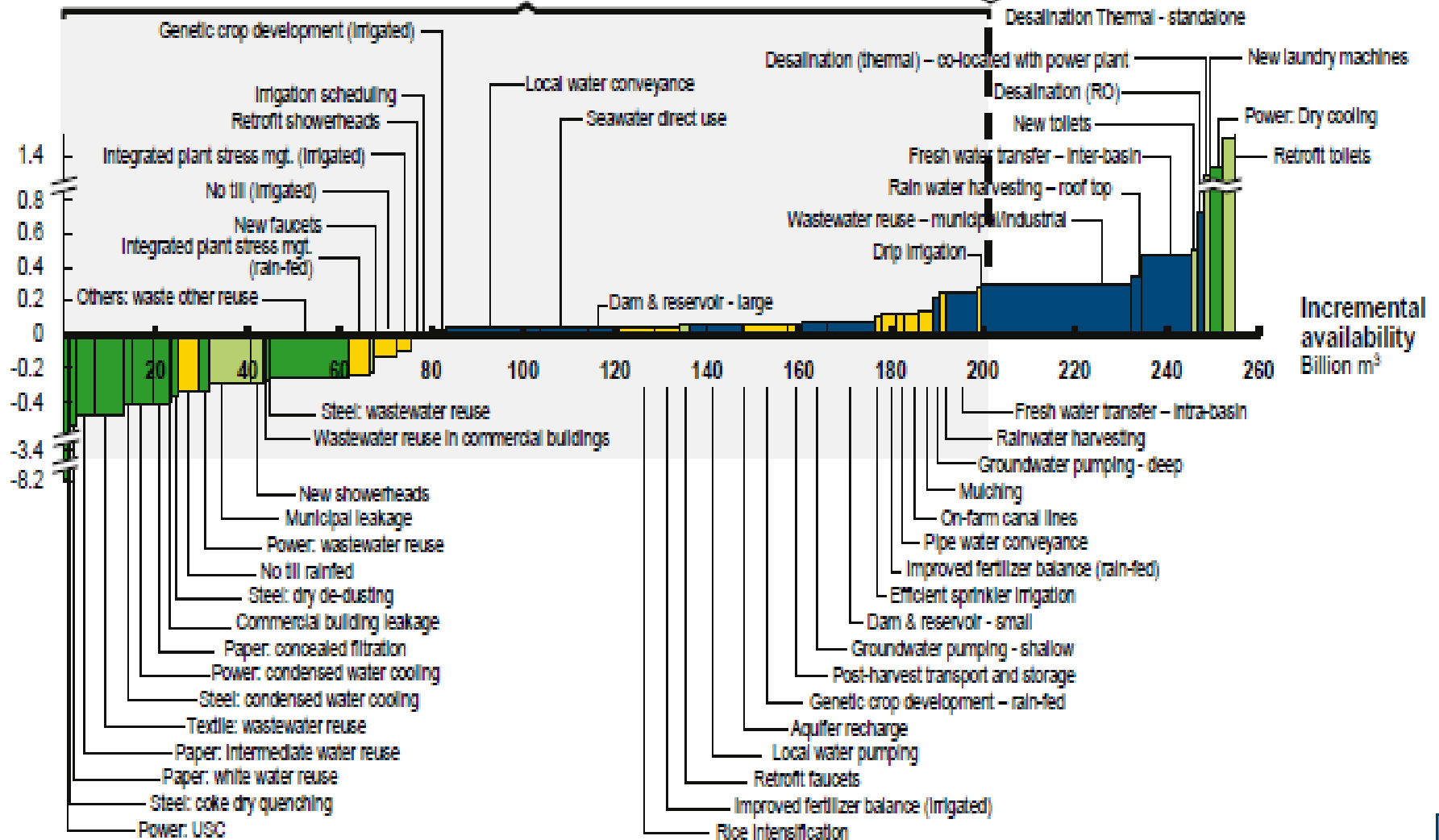
China - Water availability cost curve



Cost of additional water availability in 2030,
\$/m³

Supply/demand gap in 2030 = 201 billion m³
Total cost to fill gap = - USD 21.7 billion

Specified deficit
between supply and
water requirements in
2030



Tools for planning water

The Department has collated resources to provide a 'one-stop-shop' for information on planning and implementation. The tools include: best practice guidelines; fact sheets; case studies and tips to assist your business in self assessment and identify opportunities for water efficiency savings.

This is a comprehensive database and includes tools developed by Australian and international organisations. These tools have been developed for a range of industry sectors, however there are resources which are more general in scope or cover many industry sectors.

The Department has also developed tools for identifying water efficiency opportunities. Currently there is no sector specific information on water efficiency opportunities.

Select your areas of interest

Sectors:

Search

Clear

Make a selection

Agriculture and farming

All sectors

Automotive

Beverage

Car washing

Commercial office buildings and shopping centres

Construction industry

Dairy industry

Education

Food processing

Horticulture

Hospitals and health

Hospitality and tourism

Laundries

Manufacturing

Mining

Nurseries and Green Areas

Petroleum

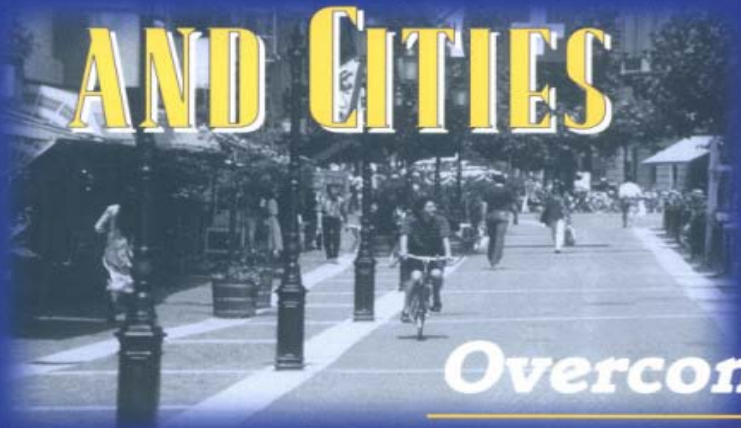
Water Utilities

Other

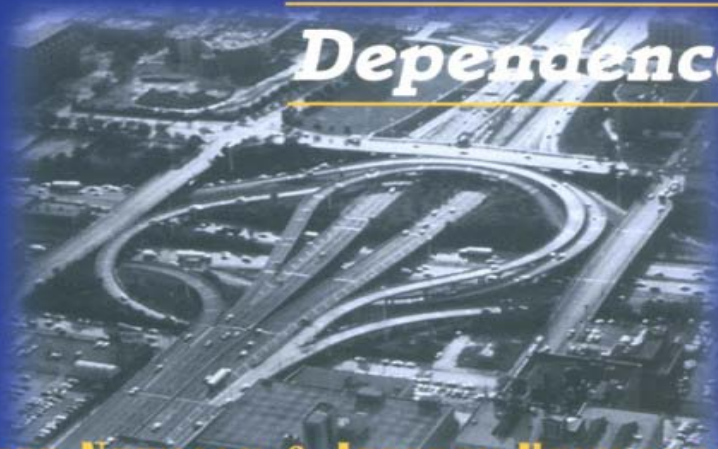
Make a selection

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SUSTAINABILITY AND CITIES

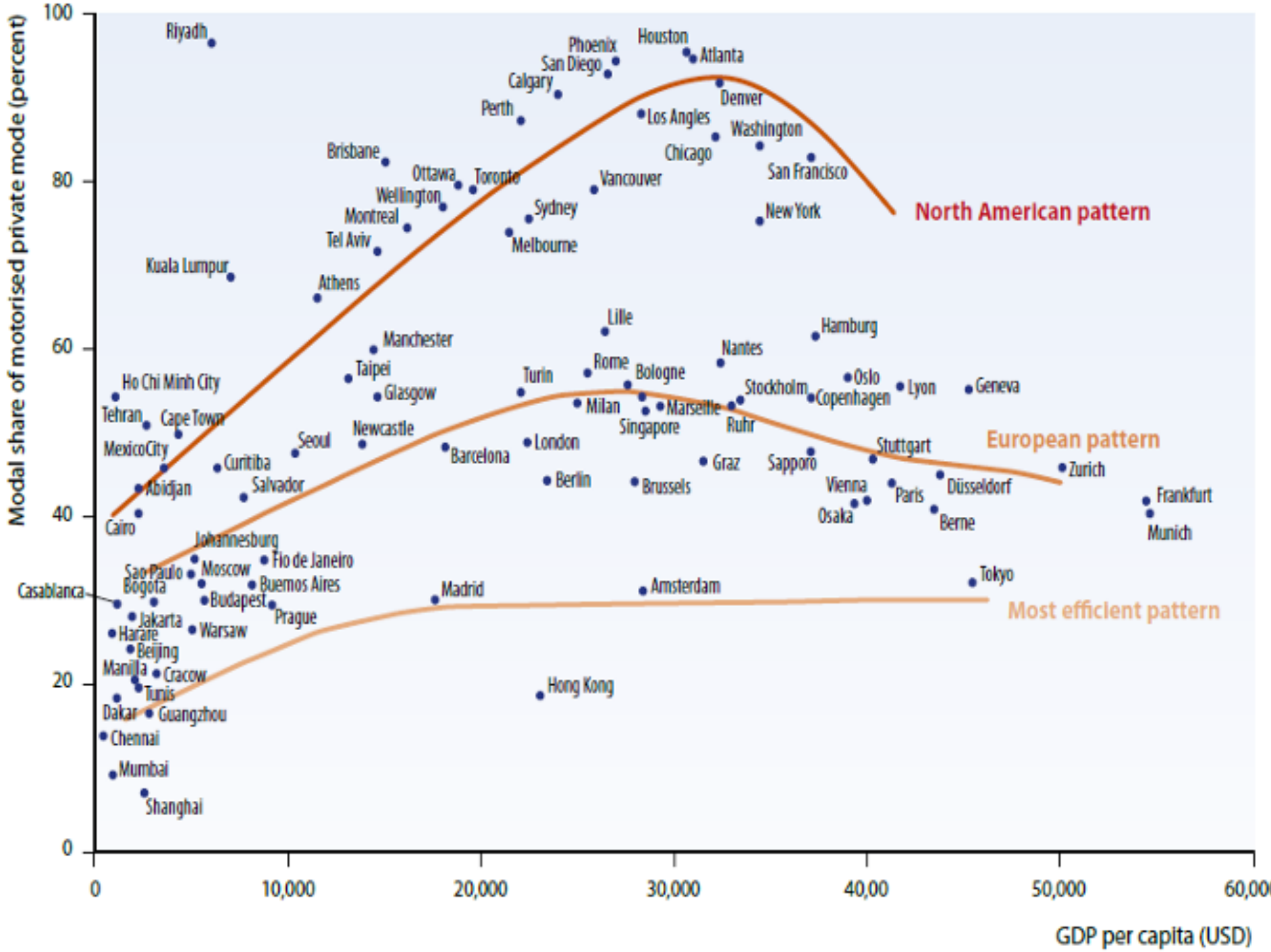


*Overcoming
Automobile
Dependence*



PETER NEWMAN & JEFFREY KENWORTHY

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City	3km	5km
Brisbane	29%	45%
Melbourne	37%	53%
Perth	32%	48%
Sydney	25%	42%

Curitiba's population quadrupled in 20 years to 2.5 million — with a city budget per capita 1/15 Melbourne.



- 70% recycling rate
- 70% patronage on public transport of all daily transits.
- Globally significant biodiversity reserves
- Leading urban water sensitive design.

Curitiba, Brazil

In 1980's per capita GDP was only just 10% above the national average. By 1996 its per capita GDP was 65% above the national average.

(<http://www.natcap.org/images/other/NCchapter14.pdf>)



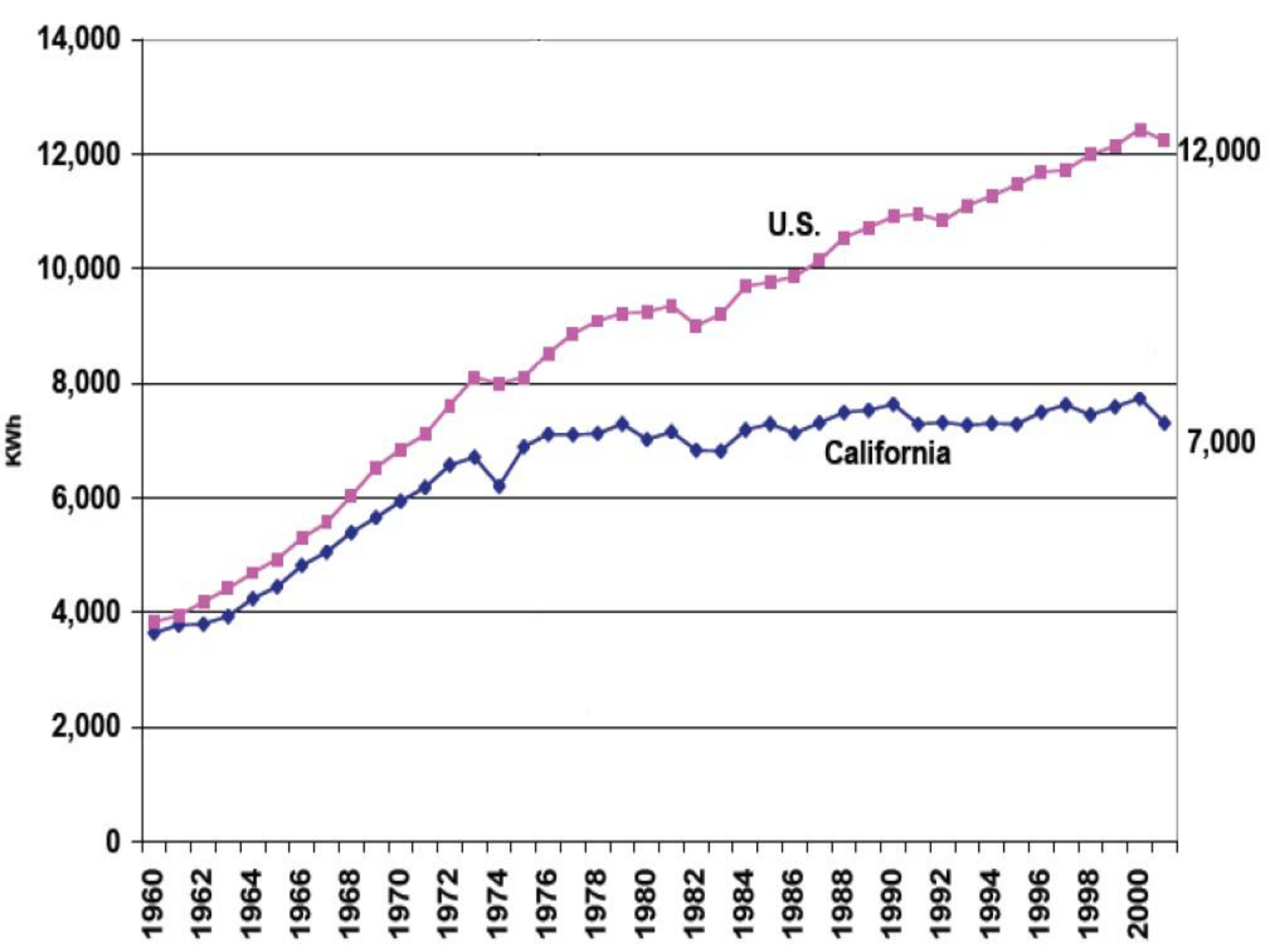
Energy Efficiency and Demand Management

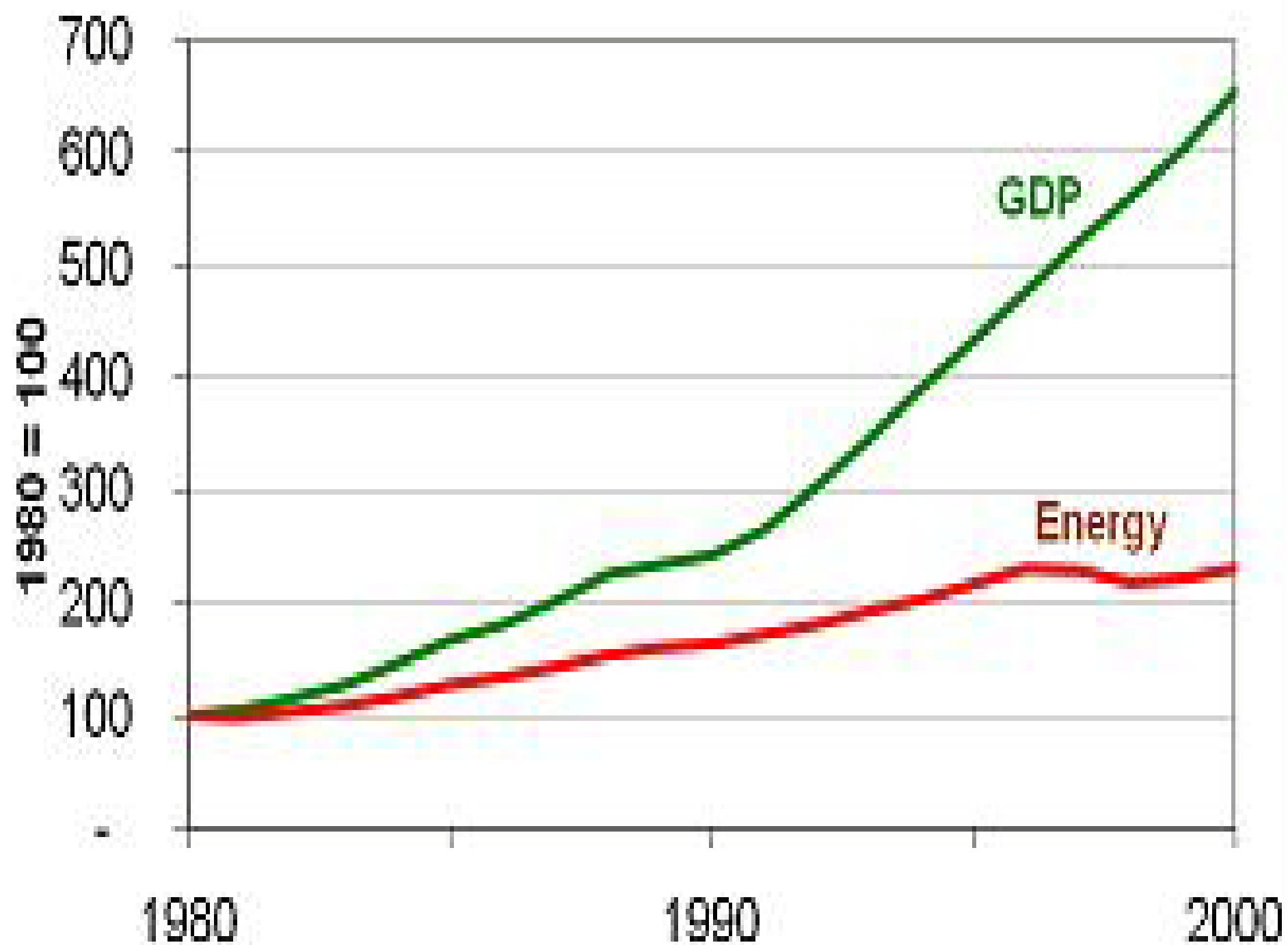
Pursuing GHG reduction targets through a focus on energy efficiency makes economic sense as *McKinsey Consulting* found “ *By choosing more energy-efficient cars and appliances, improving insulation in buildings, and selecting lower-energy-consuming lighting and production technologies, developing countries could cut their annual energy demand growth by more than half from 3.4 to 1.4 percent over the next 12 years. This would leave energy consumption some 22 percent lower than it would otherwise have been—an abatement equivalent to the entire energy consumption of China today.*”

Energy Efficiency and Demand Management

"Many people are unaware of the scale of opportunities for reducing energy demand. By showing how global energy demand can fall to a quarter of its current level without any decline in services, the team hope to redress the balance. We think it's pretty unlikely that we'll find a good response to the threat of global warming on the supply side alone. But if we can make a serious reduction in our demand for energy, then all the options for changing the energy supply system look more realistic, as renewable energy systems only need to produce a quarter of the energy being currently produced."

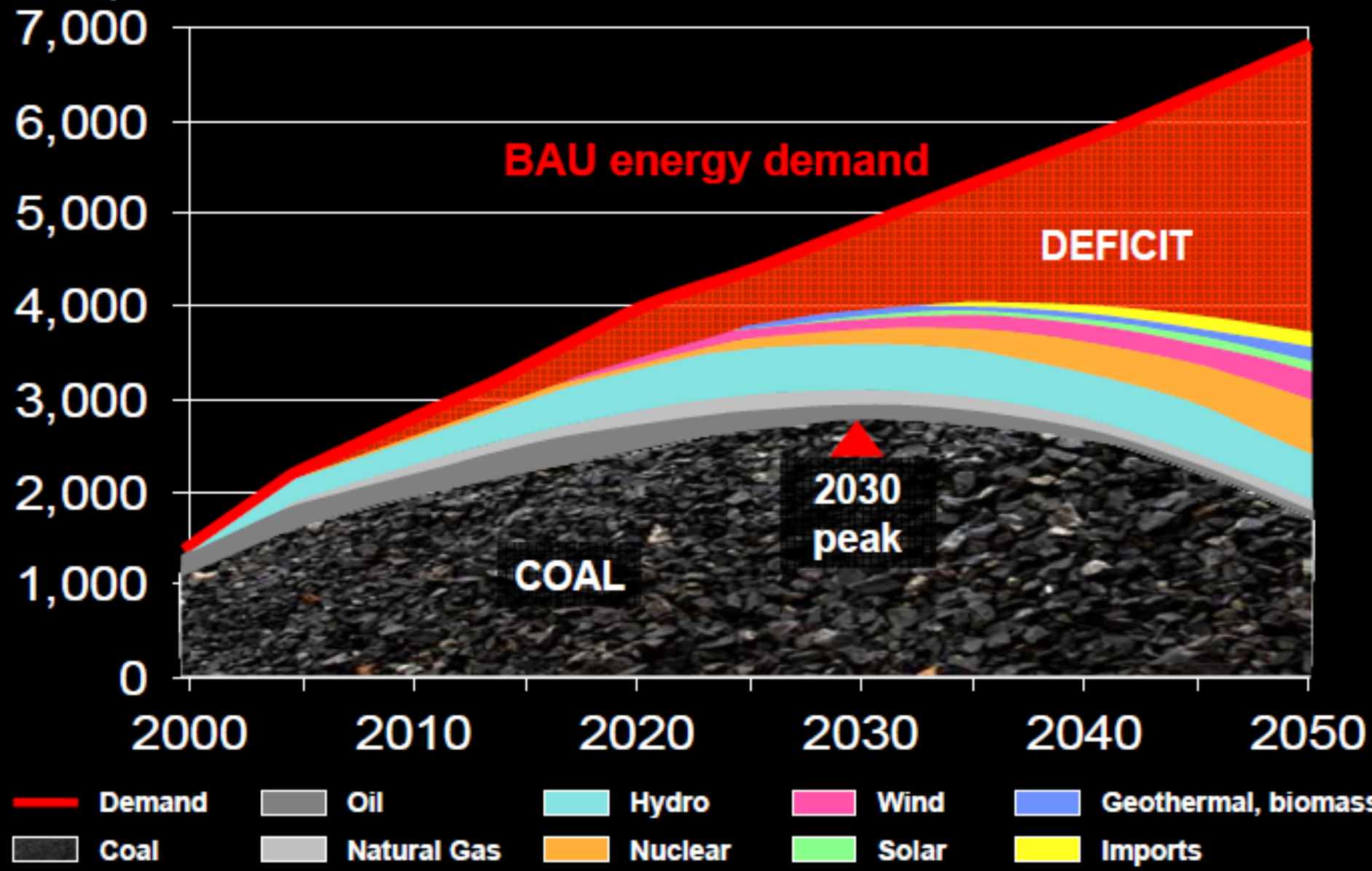
Julian Allwood, University of Cambridge



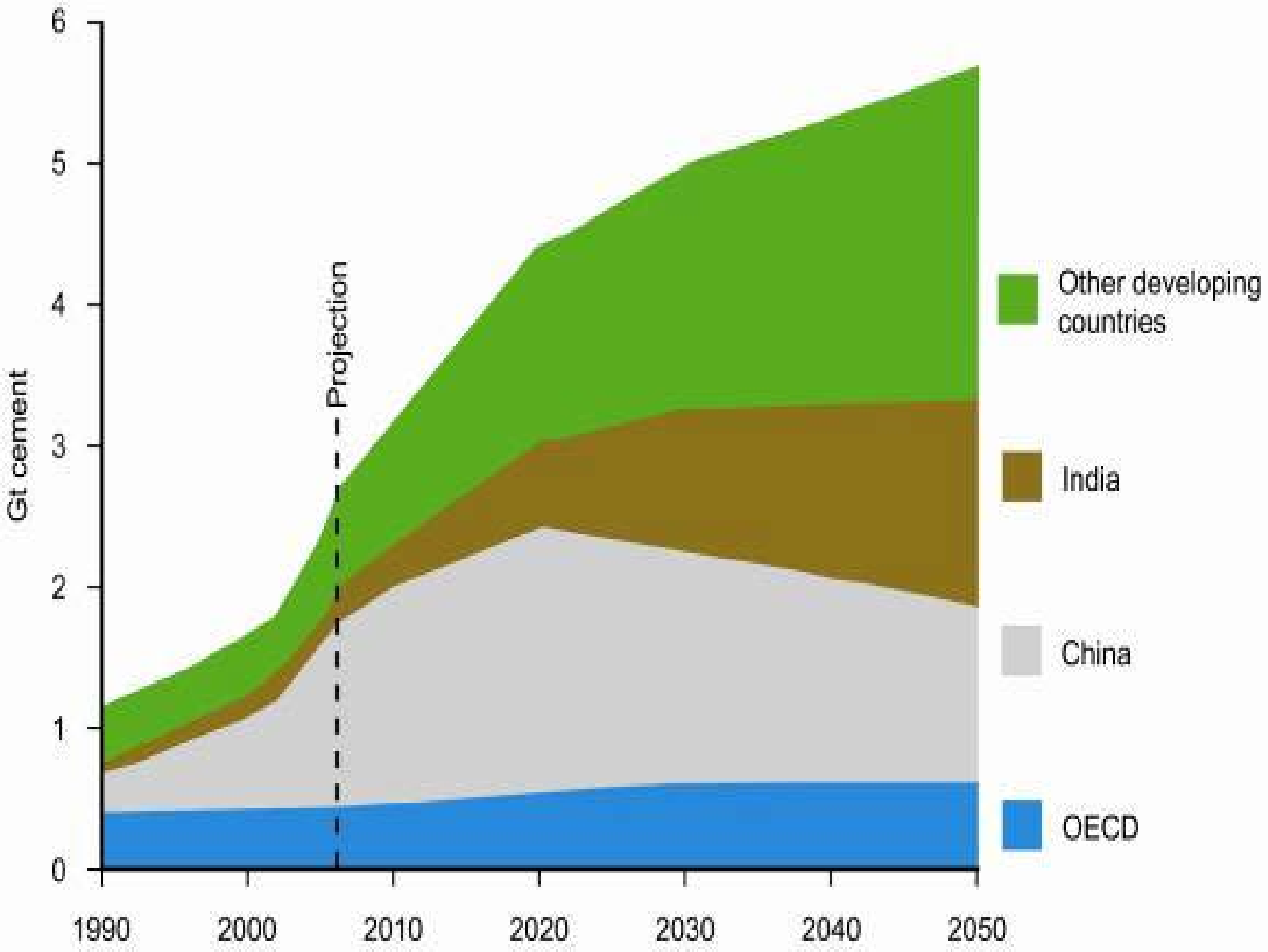


All Energy Sources

Million Metric Ton
Coal Equivalent



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates



Alternative Cement - Geopolymers.

- They are formed by reaction of an aluminosilicate powder with an alkaline silicate solution and require no special curing.
- Geopolymer cements enables a five fold energy efficiency and greenhouse gas emission reduction according to LCAs including all aspects of production. Net Balance Foundation (2007) '*Zeobond carbon emission life cycle assessment of geopolymer concrete*'. Net Balance Foundation.
- Geopolymers can be manufactured at room temperature using fly ash (currently >70% of fly ash goes to landfill) as main feedstock. Provis, J., and van Deventer, J. (eds) (2009) *Geopolymers: Structures, processing, properties and industrial applications*, University of Melbourne, Australia, Woodhead Publishing Limited, England
- 2007/8 studies of 1960s Ukraine and Russian geopolymer buildings show that geopolymers have better durability. Xu, H. Provis, J.L., van Deventer, J., Krivenko, P.V., (2008) *Characterization of Aged Slag Concretes*. ACI Materials Journal, March-April 2008.

Leading Australian Geo-polymer R&D Programs

- University of Melbourne www.chemeng.unimelb.edu.au/geopolymer/
- CRC Sustainable Resource Processing - CSIRO, Curtin Uni at <http://cmr.curtin.edu.au/areas/geopolymers.cfm>
- CSIRO - <http://csiro.au/science/Geopolymers-Overview.html>

First Australian Geopolymer Commercialisation

- Zeobond Pty Ltd – <http://www.zeobond.com>
- Further Information Freely Available through Smith, M et al (2009) *Factor 5 in eco-cement: Zeobond Pty Ltd*. CSIRO ECOS magazine at http://www.ecosmagazine.com/?act=view_file&file_id=EC149p21.pdf

Novacem (UK) - <http://novacem.com/technology/novacem-technology/>

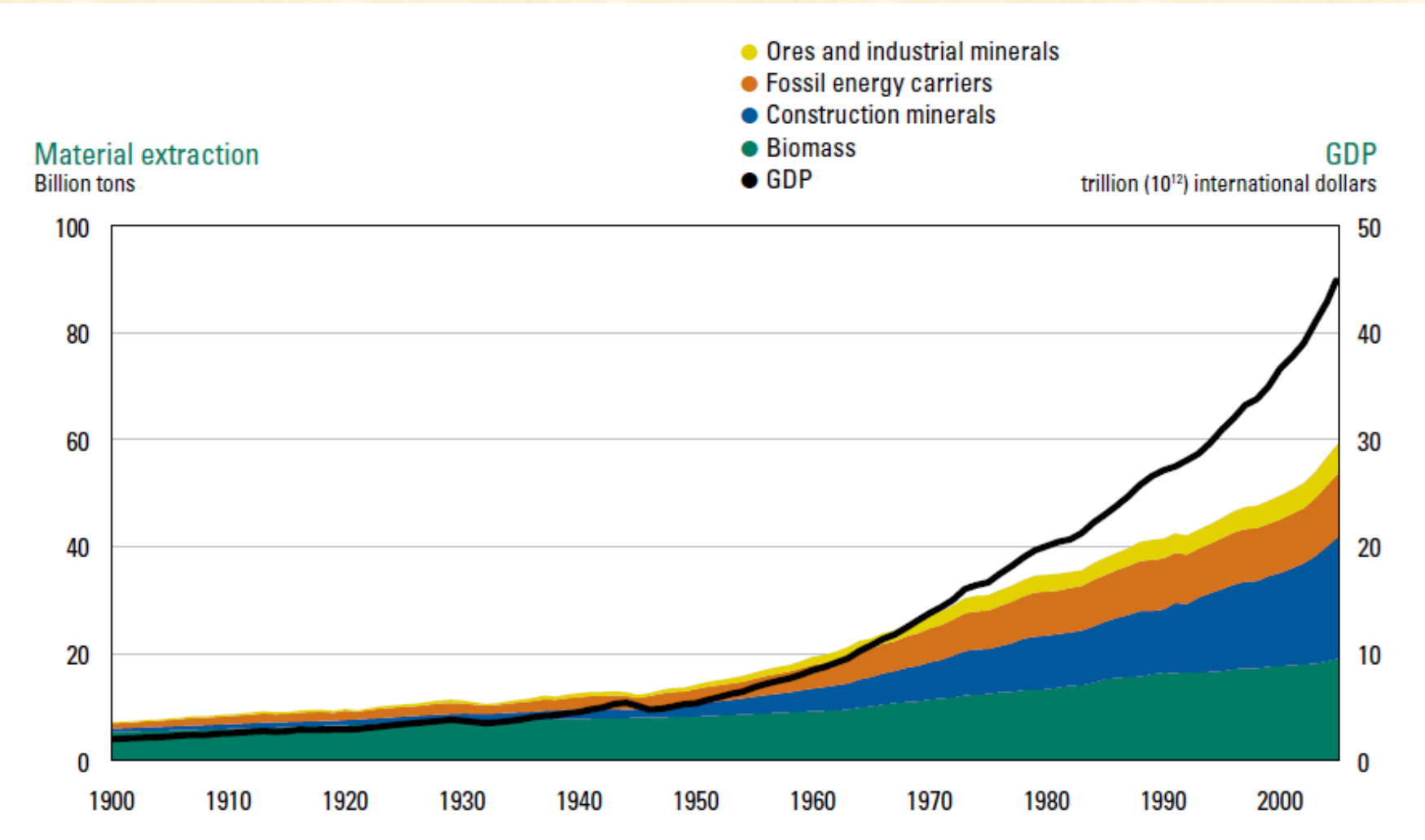
Los Gatos Calif.-based Calera, USA. - <http://www.calera.com/>

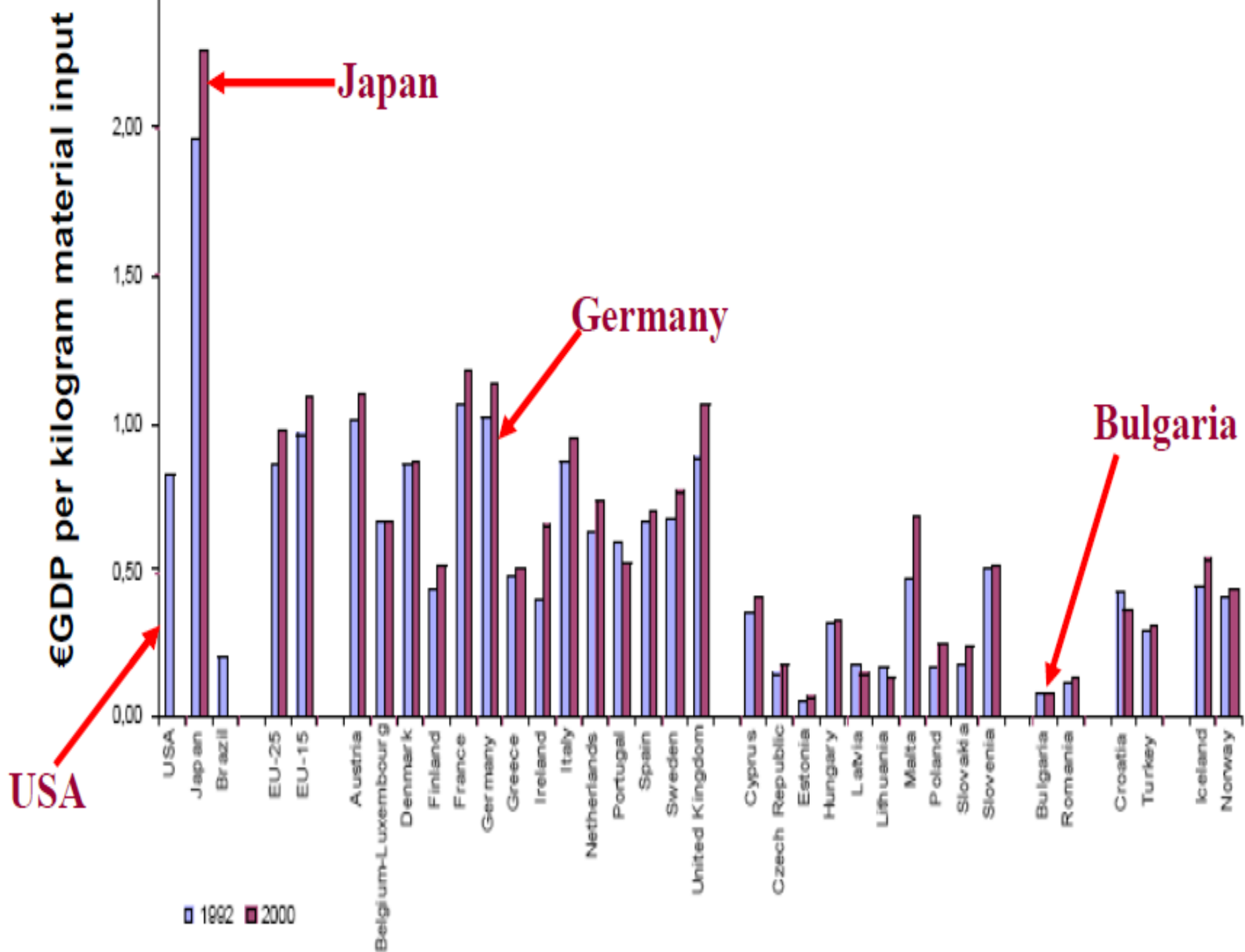
Sriya Green Materials, in Marietta, USA.

Manufacturing – International Collaboration Opportunities.

- Globally, the manufacturing sector contributes more than any other industry sector to GHG emissions.
- Biggest impact is over the life cycle of products. Eg: Carbon LCA of chemical products by McKinsey, reveals that GHG savings enabled by the chemical industry are more than double the industry's emissions (Insulation) @ <http://www.petrochemistry.net/climate-change-and-petrochemical-industry.html>
- Almost all manufactured appliances that involve heating and cooling are poorly insulated. Commercial Ovens, Cooking & Industrial Equipment, don't have MEPS.
- Australia showed any nation can punch above our weight eg: Banning Inefficient Lighting.
- Further info Lecture 5.2: Energy Efficiency in Manufacturing http://www.naturaledgeproject.net/Sustainable_Energy_Solutions_Portfolio.aspx#EnergyTransformedLecture6_2

Global resource extraction – 1900-2005

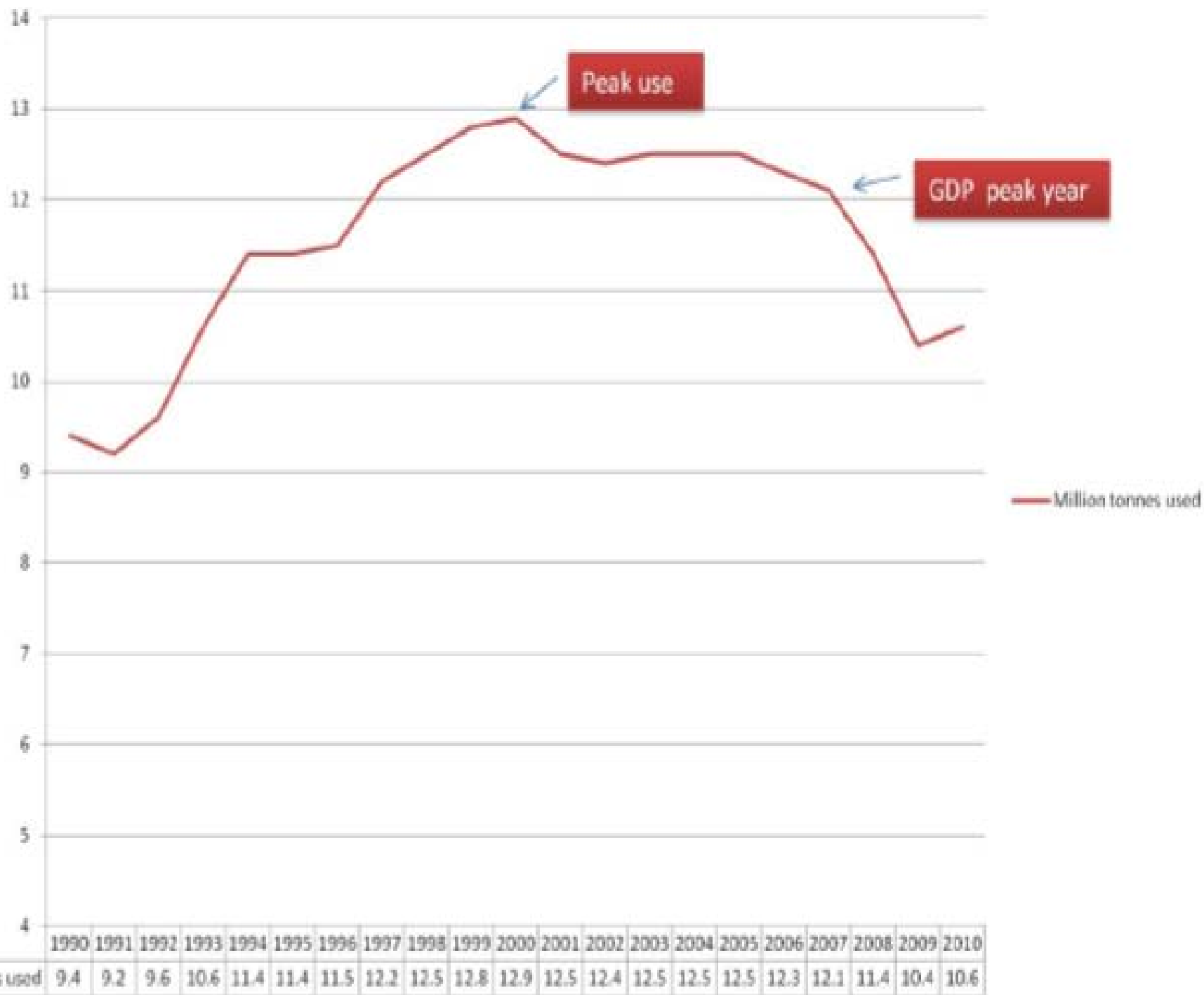


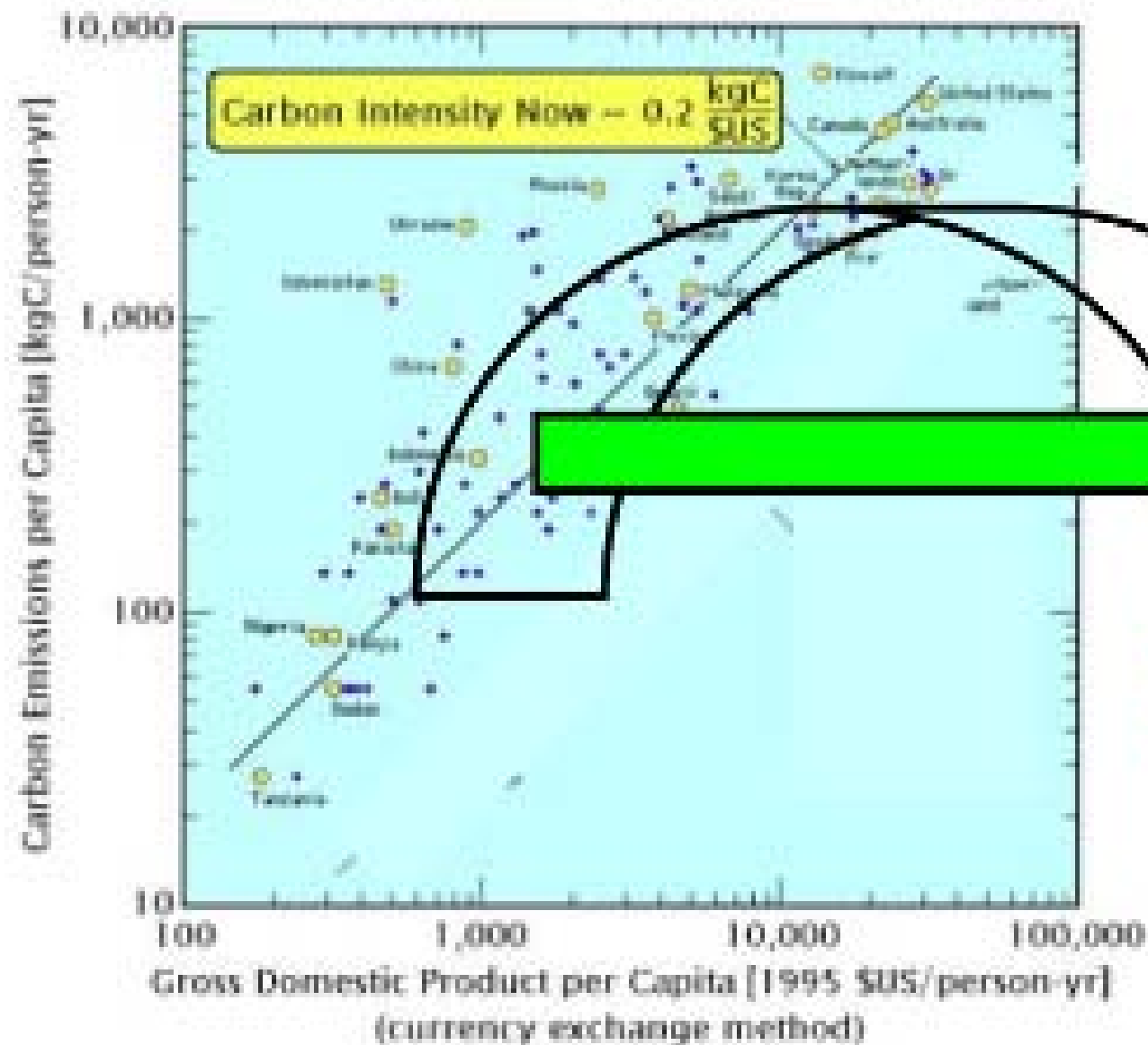


Green Transformation – Materials .

Transition towards a cyclical material society.

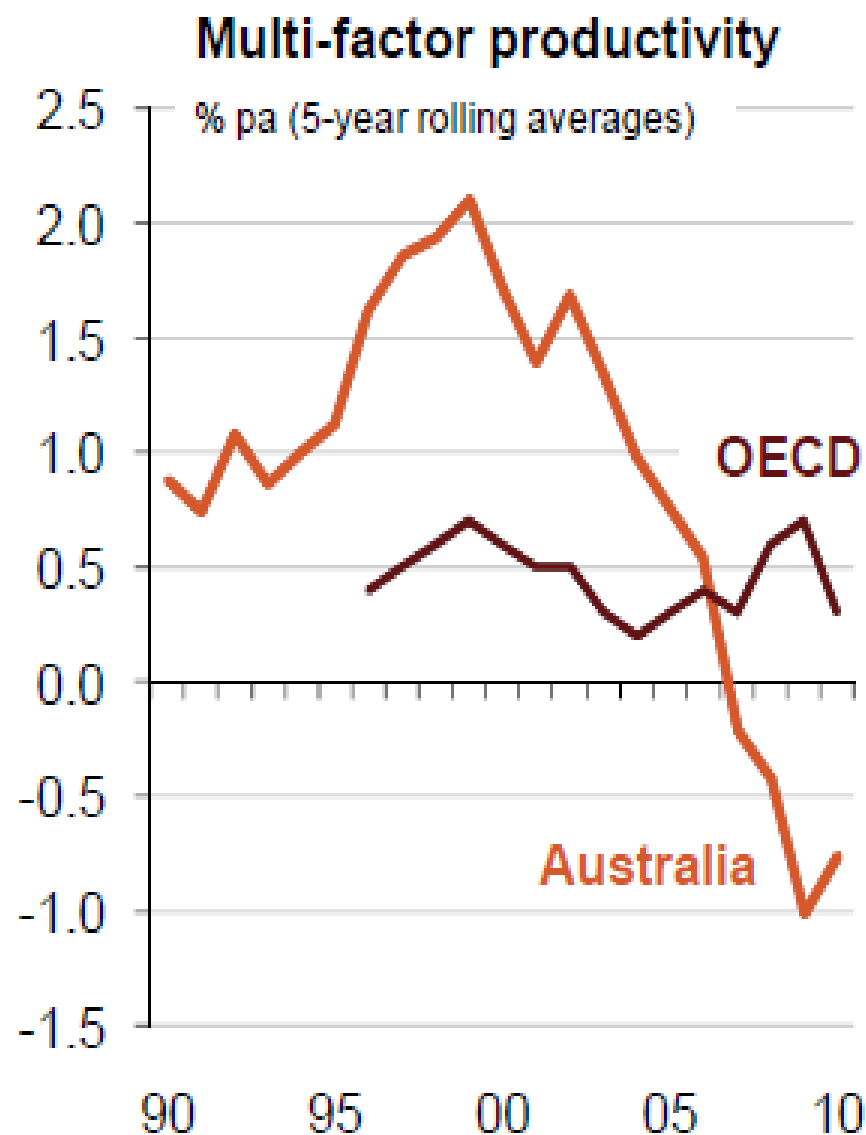
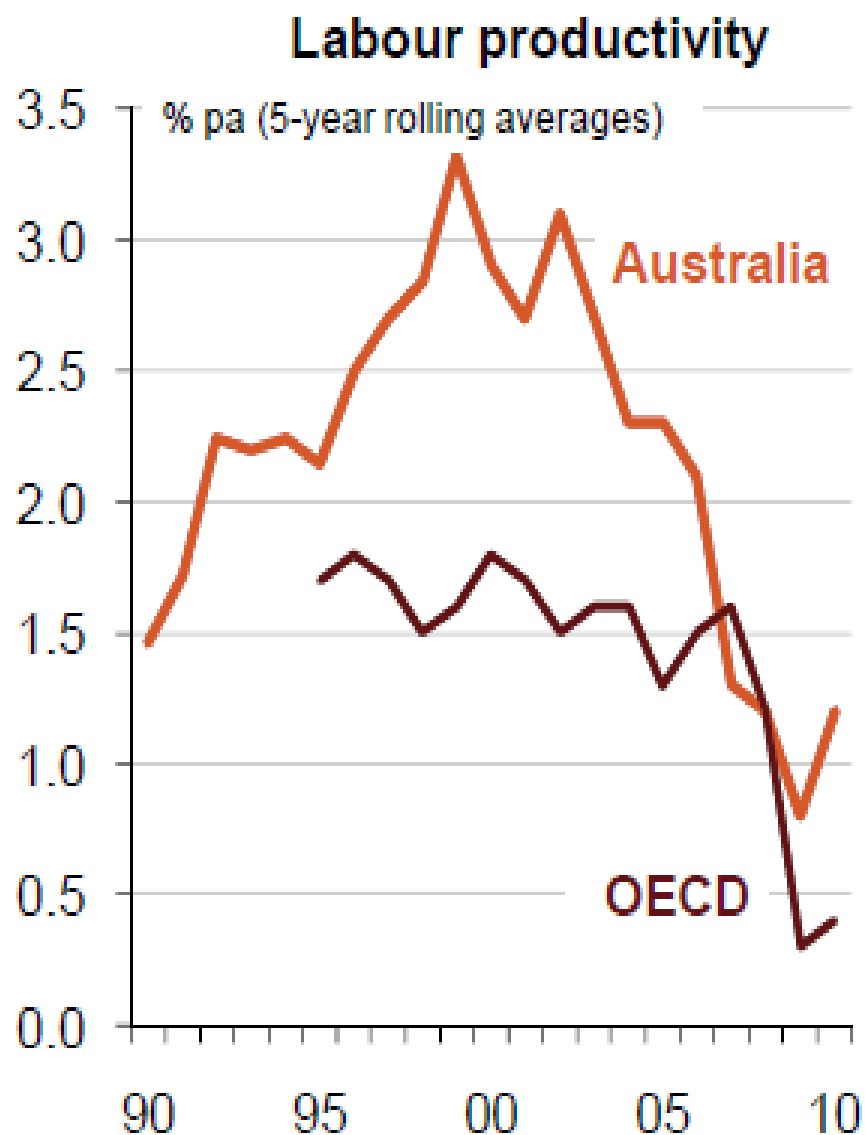
- Current global recycling rate only 25%, technical potential to lift to 85% (UNEP, Green Economy, 2011)
- Only 15% of all e-waste is recycled.
- The UNEP International Panel on Resources estimates that out of 60 surveyed metals, only 18 are currently recycled at rates above 50%, and 36 metals have recycling rates of less than 10%, leaving significant scope for further progress in this area.
- Less than 1% of rare earth metals are currently recycled.
- Glass can almost 100% be recycled, yet glass recycling rates in the USA are only 20%.





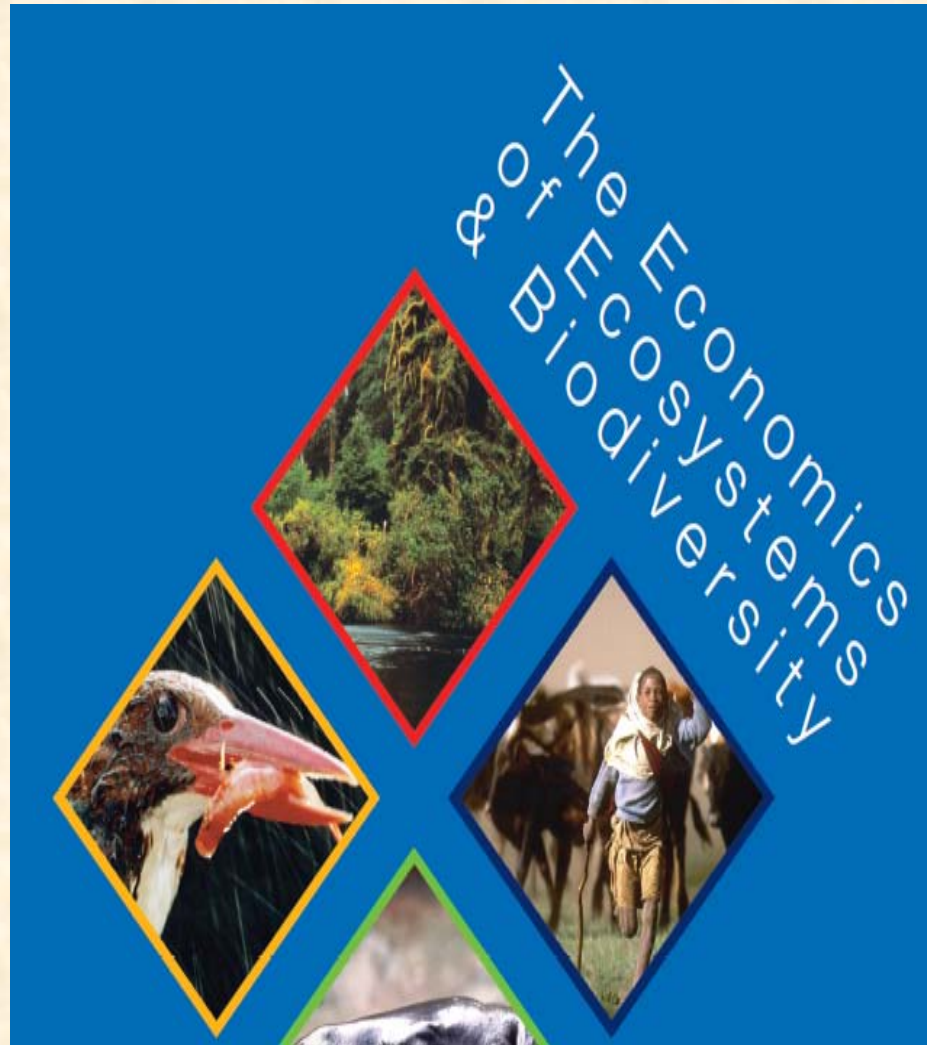
**„rich and
carbon free“**

Chart 6: Australian and OECD productivity growth

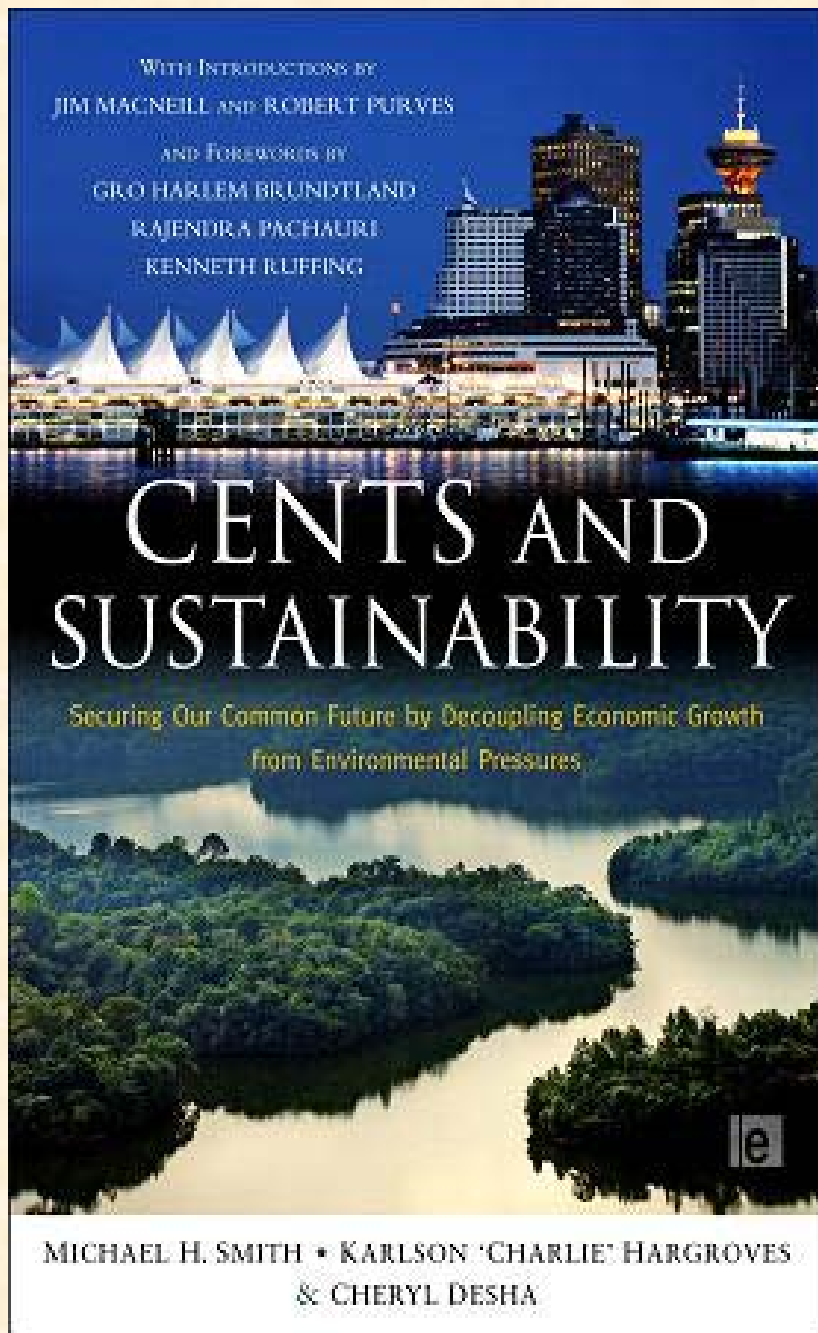


Note: OECD labour inputs measured as persons employed (as opposed to hours worked).

Sources: ABS; OECD; The Conference Board.



<http://teebweb.org/>



‘Since the Brundtland Report we have long awaited a book that tackles the formidable analytic task of developing a framework & realistic strategy to simultaneously achieve environmental sustainability, economic and jobs growth, and poverty reduction. Now with *Cents and Sustainability* that wait is over. ’

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