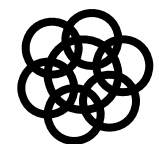
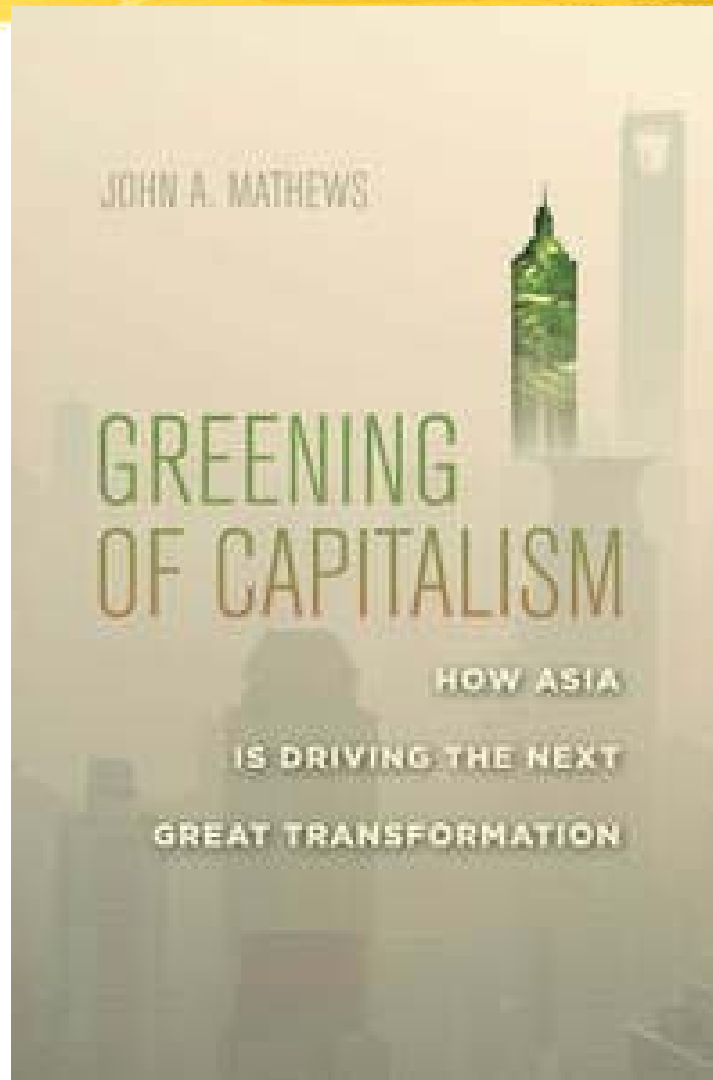


What is driving the greening of China? China in the new political economy

**SPERI Conference
Sheffield University
1 July 2014**

**Professor John A. Mathews
Professor of Strategy, MGSM, Macquarie University, Sydney**

*Greening of Capitalism: How Asia is Driving the Next
Great Transformation*



Industrial dynamics perspective: Why renewables provide the best form of ‘energy security’

The green transition – in many ways, the biggest business transition there has ever been, the **biggest business opportunity of 21st century**

But what dominates debate is a mainstream economics perspective – carbon taxes; cap and trade; a cost-based perspective

Viewing green programmes solely as carbon emissions-reducing vehicles is self-defeating – places programmes outside evolutionary and entrepreneurial business dynamics, and sets up false dichotomy: development vs. zero-growth

Instead, can view green growth as part of a larger transition

*China’s pursuit of renewables (to complement its coal-based energy) is not a moral imperative, but an economic imperative

Renewables are manufactured devices, and can be utilized anywhere -- energy is harvested, and captures increasing returns

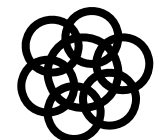
*Renewable power viewed not as a carbon-reducing technology, but as based on manufacturing – thereby enhancing energy security

A powerful source of energy security



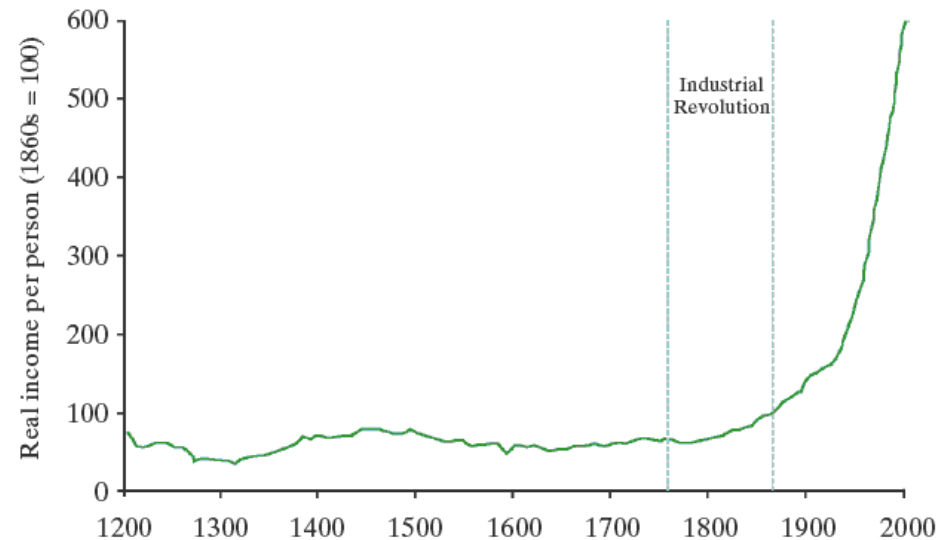
Twelve theses on greening of capitalism

1. Fossil-fuelled industrialization has lifted billions out of poverty
2. ... but in its 'Business as Usual' form it cannot scale
3. Kyoto, carbon taxes or CSR will not work on their own ...
4. But China's green development model could provide a solution
5. In China, and around the world: competitive emulation will drive diffusion
6. Transition dynamics driven by cost reductions will be compatible with growth
7. But a transformation will require smart government intervention ...
8. ... and private sector financing attracting institutional investors
9. Government policy settings will be critical to building confidence
10. Fast-follower latecomer strategies will prosper ...
11. ... while the outcome is anything but determined
12. Greening is a vast new business opportunity, not a cost



Why China wants to industrialize: Growth of per capita income, England, 1260s – 2000s

REAL INCOME PER PERSON IN ENGLAND,
1260s–2000s



Source: Gregory Clark, *A Farewell to Alms: A Brief Economic History of the World*

A view of the Industrial Revolution as escape from the ‘Malthusian trap’

Agrarian economy: as income rises, so does population

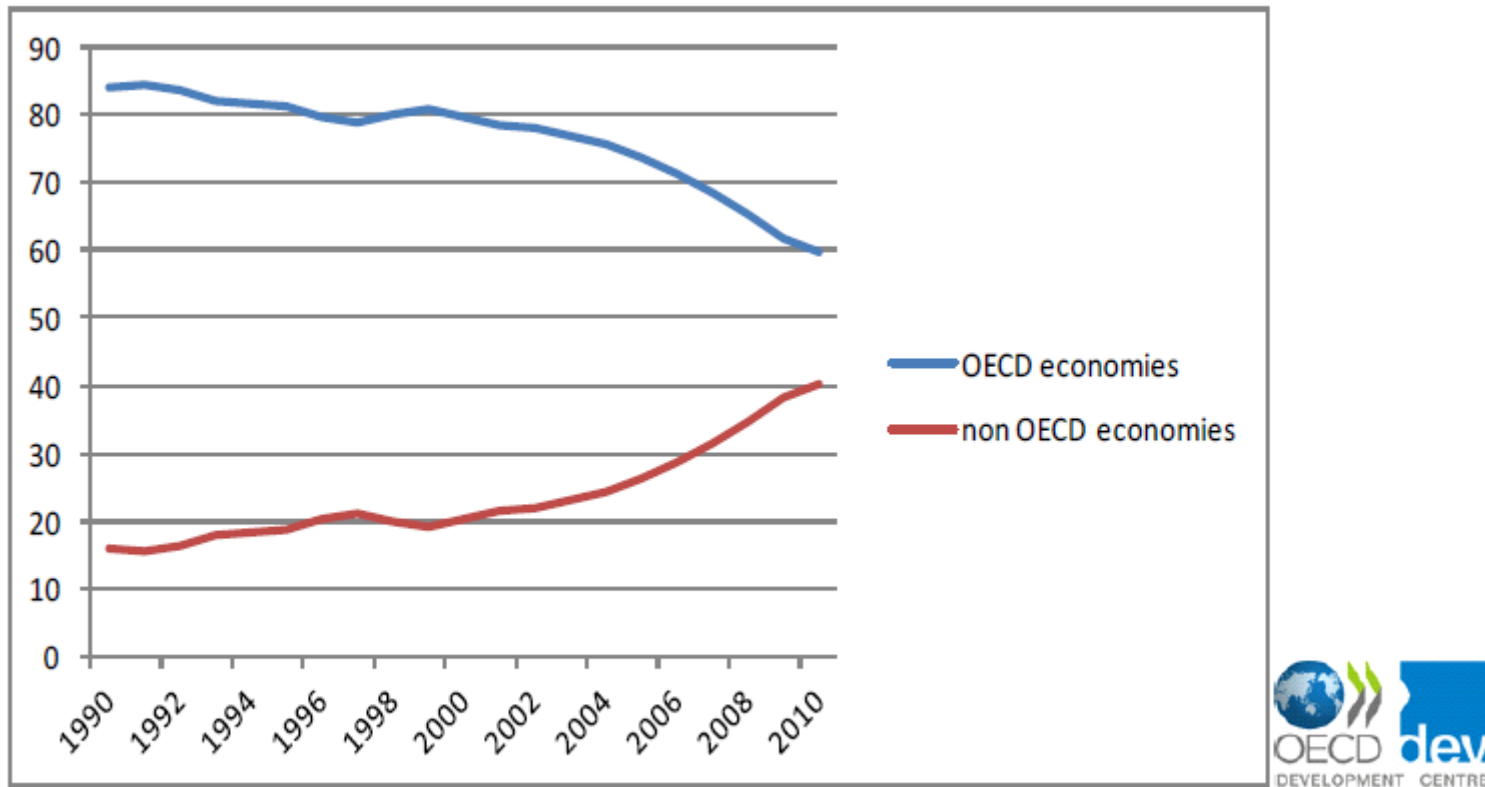
Industrial economy: can sustain endless rises in per capita income

So long as resource barriers are not infringed

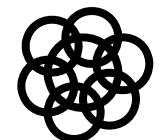
Fortuitous role of fossil fuels: Created a ‘subterranean forest’ (Sieferle)

Shifting Wealth: Manufacturing is shifting East

Share of manufacturing industry value added in total world manufacturing value added, 1990-2010

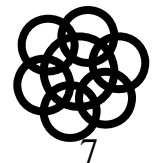
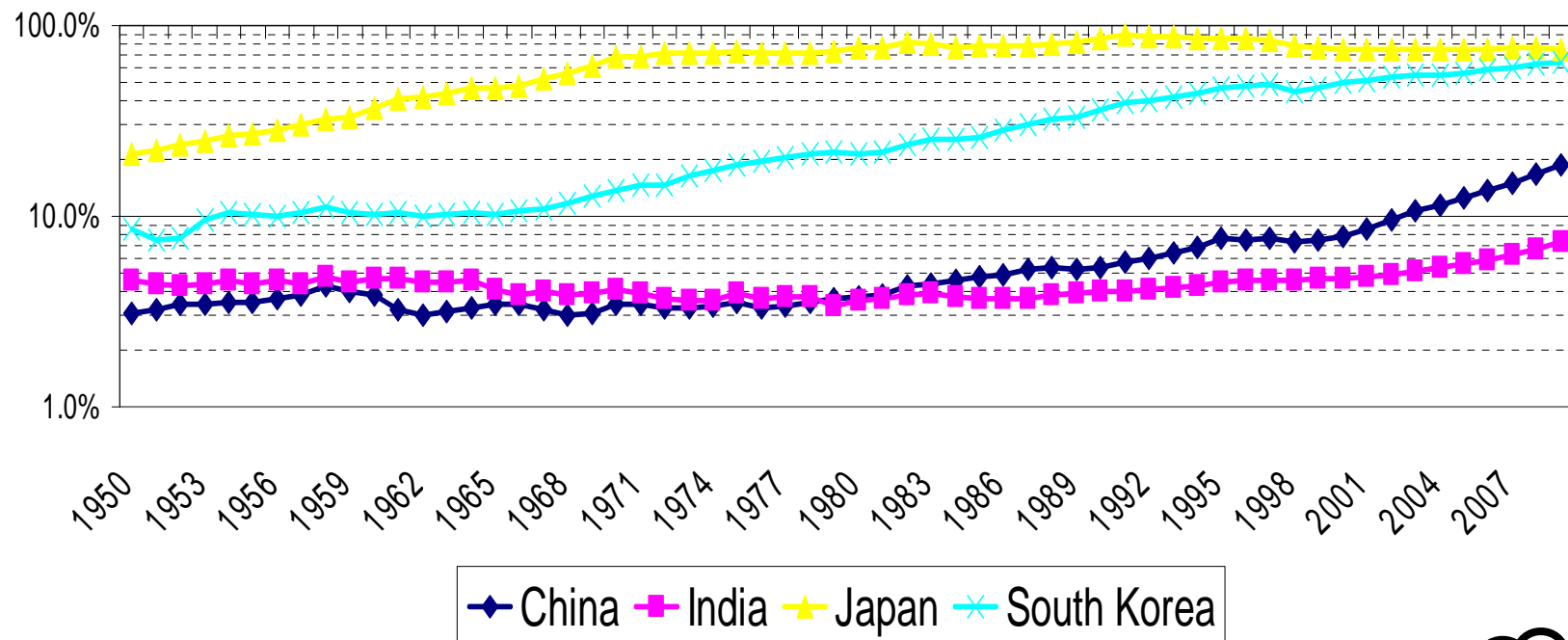


SOURCE: OECD Development Centre based on IHS Global Insight, special tabulations (2011) of World Industry Service database.
Note: OECD: no data for Austria, Estonia, Greece, Hungary, Iceland, Luxembourg, Portugal, Slovak Republic, Slovenia.

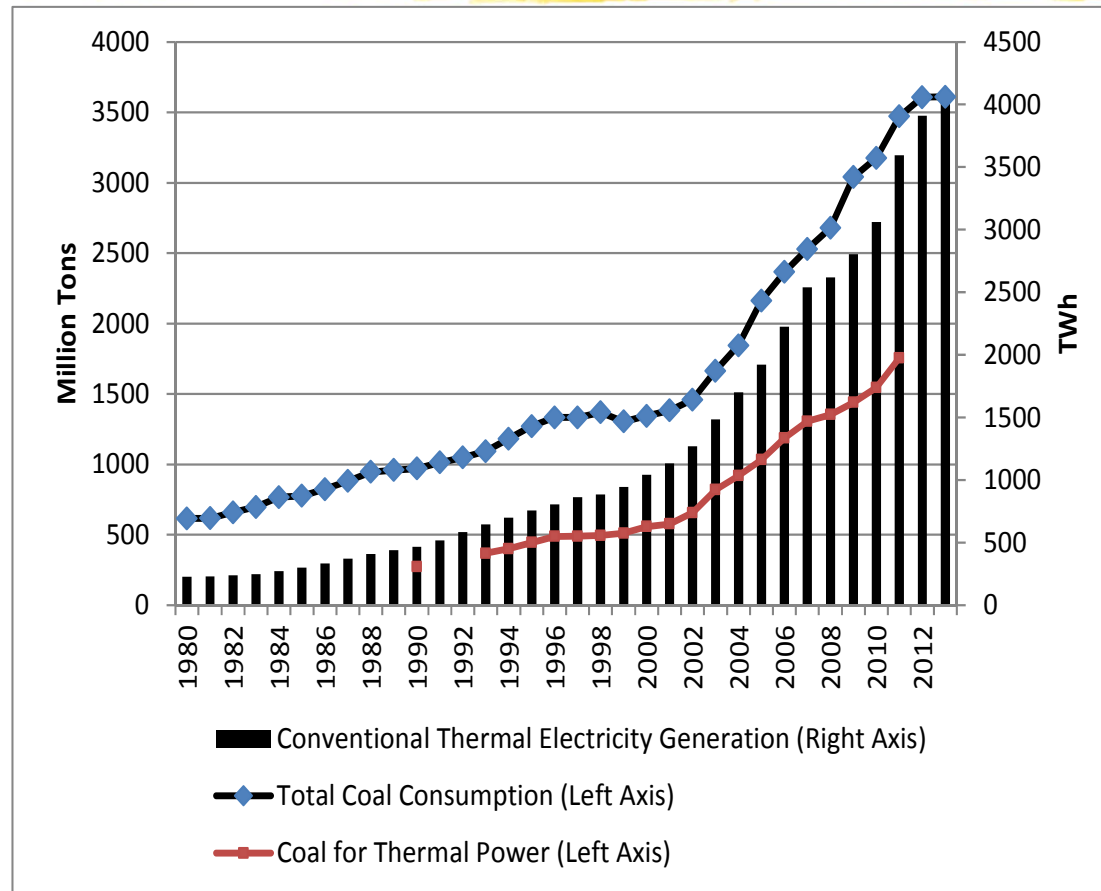


The “great convergence” Asian convergence GDP per cap

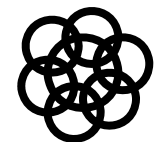
ASIAN CONVERGENCE (relative to US GDP per head, at PPP)



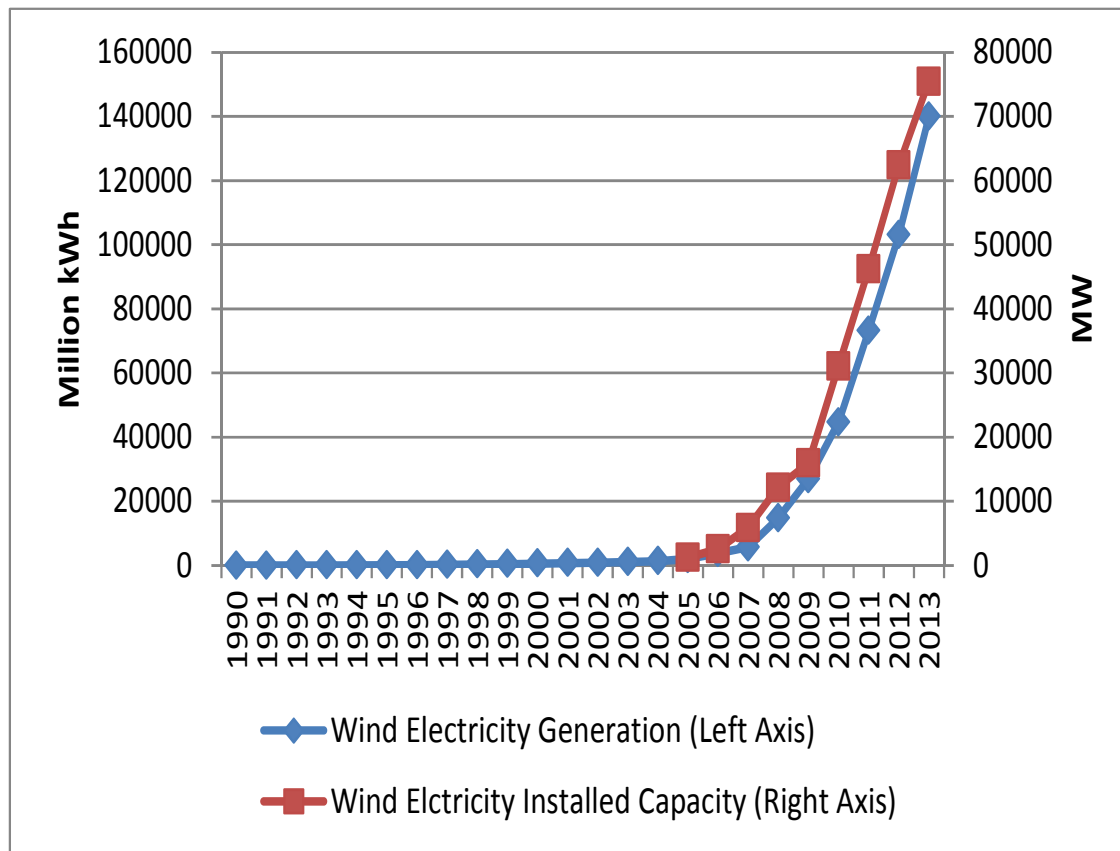
One face of China: Chinese power generation and rising coal consumption



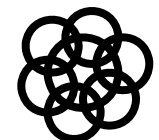
Source: Mathews & Tan; primary data: US EIA,
China Electricity Council



A different (green) face of China: China's build-up of wind power



Mathews & Tan: Source of primary data: US EIA;
World Wind Energy Report



The issues

Can China (and then India) scale an industrial production system that will lift not just 1 billion people out of poverty, but 5-6 billion?

What would be the implications of China following a BAU pathway – using coal, oil, gas in the way that Western countries did?

Can the ‘western’ industrial model scale in this way? Answer: No

But can an alternative be built, and in time?

Can China go beyond building the largest renewable energy system on the planet?

Or will ‘carbon lock-in’ doom us all?

Can carbon taxes and carbon markets make a sufficiently strong difference?

Can corporate and social responsibility save the system?

How can state intervention drive the transition?

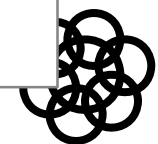
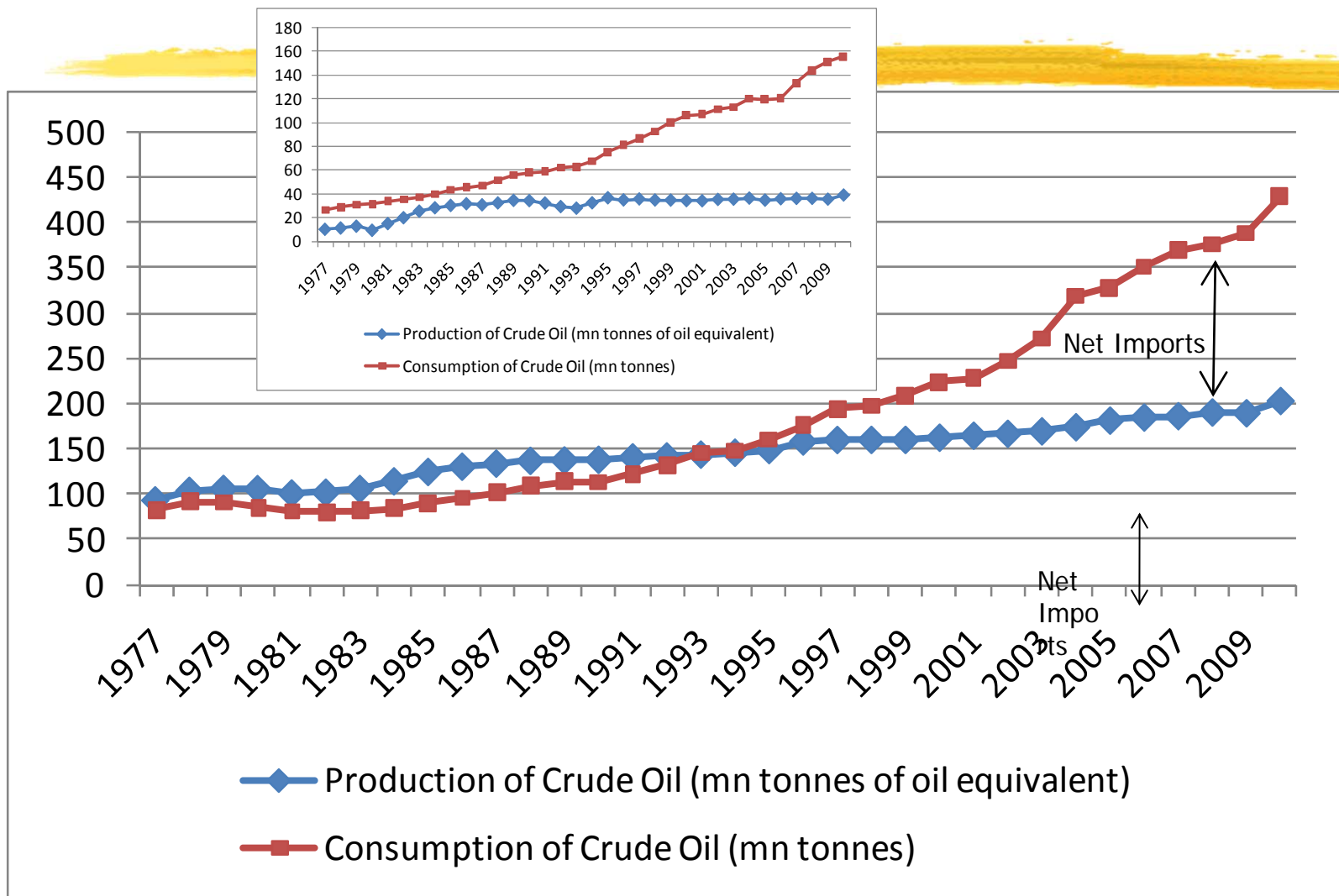
Big questions, big issues

Need ‘big’ social science research, to illuminate the ‘next’ Great Transformation’

First question: Is the fossil fuel era coming to an end?

How can China (and India) gain energy security?

The energy issue and development: China's (India's) looming oil/energy gap



Financial Times: China now world's largest oil importer

October 9, 2013

The new gas guzzler

By Ed Crooks and Lucy Hornby

China has overtaken the US as the world's top oil importer.

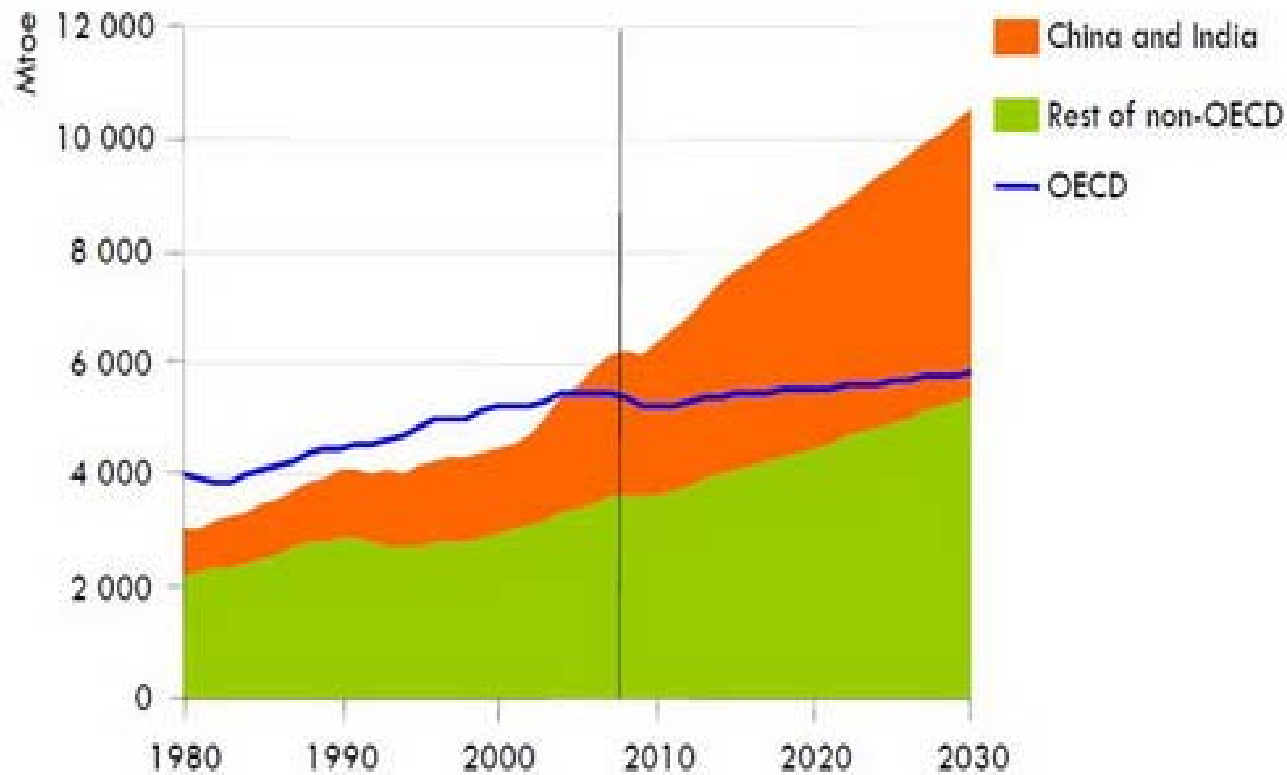
Therefore – China most vulnerable to rise and fall of oil prices ...

Energy security counts as most important issue in China

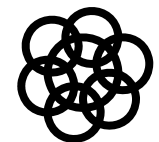


Oil consumption shifting to China and India

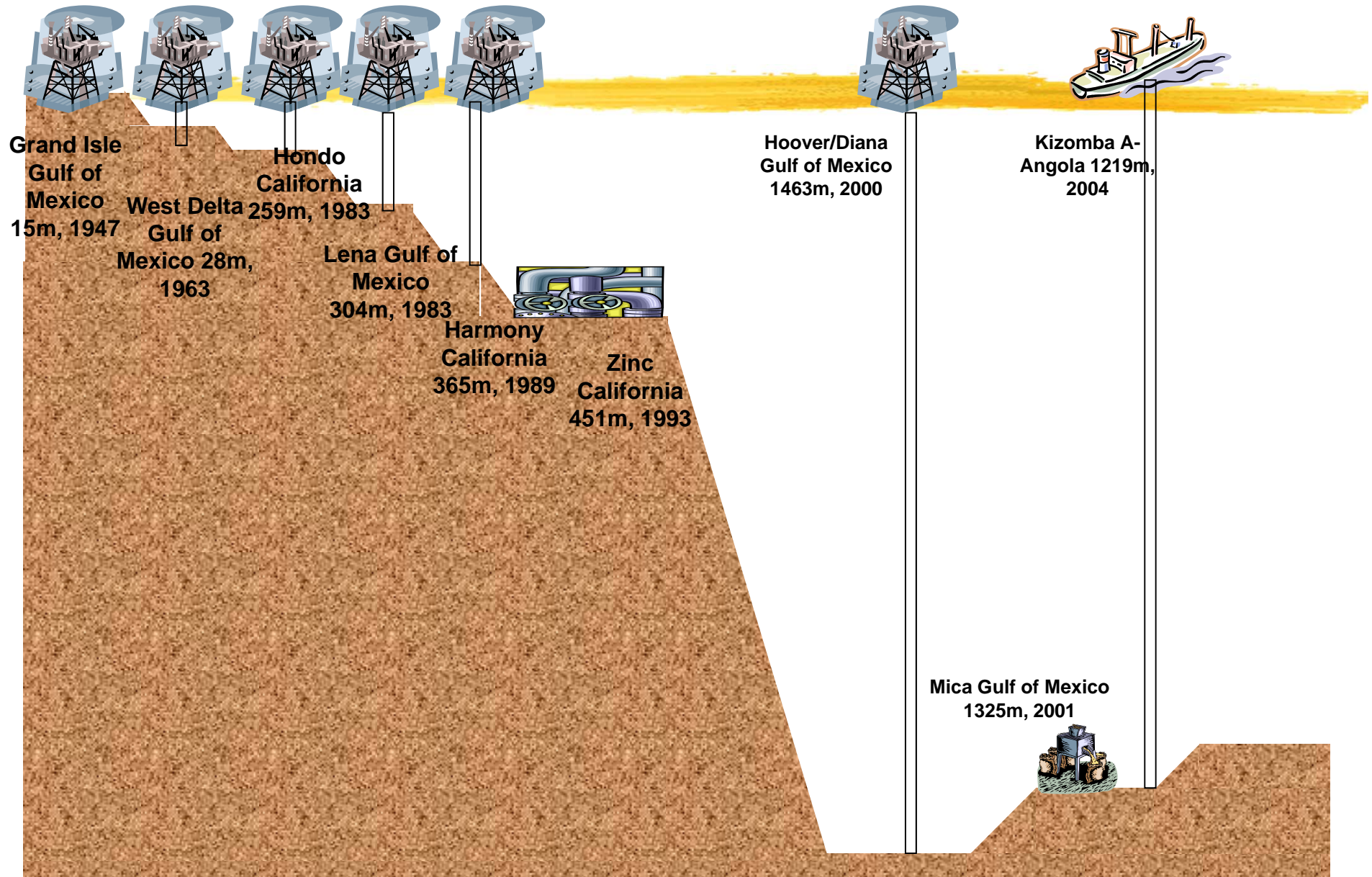
The IEA's 2009 report shows that China and India will continue to expand their oil consumption, but OECD countries are tailing off



Source: IEA 2009



Extracting oil is increasingly difficult and expensive

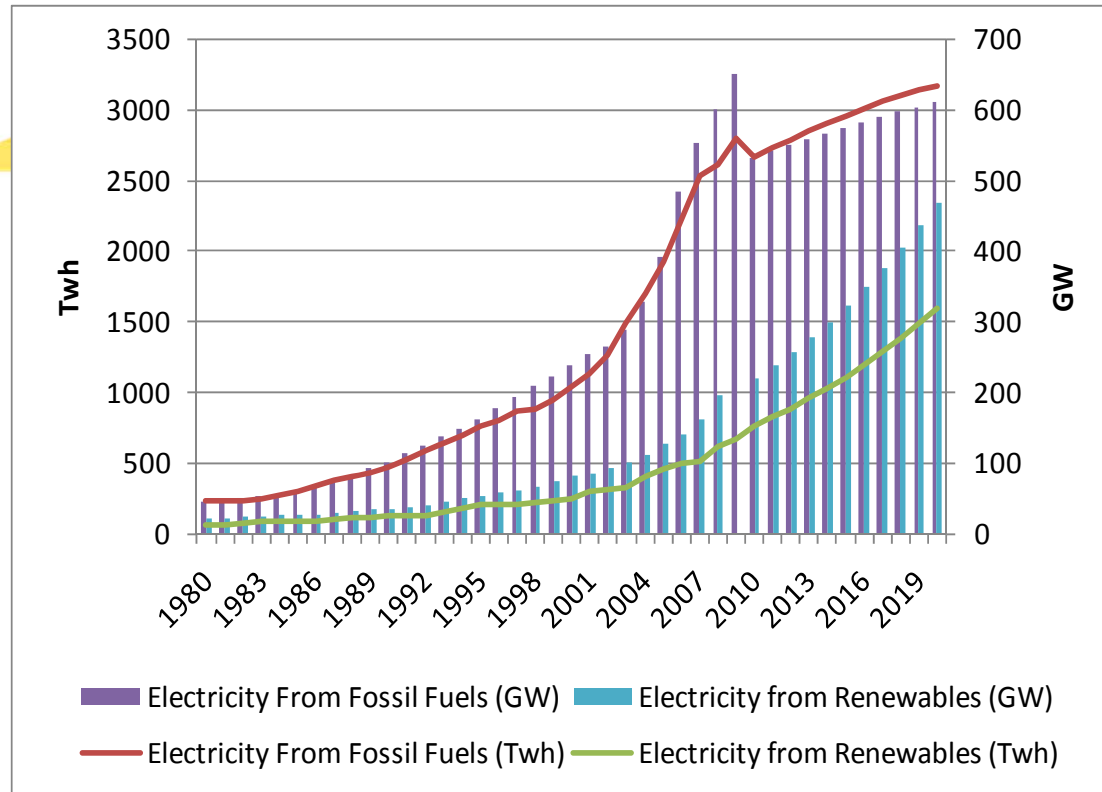


How we became dependent on the motor car – and oil

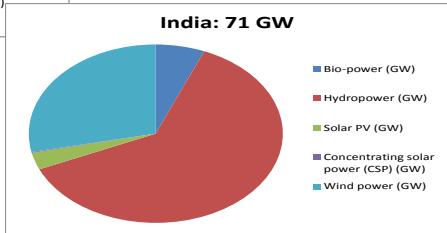
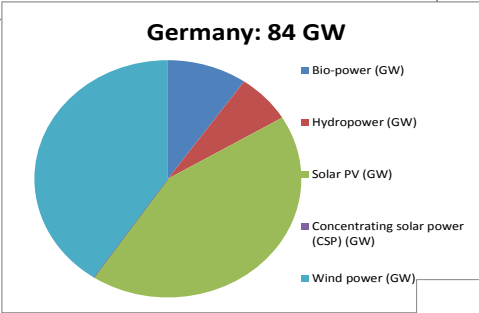
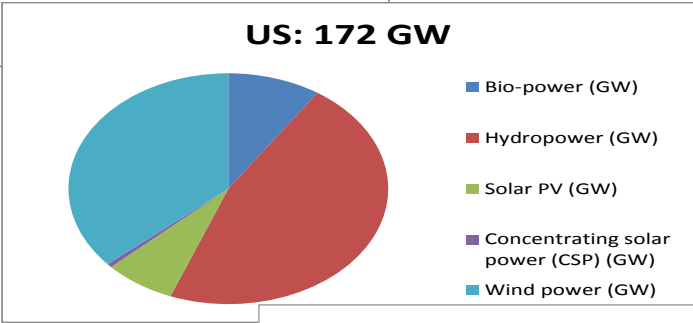
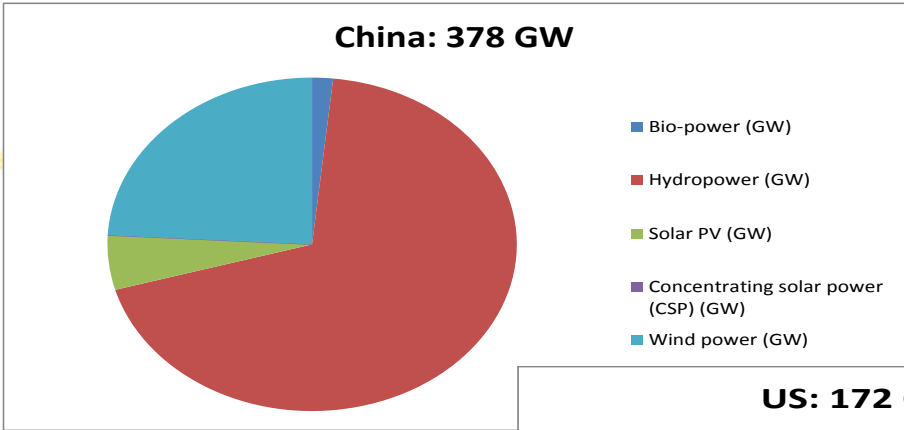
Ten years that changed the US



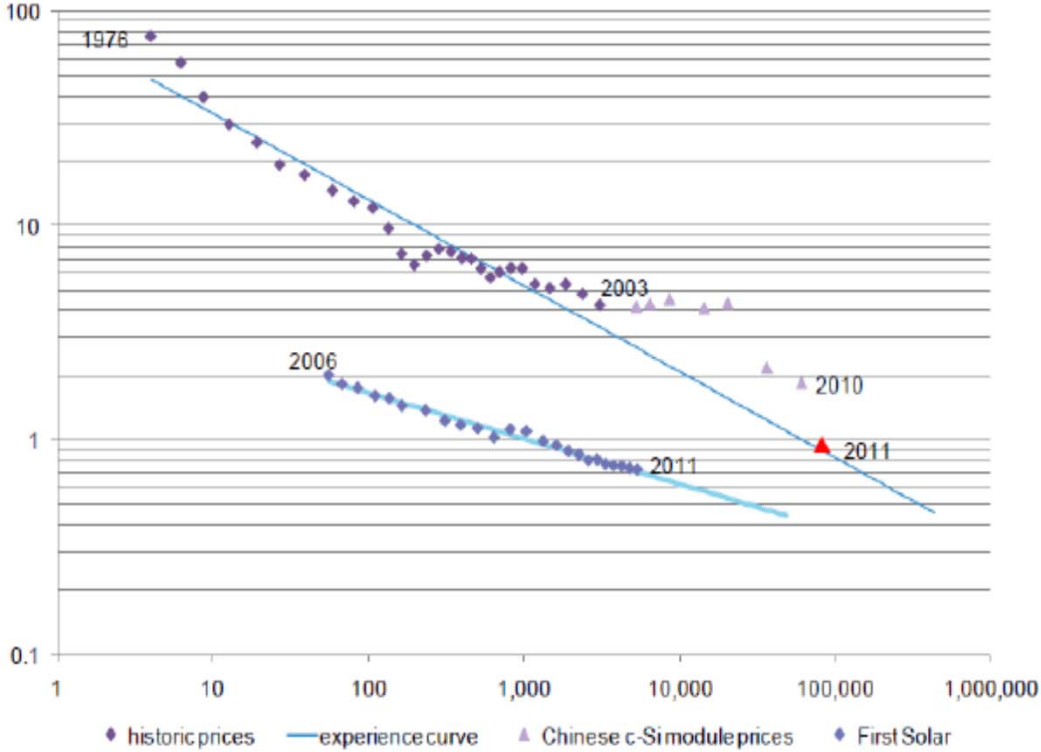
China: electric power generation, up to 2020: Renewables 30%



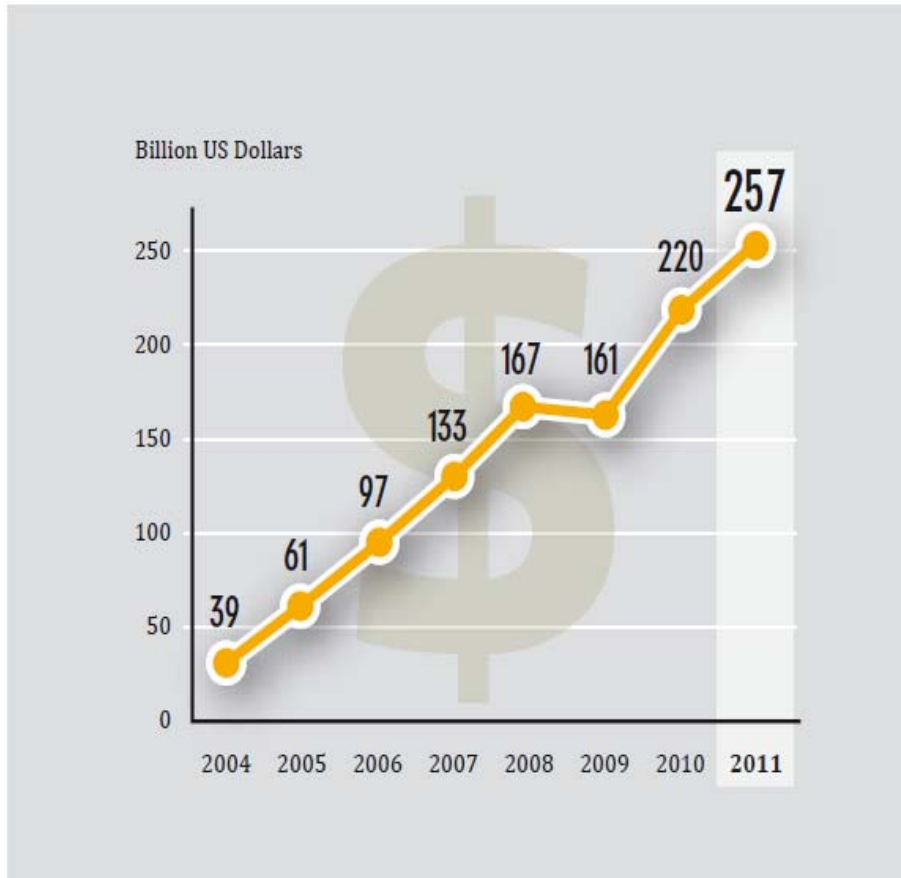
China's renewable power system cf others



Solar PV becoming universal: Learning curve (BNEF)



Investment Flows

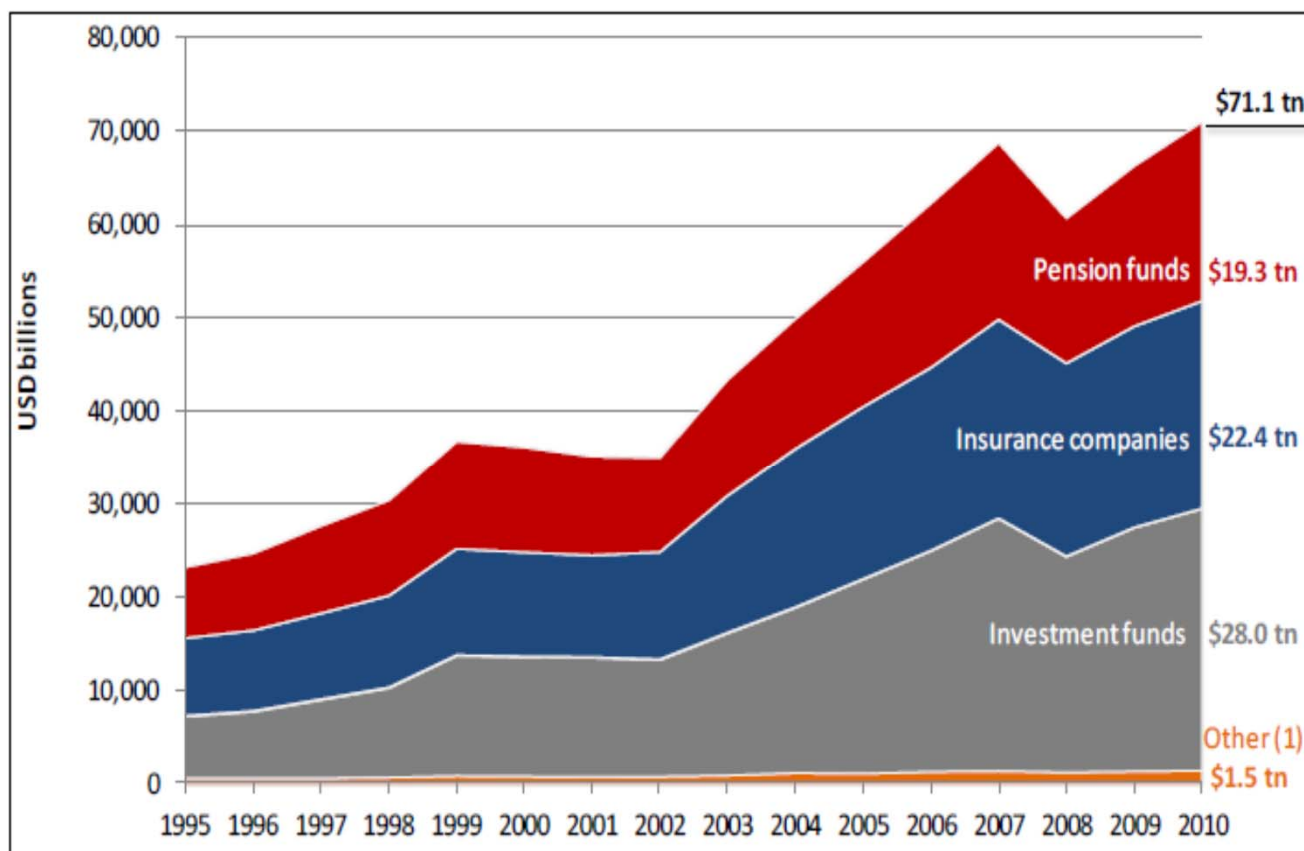


Source: UNEP/Bloomberg: Global Trends in Renewable Energy Investment 2011

- Total global investment in **RE jumped** in 2011 to a record of \$257 billion, up 17% from 2010
- This is 6 times the level of investment in 2004 and 94% more than the total investment in RE in 2007
- Total investment exceeds
 - \$267 billion including estimated \$10 billion (unreported) invested in solar hot water
 - ~\$282 billion including the \$25 billion invested in large hydropower (>50 MW)
- Despite the rise in investment, the rate of growth of investment was below the 37% rise in investment from 2009 to 2010

2012

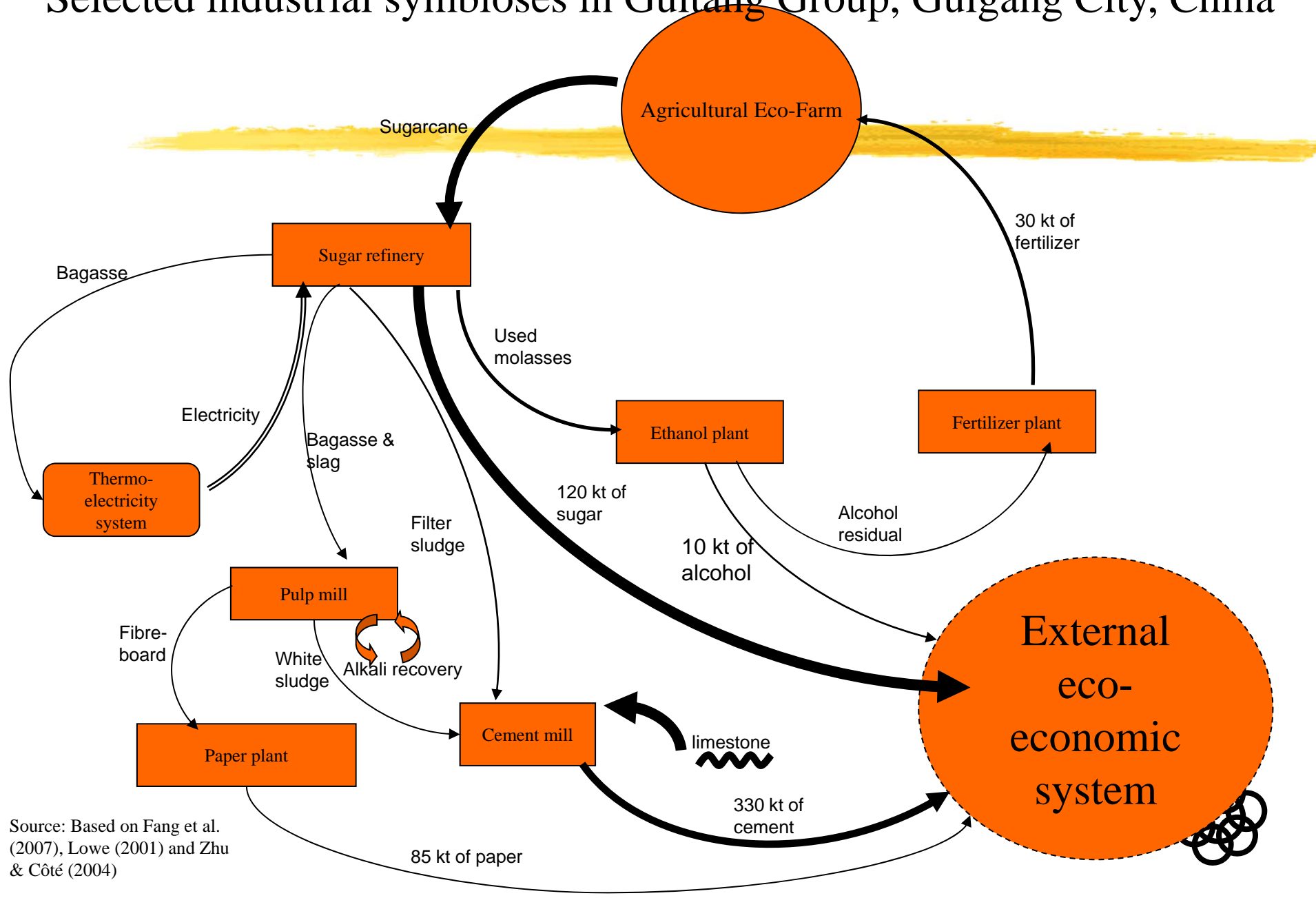
Funds available for investment (Institutional investors)



Source: OECD Global Pensions Statistics and Institutional Investors databases and OECD estimates¹⁵

Source: Andersen (2002) Fig. 1, based on Mitchell, B.R. (1988) *British Historical Statistics*. Cambridge: Cambridge University Press, p. 541. [Data for Ireland are not included. The data for 1868–70 are lacking or are problematic.]

Selected industrial symbioses in Guitang Group, Guigang City, China

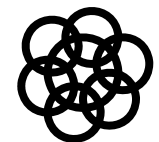


Source: Based on Fang et al. (2007), Lowe (2001) and Zhu & Côté (2004)

World's biggest business opportunity – investing in green industries
Who will join these entrepreneurs?

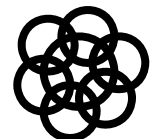


Elon Musk (Tesla Motors);
Wang Chuanfu (BYD);
Masayoshi Son (Softbank



FINANCE: Investments needed for a renewable energy upsurge 2010-2050

- A 10 trillion watt expansion 2010-2030
- Doubling of present electric power levels
- To be driven by China and Germany (plus Japan?)
- At Euro 4 per Watt (\$5/W), investment of \$50 trillion needed
- Dwarfs current investment (\$200 billion in 2010)
- Dwarfs public resources, e.g. \$100 billion committed to Global Climate Fund (Cancun 2010)
- Private sector financial instruments needed on huge scale
Climate bonds; Green banks (e.g. CEFC in Oz)
Equity finance not yet helping – Stock Exchanges still promoting Fossil-fueled investments
- BUT: global pension fund system and institutional investors have \$71 trillion under management
- How to tap these funds????????????????????



‘Climate bond’-like financial instruments

European Investment Bank (EIB) **Climate Awareness Bond 2007**

Euro 600m 5-year bond, issued by the EIB (financial arm of the EU through the services of merchant bank Dresdner Kleinwort

World Bank **Green Bonds 2009**

US\$350m 6-year bond issued by the World Bank

Second issue 2009: State of California purchased US\$300m

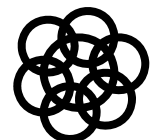
US Treasury: **Green Bonds 2009**

Oct 2009 US Treasury released \$2.2 billion in Green Bonds to power up the financing of renewable energy initiatives

African Development Bank 3-year US\$500 million Green Bond
(Oct 2013) – for funding green growth projects

Many kinds of financial instruments available!

The key to the greening of capitalism ...

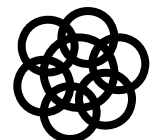


2013: Kexim Green Bond issue

- March 2013 Korean Export Import Bank
- Floats \$500 million 5-year bond designated for climate investments
- Targeted at institutional investors (pension funds, SWFs)
- Oversubscribed
- Funds to be channelled to green projects, audited by 3rd party CICERO (Centre for Int Climate and Env Research, Oslo)
- US investors took 47%; European 32%; Asian 21%
- Kexim has AA3 credit rating – bonds carry little risk
- Projects involving Korean firms around the world
- Coupon payments to be made from consolidated revenues

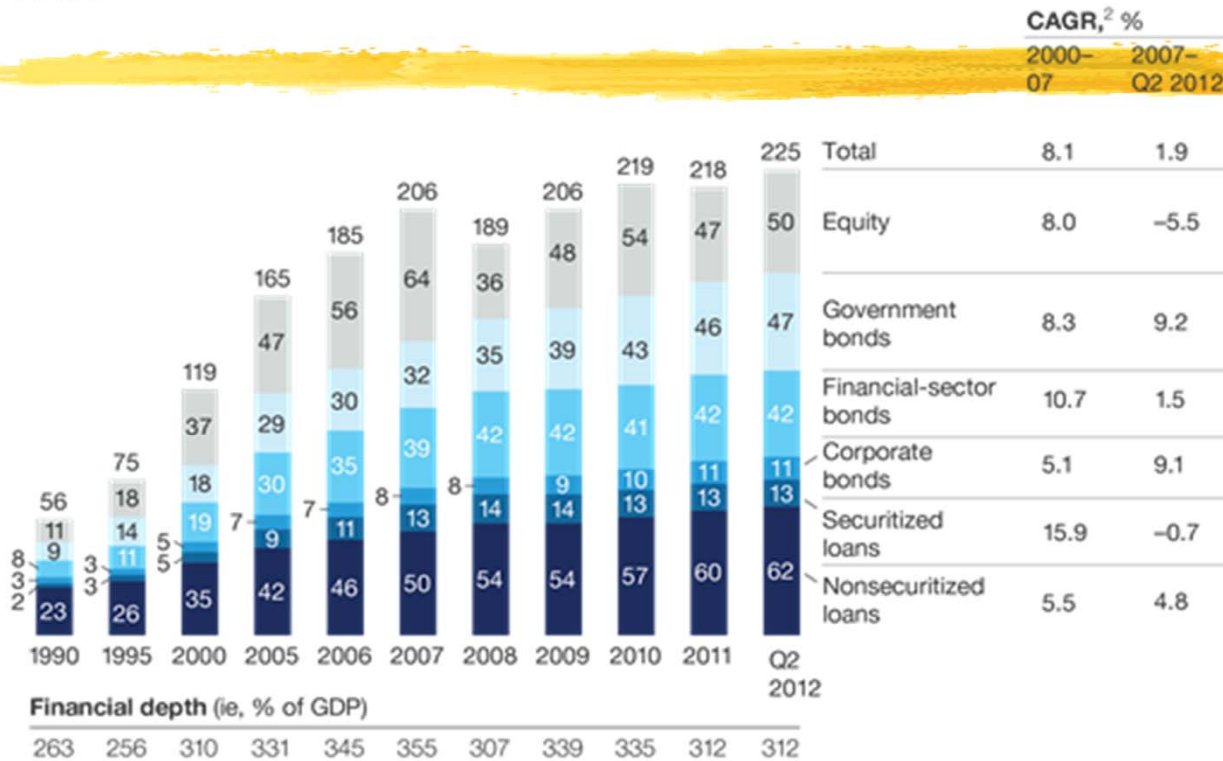
Bonds are serious business – if there is default, this would be counted as sovereign Korean default

Strong discipline for holding to green investment promises



Global financial assets: \$225 trillion Bonds > equities

Global stock of debt and equity outstanding,
\$ trillion¹



¹End-of-year figures for a sample of 183 countries, based on constant 2011 exchange rates. Figures may not sum to totals, because of rounding.

²Compound annual growth rate.

Source: McKinsey Global Institute analysis

Source: McKinseys Global Institute, *Financial Globalization: Retreat or Reset?*
March 2013

The carbon budget: How stock exchanges are still funding the fossil fuel economy (Carbon Tracker Initiative)



What is driving China's energy revolution – and why can we expect India, Brazil et al to follow?

Climate change is probably least of China's concerns

-- after all, US and Eur created around 80% of the problem

More pressing as a driver is to clean the skies of smog: BIG problem

And to solve China's energy security problem

Oil, gas etc. – from Russia, Saudi Arabia, Venezuela, Nigeria

All geopolitical hotspots – threaten war, revolution and terrorism

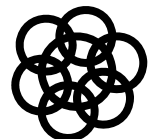
Better: Use **manufacturing industries** to build devices that tap into renewable energies and resource recirculation

Apply China's **latecomer catch-up strategy** to energy and resources problem

Building renewable energy industries creates export platforms of tomorrow (12th Five Year Plan) and drives industrial development

This relieves energy insecurity

And it clears skies What is there to lose?



Issues/debates

The “Age of Renewables” has arrived – China leading the transition

Germany and Japan following; US lagging

Investing in renewables and circular economy --

mitigating climate change – and enhancing energy security,
creating new clean jobs, creating new industries and
export platforms for tomorrow

Carbon credits are not the answer

Merely create “carbon bubbles” – and do nothing to
address stranded assets of “unburnable carbon”

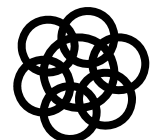
Finance is about to be mobilized at serious scale

Green bonds, climate bonds, green banks

Asian Infrastructure Investment Bank about to be launched

Debt drives Schumpeterian creative destruction

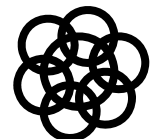
If capitalism created the problem, then it is capitalism that has
to be used to find the solution



Summary of argument: Why “green growth”?

1. The current transition to green (clean) technologies is part of a wider transformation of the global business system
2. The first ‘great transformation’ – an unrepeatabe bonanza created by capitalist institutions and methods combined with fossil fuels
3. Now after 200 years spreading worldwide, driven by Chindia
6 billion mid-income people by 2050, cf 1 billion in 2000
4. But the western model of industrial capitalism does not ‘scale’ to such an expansion; **need new model of green growth**
5. A new model IS being developed, particularly by China (+ Germany, Jpn)
6. ‘New model’ based on changes to:
 1. Energy markets: renewables the default option (manufactured devices)
 2. Resources/commodities: recirculation (Circular Economy)
 3. Finance: from generic to targeted eco-finance
Using financial system and banks to drive investment in green projects
7. This ‘new model’ is based on an **understanding of industrial dynamics, and transition from one technoeconomic paradigm to another**

An uncontrolled social experiment under way – could turn out very badly
Cautious grounds for optimism – industrial dynamics of transition





Renewables: manufacturing, increasing returns, energy security



Renewables, manufacturing and green growth:

Energy strategies based on capturing increasing returns

John A. Mathews **a,***, Erik S. Reinert **b**

a Macquarie Graduate School of Management, Macquarie University, Sydney, NSW 2109, Australia

b Professor of Technology Governance and Development Strategies, Tallinn University of Technology

Dominant perspective frames energy futures and the case for renewables and cleantech in terms of their contribution to mitigation of climate change, as well as cleanliness and absence of carbon emissions. By contrast, energy security is generally discussed in terms of security of access to fossil fuels. In this paper we make a different case for renewables: we contrast the extraction of energy (fuels), which – in spite of technological change – takes place under diminishing returns, with the harvesting of nature's renewable energy, which takes place in a process utilizing manufactured devices, where manufacturing generates increasing returns and costs decline along steep learning curves. This gives a fresh perspective on both renewables and energy security.

