The role of radical and systemic changes for green transformation

Fred Steward

Professor of Innovation & Sustainability

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Policy Studies Institute

University of Westminster

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A new transitions policy discourse – the low carbon society/green economy

- Change in policy landscape from climate change 'problem' to low carbon innovation 'solution'
- Incorporation of ambitious targets into national policy agendas
- Narratives of transformation innovation from margin to mainstream since 2000

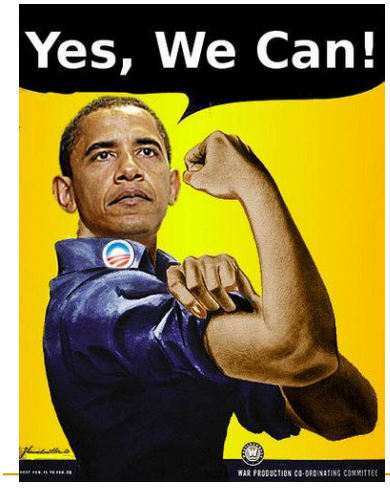
The UK Prime Minister

We need to make the transition to a low carbon economy urgently

David Cameron

January 2010

'the transition to a green and low-carbon economy is essential' (Nov 2009)



European Union

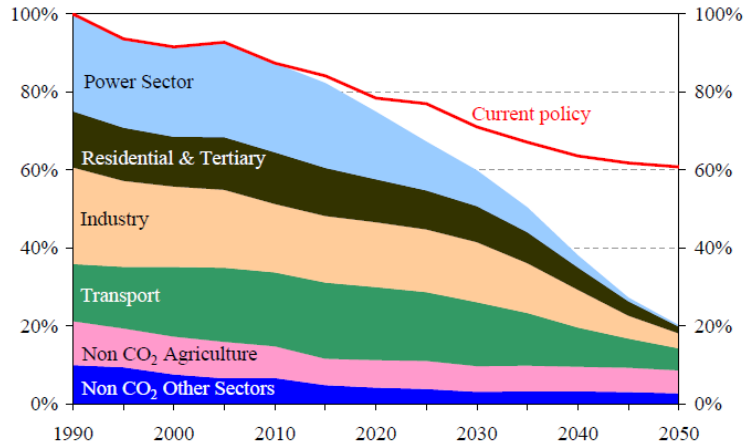
- we will take a historic step towards …the transition to a low-carbon world economy.

- Manuel Barroso
- December 2007

Transition, transformation, innovation

- the need for a 'transition to a low carbon economy' (COM(2011) 112)
- 'our economy will require a fundamental transformation within a generation…in producer and consumer behaviour'. (COM(2011) 571
- the key to the transition to a green and low carbon economy is 'significant innovation'. (COM(2011) 571)

The European Union Roadmap for moving to a competitive Low Carbon Economy 2011



New ambitions for innovation as the sustainability solution

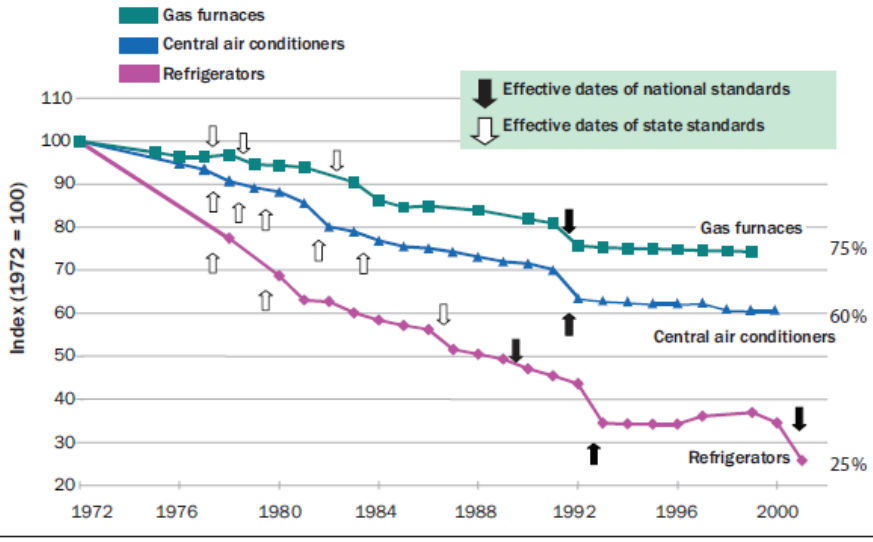
- A variety of governments are incorporating carbon targets into their economic and social policies
- The targets are highly ambitious given the national track records
- Innovation is seen as the politically desirable solution

The limits of incrementalism

- Greening of technology – incrementalism does deliver…but
- Lock-in and narrow focus
- Relative improvements in resource use & pollution impact eg: household appliances, cars, aeroplanes
- Yet, environmental impact of household and personal transport continue to increase - the 'rebound effect'

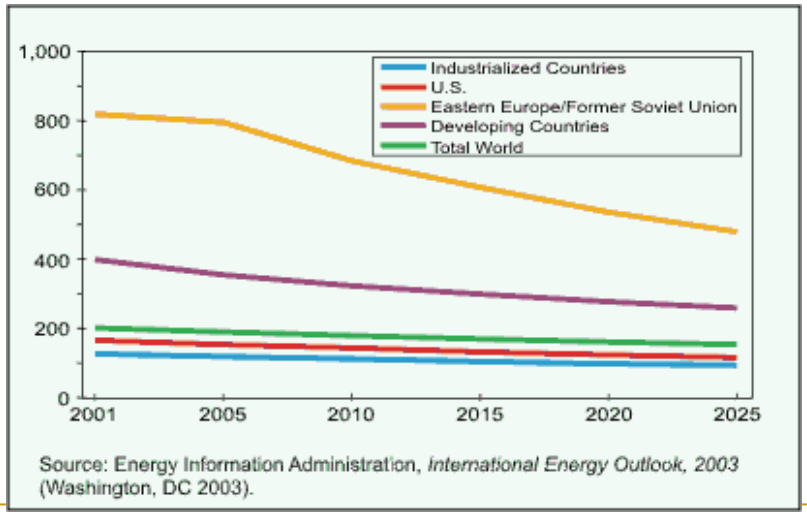
Figure 23

Impact of standards on efficiency of 3 household appliances



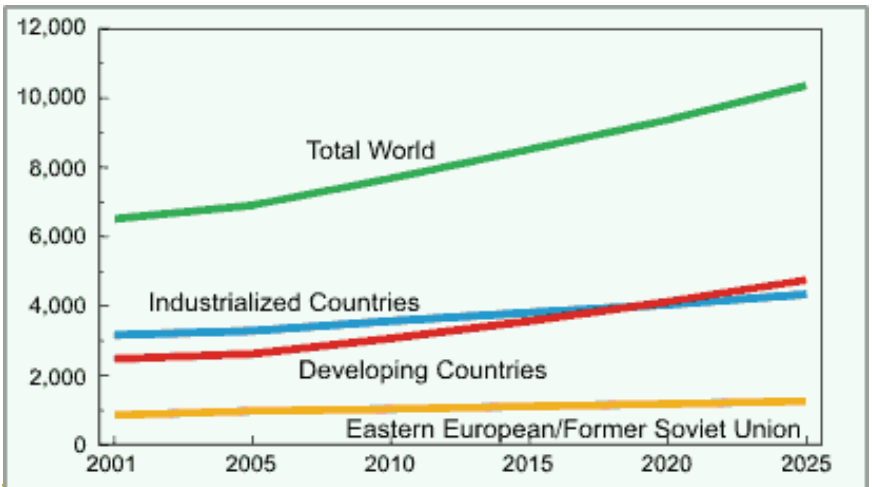
Source: A. Rosenfeld, California Energy Commission; S. Nadel, ACEEE, in ECEEE 2003 Summer Study, www.eceee.org

Global carbon intensity



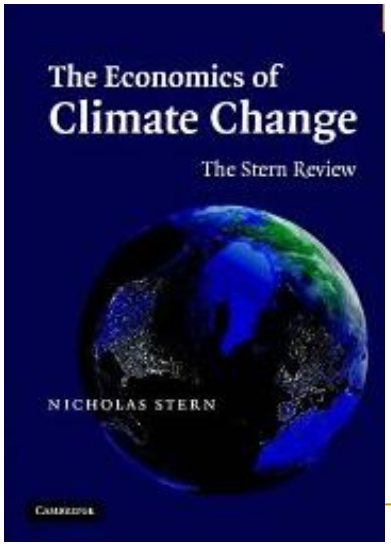
Source: Energy Information Administration, *International Energy Outlook, 2003* (Washington, DC 2003).

Global CO2 emissions



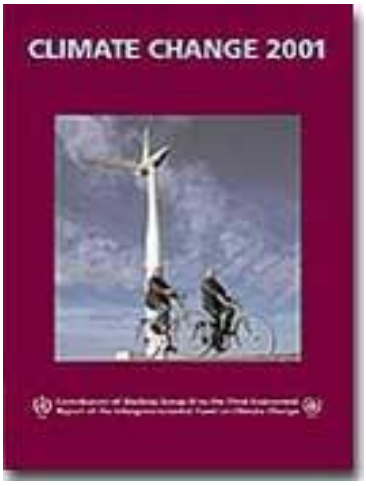
Source: Energy Information Administration, *International Energy Outlook, 2003* (Washington, DC 2003).

Stern review 2006



- managing the **transition** to a low-carbon economy
- radical change may not be delivered by the markets
- technology-neutral incentives should be complemented by focused incentives to bring forward a portfolio of technologies
- technology-specific early stage deployment support
- governments must accept that some technologies will fail.

Policy roots: IPCC report on mitigation



- ***transition*** *strategies to achieve...long-term social and technological changes*
- **transition** from the world's present energy system towards a less carbon-emitting economy

The new sociotechnical transitions thinking

- Kemp, René (1994), 'Technology and the Transition to Environmental Sustainability. The Problem of Technological Regime Shifts', *Futures* 26(10): 1023-46
- Geels, F.W., 1999, 'Technological transitions and socio-technical scenarios', in: Dolfsma, W., Geels, F.W., Kemp, R., Moors, E. and Rip, A., 1999, *Management of technology responses to the climate change challenge: Theoretical elaboration of the co-evolutionary 'technology-in-society' Perspective*
- **Transities vanuit sociotechnisch perspectief**

Frank Geels and René Kemp[1]

Nov 2000

think sociotechnical innovation

- 'system innovations' involve several different technologies, a variety of social and behavioural innovations, and a diversity of societal actors
- they are better described as 'sociotechnical' innovations rather than either technological or social innovation
- most innovation policy and practice remains focused on singular technologies and needs to be reoriented

A synthesis within innovation studies

- Seeks to bridge economic and sociological strands in STIS
- Dynamics of innovation in meso level sociotechnical systems
- Engaged with practice 'managing/governing transitions'

Sociotechnical networks

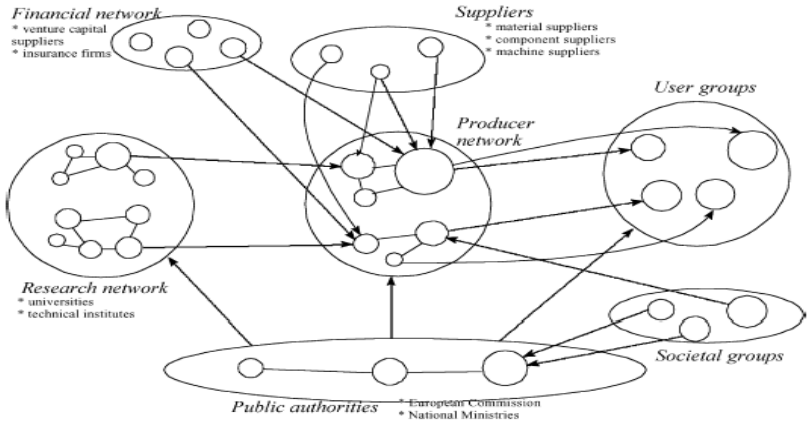


Fig. 2. The multi-actor network involved in sociotechnical regimes.

Multilevel perspective

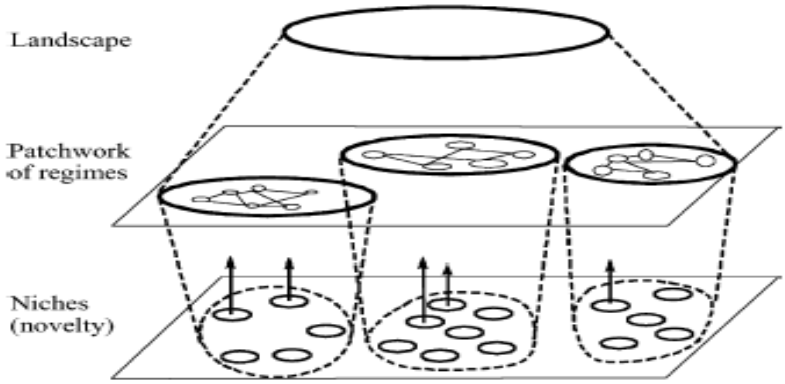


Fig. 3. Multiple levels as a nested hierarchy.

Disrupting & reconfiguring through niches

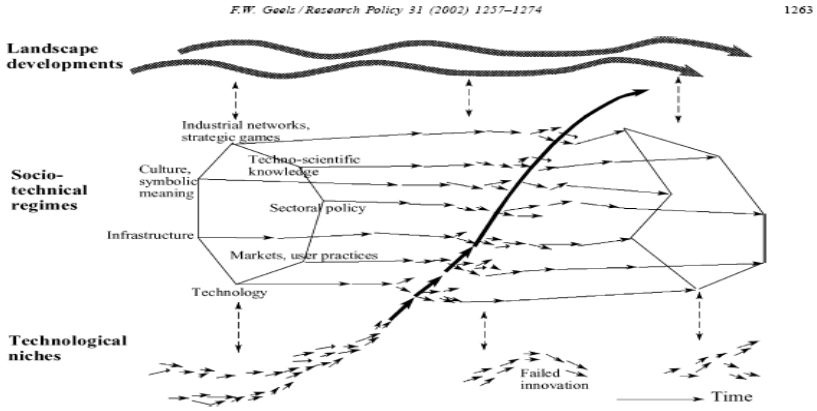


Fig. 5. A dynamic multi-level perspective on TT.

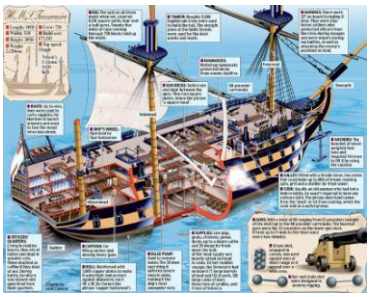
A distinct meso level 'lens' or 'gaze'

- Nor a 'macro focus on a new principle of the economic system (mechanisation, information etc)
- Not a 'micro' focus on the new product or process
- The 'meso' reveals situated sociotechnical paths and choices

Sociotechnical transitions happen

- Intercontinental transport: sail – steam
- Domestic mobility: horse – automobile
- Sanitation: home based – civic sewage system
- Information: notepad – personal computer

Sailing ship sociotechnical network



Woodworkers

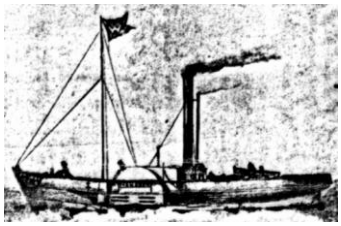
Weather

Preserved food

Forests

Naval dockyard as innovator

Steam ship sociotechnical network



Old narratives

- Powerful narratives with influential advocates
- Recognise past periods of radical change
- Tend to inscribe established political positions and guidelines
- Evocative of actual changes despite problems

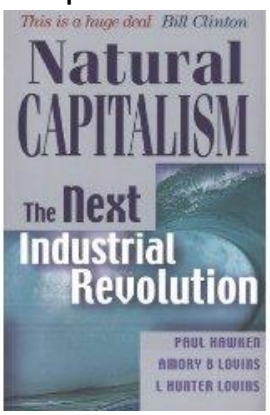
A new 'Manhattan' project

- a 'Manhattan project' for climate change technology research
- Evidence to US Congress committee, September 2006
- 5-10 fold increase in energy R&D to $50-100bn for 10 year programme

- Daniel Kammen (Director, Renewable and Appropriate Energy Laboratory (RAEL) University of California, Berkeley

A new industrial revolution

- Amory Lovins – US environmentalist & entrepreneur



- Peter Mandelson, former BIS minister

A new social deal

EUROPEANGREENS.EU
United green parties of Europe

A Green New Deal for Europe

A Green New Deal

Joined-up policies to solve the triple crunch of the credit crisis, climate change and high oil prices

The first report of the Green New Deal Group

A new moral crusade

- Head of NASA Goddard Institute for Space Studies
- No halfway house on moral principles
- Carbon dependency moral equivalence
- Rhetoric of reaction

- James Hansen
- Leading climatologist

- Marc Davison, University of Amsterdam

transformative sociotechnical innovation

- new types of innovation actors
- new types of knowledge

2x2 matrix – partial narratives

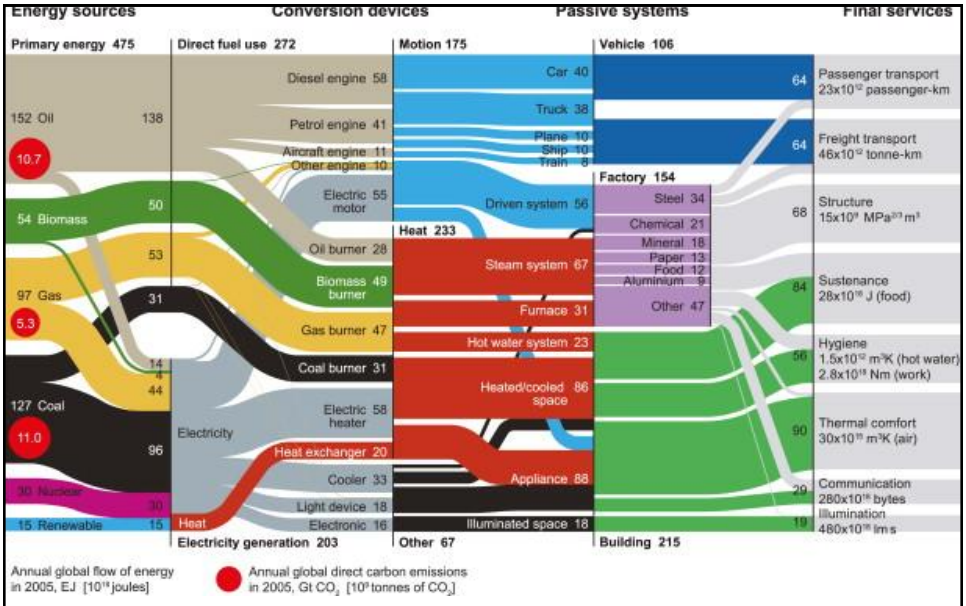
State	**Big science**	**Green new deal**
Individual	Industrial revolution	Moral crusade
	Technology	Society

We need a new narrative

- How social and technological innovation interact with each other
- New routes for global institutions to effectively interact with established institutions of national governance
- Intersection of individual and collective
- Convincing approaches to the urgency of the climate change challenge

Transformative innovation

- incremental innovation, however successful, is insufficient to meet the scale of the challenge
- radicalism resting on either idealistic social change or wishful technological fantasies will not deliver either
- need a new type of transformative innovation.



Global energy flows 2005

Cullen & Allwood 2010

Transformative innovation – a new focus

Defra's Evidence Investment Strategy
2010–2013 and beyond

- **Incremental innovation**
  small innovations, or improvements to optimise existing systems of knowledge, e.g. reducing packaging waste;
- **Radical innovation**
  partial system redesigns, e.g. improvements in recycling which require innovations in product design and infrastructure for recycling;
- **Transformative innovation**
  full system redesign and culture change in the way people think about products and services, e.g. industrial ecologies or life cycle approaches to product design.

New actors

- leaders will be the institutions and organisations who deal with the key systems of mobility and household living.
- different to traditional product focused innovators
- regional players are well placed for this
- key responsibilities for transport, housing, waste and energy systems
- enable the participation of the diversity of actors involved in system innovation

New knowledge

- more integrated and practice based than conventional academic science
- learning by doing - innovative approaches to mobility and household living in practice
- experimentation is often more feasible at regional - scale is manageable yet significant resources can be leveraged.
- challenge is to move from the specific to the general.

Technology is not enough

- the most significant contributions to green house gas emission reductions over the next decade to 2020 are likely to be based on existing technologies
- Although many are already economic their diffusion remains low
- Singular technological innovations need to be embedded in innovative systems of household living and personal mobility

Innovation Exemplars

Old	**New**
Atom bomb	The jeep
Concorde	Easyjet
Double helix	The internet
Penicillin	Public health systems
Science & corporate actors	Public and entrepreneurial actors

Business model innovation

- business model: 'a conceptual tool to express the business logic of a specific venture'
- New pricing
- New logistics

A 'distinctive approach to innovation'
Innovation Union (COM (2010) 546

- **3 principles**
- **challenge-led**
- **broad concept of innovation**
- **all actors and all regions** .

‘challenge-led’

- a break with the over-reliance on market based encouragement of technology driven innovation
- the 1980s shift from mission-oriented to diffusion- oriented innovation policy is no longer fit for purpose
- emission reduction targets express a global challenge in quite precise and specific terms

‘broad concept’

- new territory outside technological innovation ‘induced’ by market incentives
- ‘demand’ pull from citizens and consumers as well as ‘supply’ push from universities and business
- innovation takes ‘many forms’ such as novel advances in organizations, services and business models

‘all actors and all regions’

- ‘wide partnership’ of social actors from ‘not only the business sector, but also public authorities at national, regional and local level, civil society organizations, trade unions and consumers’.
- radically shifts the agenda from a selective preoccupation with hi-tech regional clusters to a mainstream concern with all regions.

A ‘comprehensive path’ for transition

20/20/20 policy (COM[2008]30)

- new policies needed in addition to the traditional avenues of research based technology programmes or indirect market schemes.
- a range of actors which will involve consumers as well as producers
- a diversity of innovation to address ‘energy efficiency’ of everyday consumption as well as shift to low carbon energy production

Traditional approaches

- Current interpretation of diversity favours the incumbents:

- Off shore wind
- Carbon capture and storage
- Nuclear
- Electric car
- ‘silos’ or ‘networks’ ?

New systems need stronger voice

- Small local waste into biogas
- Smart grids
- Micro generation
- Combined heat and power
- Multimodal transport – cycles to buses

The Feasibility of Systems Thinking in Sustainable Consumption and Production Policy

October 2008

A research report

A sustainability oriented innovation policy

- Need for system innovation
- Involves technology & social change
- Crosses the production & consumption divide
- The reintroduction of societal mission

Requirements for systemic policy instruments

- Address 3 core systemic issues
  - networks
  - expectations
  - learning
- Need for a new integrated policy framework