

Into the Green Economy Eco-innovation Dynamics and Policy Challenges

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Old environmental paradigm – up to ca. 1996-2006

Firm

The environment
a burden to
business

Market

Markets
cannot go
green

Economy

Economic
growth is
accompanied
by
environmental
degradation

- Inherent negativ
external effects on
the environment
from production &
consumption

New eco-innovation paradigm – post 1996- 2006

Firm

***Green
Growth***

- the
environment
a business
opportunity

Market

***Green
market***

- the
integration of
environmental
parameters into
the economic
process

Economy

***Green
Economy***

- economic
growth
decoupled
from
environmen
tal
degradation

The slow rise of the 'eco-innovation' agenda

- **slow realization of green growth potentials among business and policymakers?**
- Climate mitigation – synthesis of climate concerns, energy supply issues and security policies
 - has created a very powerful new global political agenda linking up environmental and innovation/economic policies

The Green Economy as Techno-economic paradigm change

Green economic evolution causing structural change of the global economic system

- substantial 'creative destruction' and creative accumulation around the globe

Some questions:

- Which regions, industries and companies will be the winners and losers in this transformation?
- What are the needs for organizational and institutional change to achieve the modern resource efficient society?
 - What are the needs for policy renewal?

Techno-economic paradigms and long waves in the economy

Technical/ org. innovations	Examples of key visible innovations	Carrier industries	Core input	Organizational /institutional changes	Timing of upswing and <i>downswing</i>
Steam-powered mechanization of industry	Liverpool- Manchester railroad (1784)	Railways Steam-engines Machine tools	Iron Coal	Joint stock companies <i>Subcontracting</i>	1848-1873 <i>1873-1895</i>
Electrification of industry and society	Edison's New York electric power station (1882)	Electrical equip. Heavy engin. and chemicals	Steel Copper Metal alloys	'Taylorism' Giant firms	1895-1918 <i>1918-1940</i>
Motorization of transport, civil economy and war	Ford's Highland Park car assembly line (1913)	Automobiles Diesel engines Aircrafts Refineries	Oil Gas Synthetic materials	'Fordism' Hierarchies	1941-1973 <i>1973-</i>
Computeri- zation of entire economy	IBM 360 series (1960s) and Intel micro- processor(1972)	Computers Software Telecom	Integrated circuits	Networks; internal, local, and global	??

Source: Freeman and Loucã, 2001

Recent techno-economic paradigm changes

Technical/ org. innovations	Examples of key visible innovations	Carrier industries	Core input	Organizational /institutional changes	Timing of upswing and <i>downswing</i>
Biotech enabled innovation in industries	Corn Biofuels...	Pharmacy Medico Food Energy?	Enzymes DNA Cell and micro organisms	??	?? ??
Nanotech- enabled innovation in industries?	??	Medico Military Electronics?	Increased mastering of matter?	Integrative learning?? Variety based economics?	?? ??
Greening of production & society	Renewable energy Smart green buildings/cities	Energy Chemical ICT Biotech/nano?	Renewable resources	Circular economy City&Industrial symbiosis	1997-2007... ??

..?

Source: own source

The scope of the eco-innovation challenge

From Empty to Full-world economy

- the quest for still more improvements in global resource-efficiency will remain an ongoing challenge to humankind (Daly, 1996)

The TAP formula

Env. degradation = innovation + consumption/capita + pop. growth
(Foster, 1994)

The Green Economy formula:

$$\text{Eco-system viability} = \text{Eco-innovation} + \text{consumption/capita} + \text{pop. growth}$$

Source: own source

Defining eco-innovation

Two main types of eco-innovations

1. Ressource handling and clean-up
 - the traditional 'environmental sector'

 2. Those innovations which are 'greener' than the alternatives
 - low/zero ressource extraction, low/zero emission, recyclability, green organizational & marketing innovations
-
- Potentially includes all types of innovations and companies

 - Moving target,relativity

Eco-innovation in economic terms:



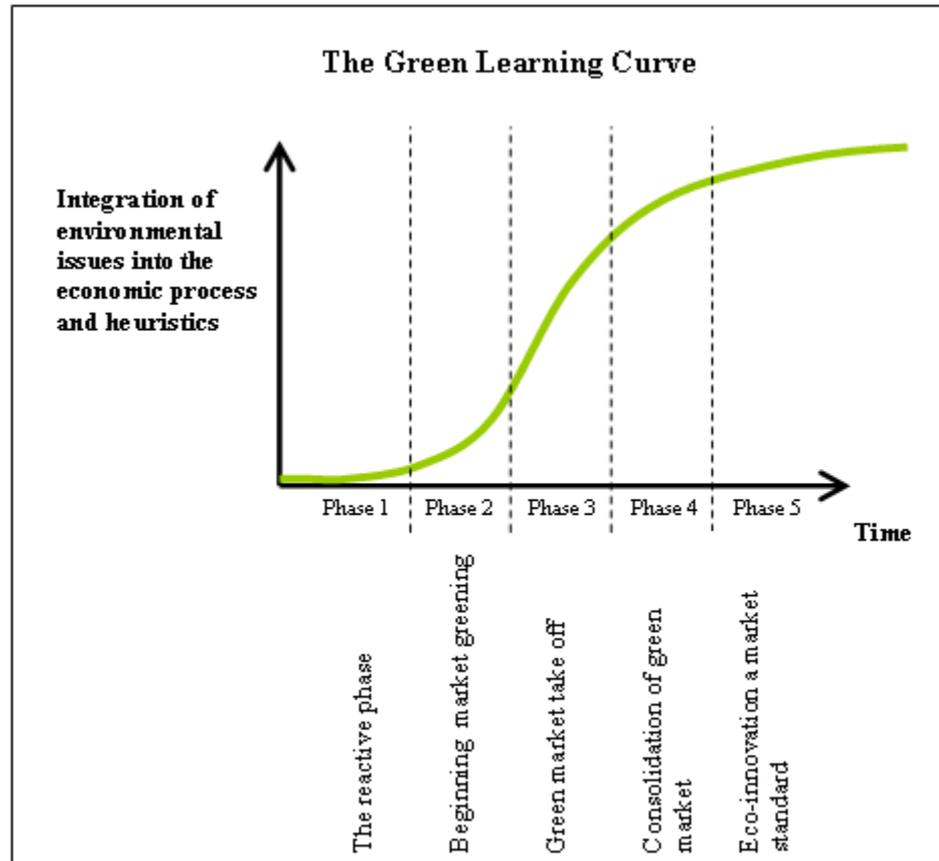
Definition:

"Innovations which are able to attract green rents on the market – they create value to users while progressively reducing net environmental impacts"

(Andersen, 2007, 2009)

- Competitiveness parameter rather than environmental assessment
- The green competitiveness parameters differs from company to company

The greening of the economy



7 distinct features of eco-innovation

1. Extraordinarily systemic (global life cycle assessment, recycling, technical infrastructure, SCP)
2. Unusually high information costs (credence characteristics, relativity, complexity)
3. Normative element (inherently good to be green)
4. Environmental potential in part technology dependent
5. Technical infrastructure and physical planning important
6. Policies play a high role
7. The carrying capacity/resilience of the local natural environment matters

(Source: Own source)

Implications of the characteristics

- Uneven greening in National Innovation Systems
 - **high national/regional specificity to eco-innovation** (policy, geography, history..)

- Uneven greening in Sectoral Innovation Systems
 - **very high green transaction costs in value chains**
 - very demanding/costly to create well-functioning green markets

- Unusually demanding learning and transformation process
 - at the level of selection, at the fundamental learning/cognitive level.

- Stronger globalization element than is usually recognized -
 - environmental performance in global value chains, int. division of eco-innovative labour

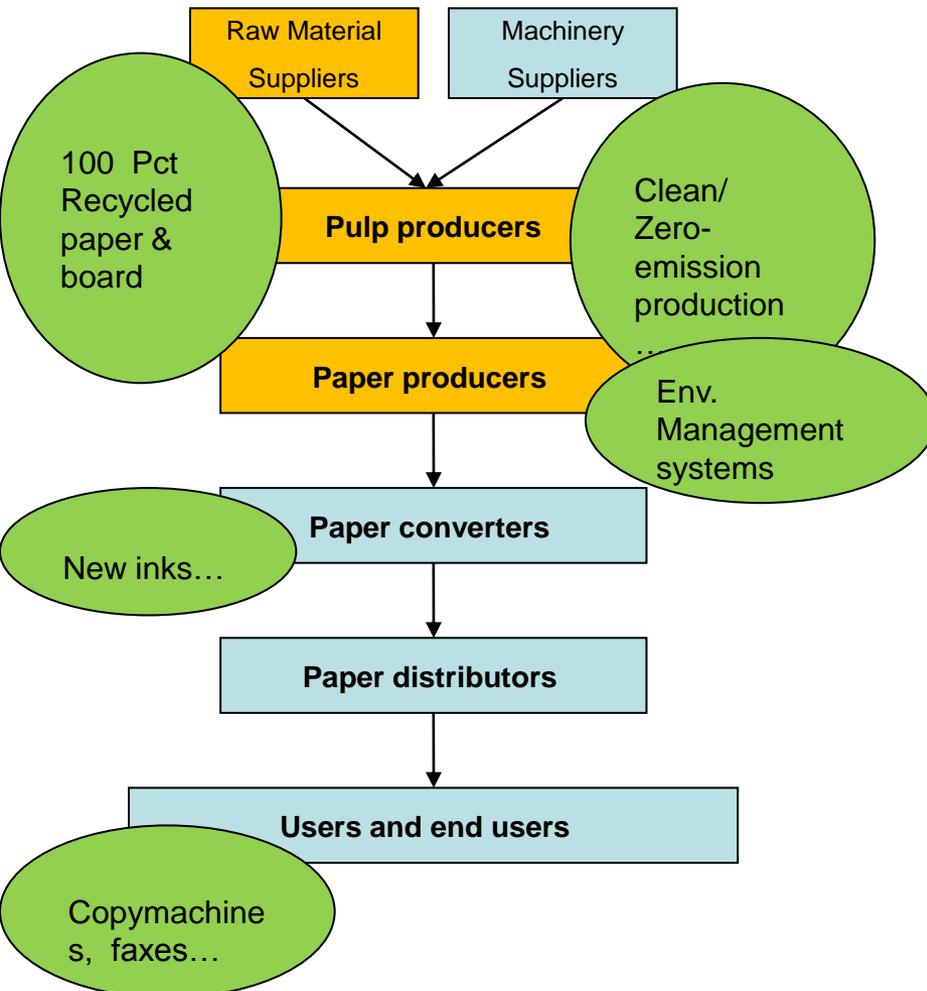
The case: Eco-innovation in the paper chain



Eco-innovation in the 1990s

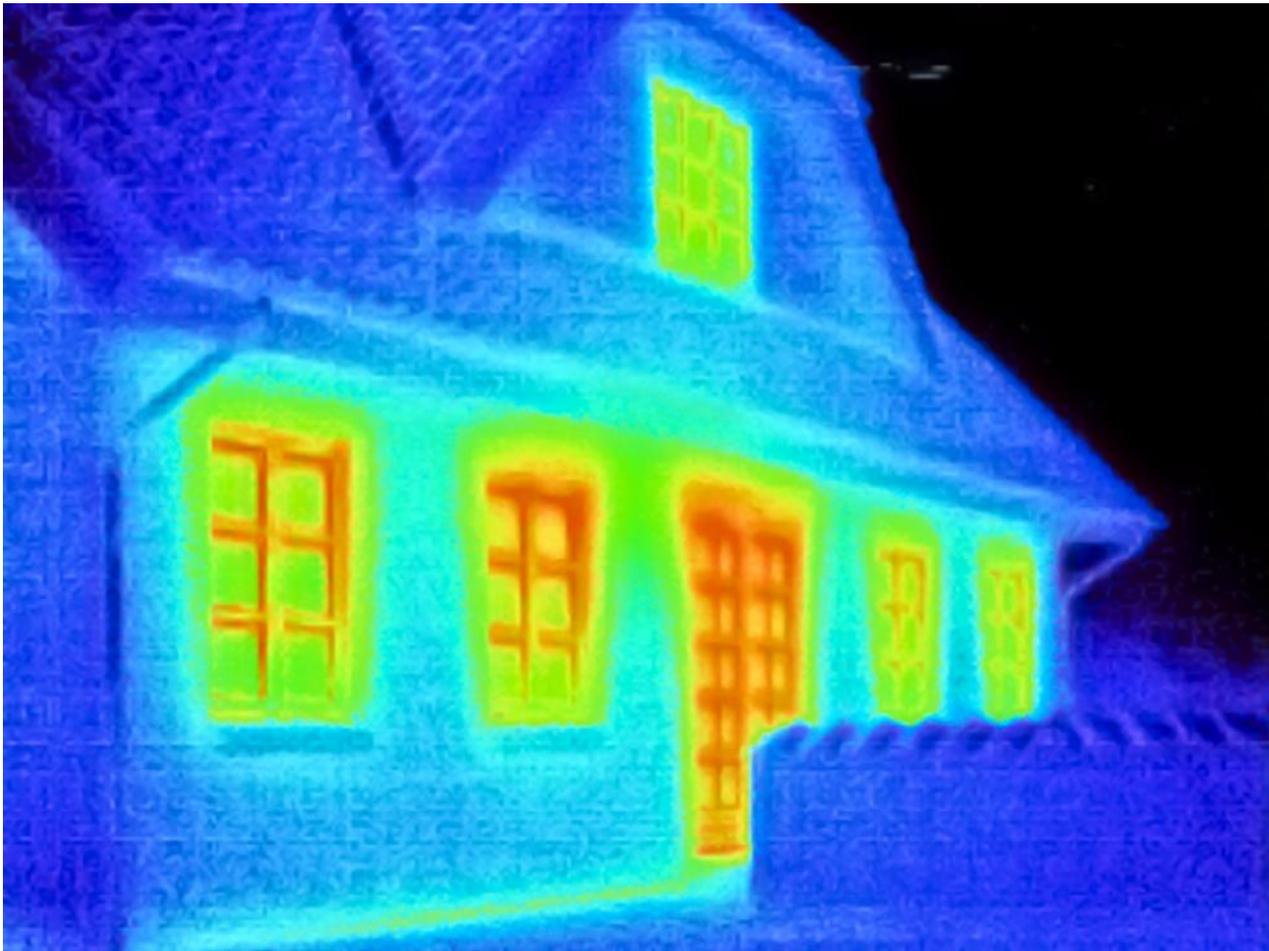
The Danish Paper chain

3 firm cases: container board, moulded board, office paper



- Lacking green intra-organizational structures, capabilities and management systems
- Lacking inter-organizational structures
- Inconsistent policies
- Lacking market supporting institutions such as information and technical standards
- ❖ Very high transaction costs to greening

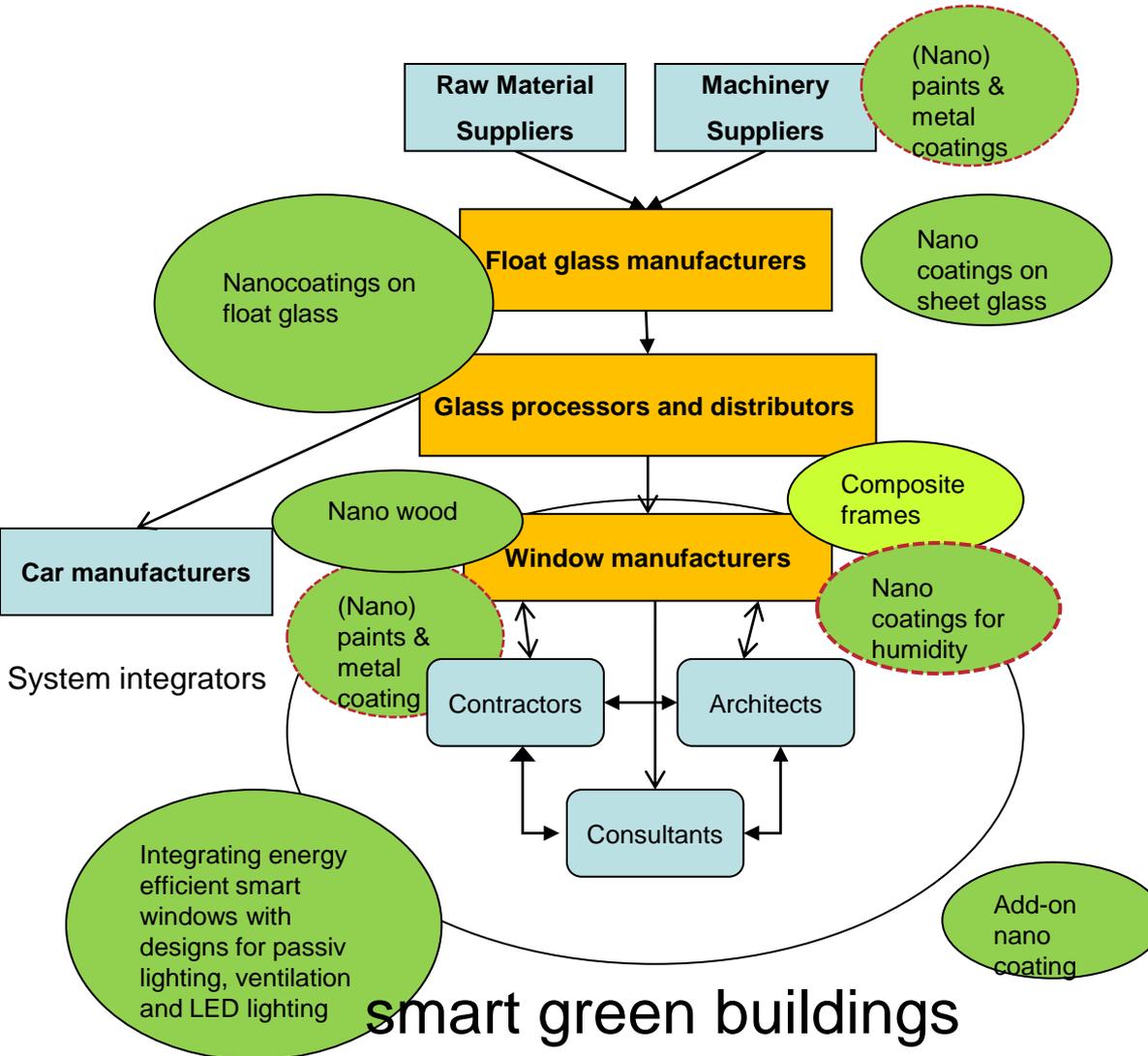
The case: Eco-innovation in the window chain



Eco-innovation in the 2000s

The Danish window chain (construction)

8 company cases on the uptake of green nanotech in the window chain



➤ Well-functioning intra-organisational green systems and capabilities in many firms, still lacking in some (smaller firms, service firms)

➤ Inconsistent policies

➤ Better but inadequate market-supporting institutions

➤ Firms on more similar 'green wavelenth'

❖ Change in the organization of the value chain – new system integrators target systemic eco-innovations

❖ Lower but still high green transaction costs

Energy efficiency policies affecting innovation in the window chain

1. 1948-1961: Government loans and normative demands requiring two layer windows in all new builds.
2. 1961-1978: The first BR U-values of 2,9 for vertical and 3,0 for roof windows.
3. 1979: The BR limits to maximum area of windows (15 pct.) in a house.
4. 1995-2005: The BR 2,0 U-value in new builds. The areal demand was extended to 22 pct. and included doors.
 - *EU: Directive 2002/91/EC on the Energy Performance of Buildings.*
 - *Danish Action plan for the future energy saving effort, 2005.*
 - *EU: Action Plan for Energy Efficiency, 2006.*
5. 2006-2009 "Energy frame considerations" are replacing U-values in the BR.
 - *EU: 2009 Climate policy goals of 20 pct. energy efficiency gain by 2020. The building sector should cut 300t of CO2 per year by 2020.*
 - *EU: 2009. Launch of upcoming new directive On the Energy Performance of Buildings.*
 - *2009: Danish Strategy for the Reduction of energy use in Buildings*
6. 2010: New law: The "energy balance" is tightened by 25 pct. in 2010, 25 pct. in 2015, further tightenings in 2018 for public buildings and others in 2020. There will be component requirements on energy efficient renovations.

Trends in corporate eco-strategies & reporting

Findings of the international KPMG survey on corporate sustainability based on 378 senior executives in different industries around the world:

- Just over **60 pct** of companies surveyed have a working strategy for corporate sustainability (2008 around **50 pct**)
 - over 70 percent of the remaining companies expect to implement a strategy within 1 to 5 years

- **Size matters:** Nearly **80 pct** of the large companies polled have a strategy, compared with just **under 50 pct** of the smaller businesses

- Of those with strategies only **33 pct** have issued a public report on their progress
 - progressive companies are developing common standards for measurement and benchmarking (the Global Reporting Initiative (GRI) and the International Integrated Reporting Committee (IIRC))

3 Barriers to eco-strategies in companies

The KPMG survey captured three main reasons for slow corporate progress on sustainability:

- Measurement and signalling problems to stakeholders
 - widely differing national and state rules on env. reporting: A lack of common set metrics, tools & information systems for measurement and analysis of the impact of corporate sustainability programs

- Financing problems
 - A lack of available financing that will put sustainability on par with operational programs that have a higher short-term return on investment (ROI)

- Inconsistent regulation
 - A lack of a clear and rigorous international framework of regulation within which companies can plan with confidence.

Source: KPMG (2011) [Corporate sustainability: A progress report](#)

Collaboration

- **Interfirm collaboration** – vertically and horizontally

- **Private-public collaboration**
 - from regulator to partnerships
 - new players: ministries of trade and industry, economy,

- Public administration key role
 - Trade off cost-effectiveness/efficiency – innovativeness
 - Leap frogging opportunities

The Green Economy is linked to the Knowledge Economy

➤ **The changing competitive conditions of the learning economy is a prerequisite for the green economic evolution.**

1. Competition increasingly on other issues than costs, (just in time, service, well-functioning institutional setting, labour markets, branding...)
2. High information (ICT) and knowledge needs to a) communicate on the market and b) create smart solutions
3. Well-functioning public administration/institutional structures /technical infrastructures to deal with continuous new negative environmental externalities from innovation

Policy aspects

Eco-innovation policies should:

- **Make it attractive and easy for all companies/industries to go green**
- Provide consistent strong signals for green performance/demand
- Create a (national) innovation system that systematically seeds eco-innovation
 - The vision of the GNIS (green national innovation system)

Novel eco-innovation policy rationales and goals

Old Environmental policy regime	New Eco-innovation regime
Reduce environmental degradation	Achieve a high eco-innovative capacity in NIS/RIS/SIS
Target heavy polluters	Target all companies & markets (value chains)
The pollutor pays	Reward the eco-innovative
Reduce acute environmental problems	Eco-innovation has become the 'natural'/routine innovation in the economy

Source: Own source

5 core policy targets for eco-innovation

1. Build well-functioning green markets/a selection environment that favours eco-innovation
 - consistent policies/public signalling
 - Market-supporting institutions (reporting, labels..)
2. Build a strong green knowledge base (R&D, education) and support collaboration/learning across firms and across firms and knowledge institutions
3. Green financing and rewards
4. The creative destruction of values, institutions/standards and technical infrastructures which hamper eco-innovation and the creation of new greener ones
5. Vision based innovation policy- establish the vision of the smart circular green **economy**

Examples of a visionary eco-innovation rationale

METI Japan; Eco-innovation vision from 2007 (METI 2007)

➤ Eco-innovations are 'a new field of techno-social innovations that focus less on products' functions and more on the environment and people'

1. zero emission based infrastructures,
2. sustainable lifestyles by selling services instead of products,
3. promoting *kansei values* (sensitivity)

'Craddle to cradle' – business impact because of the vision, better than WBCSDs 'eco-efficiency'?

➤ The eco-innovation agenda is renewing the innovation agenda!

Lessons - more attention to:

- the green industrial dynamics – different conditions for eco-innovation
- the position on the green learning curve for given actors
- the market formation side (rather than the R&D side)
- link up eco-innovation to SCP
- eco-innovation indicators – the rate/nature of eco-innovative progress
 - stakeholder signalling and policy support

Thank you