

Measuring eco-innovation

Results from the first two MEI workshops

René Kemp



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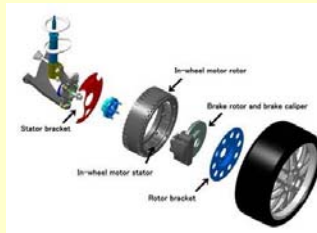


Eco-innovation is receiving attention

- By **nations**: NL has an eco-innovation agenda, Germany, UK and F are championing environmental technology
- By **cities**: London –60% GHG emissions by 2020
- By the **Commission**: ETAP, carbon trading, EU as a leader in eco-innovation
- By **business**
- By **finance**
- By **consumers?**



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Eco-innovation

potential for making Europe more **competitive** and more environmentally **sustainable**



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A project for FP6

- Call FP6-2005-SSP-5A, Area B, 1.6, Task 1
- In cooperation with **Eurostat**, **EEA** and **JRC**
- Project officer Michele Galatola of DG Research
- One of 4 projects funded by DG research
- The other projects are:
 - ECODRIVE
 - ETTAR about transport
 - FUNDETEC about finance



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Project objectives:

- 1) **Conceptual clarification** of eco-innovation (developing a typology) based on an understanding of innovation dynamics
- 2) Identification of the main **methodological challenges** in developing indicators and statistics on eco-innovation
- 3) **Defining further research** needed to address these methodological challenges in developing eco-innovation indicators
- 4) To make **recommendations for possible indicators**, taking into account the availability of data



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The partnership

- Research team
 - MERIT (NL)
 - ZEW (Germany)
 - Risø (DK)
 - Imperial College London (UK)
 - LEIA (Spain)
- DG Research and DG environment
- Collaborators
 - Eurostat
 - EEA
 - JRC



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5 Workshops

- Workshop 1 about **definitional** issues
- Workshop 2 about **panel survey** analysis
- Workshop 3 about **eco-patent** analysis and **documentary and digital source** analysis
- Workshop 4 with ECODRIVE
- Final workshop



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Working definition

- **Eco-innovation** is the production, application or exploitation of a good, service, production process, organisational structure, or management or business method that is novel to the firm or user and which results, throughout its life cycle, in a reduction of environmental risk, pollution and the negative impacts of resources use (including energy use) compared to relevant alternatives



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About the broad definition

- To us the above definition of eco-innovation is relevant and appears workable for statistical agencies and for future data collection activities from companies. There is a wide consensus in the MEI project that data collection and **indicator research should not be limited to environmentally motivated innovations** but also should comprise “environmentally beneficial normal innovations” for the reason that they constitute an important category, about which we know very little.



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- **Environmental friendly normal innovations are an important category.** The environmental gains of normal innovations have never been the object of systematic study. It is being estimated however that 60% of the innovations of the Dynamo Database in the Netherlands offer environmental benefits. It also was found that 55% of the innovations supported by a general innovation scheme for research cooperation (IS) offered “sustainability benefits”.



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Classification

A. Environmental technologies

Pollution control technologies including waste water treatment technologies

Cleaning technologies that treat pollution released into the environment

Cleaner process technologies: new manufacturing processes that are less polluting and/or more resource efficient

Waste management equipment

Environmental monitoring and instrumentation

Green energy technologies

Water supply

Noise and vibration control



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B. Organisational innovation for the environment

Pollution prevention schemes: aimed at prevention of pollution through input substitution, a more efficient operation of processes and small changes to production plants (avoiding or stopping leakages and the like)

Environmental management and auditing systems: formal systems of environmental management involving measurement, reporting and responsibilities for dealing with issues of material use, energy, water and waste

Chain management: cooperation between companies so as to close material loops and to avoid environmental damage across the value chain (from cradle to grave)



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C. Product and service innovation offering environmental benefits:

- **New or environmentally improved products** (goods) including eco-houses and building
- **Environmental services:** solid and hazardous waste management, water and waste water management, environmental consulting, testing and engineering, testing and analytical services
- **Services** that are less pollution and resource intensive. An example is car sharing.

D. Green system innovations

- **Alternative systems of production and consumption** that are more environmentally benign than existing systems: Examples are biological agriculture and a renewables-based energy system.



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Template for eco-innovation indicators and methods for analysis

Method of analysis	Studies of eco-innovation using this method	Indicators	Purposes	Limitations	Possible ways for overcoming limitations	Possibilities for combination with other indicators and methods and suggestions for data collection
Patents	<p>Brunnermeier, Cohen (2003) Lanjouw and Mody (1996), Popp (2001, 2003, 2005), Marinova and McAleer (2003), Nameroff et al (2004), De Vries and Wehagen (2005), Verspagen (2005) Oltra and St Jean (2006, 2007)</p> <p>Important general studies on patents are: Galiches (1990) and Arundel and Kabla (1998)</p>	Patent counts, citations	<p>To measure rate and direction of invention, which can be mapped and can be related to possible determinants</p> <p>Patents may also be used to determine spillover effects, to monitor diffusion and to determine relative strengths (specialization of actions in certain technology areas).</p> <p>Patents allow for comparative analysis across nations for technologies</p>	<p>Many innovations are not patented</p> <p>Many patents do not result in innovations</p> <p>Value of patent differs greatly</p> <p>Identification of eco-patents depends critically on search terms</p> <p>Patent analysis only suited for technological innovations (primarily end-of-pipe technologies and alternative energy technologies)</p> <p>Propensity to patents differs between sectors and also between companies (smaller companies tend to patent less, unless they have patent experience).</p>	<p>Careful reading of patent abstracts helps to determine whether a patent is an eco-potent or not</p> <p>Value of patents can be ascertained through citations (for older patents) and by consulting industry technology experts; patents that are not used should be eliminated from the innovation study</p> <p>The propensity to patents should be taken into account.</p>	<p>One could contact inventors and ask questions about the patents (for example to what extent they are spurred by specific regulations, the revenues for the inventor, etc.)</p> <p>Comparison with innovation output indicators helps to assess the relevance of patents as a measure for innovation; it also helps to assess the robustness of the results</p> <p>The official database of the European Patent Office is subject to several limitations: no more than 5 keywords and IPC codes can be included in a single research and one can maximally retrieve 500 patents It is proposed to make the database more user friendly.</p>



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Method of analysis	Studies of eco-innovation using this method	Indicators	Purposes	Limitations	Possible ways for overcoming limitations	Possibilities for combination with other indicators and methods and suggestions for data collection
Survey analysis	Henriques, Sadorsky (1996) Cleff, Rennings (1999), Hemmelkamp (1999) Rennings, Zwick (2002) Gray, Shadbegian (2003) Fronzel, Horbach, Rennings (2005) Gonzalez (2005) Horbach (2006) Mazzanti, Zoboli (2006) Rehfeld, Rennings, Ziegler (2007), Arimura, Hibiki, Johnstone (2007)	Existence of a budget specifically related to environmental R&D R&D expenditures Total innovation expenditures, The type of eco-innovation can be determined by asking if they have introduced such an innovation in the last three years Environmental impacts of innovation activities	Determining whether a company has eco-innovated, if so, in what way (in pollution control, through product change, etc.) Companies can be asked about the influence of facilitating factors, barriers and motivations. The influence of these can also be determined econometrically if one has information on these variables The results help to learn about the effects of policy instruments and help to target policies to innovation determinants	Most of the surveys are only point in time sources so that the dynamic character of eco-innovation can not be addressed. Low response rates concerning quantitative variables resulting in high non-response errors Answers based on self-perception may be misleading (too subjective)	The use of special panel data surveys for eco-innovation but this is very expensive. The second solution is to add questions on eco-innovation to regular surveys Use of qualitative variables Comparison of the plausibility of survey results with other eco-innovation sources	Suggestion to enlarge the CIS by two additional questions on eco-innovation Joining different sources, e.g. the combination of the Mannheim Innovation Survey with a list of suppliers of environmental goods and services Adding further information from official statistics to survey data



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Questions for use in CIS

- 1° Question: Environmental regulation as innovative source
- Did you realize innovations from 20XX to 20XY (new or significantly improved products or production processes) **predominantly** because of new **environmental** policies?
- no, yes
-
- If yes, which **environmental policies** were decisive for the introduction of these innovations, please note the names of the regulations in order of their importance
-



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Second question: Filter question for innovation

How important were each of the following effects of your product (good or service) and/or process innovations introduced during the three-year period 20XX-20XX?

(Degree of importance: Not relevant - Low - Medium - High):

Reduced materials and energy per unit output

Reduced environmental **impacts**

Improved health and safety



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Third question: Purpose and category of eco-innovation

Please answer the following question if you **observed** reduced environmental **impacts** of your innovation activities (high or medium):

a) What was the main purpose of your innovation activities:

- Reduction of environmental impacts
- Other purposes

b) Predominant category of your innovation:

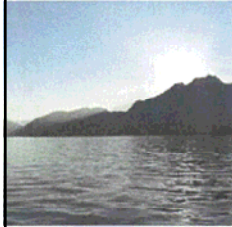
- Product innovation
- Process innovation
- Organisational innovation
- Presentational innovation



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MEI project website: www.merit.unu.edu/MEI



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MEI is a project for the European Commission funded by DG Research (Call FP6-2005-SSP-5A, Area B, 1.6, Task 1). MEI stands for Measuring Eco-Innovation.

Specifically, MEI offers a conceptual clarification of eco-innovation (developing a typology) based on an understanding of innovation dynamics. It will identify and discuss the main methodological challenges in developing indicators and statistics on eco-innovation and how these may be overcome.

Challenges for eco-innovation measurement to be investigated are

1. The ongoing nature (changing characteristics) of an eco-innovation
2. The novelty and importance of an innovation
3. Possibilities for combining different innovation measures (input indicators and output indicators, direct and indirect measures)

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