



Industrial clusters and regional innovation based on hydrogen and fuel cell technologies

Andersen, Per Dannemand; Tanner, Anne Nygaard

Publication date:
2008

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Andersen, P. D., & Madsen, A. N. (2008). Industrial clusters and regional innovation based on hydrogen and fuel cell technologies [Sound/Visual production (digital)]. Workshop on socio-economic aspects of hydrogen, Brussels (BE), 01/01/2008, http://www.risoe.dk/rispubl/art/2008_43.pdf

DTU Library

Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Industrial clusters and regional innovation based on hydrogen and fuel cell technologies

Presentation at
Workshop on Socio-Economic Aspects of Hydrogen
24 April 2008, Brussels

Per Dannemand Andersen* & Anne Nygaard Madsen
Foresight and Innovation Section
Department of Management Engineering
Technical University of Denmark
P.O. Box 49, Building 110, DK-4000 Roskilde, Denmark

*) per.dannemand@risoe.dk

Self-declared H2FC communities

The Internet provides numerous examples of communities (remote islands, cities, municipalities, regions, etc.) that declare themselves as hydrogen communities. For example

- Outer Hebrides (UK): The Western Isles Hydrogen Community Plans: Creating a Pathway to the Hydrogen Economy
- North Rhine-Westphalia (Germany): Fuel Cell and Hydrogen Network in North Rhine-Westphalia

Regional authorities develops fully-fledged strategy plans and allocated significant public financing in achieving the goals of such strategies.

Why community authorities' engagement?

Two reasons:

- energy and environmental policy concerns
- industrial or political-economical policy concerns (creation of regional high paid jobs – taxation foundation)

- Government or regional/local authorities are key stakeholders - involved in nearly 80% of the potential hydrogen communities based on a call for Registration of Interest. (Shaw and Mazzucchelli, 2007).

- Is this a waste of taxpayers money?

The research questions

1. Do geography and cluster aspects matter in establishing a European hydrogen energy technology innovation system?
2. Is it possible to locate communities or regions in Europe with a potential to develop clusters based on hydrogen and fuel cell technologies?
3. Are there any geographical match between such potential hydrogen communities and generally innovative regions in Europe?
4. Are there any geographical match between potential hydrogen communities and existing industrial clusters in Europe?
5. Which policy measures can be recommended to facilitate the emergence of industrial clusters based on hydrogen and fuel cell technology?

Theoretical approaches (and data) - technology, sector or geography

(National) Innovation Systems - NIS

- *“the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies”* (Freeman, 1987)

Technology-specific Innovation Systems – TIS

- Science, Technology and Innovation policies
- Jacobsson & Bergek 2004, Hekkert et.al. 2006, Carlson & Stankiewicz 1991

Sectoral Innovation Systems – SIS

- Breschi & Malerba 1997, Malerba 2002

Regional Innovation Systems - RIS

- Regional Development policies
- Cooke, 2001; Storper, Asheim & Gertler, 2004; Asheim & Gertler, 2005

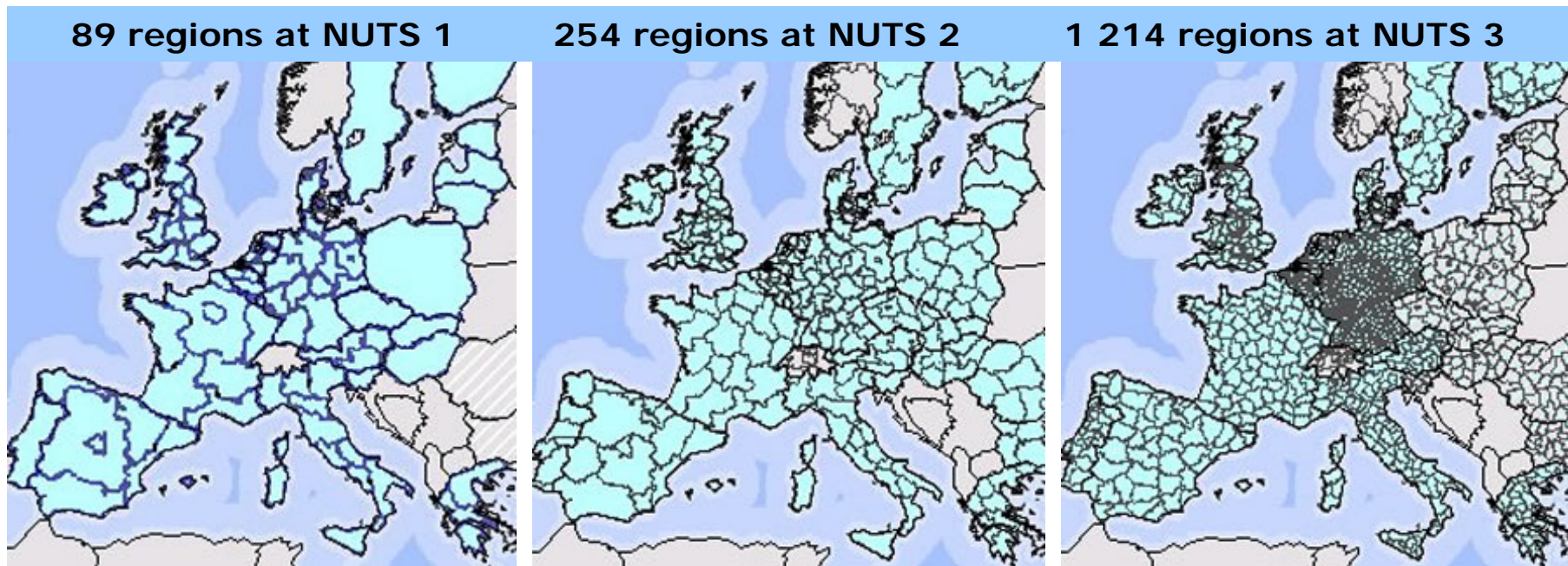
Regional innovation systems and clusters

- A cluster is a "*geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example universities, standard agencies, and trade associations) in particular fields that compete but also co-operate*" (Porter, 2000).
- Clusters approach is more sector or technology specific than regional innovation systems.
- Regional H2FC innovation systems and clusters may co-exist in the same territory as - or even include - as innovation systems and clusters.

Data 1

NUTS (Nomenclature d'Unités Territoriales Statistiques)

Classification of geographical units used for statistics across the EU.



Source: <http://www.histoire.ac-versailles.fr/old/geographie/Nterrit/NUTS.htm>

Data 2

Regional Innovation Scoreboard

The Regional Innovation Scoreboard is:

- developed by MERIT at University of Maastricht.
- carried out at NUTS 2.
- measures seven innovation indicators including human resources in science and technology, patent applications and employment in medium-high and high-tech manufacturing.
- indicating the general innovation climate based on quantitative data within each region.

Data 3

European Cluster Observatory

- European Cluster Observatory builds its definition of a cluster sector on Michael Porter's analysis of employment distribution in North America.
- The European Cluster Observatory has carried out there cluster analysis in 32 countries with NUTS2 regions as the geographical unit.
- *(to be explained further in the final version)*

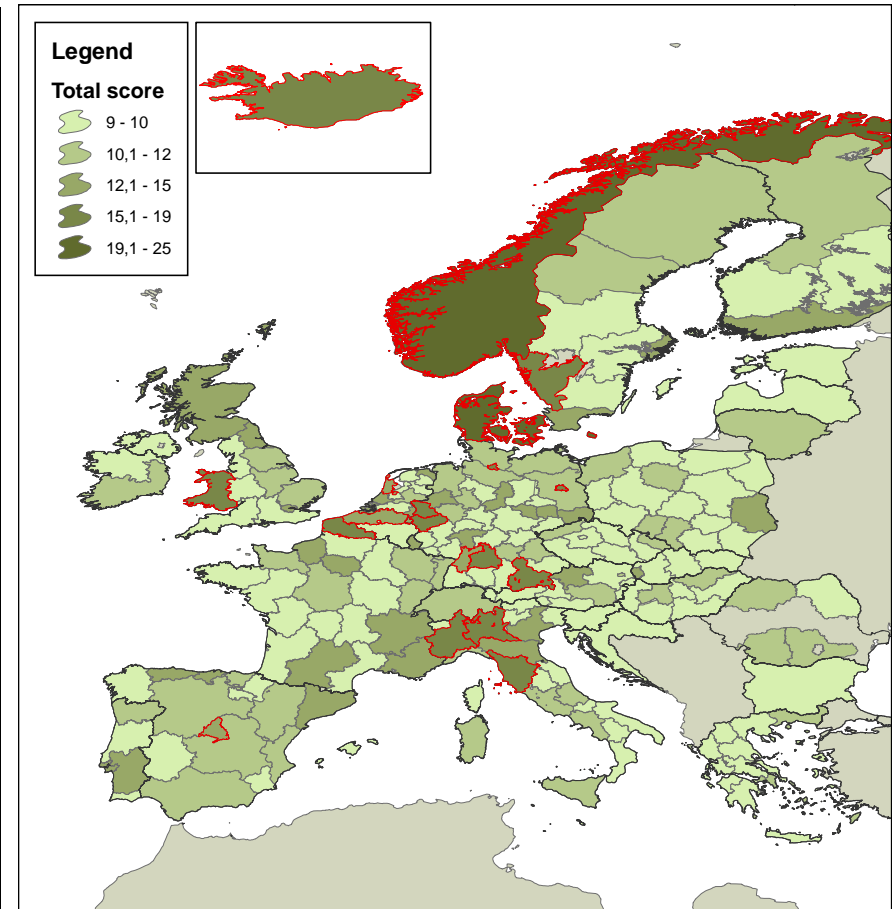
Data 3

Available (analysed) data on NUTS2 level

- Existing hydrogen production capacity (1..4)
- Existing hydrogen pipeline infrastructure (1..4)
- Hydrogen filling stations in operation and planned (1..4)
- Hydrogen and fuel cell demonstration projects (1..4)
- Registration of Interest (RoI) for communities undertaking hydrogen and fuel cell projects and innovative applications (1..4)
- Calculation of a 'score' across these data
- *(to be further explained in the final paper)*

19 "high-level H2FC regions"??

Baden-Württemberg (D)	DE11	Stuttgart	16
Baden-Württemberg (D)	DE12	Karlsruhe	15
Bayern, (D)	DE21	Oberbayern	17
Berlin, (D)	DE30	Berlin	19
Hamburg (D)	DE60	Hamburg	16
Iceland, (IS)	IS00	Iceland	16
Madrid (Es)	ES30	Comunidad de Madrid	15
Nord – Pas-de-Calais, (F)	FR30	Nord - Pas-de-Calais	16
Nordrhein-Westfalen (D)	DEA1	Düsseldorf	17
Nordrhein-Westfalen (D)	DEA2	Köln	17
Regione Arrezzo (I)	ITE1	Toscana	17
Reg. Lombardia / Piemonte (I)	ITC4	Lombardia	16
Reg. Lombardia / Piemonte (I)	ITC1	Piemonte	16
Scandinavia (DK)	DK00	Denmark	25
Scandinavia (NO)	NO00	Norway	22
Scandinavia (SE0A)	SE0A	Västsverige	16
Vlaams Gewest (BE)	BE2	Vlaams Gewest	15
Wales (UK)	UKL	Wales	17
WEST-NEDERLAND (NL)	NL32	Noord-Holland	15



Match between “High-level H2FC regions” and EU’s Regional Innovation Scoreboard

Score in the Regional Innovation Scoreboard	Number of high level H2FC regions
Highest third (86 NUTS2 regions)	13
Medium third (86 NUTS2 regions)	5
Bottom third (86 NUTS2 regions)	1

Distribution of 19 high level H2FC regions over the 358 NUTS2 regions’ score in the European Regional Innovation Scoreboard

Other clusters in “high-level H2FC regions”

Cluster categories	Industries examples	Examples from European H2FC Technology Platform's NEW-IG members
Oil & Gas Products and Services	refineries	Statoil Hydro ASA, Gaz de France, Shell Hydrogen BV, Total France
Automotive	motor vehicles and components	Daimler, Adam Opel GmbH, Volkswagen, Centro Ricerche Fiat, AVL List GmbH
Power Generation and Transmission	generators	Siemens, E.ON Sverige AB, EWE AG, GAMESA Corporacion Tecnologica
Heavy Machinery	tractors, locomotives	Wärtsilä Finland, Gruppo Sapio, Ansaldo Fuel Cells
Chemical Products	chemicals, industrial gases	Linde Gas, BASF Fuel Cells GmbH, ILT Technology
Production Technology	tanks	Topsoe Fuel Cells ?
Transportation and Logistics	air transport	Rail Safety and Standards Board?

Cluster Quotient

$$CQ_i = (A_i/B)/(C_i/D);$$

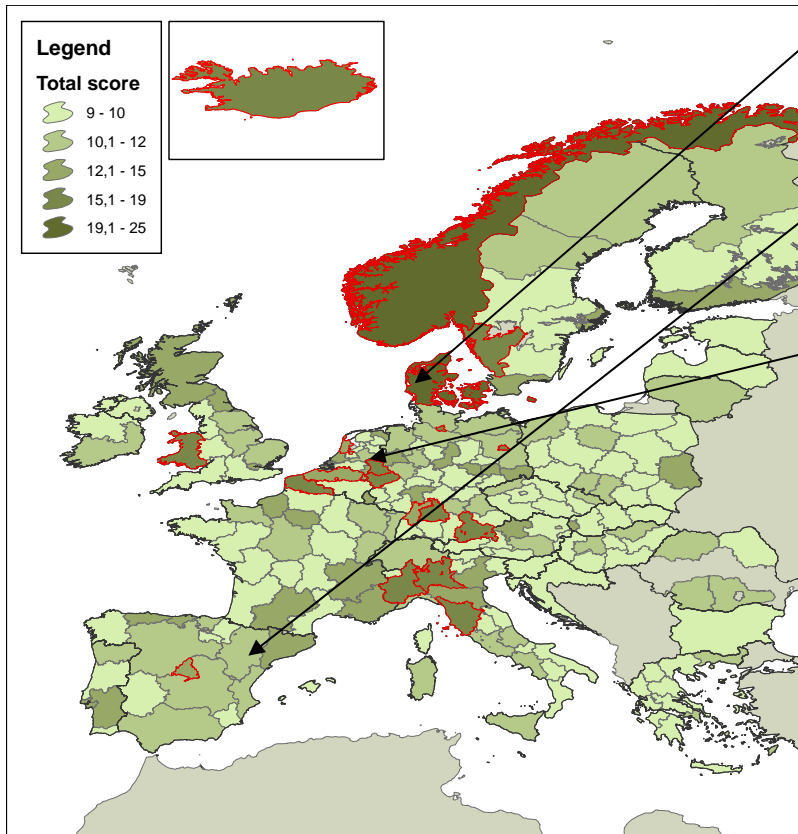
where

- i is a cluster according to the Cluster Observatory, e.g. Automotive
- A_i is the number for i Clusters in all high level H2&FC regions
- B is the number of all high level H2&FC regions (=19)
- C_i is the number of all i type clusters (e.g. automotive) in all regions analysed by the Cluster Observatory
- D is the number of all regions analyzed by the Cluster Observatory(=258)

Other clusters in “high-level H2FC regions”

Cluster Categories	Cluster Quotient	Industries examples	Examples from European H2FC Technology Platform's NEW-IG members
Chemical Products	3.3	chemicals, industrial gases	Linde Gas, BASF Fuel Cells GmbH, ILT Technology
Power Generation and Transmission	3.0	generators	Siemens, E.ON Sverige AB, EWE AG, GAMESA Corporacion Tecnologica
Production Technology	2.8	tanks	Topsoe Fuel Cells ?
Oil & Gas Products and Services	2.0	refineries	Statoil Hydro ASA, Gaz de France, Shell Hydrogen BV, Total France
Automotive	2.0	motor vehicles and components	Daimler, Adam Opel GmbH, Volkswagen, Centro Ricerche Fiat, AVL List GmbH
Heavy Machinery	1.8	tractors, locomotives	Wärtsilä Finland, Gruppo Sapio, Ansaldo Fuel Cells
Transportation and Logistics	1.3	air transport	Rail Safety and Standards Board?

Three examples on regional cluster policies



- NUTS3: The Hydrogen Initiative of Western Jutland
- NUTS2: The Hydrogen Energy Initiative in Aragon
- NUTS1: Fuel Cell and Hydrogen Network in North Rhine-Westphalia

Similarities in the examples

Every regional initiative to promote regional growth and competitiveness is unique. However, some similarities between the three studied regions exist.

- Initiatives builds on existing industrial strengths and clusters.
- Regional government (and civil servants) is an important driver for the development.
- The activities has run for more than five years and the regions start to profit by their effort.
- The different network initiatives now work autonomous and have become a brand for the region.

Regional policy instruments in the examples

- Establishment of networks between relevant companies (sub-suppliers, manufacturers, power industry) and research institutes in and outside the region.
- These networks have been formalised in organisations that now works on:
 - raising capital and funding projects to create knowledge
 - planning and keeping local or regional workshops, network meetings etc. to diffuse knowledge
 - planning and representing the region (and its companies) on national and international fairs and conferences
- Direct project funding and regional support to companies creating new jobs in the region.
- Stimulating markets:
 - Hosting and supporting H2FC demonstration projects.
 - Mix of partners from both public and private sectors.
 - Involvement of regional industry in projects.

Policy conclusions

The promotion of clusters should be based on measures tailored to the specific needs of a particular region. However, some general elements can be identified:

- Support to formulating a vision and strategic aim
- Inclusion of industry (both component manufacturers and energy firms) already in early stages are especially vital.
- Promotion of networks among companies, research institutes and regionally based interest groupings,
- Stimulation of regional markets for innovative products – e.g. through public procurement policies
- Facilitation of administrative procedures, by reducing the administrative burden on innovation activities????
- Establishment of regional research and innovation centres with the aim of developing research driven clusters of global excellence.
- Modern cluster policies also emphasise the need for a good coordination of policies at both EU, national and regional levels.

Thank you for your attention!

Thanks to

- the European Commission's for funding the integrated project Roads2Hycom under the Sixth Framework Programme. The project was conducted by a consortium of 29 partners from industry, research institutes and universities.

Special thanks for valuable contributions and comments to

- Sören Christian Trümper (PLANET GbR)
- Susanne Shaw and Paola Mazzucchelli (JRC-Petten)
- Raimund Bleischwitz (College of Europe)