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Collaboration in a Local Hydrogen Cluster in Germany

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According to Michael Porter [1] a Cluster "is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities". As the sum of its parts is of greater value than each individual company or institution (e.g. clusters create synergy). As Feldman [2] points out cluster formation is a process that relies on the coevolution of technology, business models and local supporting institutions.

Clusters have the potential to improve competitiveness (which results in improved productivity) in three ways: (1) they improve productivity through improved access to specialized suppliers, skills and information. (2) Innovation is given more importance as the need for improvement in processes of production is highlighted and (3) once established, clusters tend to grow as a result of the creation of new firms and the entrance of new suppliers.

1 Approach and Members of HyCologne

HyCologne is a regional hydrogen and fuel cell cluster in the Rhine area around Cologne. They work to establish hydrogen as an energy carrier in and around Cologne. Within its members HyCologne organizes meetings to network organizations relevant to hydrogen as an energy carrier. They are involved in international fairs and events relevant to hydrogen and activities for public awareness for hydrogen technology. This includes developing hydrogen safety programs, general public education programs, and fire department training programs. The following Organizations are members of the formalized Cluster HyCologne [3]:

1. ChemCologne e.V. » Chemical Cluster in the Cologne Area
2. CK Standortentwicklung » Regional Consulting Company
3. CHEMPARK » Service provider for the Leverkusen Chemical Park
4. DLR e.V. » Research Institute
5. Energy Hills » Energy-Cluster in the Euregio (Aachen, Heerlen, Maastricht)
6. Fachhochschule Köln » Cologne School of Applied Sciences
7. IHK Köln » Cologne Chamber of Commerce
8. InfraServ GmbH & Co. Knapsack KG » Service Provider for Chemical Park Hürth
9. NOVALINK » Technology consulting firm
10. Praxair Deutschland GmbH » Worldwide provider of industrial gases
11. Regionalverkehr Köln GmbH » Regional Transport Agency Cologne
12. Rhein-Erft-Kreis » District around Cologne

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13. ST@RT HÜRTH GmbH » Technology and Start-Up Centre
14. Stadt Brühl » City of Brühl
15. Stadt Hürth » City of Hürth
16. Stadt Köln » City of Cologne
17. Stadtwerke Brühl GmbH » Public utilities Brühl, service provider
18. Stadtwerke Hürth AöR » Public utilities, Hürth, service provider
19. TÜV Rheinland » Safety and Certification
20. Wirtschaftsförderung Rhein-Erft GmbH » Local Agency for Economic Development the definition of cluster types (Porter 1999) HyCologne can be understood as nt

According to a horizontal cluster as different public and private organizations are sharing resources and are managing knowledge centrally and formalized. This knowledge is brought together by two cluster managers and is used to (1) initiate new projects, (2) share technological risk and (3) enable interorganizational learning.

2 The Main Tasks of the Cluster

HyCologne is organized as a Public Private Partnership and consists of currently 20 members who facilitate the commercialization of hydrogen energy technology in the area of Cologne. HyCologne is following four main tasks: (1) Strengthen the strong cluster with other universities, public partners and private stakeholders (2) Using the existing resource of waste-hydrogen from the local chemical industry [4] and expanding the existing hydrogen infrastructure (pipeline network) (3) Operation of a hydrogen bus fleet vehicles including filling stations and infrastructure [5] (4) Establishment of fuel cell power plants for industrial electricity and heat generation (CHP).

With its 20 members HyCologne is working on networking among its members for relevant projects. They also help by raising capital and finding third party funding for projects. Current projects include: Development of a hydrogen infrastructure for hydrogen fuelled buses and hydrogen fuelling stations utilizing the waste hydrogen from the local chemical industry. The initial refuelling station and two buses are planned to be operational in 2010. Other projects include: Stationary Combined Heat and Power (CHP) fuel cell power plant units for energy production to utilize the hydrogen waste stream from the seven sodium chloride electrolyzing plants around Cologne, mobile and portable fuel cell systems, turbine- and power plant technology, hydrogen infrastructure and logistics and consulting services for public and private organizations

3 A Bottom-up Hydrogen Cluster

HyCologne is one of the few independent hydrogen clusters in Germany. There is no direct funding to the cluster like many other networks (Energy Agency NRW, Hestia Agency, etc.) HyCologne understands itself as an entrepreneur driven cluster that is "bottom up", meaning that private organizations networked among themselves to form HyCologne instead of being a state initiated venture and remains a neutral position when consulting among its members. There is great scope for utilizing hydrogen in a number of stationary and transport projects. These include building a fuel cell power plant and the setup of a fleet of hydrogen buses and

other vehicles which will be operated on regular service in Cologne and the surrounding area. HyCologne collaborates with a number of manufacturers, other clusters and cities around the world to not only achieve this goal technically but also run the fleet on an economic viable basis. The hydrogen cluster can provide valuable knowledge transfer and project collaboration regarding management of hydrogen as a fuel.

Little is known how clusters come into being [6]. Anecdotal stories suggest that successful clusters start themselves but there is little evidence that it is possible to proactively start a successful cluster. Evidence from those who have tried to start clusters is just that – it is very difficult.

4 Cluster Genesis and History of the Cluster

There are other factors that are helpful in the genesis of a technology cluster. A link to a university provides and research institutes brings in an increased flow of ideas, adds to the pool of individuals who may become entrepreneurs and is a key mechanism for developing a science park. This has been done in 2006 with DLR and in 2008 when the Cologne School of Applied Sciences became members of HyCologne. The existing hydrogen infrastructure (pipeline in the chemical park) turned out to be hard to access as the use and mode of operation is interconnected with other processes which are rather sensitive.

The establishment of HyCologne took around five years to become noticeable and it will probably need another five years to become a major entity. One of the key factors for any new cluster seems to be the importance of entrepreneurship as an endogenous process. Entrepreneurs provide encouragement and their successes persuade others to follow their ideas. These individuals also bring initial funding with them to allow a first organization of the cluster which creates returns and binds a lot of resources (e.g. time and money).

HyCologne goes back to the "Interest Group for Hydrogen (IGH₂)" which has been initiated in 2004 by a local start-up-centre (START Hürth), an industrial service provider (Infraserv Knapsack) and a small technology consulting company (Operathing). After having understood that big resources of hydrogen are available in the chemical park and could be used for infrastructure projects in the Cologne-Area the initiators hired a network agent to further examine the local situation and win more partners in the region. After a period of learning and listening to local companies, there were other partners joining the network paying some money to further establish a central management and administration office. The strategy of the state founded "Energy Agency NRW" [7] was focussing on the field of "special applications" (e.g. bikes, UPS, small applications) and thus had little share with the large technological systems approach [8] of HyCologne. Since the beginning IGH₂ and later HyCologne have been focussing on large scale technologies like public transport, buses, fuelling stations and power plants. Given the fact that NRW is the biggest federal state in Germany with a high and dense population the government of NRW has started to accept this reasonable strategy since 2008 and now also begins to initiate large scale projects in the transport sector. In early 2007, HyCologne was formally founded by seven members as a public private partnership (e.V. [German: eingetragener Verein]). Soon after the formal founding the number of members increased rapidly and new partners were willing to join the cluster.

5 Results and Outlook

Now in May 2010 there are 20 partners forming a rather strong backbone for local hydrogen energy projects in the Cologne area all willing to support new projects with hydrogen as an energy carrier. The coming years will show whether HyCologne is able to contribute to the initial stage of a hydrogen infrastructure in Germany through giving specific examples and demonstrations how hydrogen related projects can be successfully realized on a local level.

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