

**40th Congress of the European Regional Association (ERSA)
Barcelona, August 30th to September 2nd 2000**

**The impact of success factors for environmental innovation for regional
development strategies - how can regions benefit from environmental
specialisation?¹**

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Abstract

The current effects of international competition and of globalisation processes force regions/countries to compete with each other. Porter's (see Porter, 1990) industrial cluster concept provides essential arguments for competition amongst regions. Regional effects of environmental innovation activities need to be analysed utilising innovation theory and network analysis (see DeBresson and Amesse 1991, Schönert 1996). The paper focuses on business strategies for environmental specialisation. With the aim of working out relevant success factors for promoting environment-oriented innovation the Stimulus – Organism – Response Model (S-O-R) provides the conceptual framework for providing clues to companies' to create the competence for environmental concentration. The paper also deals with strategies supporting such an industrial specialisation. Putting together the business related success factors and the policy-induced factors for innovation this contribution provides a conceptual framework of stimulus and response factors influencing companies' environment-oriented innovation behaviour, which could be a guideline for national and regional decision makers to initiate environmental clusters.

1 INTRODUCTION

The current effects of international competition and of globalisation processes force regions/countries to compete with each other. Porter's (see Porter, 1990) industrial cluster concept provides essential arguments for competition amongst regions. Regional specialisation is one of the most adapted regional policy strategies. In order to emphasize the strengths of a region they need to identify potential areas of specialisation – one can be environmental specialisation.

There is a lot of literature existing in the field of national innovation systems (among others Lundvall 1992, Nelson 1993), which functions as a basis for identifying strategies on the regional level as well. But there are only a few empirical studies existing on regional environmental innovation strategies (e.g. Rehfeld 1994, Schönert 1996). More detailed empirical evidences could provide assistance for regional policy to specialise on environmental strategies. For the European landscape the European Commission supports regions with their Regional Innovation and Technology Transfer Strategies and Infrastructure Programme (RITTS), which falls under the financial and administrative responsibility of DG XIII, and with the Regional Innovation Strategies (RIS) of DG XVI. The latter *"aims at establishing efficient regional innovation systems in less favoured regions (LFRs) to close the so-called 'technology-gap' between the LFR's and the more technologically advanced regions"* (Landabaso and Youds 1999). Both do not specifically focus on environmental specialisation strategies.

On the other side there is a need for detailed information on business strategies for companies to specialise on environment-oriented innovation. The question of how to identify success factors for developing and implementing environment-oriented innovations and how regional policy can support that arises. There is some literature and empirical evidence existing on competition advantages of companies, which specialised on the development of environment-oriented innovation ("first mover advantage", see among others Carlton and Perloff 1990). Porter and van der Linde (1995) argue that environmental regulation can also initiate innovation activities on the technology user side. An empirical study on the first mover advantage hypothesis in Austria (see Köppl and Pichl 1997) showed that especially user firms with implemented clean technologies had competition advantages. The technology developers depend more on the market demand in Austria. Those market driven approaches can give some

answers to the above-mentioned question of identifying success factors. But there is still a need for more business internal and external factors (e.g. networks and co-operations) for completing the picture of initiating the development and implementation process of environment-oriented innovation.

The linkage between the policy induced and the business related factors could be a first attempt to build up a conceptual framework of stimulus and response factors influencing companies' environment-oriented innovation behaviour, which could be furthermore a guideline for national and regional decision makers to initiate environmental clusters.

The paper firstly bases on a national and international sample of case studies, which is still ongoing and therefore can only provide tentative results (European Union funded project in the 4th framework programme under the TSER-programme– entitled "Towards an Integration of Environmental and Ecology-oriented Technology Policy. Stimulus and Response in **Environment Related Innovation Networks. (ENVINNO).**" 1999-2001. and a Austrian National Bank funded project "Pilot Study ÖKOLINNO" 1998-1999). The aim of these studies is to identify relevant success factors for implementing environment-oriented innovations by analysing various stimuli (e.g. policy-induced, market-induced) and companies' responses (see Mellitzer and Sedlacek 2000). In this context the paper summarises the most important success factors.

Secondly the contribution works out what role the local and regional level plays especially by taking into account new developments of innovation supporting policy fields (see Schubert and Köck 2000). Furthermore it will identify arguments how regional policy could actively push the establishment of environment-oriented regional economies aiming at regional industrial clusters with environmental specialisation. Therefore the paper will concentrate on some Austrian examples of local and regional policy initiatives, which tend to support more or less environmental innovation strategies (see Schubert and Sedlacek 2000b).

2 STIMULUS AND RESPONSE PATTERNS

The successful development and implementation of environment-oriented innovations depends on various impulses from outside as well as emanating inside a company. The Stimulus – Organism – Response Model (S-O-R model) provides a scheme to analyse an action-reaction chains resulting from various impulses. The above mentioned research project ENVINNO follows this concept. For identifying success factors for the development of environment-oriented innovation, the following areas must be taken into account (for more details see Mellitzer and Sedlacek 2000): **networks and co-operation management, market structures, business internal factors, policy induced factors.** In the following paragraphs a short overview of the most important concepts and theses with an emphasis on regional policy is given.

Networks and co-operation-management

Klemmer, Lehr and Löbke (1999) emphasise that environment-oriented technology transfer processes can be achieved by co-operation of all relevant and involved actors. Co-operation in fact is a central factor for the development of environment-oriented innovation. *"With the appearance of spill-over effects co-operation promotes innovation"* (Blazejczak et al. 1999, p.7). In the company case studies two types of innovation networks were identified: user-induced and supplier-induced networks. Innovation networks are on the one hand project- and knowledge-oriented. On the other hand network activities are influenced by strong personal relationships between key actors of the involved companies and organisations. The life span of an innovation network depends on the complexity of the problem and the innovative solutions sought.

The network approach is part of regional specialisation strategies (see Aydalot and Keeble 1988, Camagni 1991). To build up a regional innovation system all the relevant regional actors need to be integrated. There are some examples existing where regional decision makers, organisations and companies are integrated into a co-operation network (see section 3). Regional policy can actively be part of such an co-operation or communication network.

Market structure

Analyses quoted in the literature identifying success and failure of new product development often conclude that successful new products result mostly from market

induced projects ("demand pull") (i.e. Myers and Marquises 1969 or Roberts and Burke 1974 both quoted in Kleinschmidt, Geschka and Cooper 1996). Essential success factors are preceding extensive market surveys and marketing both increases the success of new products. Besides the policy induced factors, market impulses are the most important stimuli for the development of integrated technologies (see also Mellitzer and Sedlacek 1999 and 2000). The most important market incentive is the challenge of reaching the technology leadership. The attainment of technology leadership usually implies high R&D efforts and high development costs. In many cases additional know-how must be acquired or additional investment in the education of their own manpower is warranted – a field where local or regional initiatives can provide the relevant support infrastructure.

Business internal factors

The environmental management literature (among others Steger 1993, Meffert and Kirchgeorg 1998, Staehle 1998) offers an overview of the importance of strategic management systems. Such a system constitutes the basis for the implementation of environment-oriented innovations. Without any environmental orientation in a company the development as well as implementation of environment-oriented innovations is not stimulated. The company case studies (see Mellitzer and Sedlacek 1999 and 2000) have shown an unambiguous connection between proactive business strategies and successful implementation of environment-oriented innovations.

The following factors have been quoted as essential for innovation:

Awareness of the environmental problem

Those companies with the intention of developing and implementing environment-oriented technologies are fully informed about their own environmental situation. They have implemented information systems and use earmarked studies to have extensive and meaningful information over type and quantity of emissions, the raw material - and energy consumption, the volume of solid waste as well as and the costs emerging from their disposal. Besides the knowledge of the operational environmental situation, such companies are proactive, i.e. they follow legal developments and try to fulfil regulations and standards. Those companies producing environment friendly products need to invest in their "environmental image" in order not to lose credibility in the eyes of their

customers. This environmental awareness can be greatly enhanced by local and regional environmental policy programmes (e.g. LA 21, EcoProfit, etc.).

Expected benefits

Internal persuasion of the commercial and technical management personnel and the willingness to co-operate with external project associates is easier to communicate and to justify, if the benefits (in quantitative and monetary terms) of the innovative environment-oriented technology to be developed are well known. There exist different types of benefits: economic and ecological advantages as well as image effects. A clear separation between these individual components is hardly possible in practice, for example a reduction of the hazardous waste – as a clear environmental benefit - means also a perceptible cost reduction nowadays. A more efficient and ecologically friendly production process often makes staff reduction possible. The ecological effects tend to be taken into account in the cost-benefit assessment - however they are not the most important factors in the analysed cases to induce the development of an environment-oriented innovation (see Mellitzer and Sedlacek 1999). Tailor made subsidy schemes on the national, regional and local level as well as on the European level (e.g. RITTS programme) can initiate innovation activities by offering financial benefits combined with demanded support infrastructure.

Business culture

Business culture is one of the most important factors influencing the willingness to innovate, i.e. an open and active culture with a flat hierarchy positively influences the entire process from the original idea, the final decision up to the implementation of innovative technologies. Such a business culture strongly depends upon specific persons and their competences included in this process, such as: The use of environment-oriented innovations necessitates a tight and co-operative teamwork among the business manager, the initiator, the project leader, the environmental health officer and the technical director. The "lived inventor spirit" is reinforced positively if successes have already been achieved in the past. Therefore the implemented environment-oriented innovation is often a result of former environmental innovation activities in a company. In some cases they have received environmental awards for their innovative activities. The proactive thinking of a company promotes the continuous search for new ideas, processes and products. Companies without any visionary strategy are focussing their

goals on short-term monetary outputs. There is a significant connection between the environment-oriented innovative behaviour and an environment-oriented production process. To support such a trend towards a pro-active business culture a specific "milieu" is warranted, which is often given in a local or regional context (see Maillat 1991).

Policy induced success factors

The current policy evaluation literature (among others Heritier 1993, Jänicke and Weidner 1995, Jänicke, Kunig and Stitzel 1999) maintains the thesis that specific instruments cannot produce consistent policy results without explicitly considering systemic effects. Only those strategic policy styles taking systemic considerations into account stimulate innovation in companies. The protagonist constellation, especially the relationship between regulators and those who are regulated, exerts an influence on the enforcement of this policy style (Jänicke, Kunig and Stitzel 1999). Numerous empirical studies have proved that environment-oriented innovations are generated above all in series of network relationships between state and non-state protagonists (Jänicke and Weidner (ed.) 1995, Jänicke, Kunig and Stitzel 1999). Additionally policy integration – i.e. co-operation of different policy field actors – is an essential stimulus for environment-oriented innovation activities. Especially the focussed co-operation between environmental, technology and research policy actors can deliver essential impulses. The essential factors considered are:

Regulatory specifications

Regulatory obligations (e.g. standards) lead in many cases to repairing strategies (development of end-of-pipe technologies). This hypothesis was confirmed in German case studies (Klemmer (eds.) 1999) examining the effect of environmental policy instruments on companies' innovation activities. A common result of these case studies was the fact that regulatory instruments do not stimulate any technology development (Klemmer, Lehr and Löbbe 1999). Environment-oriented innovations are developed as well as implemented by companies that behave on the one hand proactively and are aware of market and cost advantages on the other hand. In those cases the regulatory specifications were shown to offer chances for opening up new market areas, which could stimulate environmental industries. In many cases announcements of new regulation alone can already initiate effects (Klemmer, Lehr and Löbbe 1999).

Compared to those regulatory instruments economic instruments can be classified as "dynamically efficient and innovation-friendly" (Klemmer, Lehr and Löbke 1999, S. 81). Summing up the current policy analysis literature, the policy systems of the nineties are nowadays evolving towards "concrete aims and flexible instruments" (among others Jänicke, Kunig, Stitzel 1999).

Financial assistance

The development and the use of innovative environment-oriented technologies are always connected with uncertainty and high financial risks. The financial support (by state, provinces or communities) can essentially reduce risk and causes therefore an increase of companies' interests in environment-oriented innovations. Pure subsidies can only be "second-best solutions". On the other hand subsidies can initiate accompanying effects. In some cases, subsidies will increase sales prospects and consequently will offer incentives for innovation (for example, the wind-energy subsidies, Hemmelskamp 1999). Since environment-oriented innovations are affected by "multiple impulses" (Klemmer, Lehr and Löbke 1999, S. 80), financial assistance will in connection with other incentive-factors provide important impulses for the development of environment-oriented innovations.

3 The Role of the Regional and the Local Level in Austria

Austria as a federal republic has to act according to the subsidiarity principle. The nine states ("Länder") have their own regional governments responsible for the states' economic, ecological and social development. Therefore Austria has a long tradition in splitted competencies, which can be interpreted both as a strength and a weakness.

The national environmental plan (NUP) is a guideline for national environmental and sustainability strategies. Taking into account that Austria with its strong federalism has a long tradition in integrating the "Länder" the following question arises: *Are there any specific objectives focussing on regions or municipalities included in the NUP?*

Regions are one important target group in the NUP, which should support the goals and strategies of the national level, but there is no detailed or strategic focus to oblige the "Länder" to implement their own regional plans as for example in the Netherlands.

To fulfil strict goals and to achieve sustainability decentralised planning offers more efficient and more accepted strategies. But by choosing individual plans in each region the problem of existing externalities and trade offs arises which might result in inconsistent regional and sectoral plans. A higher degree of consistency can only be reached in regions where problems are separated. In most cases, e.g. pollution control, cross boundary effects will affect the efficiency and consistency of such regional plans. To profit from the advantages of regional or local solutions the following aspects need to be taken into account:

- **Closed versus open systems:** Generally regions are not completely closed, there are interactions between regions existing which open up their boundaries. Inter-regional co-operation is a minimum requirement in open systems.
- **The larger the region the harder the consistency:** Size is a relevant factor for implementing successful regional strategies. If there are clear rules, e.g. clear defined environmental planning regions, obliged size might not be the critical factor. One strategy could be to downscale overall national targets, e.g. the Kyoto target.
- **Organisational mediators:** The installation of organisational mediators could be an effective instrument to combine individual regional or local strategies and to guarantee consistent solutions. For sectoral strategies on the regional or local level the chambers of commerce and their regional subsidiaries could function as such mediators.

To achieve sustainable development in a country means to guarantee consistent solutions for each dimension (social, environmental and economic) and to define minimum requirement quality goals for each dimension. This means that a sustainable resource management system has to be integrated in existing markets. Furthermore an argument to downscale from global to national and from national to regional or local markets with strict and overlapping goals. A sustainable management system could be a solution to cover national, regional and local strategies.

3.1 The Austrian Experiences with Local and Regional Programmes

With its traditional federal system Austria has several examples of strategically oriented programmes on the regional and local level. These programmes do not completely fit in the sustainability concept but are strategies to strengthen regional or local economies (regional development strategies) without harming society and the environment. The following paragraphs should give an overview of these individual programmes and should analyse if and to what extent these programmes are goal oriented and following the national environmental strategy.

(A) Local programmes

Local Agenda 21 (LA21)²

The local agenda 21 is the first strategic implementation plan on the local level. Chapter 28 of the agenda 21 is addressed to local political decision-makers:

“Because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and co-operation of local authorities will be a determining factor in fulfilling its objectives. Local authorities construct, operate and maintain economic, social and environmental infrastructure, oversee planning processes, establish local environmental policies and regulations, and assist in implementing national and subnational environmental policies. As the level of governance closest to the people, they play a vital role in educating, mobilising and responding to the public to promote sustainable development.” (United Nations, 1993, Agenda 21, section 28.1 in Lafferty 1998).

Chapter 28 is one of the shortest sections in the agenda 21 and contents of four guidelines. But nevertheless is this bottom up approach one of the most important implementation strategies for the systemic environmental policy approach. For implementing federal sustainable development strategies (top down approach) both national and local strategies need to be linked. The overall goal of the local agenda 21 is to work out national local agenda 21 'action plans'. These 'action plans' can be entirely different in each municipality depending on geographical and topographical specifics, the local and regional economic structure, etc. Local agenda 21 is outlined as a permanent ongoing process, which implies that targets need to be adapted permanently. The most important advantage is *“the key role of local authorities to take responsibility for introducing, interpreting, adapting and eventually implementing the most relevant aspects of Agenda 21 for their local communities”* (Lafferty 1998, p. 167). The local

Agenda 21 is participatory – with the aim of bringing together key actors and stakeholders in a community. These stakeholders are involved in designing and implementing the local 'action plan' including quantitative and qualitative targets and measures to achieve these goals. In most cases the community establishes a co-ordination team consisting of protagonists of each stakeholder group (decision makers, economic actors, citizens, etc.) responsible for identifying strengths and weaknesses first and secondly for formulating future strategies (incl. visions).

Austrian examples

Currently there are only pilot agendas implemented in Austria but there is one example, which can be seen as internationally, accepted - "Graz Ökostadt 2000" (Magistrat Graz 1995). In July 1995 the city government in Graz approved the agenda. This concept is explicitly focussing on environmental concerns and their effects on environmental policy. It clearly lacks in implementing the sustainable development concept, although it refers to the Aalborg initiative "European Cities and Towns" (Denmark 1994). The agenda covers several programmes which should support a sustainable environmental policy, i.e. EcoProfit, EcoDrive, municipal energy concept (KEK), "Klimabündnis" (Climate Alliance), etc. The agenda includes quantitative goals for several areas of environmental problems, i.e. air, noise, energy consumption, traffic, waste disposal, water and soil pollution, green areas, which need to be met by the year 2000. The controlling and evaluation process hence starts this year.

EcoProfit³

EcoProfit stands for "Ecological Project For Integrated Environment oriented Technology". In 26 locations in 7 countries, more than 250 enterprises have been granted the EcoProfit-Award. EcoProfit was created in Austria and has become an internationally well-known and often carried out programme. Currently the projects are characterised by intensive co-operation between companies, administration and research units with the intention to initiate the introduction of voluntary environmental measures, among these the implementation of measures involving cleaner technologies. The projects aim particularly at SMEs providing incentives for voluntary action to improve environmental performance. These companies have raised their eco-efficiency significantly and have, moreover, found new partners in local authorities. On the grounds of four evaluation studies, factors leading to success have been identified.

EcoProfit's basic goal is to create a win-win situation. Innovative and integrated environmental techniques strengthen companies economically and at the same time improve the regions' ecological situation. Furthermore law does not regulate activities within this programme, but use of the discretionary possibilities of municipalities and regions is made. It can flexibly be adapted to regional needs concerning the content, which means that individual topics can be put on the agenda of the workshops organised according to need, consulting services can be requested. The flexibility of instruments and the institutional flexibility allows specific regional adaptations.

EcoProfit examples in Austria

Developed in the early 1990s in Graz, Austria, EcoProfit started as a "Cleaner Production Program". EcoProfit earned Graz its reputation as a clean city across Europe. In 1996, Graz was awarded the European environmental prize, "Sustainable City Award 1996," and EcoProfit was one of the reasons for that. In 1994 other Austrian cities followed suit and introduced their own projects – Klagenfurt (1995), Dornbirn (1996), Lower-Austria (1996), Lustenau (1997), Lauterach (1997), Bregenzwald (1997), Götzis (1997), etc.

Kplus⁴

The Kplus programme is a federal initiative to improve co-operation between scientific institutions and industry in Austria. It is a RTD programme under the auspices of the Ministry of Science and transport (BMWV) and started in autumn 1998 – *"the BMWV entrusted the Technologie Impulse Gesellschaft (TIG) with responsibility for managing the programme."* The Kplus programme is a result of the federal governments' technology offensive (*"Technologiemilliarde"*). It is embedded in the Austrian research promotion system with the specific aim of initiating co-operation projects between academic and business actors.

The Kplus "competence centres" are located in different regions in Austria and are therefore an important link to the regional innovation systems. In most cases the states (*"Bundesländer"*) and municipalities are co-financing these centres. The yearly budget

of each centre is between 2 and 4 million Euro – 35% are provided by the Technologie Impulse Gesellschaft (TIG), 25% by other public sources and 40% by industry. After running a pilot scheme in 1998 five additional centres were approved 1998 at the end of January 2000. The foundation document states the following goals:

- improved utilisation of existing competencies and resources
- development of new knowledge
- creation of national competencies and critical masses through the implementation of long-term research programmes
- changing research culture – which means co-operative projects, professional project management
- strengthening of the business location Austria
- increasing Austria's participation in international RTD programmes
- development of human resources

Austrian examples of competence centres

As mentioned before five Kplus competence centres were selected within the scope of this pilot scheme at the end of 1998:

1. The sensor technology centre "Carinthian Tech Research" (CTR) in Villach
2. The "Telecommunications Research Centre Vienna" (Forschungszentrum Telekommunikation Wien, FTW).
3. The "Light Metal Competence Centre Ranshofen" (Leichtmetall-Kompetenzzentrum Ranshofen, LKR)
4. The "Materials Centre Leoben (MCL)"
5. The "Software Competence Centre Hagenberg (SCCH)"

With these five new centres being approved in January 2000 more than 160 companies of all sizes participate in at least one Kplus centre. Within the next period it will be interesting if there will be installed environment-oriented competence centres. According to the Austrian technology policy concept (1996) with its environment orientation it will be a future strategy for the Kplus programme. Currently there are no efforts existing.

(B) Regional programmes

Regional Agenda 21 (RA21): "From the local to the regional agenda 21"

One of the most important sub-goals of the local agenda is the introduction of an inter-municipality learning process. The development of common initiatives between municipalities in form of inter-municipality co-operation is usually thought of as the only way of reaching this goal (Lafferty 1998). Another strategy for municipalities located in a region could be the development of regional agenda. Especially for urban agglomerations this might be a tool for combining urban and rural strategies without endangering the basis of each.

The weakness of this concept lies in the administrative responsibilities of regions in most European countries. There is a gap between the local and the federal level in terms of legal competencies, which means that there are specific responsibilities at the local and the federal level. Regional governments normally do not administrate regions. Those countries with a federal system do have a state level in between. Therefore it would be easier to refer to the state level ("Bundesländer") in those countries with federal and subsidiary approaches – e.g. Germany and Austria. The regional agenda concept is a very new one without much empirical evidence to base arguments on. Nevertheless, there are examples of concrete regional agenda 21 in Europe, e.g. in Norway (see Lafferty 1998).

Austrian examples

In Austria there are no direct examples of regional agenda 21 projects. But there are some examples of developing regional sustainability concepts on the state level existing, e.g. in Upper Austria, which could potentially lead to a kind of regional agenda 21.

Cluster Approach

The cluster approach is one of the most elaborated concepts for regional economies and concentrates on innovation and competition aspects. Within their regional innovation system regional economies try to specialise in several industrial clusters. Further contributions have come from Porter's cluster approach where in particularly Enright

(1995) has pointed to a regional dimension of this concept. It is argued that the competitiveness of firms depends on innovations, which are stimulated both by competition and co-operation within localised industrial clusters.

A very new form is the formation of ecological clusters. Those companies developing and producing environmental technologies – e.g. energy technologies – can profit from regional clustering in terms of supporting economic and ecological cycles.

Austrian examples

A study⁵ investigated cluster structures in Styria in the mid eighties. Vehicles/transport is the strongest growing cluster in Styria, and there are 37 firms with 7 800 employees (1996 figures). It comprises the manufacturing of car and rail systems and components. With regard to vehicles, Styrian firms are either suppliers of components, ranging from simple parts to complex subsystems (e.g. transmission, motor), or assembly plants (e.g. Chrysler-Steyr). The vehicle-sector is the primary target of the Styrian "cluster policy". At the national level this sector was supported with the intention to reduce the balance of trade deficit through increased subcontracting by Austrian firms.

The organisational structure of this cluster got more elaborated at the end of the nineties after implementing the goals of the Styrian technology policy concept which aims at the creation of an enterprise support system for innovation. Relevant decision makers and organisations are intended to be integrated into a co-operation and communication network. A board of experts (*Joanneum Research* and the Technology Agency of the Styrian Government, the Steering Committee and the Co-operative Forum) acts as a consultant to decision makers. The strategies and goals of the Styrian Technology Policy Concept relate to (1) co-operation, (2) absorption and diffusion, and (3) quality and qualification (Tödtling/Sedlacek 1997). In 1999 the vehicles/transport cluster initiative (AC Styria) became independent as a company ("AC Styria Ges.m.b.H.").

As one of the medium term goals in the Styrian technology policy concept the formation of an ecological cluster was intended. Currently a new platform "Eco-Cluster East Styria" was founded which is co-ordinated by the regional management in East Styria (RMO) with the aim of linking several projects in the area of renewable energy technologies. The platform functions as a regional environment-oriented network with

competencies in renewable energy technologies. Six institutions (regional bureau of Joanneum Research in Hartberg, Kornberg institute, local energy agency East Styria, energy workshop Weiz, innovation centre Weiz for energy) are involved in building up this cluster. Within the Interreg II-programme of the European Commission this initiative receives fundamental funding for developing the organisational structure, building up an eco-database, a management system and for assisting the network. After initiating core projects the network wants to install an "energy highway" ("Energieschaustraße") where about 120 companies will be included (see Trummer 2000).

4 Conclusions

In our case study analysis we identified the following success factors: policy induced factors, market structure leadership as a result in a change of the market structure, business internal factors, networks and co-operation management. These success factors are stimulus – response elements in specific innovation projects. Therefore the mutual dependence of each factor needs to be analysed further. The quasi-optimal combination of stimuli to initiate innovative response patterns is one of our research goals. Some preliminary results⁶ are the following:

- The central role of environmental policy and technology policy as one of the most important stimuli is evident in the literature. The concrete impulse for initiating environment-oriented innovation is the co-ordination between these two policy fields (**policy integration**). Policy programmes to promote networks and specific co-operation projects need to be worked out further (**networks and co-operation management**) on different spatial levels. The importance of the local and regional level in this context
- Especially environment-oriented innovation strategies need to be analysed on an **international scale**. In many cases the market for those technologies is international. Therefore the importance of cross-boarder co-operation has to be taken into account.
- Products existing and available on the market influence the development of environment-oriented technologies. In many cases existing end-of-pipe technologies are the base for innovative solutions.

- Technology developers are well informed about the **market** and their **competitors**. Often the market is the driving force for innovative solutions.
- The developer is furthermore well informed about the market potential of users. The need for tailor made adaptations makes it necessary to be informed about the industry specific needs.

The question of supporting regional environment-oriented innovation strategies depends upon various factors. There are some initiatives existing on the federal level that could potentially influence such strategies positively. The Austrian federal environmental strategy (NUP) shows a lot of inconsistencies and ineffectiveness' in terms of scaling down the national environmental plan to other spatial levels. Most of the regional and local initiatives are participatory approaches, i.e. EcoProfit, LA 21, which is one of the most warranted criteria for sustainability programmes. But it is still a challenge for all these programmes to achieve sustainable development. The presented initiatives are currently too young to be completely evaluated, in most cases the initiative or programme exists in the first generation without any controlling experiences. The following table (see table 1) tries to give a short overview of a very tentative evaluation of the Austrian initiatives.

Although the critical aspects of the NUP seem to predominate, i.e. too detailed, no strict goals, no clear competencies for regions and municipalities, it functions as a national environmental strategy (one of the postulates of the new public management approach). But looking to the regional and local level this strength of the NUP is not implemented. There are several quite detailed and efficient but only single acting initiatives implemented. There is no environmental strategy obvious on the regional and local level in Austria. Therefore there can be a lack of co-ordination identified, which can be interpreted also as strength in terms of regional and local flexibility. To combine both – strength and weakness – a sustainable management system is warranted to achieve the hierarchically ordered goals. For such a management system clear organisational rules are needed:

- Ex ante co-ordination before installing the plan
- A participative goal discussion and goal definition to implement consistent plans on different spatial levels.
- A strict controlling process for fulfilling the goals and to control consistency.

Table1: Evaluation of Austrian policy initiatives aiming at sustainable development

Spatial levels ⇔ Evaluation ↓	National level: NUP	Regional level: "Eco-Cluster Styria"	Local level
goals	too vague	clear goals which can be defined as sub-goals of the Styrian technology policy concept	LA21 –Graz: detailed EcoProfit: clear Kplus: clear
strategic	the strategic orientation is one of the strengths	yes, for the region and for industries	LA21 –Graz: yes EcoProfit: strategies for industries Kplus: co-operation between industries and science
instruments	too specific	more project oriented	LA21 –Graz: covers several programmes EcoProfit: several voluntary instruments Kplus: goal specific instruments
competencies	no clear competencies of regions and municipalities	clear competencies of each participating institution	LA21 –Graz: clear competencies EcoProfit: clear competencies Kplus: variable but clear competencies
update	still missing	-- (started in the year 2000)	LA21 –Graz: ongoing process EcoProfit: learning process Kplus: no (just started)
sustainability (SD-concept)	it is mostly environmental policy oriented, but generally the SD-concept is the basis for the plan	is implemented	LA21 –Graz: basis for this initiative EcoProfit: as a prerequisite Kplus: no
general	too detailed	too early for evaluation	LA21 –Graz: acts as a model or pilot project EcoProfit: very successful Kplus: national technology offensive

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¹ The paper is based on a European Union funded project – 4th framework programme, TSER – entitled "Towards an Integration of Environmental and Ecology-oriented Technology Policy. Stimulus and Response in **Environment Related Innovation Networks. (ENVINNO).**" 1999-2001.

² The whole paragraph is based on: Schubert/Sedlacek 2000a and <http://www.iclei.org/iclei/la21.htm>

³ The whole paragraph is based on: Martinuzzi/Huchler 1997 Eco-management in Companies.", EMAS conference in Manchester 1997 and Huchler/Martinuzzi/Obermayr 2000.

⁴ The whole paragraph is based on: Swoboda 1999, Wiener Stadtgespräch 1999 and <http://www.tig.or.at/>.

⁵ Fabris, W. et al.: Wirtschaftsleitbild Steiermark. Vienna, 1995

⁶ The European sample of case studies is still ongoing.