INTERREGIONAL INNOVATION POLICY
OPPORTUNITIES AND CHALLENGES
IN THE ALPS-ADRIATIC REGION

PROJECT PART-FINANCED
BY THE EUROPEAN UNION

North East South West
INTERREG IIIC

CORINNA Cooperation of Regions for Innovation

KWF Kärntner Wirtschaftsförderungs Fonds

JOANNEUM RESEARCH

WIBAG Wirtschaftsservice Burgenland AG

FFG

Hungarian Science and Technology Foundation

IER

FRIULI innovazione Research and Technology Transfer Centre

Wirtschaftsförderung Region Stuttgart

BMWA BUNDESMINISTERIUM für WIRTSCHAFT und ARBEIT

NKTH National Office for Research and Technology

REPUBLIC OF SLOVENIA
MINISTRY OF HIGHER EDUCATION,
SCIENCE AND TECHNOLOGY

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Interregional Innovation Policy

*Opportunities and Challenges
in the Alps-Adriatic Region*

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Foreword

The ever-growing need of companies for specialised knowledge for achieving and defending their competitive advantage and the limited capabilities of regions—particularly of small ones like Carinthia—to satisfy that demand within their borders, put a premium on the ability of a business to cooperate. We think that cooperation is made much easier when meeting partners face to face is not costly and when shared cultural values and traditions make for a swift understanding. All this is the case for partners that may be found one hour of driving time away. The history of the past hundred years has put many of them behind national borders that we only slowly begin to ignore when we think about who could support us in any tricky question of business life. Very often, we have to cross those borders to find the partner that may help us most.

It is for this reason that we were happy to take part in the INTERREG IIIC project CORINNA —and even take its lead— that set out to foster cooperation in R&D and technological innovation with our neighbouring regions. The most important obstacle to such cooperation is the lack of knowledge about our neighbours' offers: Carinthian business men seem to be much better informed about R&D services in far away Munich and Vienna than about sometimes superior opportunities in Ljubljana or Udine. The CORINNA project has done a lot to provide information for business people and researchers to show them what is waiting nearby to be used for their advantage. We invite you to visit www.corinna-net.info to assess that information.

We admit that there is still a lot to do for the policy makers in our regions to support their companies in living up to the full potential of their location. In many cases, policy makers themselves are not aware of the opportunities that offer themselves as soon as we look for partners across the borders of our regions. This book should assist in overcoming that lack of knowledge. It tackles the issue of interregional innovation policy from various standpoints and in different styles. It contains articles by economists, policy makers, and people from public administration that will inform you on the broader economic picture and options for cooperation in our regions, the strategies and projects of their governments, and on the major companies and institutions that have a role in R&D and the promotion of technological innovation in these regions.

This book addresses people interested in R&D and innovation in our regions—in public administration but also in companies and research organisations. We would like to thank Christian Hartmann and his colleagues of Joanneum Research in Graz for the concept and the preparation of this book, and all other CORINNA partners for their contributions to it. We are honoured by the willingness of high-level individuals shaping the technology policy of our neighbouring regions and countries to share their view on the issue. This book is not meant as a report on a finished project but as a means to promote the case of interregional cooperation in R&D and technological innovation in the future.

Erhard Juritsch and Hans Schönegger

Managing Directors of the Carinthian
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Christian Hartmann

Introduction

The Emergence of Regional and Interregional RTDI policy

Regional spaces have gained prominence in the last decade not only at the level of theoretical discussion but also as key agents for the design and implementation of science and technology policy. Globalisation, rapid technological change, and the growth of information and communication technologies (ICTs), have led to a heightened role of the regions as loci of economic governance. The pressures emerging due to globalisation processes have generated a new concern regarding the role played by local and regional-specific factors. Rather than provoking greater spatial uniformity in economic activities, these processes of globalisation—and the increasing codification of information allowed by ICTs —may actually be encouraging a process of regional specialisation (Howells 1999). Explanatory factors mentioned in the literature relate to the importance of face-to-face communication and of local-specific factors in triggering knowledge sharing and innovation (Maskell and Malmberg, 1999). Indeed, as Porter (1998, p. 90) states:

»In a global economy—which boasts rapid transportation, high-speed communication, and accessible markets—one would expect location to diminish in importance. But the opposite is true. The enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialized skills and knowledge, institutions, rivals, related business and sophisticated customers«.

Terms such as »glocalisation« (Swyngedouw 1992) refer to such parallel and simultaneous processes of globalisation and geographical specialisation, a mix between the global and the local scales in governance and economic coordination. This relates to a supposed shifting in the balance of power away from the nation state, which is ascribed to the perceived inability of national states to respond to new competitive changes. Certainly, some accounts indicate a 'hollowing out of the state' (Jessop 1994) and outline a need for coordination at supra-national levels, plus a transfer of authority downward to local levels. Regions are now said to be able to play a role in the global economy, becoming capable of 'tying down the global' to shape their own economic prosperity—if they are adequately mobilised politically (Amin and Thrift, 1994).

The Importance of Knowledge and Proximity

Much recent thinking on regional development processes stresses the role of knowledge. A heightened importance has been attached to knowledge, since it is seen as aiding regional development by promoting learning and innovation as a means of achieving competitive advantage within a knowledge economy (Cooke and Morgan 1998; Storper 1997; Maskell and Malmberg 1999). The importance of location and proximity is attributed to their allowing the sharing of tacit knowledge (Howells 1999). As a result of globalisation and the IT revolution, codified knowledge is more easily accessed and shared. However, tacit knowledge is difficult to share across long distances and, therefore, remains untraded and spatially sticky. As regions are exposed to greater global competition, it is only by the development of non-tradable, sticky, context-specific knowledge embedded in routines and social environments that regions can sustain their competitive position. The importance of (tacit) knowledge is, therefore, used to explain agglomeration or 'clustering' effects and the development of location-specific competitive advantage, i.e., an advantage that is embedded in regional and local cultures and is thus impossible to copy or replicate.

An additional argument commonly put forward, linking geographical proximity and innovation processes, consists of the regional or local level providing an adequate relational space that allows for the sharing of tacit knowledge (Uyarra 2004). Competitive regions are said to feature geographically and socio-culturally proximate and trustful relationships that allow the exchange of tacit knowledge. Favourable institutional environments in these regions facilitate knowledge exchange processes, therefore supporting and reinforcing local advantage. Ideas of 'regional innovation systems', 'relational assets', 'learning regions', 'social capital', 'institutional thickness' and 'untraded inter-dependencies' all capture this policy idea of the importance of knowledge and learning and the promotion of regional assets (Putnam et al. 1993; Amin and Thrift 1994; Cooke and Morgan 1998; Storper 1997). New approaches in the area of regional development policy have, therefore, turned to focus more on the development of conditions suitable for innovation and growth, such as clusters, networking, and the encouragement of institutional cooperation.

Shifting Patterns of Governance: Regions as Multi-Actor Spaces

Therefore, what is emerging is a shift in patterns of governance within states, a shift between central and sub-national levels of government, and a shift between the variety of new actors and agencies now involved in public/private partnerships (Adshead 2002). The operating principles of EU regional policy, for example, now entail greater delegation of responsibility to the regions and the involvement of a wide range of organisations operating in partnership. In the field of public policy, it can be said that there has been a shift in discourse towards stressing concepts such as subsidiarity and multi-level governance, all aiming to highlight »the shared, collective and interconnected roles of different states, policy arenas and policy actors in the EU policy process« (Adshead 2002, p. 14).

Innovation policy decisions take place in multi-level/multi-actor arenas (Kuhlmann et al., 1999). Knowledge resources and actors are present in a variety of different forms and organisational settings. This is because the individuals involved in the innovation process come »from many different institutions and organisations, they will often be dispersed geographically and may only be able to work on a problem or project part-time« (Gibbons et al. 1994, p. 162). Regions indeed operate in multi-actor innovation policy arenas, since regional policy domains encompass a range of political, economic, societal and scientific actors.

The Rise of Regional RTDI Policy in the European Union

The process of European integration has diffused authority across regional, national, and supranational institutions. Multi-scale governance relations in science, plus the importance of the regional dimension in innovation, are emphasised by the concept of a European Research Area (ERA) (Edler et al. 2003). Recent policy documents at the European level have stressed the role of the regions in shaping the ERA (EC, 2001). The Commission acknowledges that research governance at the level of the regions is central to the development of the ERA, stating that »regions emerge as dynamic players in developing and structuring the European Research Area« (EC 2001, p. 7). The region is, therefore, considered a key factor in the implementation of technology policy. Yet there is a possible conflict between traditional European regional policy, concerning objectives such as regional convergence and well-balanced territorial development at all levels, and the new orientation of innovation and competitiveness policy which tends to subordinate and »instrumentalise« EU regional actions and programmes. EU and regional authorities can be strategic partners, but they do not have the same interests and visions (Héraud 2003).

Indeed, we are witnessing a trend in Europe towards increasing decentralisation and devolution of political powers down to regional institutions in the area of science and technology policy. What is emerging a »multi-level governance of science and technology« and increasing linkages between science and technology policy objectives and regional development planning. This can be observed for example in the case of countries such as France and the UK, where a process of devolution from formerly centralised structures is taking place. The current system of scientific governance in the UK, geared towards scientific excellence regardless of its impact on regional economic disparities, is showing signs of change and even breakdown, as new regional identities which incorporate science and technology activities and infrastructures emerge. This is forcing science and technology policy makers at national level to consider to what extent they should take the regional development aspect into account whilst also encouraging regional policy actors to intervene in science and technology activities and infrastructures (see, e.g., Charles and Benneworth 2001; CURDS 2004). In the UK, for example, the decision of the government in 2000 to locate a new synchrotron facility at Rutherford Appleton Laboratory, Oxfordshire instead of Daresbury, Cheshire in the North West region, sparked a regional outcry highlighting the bias of research funding towards the southern regions. For the first time, the national government was told that the regional dimension needed to be considered in science policy. This decision triggered the formation of regional 'coalitions of interest' in the North West region and was crucial in building a powerful regional science lobby, centred on the region's higher education institutions (HEIs) and supported by the North West Development Agency, ultimately leading to the creation of the North West Science Council in 2001.

Another important point to be considered here is the role of EU policy, and specifically of the programmes of European regional policy, in promoting decentralisation or devolution: In traditionally centralised countries, European policy has not only achieved its intended goals such as helping lagging regions to catch up, etc., but has also indirectly promoted territorial self-organisation and bottom-up initiatives (Héraud et al. 2004).

The CORINNA project

CORINNA is short for Cooperation of Regions for Innovation and is a project to stimulate cross-border cooperation in technology development in the core Alps-Adriatic regions. It aims at informing companies and research institutions about the technological capabilities available in these regions and in assisting public administrations in finding best practices for promoting regional innovation systems.

Its six regional partners from Friuli-Venezia Giulia (Italy), Slovenia, West Transdanubia (Hungary), Carinthia, Styria and Burgenland (Austria) are supported by three partners from Budapest, Vienna, and Stuttgart (Germany), and from Slovenian, Hungarian, and Austrian ministries and government agencies.

CORINNA‘s aim is to help exploit the full potential for technological innovation in the partner regions by stimulating cross-border cooperation in fields of common technological strengths or complementarities. To date, the intensity of collaboration in technology and innovation across the borders between Italy, Slovenia, Austria, and Hungary still lags behind that of other comparable regions. Huge differences in governmental structures—federalist or centralistic -, regulations, policies, and support programmes, as well as language barriers and restructuring processes hinder efficient cooperation at both company and public policy level.

To address some of these challenges, CORRINNA aims to increase the mutual knowledge of the partner regions‘ innovation systems, policies, and strategies, to find best practices in promoting regional innovation capabilities, and to develop cooperation projects in areas of common focus.

In order to understand the differences in the partner regions' technology policies, the regional innovation systems have been mapped and a synoptic report on the regional innovation strategies was published with results being communicated to policy makers. The partners have then drawn on their increased understanding of the regions' innovation systems to discuss best practices and pitfalls in regional innovation policies and instruments. In addition, policy actors in the field have been involved in order to work out recommendations for policy changes. Finally, a number of instruments designed to lower barriers for interregional cooperation of firms and research institutions has been set up. These include: the first interregional databank of RTD organisations with a standard categorisation; guided visits that presented the regions' capabilities in areas of common strengths or complementarities; groups of experts that provide solutions to some of the major problems of cooperation which tend to inhibit the achievement of CORINNA's aims.

Structure of the Book

In part, the book presents the results of various analytical steps that were taken in the course of the project; it thus represents the condensed results of the analytical work of CORINNA. The book also offers an additional perspective in that it presents several contributions of public bodies and agencies involved in innovation policy design and implementation. The overall structure of the book is threefold:

In part A, »Priorities and Strategies«, two contributions deal with existing interregional strengths in research and development and the potential for interregional innovation policy strategies. Christian Hartmann of the JOANNEUM RESEARCH Institute of Technology and Regional Policy in Graz presents in his contribution »Comparative Analysis of the Regions of the CORINNA Project« a thorough analysis of existing specialisation patterns in the CORINNA region from an interregional comparative perspective. Damjan Kavas of the Institute for Economic Research in Ljubljana follows this with a chapter on »Synergetic Strategies«, where he discusses concrete potentials for interregional innovation policy within the context of international good practice.

In part B, »Governance«, contributions from innovation policy actors that were directly or indirectly involved in CORINNA activities are presented. Taken together, they are representative of innovation policy activities at national, regional, and interregional level. The first contribution in part B by Georg Panholzer from the Austrian Federal Ministry of Economies and Labour deals with the »Emergence of the European Research Area and its Implications for the Regional Level«. This is followed by a closer look at the regional level with the contributions of Michael Azodanloo (responsible for territorial cooperation in the government of the Province of Styria) and of Markus Gruber on the adjustment of regional innovation policy to the EU structural funds programmes in 2007-2013. Tivadar Lippényi, vice president of the Hungarian National Research and Technology Office, adds then a further perspective with his article on »Regional Dimensions of Innovation Policy: Lessons from a New EU Member Country«. Aleš Mihelič, Director General of the Ministry of Higher Education, Science and Technology of the Republic of Slovenia, gives in his contribution on national governance and interregional cooperation—an additional insight from the national level perspective. The last contribution in part B, written by Roberto Cosolini, Regional Minister for Labour, Training, University and Research in the Autonomous Region Friuli-Venezia Giulia, provides insight into research and innovation policy on the regional level of Friuli-Venezia Giulia.

The final part C, »Regional Competencies and Issues«, is then devoted to concise regional case studies, presenting regional strengths, policies and governance structures in the domain of innovation policy. First Eduard Sturm, Carinthian Economic Promotion Fund, and Kristina Zumbusch, convelop GmbH, present the case of Carinthia. This is followed by a case study of Styria, prepared by Marija Breitfuß (JOANNEUM RESAERCH Institute of Technology and Regional Policy), and a study of Burgenland by Johann Binder and Thomas Schneemann (Technology Promotion Burgenland) which completes the picture for Southern Austria. Romina Kocina (Friuli Innovazione), Klemen Koman (Institute for Economic Research, Ljubljana), and András Grosz (West Hungarian Research Institute, Győr) describe the neighbouring regions in Italy, Slovenia, and Hungary. The case study on the region of Stuttgart by Stephanie Fleischmann, Bertram Gaiser, and Martin Zagermann (Stuttgart Region Economic Development Corporation) concludes part C with a discussion of the CORINNA benchmarking region.

Part A

Priorities and Strategies

Christian Hartmann

Comparative Analysis of the Partner Regions of CORINNA

Introduction

The major aim of the component »Analysis and Research« carried out within the CORINNA project has been the provision of broad guidelines for policy benchmarking and learning among key stakeholders (policy makers etc.). Thus, on the one hand, it should provide thematic priorities in the sense of science or technology fields in order to develop a common understanding of existing common strengths upon which future development can be built, and, on the other hand, it should also give an overview of prevailing policy issues and instruments in the partner regions (countries).

The present chapter tries to amalgamate the analytical efforts that have been carried out within the project and complements the detailed country case studies that have been prepared for each region. Therefore, it can be seen as a synthesising analysis in two senses. First, it creates a common picture on innovation policy and specialisation patterns in the CORINNA space through compilation of the inputs provided by the partners and thus gives guidance for future activities. Second, it creates a new view of the whole region, combining and commenting upon the opinions of the partners as expressed over the course of the last years' work. Thus, it can thus be regarded as an attempt to create a new understanding of regional and interregional innovation policy with respect to the geographical scope of the project.

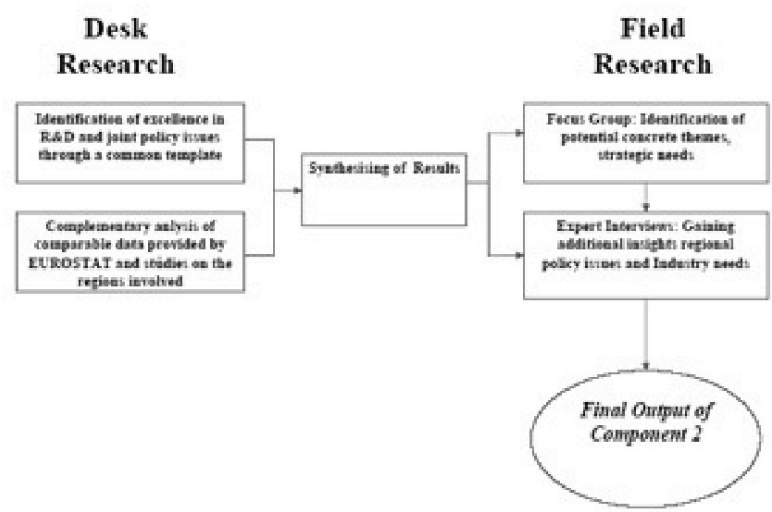
Structure of the Chapter

In order to fulfil the tasks mentioned above, the following chapter has to cover several issues.

- Part one provides a broad introductory discussion of the regional economic outline of the geographical space of CORINNA while using such standard type indicators as gross regional product, employment figures, or unemployment rates. The chapter concludes with a general SWOT analysis.
- Part two is devoted to the identification of existing specialisations in R&D within the whole region of CORINNA. It starts with a short presentation of the general capacities for R&D, using indicators such as R&D personnel or gross expenditure on R&D, and then goes on to the identification of scientific competencies present in all partner regions.
- Part three then aims at the identification of technological specialisations prevailing in regional industry. This involves a discussion of the core competencies existing in the clusters of the CORINNA space. Also, a brief discussion of the share of high technology industries in the regions is included.
- Part four aims at the identification of joint policy issues, starting with a discussion on regional cluster policies and then continuing with a qualitative assessment of prevailing problems to be addressed by regional innovation and technology policy. The existing gaps in the present framework are also pointed out.
- Part five concludes with a proposal for vertical thematic priorities in the shape of technologies and science fields. In addition to this, a proposal for functional priorities is also presented.

This synthesis report is mainly a compilation and interpretation of inputs provided by partners in the course of the work on the component 2 regional case studies. Figure 1 shows schematically the workflow that led to the synthesis report: All partners were asked to fill in templates on their regional competencies, institutional framework and policy issues. This information was then—together with additional information from national reports and EUROSTAT data—amalgamated to produce the initial findings. These findings were then subject to discussion and testing both in a focus group with high level experts and also in individual interviews with regional policy makers.

Figure 1: Schematic Overview of the Methodological Steps in Component 2 of CORINNA



Source: JR-InTeReg

It has to be noted that the main focus of the following analysis is, therefore, qualitative in its nature—the information gathered with the templates was the main source for synthesising joint strengths and policy issues. Quantitative analytical issues were not included, and the results derived are thus solely qualitative in nature.

For reasons of interregional comparability, all secondary statistics used in this analysis were—unless otherwise stated—provided by EUROSTAT (using the most recent comparable dataset available). Although the Stuttgart region is reported in the regional case studies, as it can be regarded as a benchmarking partner, it is not included in the present synthesis because this would strongly distort the identification of common issues and priorities.

The CORINNA Space—Basic Regional Economic Characteristics

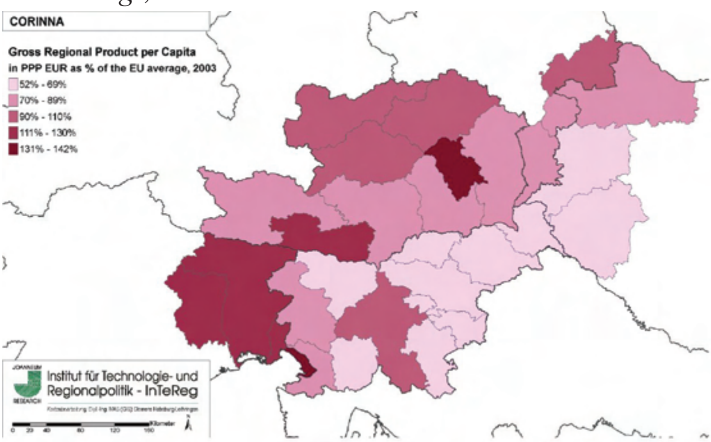
The major aim of this first part of the chapter is to provide a basic description of the CORINNA partner regions in terms of regional economic indicators. This is done in order to provide a general basis for the discussion both of scientific specialisations and of relevant policy issues.

The following discussion is divided into three sections. Section one provides a general comparative discussion about regional performance, using such standard type indicators as population density, gross regional product per capita, and unemployment rates, together with a comparison of average EU figures. The second section is devoted to the discussion of the economic structures prevailing in the regions, including tourism indicators in order to show additional information on the service sector. The third section then synthesises the information presented by providing a qualitative analysis of existing strengths and weaknesses, and potential opportunities and threats.

Gross Regional Product

The geographical space of CORINNA is characterised by persistently strong regional disparities. Figure 2 shows the level of gross regional product per inhabitant at NUTS 3 level in euro purchasing power parities for 2003 as a percentage of the EU average (=100).

Figure 2: Gross Regional Product per Capita in PPP EUR as % of the EU Average, 2003



As can easily be seen, the regional centres with their agglomerations (Graz, Trieste, Klagenfurt-Villach, and Ljubljana) show (high) levels of regional income above the EU- and regional average. Also, the highly industrialised regions of Friuli-Venezia Giulia are generally characterised by regional income levels decidedly above the reference EU value.

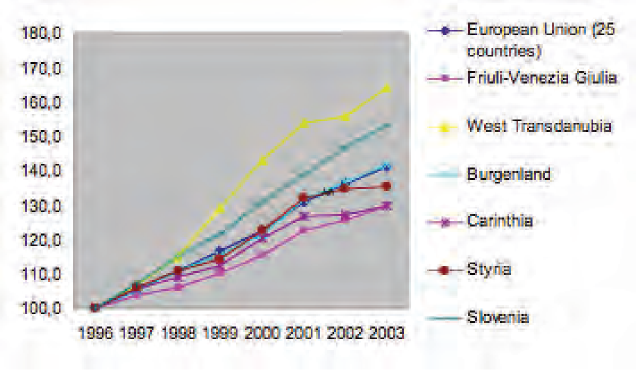
A second group of regions, mainly characterised either by strong industry or specialisation in tourism, achieves more than 75 % of the EU average: This comprises Burgenland, the West Transdanubian country Győr-Nosen-Sopron, all Styrian and Carinthian NUTS 3 regions with the exception of Graz and Klagenfurt-Villach, and for Slovenia the regions Obalno Kraška and Goriška.

A third group remains below the 70 % level of the EU average. This consists of the West-Transdanubian countries Vas and Zala, and the Slovenian regions with the exception of Osrednjeslovenska (Ljubljana), Obalno Kraška, and Goriška.

As can be concluded from above, the regional disparities in terms of income still prevail both on the level of the partner regions, but also between old and new member states of the European Union.

Figure 3 indicates the development of the gross regional product of the CORINNA regions for the period of 1996 to 2003.

Figure 3: Development of Gross Regional Product in Euro Purchasing Power Parities, 1996—2003 (1996 = 100)



Source: EUROSTAT, JR-InTeReg

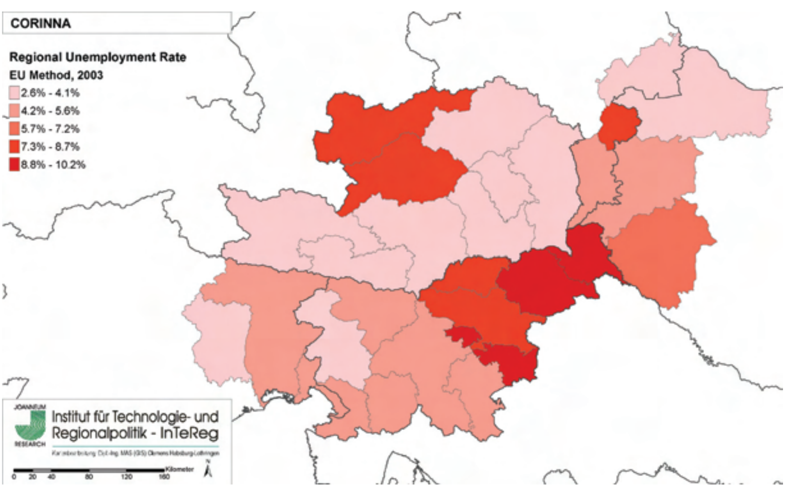
Among the partner regions of CORINNA, West Transdanubia shows the highest rate of growth. This is clearly above the EU-25 average, and indicates how fast the region is catching up. This development reflects the very high inflow of foreign direct investment that has taken place in the region in the last ten years. Slovenia, too, shows a performance unambiguously above the EU average, while Friuli-Venezia Giulia and Carinthia are lagging behind. In comparison, Burgenland and Styria are growing (almost) at the average rate of the EU 25 countries.

Disparities in growth between old and new member countries are thus clearly identifiable in the CORINNA space.

Unemployment

The geographical space of CORINNA is characterised by rather modest unemployment rates in EU terms. For reasons of comparability only EU Labour Force Survey (LFS) data of the EU (EUROSTAT) have been taken into account. These generally show a lower level than national statistics but remain stable in terms of structural characteristics and thus allow for comparison of the NUTS 3 regions here under discussion.

Figure 4: Regional Unemployment Rates, EU LFS Method 2003



Source: EUROSTAT, JR-InTeReg

Figure 4 shows the levels of unemployment on the NUTS 3 level of the partner regions of CORINNA. As can be seen, only a few regions are characterised by unemployment rates above the EU average (9.2 %): These are the peripheral Slovenian regions Pomurska, Podravska, and Zsavska.

Unemployment rates above a medium level exist in the West Transdanubian NUTS 3 regions Vas and Zala, in the Austrian NUTS 3 regions Mittelburgenland, Südburgenland, Liezen, and Westliche Obersteiermark, and in the Slovenian NUTS 3 regions Savinjska, Spodnjeposavska, Notranjsko Kraška, and Jugovzhodna Slovenija.

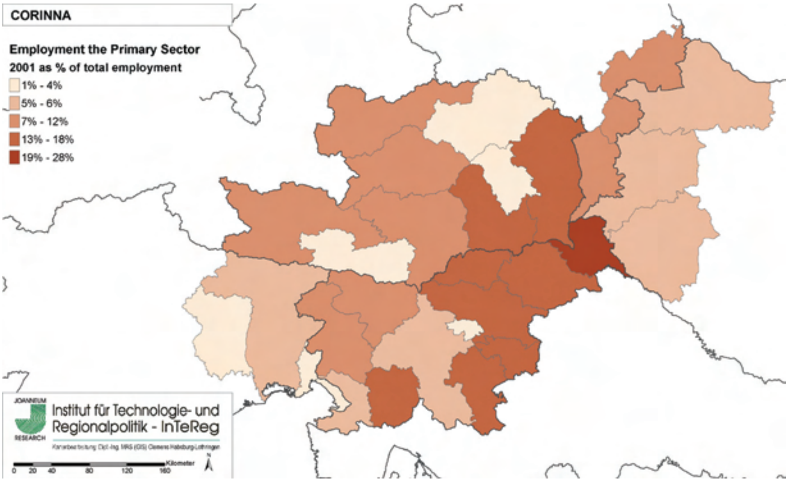
The overall picture shows that regional disparities are also present in terms of unemployment. For Slovenia there is a division of the country into a western part with low unemployment rates and an eastern part showing high rates. High unemployment in Northern Styria occurs in regions either dominated by tourism or by declining industries, while West Transdanubia exhibits particularly high unemployment rates in the region Zala, which is also dominated by tourism.

Sectoral Structures

The NUTS 3 regions in the CORINNA space show rather diverse patterns as far as their sectoral structure of employment is concerned.

Figure 5 indicates the regional patterns of employment in the primary sector (i.e., agriculture, fishing). As can be seen, the integrated area consisting of the regions of Unterkärnten, West- und Südsteiermark, Oststeiermark, Pomurska, Podravska, Koroška, Savinjska, Zasavska, and Spodnjeposavska exhibits shares in the primary sector well above the EU average. In particular in Pomurska, more than one quarter of employment remains in agriculture.

Figure 5: Sectoral Employment Structure—Employment in the Primary Sector, 2001



Source: EUROSTAT, JR-InTeReg

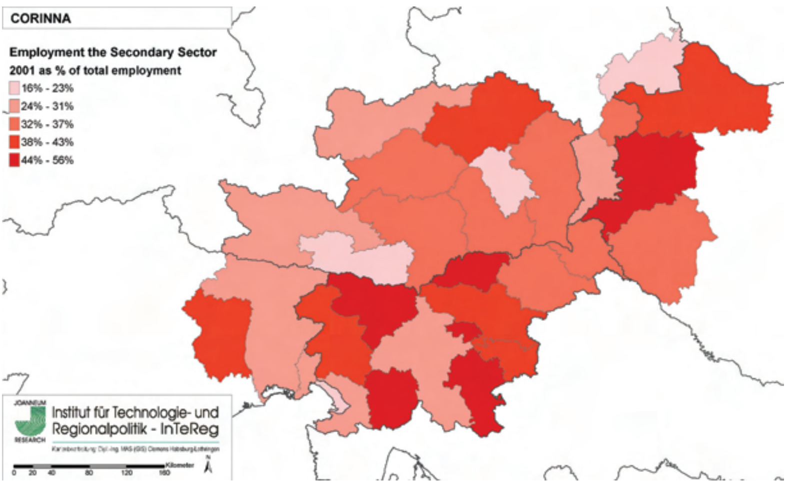
Almost no significant share of primary sector employment can be noted for the central regions Trieste, Graz, Östliche Obersteiermark, Klagenfurt-Villach. This is also true for the region of Pordenone in Friuli-Venezia Giulia, which is mainly dominated by industry.

Figure 6 presents the regional patterns of employment in industry. It differs from figure 5 (where agriculture is the dominant sector) in that no compact spaces of industry regions can be identified. Indeed, NUTS 3 industry regions are scattered over the whole geographical space of CORINNA.

As can be seen, Slovenia is host to regions with very high shares of employment in industry. In comparison, Friuli-Venezia Giulia has only one region of this kind (Pordenone) even though it is well endowed with several industrial districts (i.e., clusters).

West Transdanubia exhibits in two of its regions high shares of industry employment, indicating the gains from inward investment in the past ten years, while Burgenland and Carinthia have no such region. In Styria, in particular in the NUTS 3 region Östliche Obersteiermark, path dependencies from the raw materials cluster of the past are still evident.

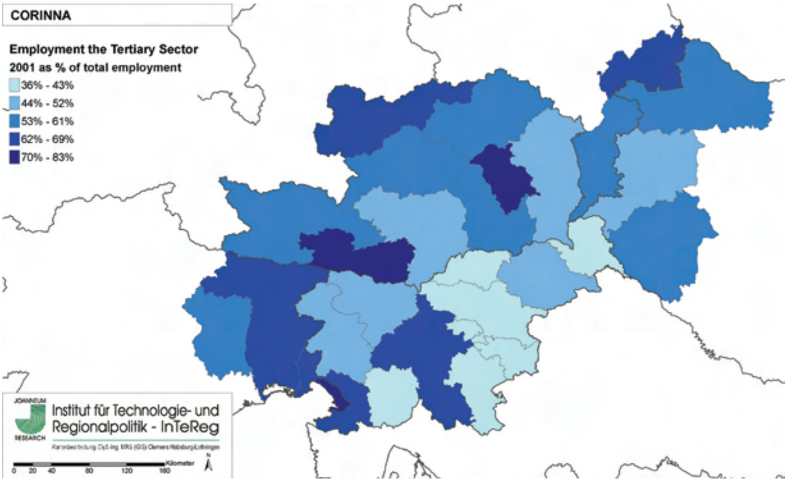
Figure 6: Sectoral Employment Structure—the Secondary Sector, 2001



Source: EUROSTAT, JR-InTeReg

Figure 7 shows regional employment patterns for the service sector. As can easily be seen, the regional centres Trieste, Klagenfurt-Villach, Osrednjeslovenska (with Ljubljana) and Graz show particularly high service-shares due to their function as business centres. As can also be seen, high shares of service employment prevail in tourism-oriented regions such as Liezen, Nordburgenland, Notranjsko Kraška, and in Friuli-Venezia Giulia.

Figure 7: Sectoral Employment Structure—the Tertiary Sector, 2001



Source: EUROSTAT, JR-InTeReg

Low levels can be found in regions either dominated by industry (e.g., Koroška or Zala), thus indicating a lack of locally based business services, or in such regions that are still dominated by agriculture (such as Podravska).

Table 1: SWOT Analysis of Interregional RTDI Cooperation Potential

Strenghts	Weaknesses
• Good to very good endowment with R&D infrastructure. All partner regions are having universities and/or universities of applied sciences. Most of the regions show also a good endowment with research and technology organisations but also with technology and science parks. • Dense population of industry clusters in the partner regions: All partner regions are characterised by various cluster and network initiatives in strong economic sectors. • Strong interregional knowledge base in mechanical engineering and process engineering—the geographical space of CORINNA could also be termed »Engineering Country« • Good accessibility of the geographical space of CORINNA. Due to continuous improvements of the transportation infrastructure, the interregional accessibility has improved strongly and will make interregional cooperation logistically easy.	• Lack of large agglomerations like Vienna or Milan in the geographical space of CORINNA. Graz, Ljubljana, and Trieste are only middle sized in terms of inhabitants. No European metropolitan centre present. • Regional disparities are prevailing. Despite high GRP growth rates, regions in the new member countries have not yet caught up with high levels of their neighbours. • R&D and innovation is supported by a very strong but narrow peak of large leading enterprises—SME's are lagging behind. • Partner regions of CORINNA are finding themselves in an unfavourable sandwich position between high technology manufacturing and services regions in the core of Europe and low technology suppliers in Romania, Bulgaria, Croatia, Turkey.
Opportunities	**Threats**
• New EU programming period is getting more R&D and innovation oriented. Problems and deficits in the relevant regions could be addressed in the future with a knowledge- and innovation-based policy approach. • Better cross-border coordination of innovation and R&D policies could lead to a coherent development and thus form the basis for an interregional science and technology space such as the Øresund Region • Further fostering of »Clustered Systems« could help to overcome the current sandwich position and to develop critical masses of actors in R&D and innovation.	• Other Cross-border Region Initiatives like CENTROPE are forming up and could absorb large quantities of national or EU funding • Globalisation threatens the industry locations in all CORINNA regions. Future competitors will be of non-European origin (such as China or India) • Parallel activities (clusters, R&D infrastructure) in partner regions could lead to fragmented competition, thus weakening the position on a broader EU-level.

Regional R&D—Specialisation Patterns

The major aim of the second part of this chapter is the identification of existing scientific specialisation patterns in the regions of CORINNA. In addition, a concise discussion of the current R&D capacities and infrastructures is also included.

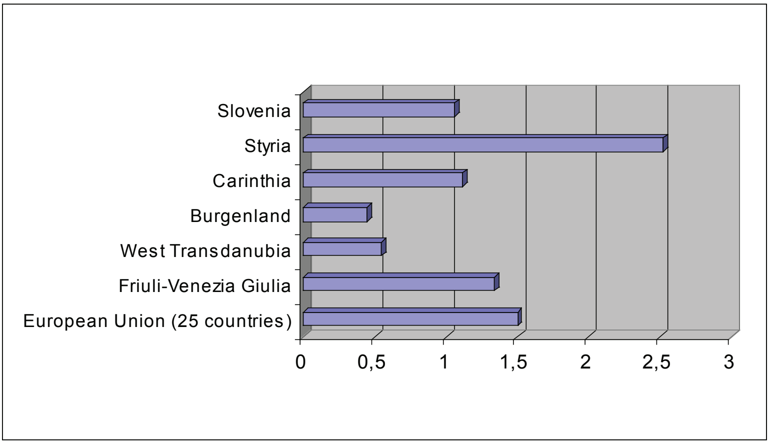
The following discussion is divided into three sections. Section one gives a general comparative overview of the existing regional capacities for R&D, also including a comparison with EU figures. For this purpose the main standard indicators such as gross domestic expenditure on R&D (GERD), business expenditure on R&D (BERD), R&D personnel, etc., are used. The second section describes the existing R&D infrastructure (Universities, Research & Technology Organisations) and also briefly discusses existing collaboration patterns within the EU-Framework Programme for R&D. The third section then synthesises the information presented, commonly shared scientific specialisation patterns are identified and described at the level of qualitative and quantitative analysis.

R&D Capacities in the Regions of CORINNA

R&D Personnel

R&D personnel can be regarded as a basic input indicator for the R&D capacities of a region or country. It reflects the extent to which a region is endowed with the most important research resources—human beings. Thus, the level of R&D personnel is a good indicator for the regional supply of R&D that an innovation system may have (OECD 2002).

Figure 8: R&D Personnel as Percentage of Total Employment, 2003



Source: EUROSTAT, JR-InTeReg

Figure 8 shows the R&D personnel as a percentage of total employment for all regions of the CORINNA space and, for reasons of comparison, the average value of the EU-25. As can be seen, only Styria exceeds the EU average value while all other regions lag behind. The strong and well developed R&D infrastructure of the region is reflected in these good R&D capacity values.

Burgenland and West Transdanubia only achieve a third of the average EU personnel research capacity while Carinthia (Kärnten) attains two thirds. Friuli-Venezia Giulia seems to be somewhat stronger and achieves results close to the EU average.

While the number of overall R&D personnel reflects the capacities of all actors in the regional science system, the indicator »R&D personnel in the business enterprise sector« provides additional insight into the extent of firm capacities for R&D, which is relevant for the production of the knowledge needed to maintain or increase competitiveness.

Table 2: R&D personnel in Full Time Equivalents (FTE) in the Business Sector, 2002, Change 1998—2002 in %

	Share of total R&D personnel, 2002	Growth in %, 1998-2002	R&D personnel in FTE in the business sector 2002	R&D personnel in the business sector per 1.000 Inh., 2002
EU 25	38,9%	11,8%	1.069.377,6	2,34
Friuli-Venezia Giulia	19,9%	-28,5%	1.343,8	1,12
West Transdanubia	17,8%		411,0	0,41
Burgenland	56,5%	255,3%	272,5	0,99
Carinthia	57,1%	81,1%	1.358,5	2,43
Styria	40,5%	31,0%	4.889,0	4,10
Slovenia	36,3%	12,5%	4.499,0	2,25

*Source: EUROSTAT, JR-InTeReg;, *) No value available at EUROSTAT for West Transdanubia in 1998*

Table 2 shows the R&D personnel in the business sector for 2002 in absolute numbers, the share of total R&D personnel, the change from 1998 to 2002 in %, and the R&D personnel per 1.000 inhabitants. As far as this share is concerned, Burgenland, Carinthia, and Styria are above the average of the EU-25 countries while West Transdanubia and Friuli-Venezia Giulia are clearly below this reference value. Slovenia barely misses achieving the EU average.

For 2002, the absolute numbers show the highest values for Slovenia and Styria, which also reflects the presence of large leading companies (that are active in R&D) in both regions. Friuli-Venezia Giulia has in its enterprises almost as much R&D personnel as Carinthia, but is almost twice as large in terms of population. The firm capacities for R&D in West Transdanubia and Burgenland are in comparison only of marginal size.

The change of number from 1998 to 2002 shows in addition whether the number of researchers in the business sector in the

CORINNA regions has grown with the EU average, has done better or even worse. With the exception of Friuli-Venezia Giulia, which reveals a shrinking number of R&D personnel in its enterprises, all regions performed better than the EU average. However, not all regions have been catching up equally successfully. Especially Slovenia remains only slightly above the EU average, and Styria has also grown (starting from a comparatively high level) much more slowly than Carinthia or Burgenland.

R&D Expenditure

R&D expenditure can be seen as a second important input indicator for the assessment of regional R&D capacities. It reflects the monetary resources that are put into R&D activities and thus complements the prevalent stock of researchers in a region under scrutiny. R&D expenditure is usually referred to as gross domestic expenditure on R&D or GERD (OECD 2002).

Table 3 shows the CORINNA regions, GERD in absolute numbers, GERD per 1,000 inhabitants, and the evolution (change in %) from 1998 to 2002. As can be seen—except for Friuli-Venezia Giulia—all regions have been doing better than the average of the EU-25 countries. In particular Burgenland and Carinthia are engaged in a strong catching up process. This is reflected in their high growth figures for GERD.

Table 3: Evolution of GERD 1998—2002, GERD 2002

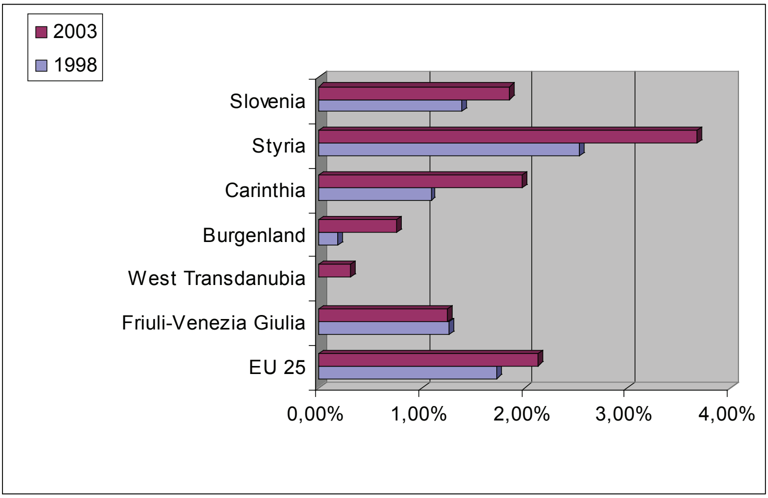
	Change of GERD 1998—2002	GERD in millions of EUR (PPP in 2002)	GERD per 1,000 Inh.
EU 25	28,9%	177.080,2	388,3
Friuli-Venezia Giulia	4,3%	348,9	292,0
West Transdanubia		38,9	38,7
Burgenland	321,3%	30,9	111,9
Carinthia	94,1%	217,4	388,6
Styria	55,9%	858,8	721,1
Slovenia	39,7%	487,4	244,2

*Source: EUROSTAT, JR-InTeReg; *) No value available at EUROSTAT for West Transdanubia in 1998*

An analysis of the absolute values for GERD shows that large differences in the levels of expenditure exist between the regions. For Carinthia, for example, the absolute level of expenditure reaches only one quarter of that found for Styria. Slovenia, which has twice the population of Styria, spends only about 60 % of the amount spent in Styria on R&D activities.

A better comparative analysis can be obtained using the R&D intensity of the CORINNA regions. R&D intensity measures the relative value of GERD in relation to the gross regional product (OECD 2002). Figure 9 shows the R&D intensity of the CORINNA regions both for 1998 and 2003. Again, it can be seen that both for 1998 and 2002, Styria shows the highest level of R&D intensity and that it exceeded the average value for the EU 25 countries. All other regions remain at various points below the EU-average. Carinthia improved strongly from 1998 to 2002 and now ranks second among the CORINNA regions.

Figure 9: R&D Intensity in Euro Purchasing Power Parities, 1998/2003



Source: EUROSTAT, JR-InTeReg

Slovenia is in third position and appears to be relatively dynamic while Friuli-Venezia Giulia is stagnating at its 1998 level. Clearly, Burgenland and West Transdanubia are lagging behind, although the former does appear to have been catching up over the relevant time span.

Table 4 presents the Business Expenditure on R&D (BERD) in absolute numbers and as a share of total expenditure. The rate of change from 1998 to 2002 is also shown. It can be easily seen that—with the exception of Friuli-Venezia Giulia—all CORINNA regions had bigger growth rates than the average of the EU 25 countries.

Table 4: Business R&D in PPP EUR 2002, Growth rate 1998—2002

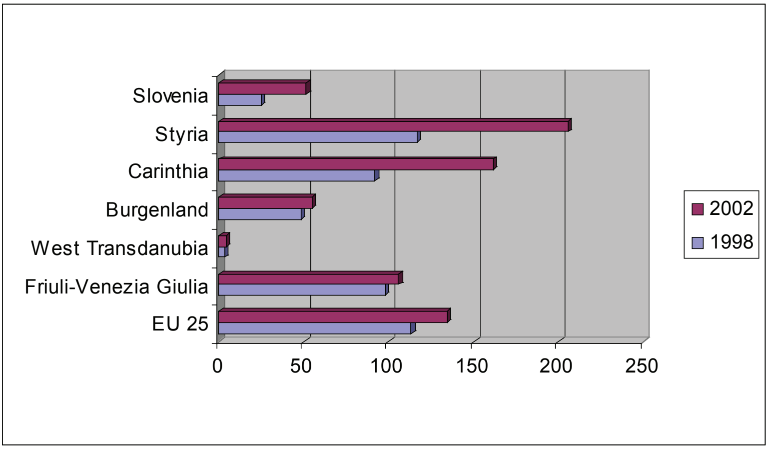
	Share of Total R&D Expenditu-re, 2002	Change 1998-2002 in %	Business R&D expenditure in millions of (cur-rent) PPP EUR, 2002
EU 25	63,4%	30,68%	112.329,66
Friuli-Venezia Giulia	42,6%	-15,16%	148,67
West Transdanubia	46,1%	*)	17,92
Burgenland	91,9%	416,21%	28,44
Carinthia	85,7%	107,02%	186,26
Styria	66,1%	70,28%	567,51
Slovenia	59,7%	60,15%	290,89

*Source: EUROSTAT, JR-InTeReg; *) No value available at EUROSTAT for West Transdanubia for 1998*

Compared to the other regions, Burgenland and Carinthia, in particular, appear to be engaged in an intense catching up process. For West Transdanubia, no value for 1998 was available from EUROSTAT. Analysis of the absolute values for BERD again shows the strong position of Styria. Although almost equal to Friuli-Venezia Giulia in terms of inhabitants, Styria's BERD is more than four times as high. This reflects the presence of strong leading firms not only in the Styrian automotive cluster, but also in the fields of machinery and equipment, and electronics.

Friuli-Venezia Giulia was able to maintain its level of output (with a slight increase from 1998 to 2002) but lost ground dramatically compared to Styria and Carinthia (it also remained below the average value for the EU 25 countries). Burgenland lagged behind and was also only able to increase its output in EPO patents marginally in the period under consideration. Slovenia was able to double its patent applications and thus to catch up with Burgenland—but it did start from a very low level of performance compared to the other regions. West Transdanubia is barely present, offering an almost nonexistent level of patent applications and no real changes from 1998 to 2002.

Figure 10: Regional Patent Applications to the EPO per Mio. Inhabitants, 1998/2002 (for EU-25, 2001)



Source: EUROSTAT, JR-InTeReg

Table 5 provides a deeper insight into patent applications at the EPO as it refers to a particular subgroup: high technology patents from 1998 to 2002. These patents refer to the technology fields of computer and automated business equipment, micro-organisms and genetic engineering, aviation, communication technology, semiconductors, and laser. High tech patents can be seen as a measure of the ability of a regional innovation system to utilise new scientific knowledge in the highly competitive field of high technology goods and services.

In the field of high technology patents, Styria is also performing very well compared to the other CORINNA regions. Starting from a very low level in 1998, it was able to increase its output tenfold and to move ahead of both Carinthia and Friuli-Venezia Giulia.

Table 5: High Tech patent applications at the EPO by priority year at the regional level; total number, 1998-2002

	1998	1999	2000	2001	2002
Friuli-Venezia Giulia	7,5	7,6	6,7	4,6	7,0
West Transdanubia	1,0	*)	2,4	1,2	0,0
Burgenland	0,4	2,0	2,6	1,1	1,3
Carinthia	12,1	22,5	16,4	24,6	20,5
Styria	4,9	10,3	17,0	28,0	40,7
Slovenia	4,2	1,7	6,7	5,5	9,3

*Source: EUROSTAT, JR-InTeReg; *) No value available at EUROSTAT for West Transdanubia in 1999*

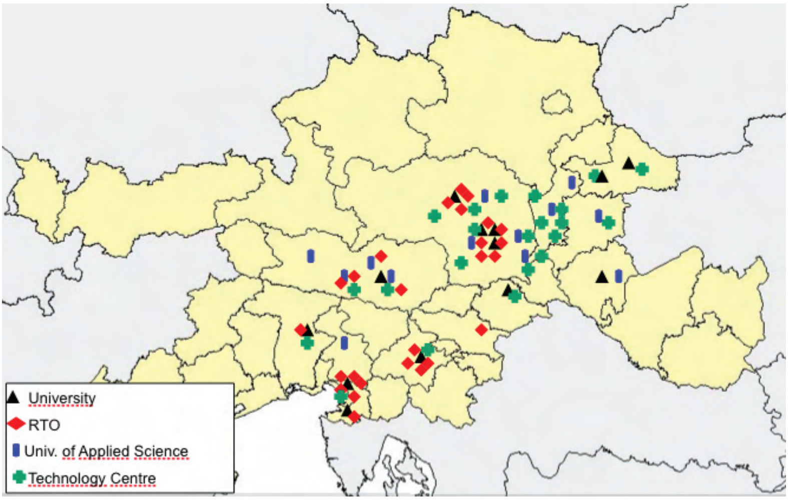
Due to its large number of patent applications in semiconductors, Carinthia led the table in 1998 and by doubling its output was able to remain in second place by 2002. Again it can be seen that Friuli-Venezia Giulia is not able to use its knowledge base as its output in high technology patent applications is outnumbered by Carinthia, a region with only half its size. Burgenland and West Transdanubia had no relevant shares in such patenting activities for the whole period under scrutiny.

R&D Infrastructure

R&D infrastructure refers here to organisations performing R&D functions but which do not belong to the enterprise sector, e.g., universities and applied research organisations (Diez 2000). This definition does not include related infrastructures with no individual intramural R&D capacities, such as technology centres and business parks.

Figure 11 gives an overview of the prevailing R&D infrastructure in the regions of CORINNA. As can been seen, the geographic space of CORINNA generally shows a rich endowment with research institutions, but large regional disparities clearly exist. The lion's share of the infrastructures is concentrated in the centres—i.e., in Graz, Ljubljana and Trieste. This is evidence of path dependency that reaches back at least to the first half of the 20th century. Universities and large infrastructures, such as the synchrotron in Trieste, as well as significant testing facilities have been amassed in such centres. Disparities on an interregional level can also be observed. While Styria, Slovenia and to a large degree Friuli-Venezia Giulia are favoured by a very dense regional R&D landscape, this is not the case for Burgenland and West Transdanubia. Both lack significant concentrations of R&D institutions—a fact that is also reflected in the weak level of quantitative R&D capacities. Carinthia is doing better in this respect and has benefitted from the infrastructure development of the past 15 years, although it needs to be noted that no technical university has yet been established in the region.

Figure 11: R&D Infrastructure in the Regions of CORINNA



Source: JR-InTeReg

In Styria, on the other hand, the competence centre programme of the federal government has enriched the regional R&D infrastructure by providing several institutions which serve to intensify and strengthen industry science links. Thus, the existence of a public private partnership model for research infrastructure can be seen as one of the major sources of Styrian success in terms of activating R&D potential for industry needs.

R&D infrastructures also form the nodes of European knowledge networks within the EU Framework Programmes for Research and Technology Development. An overview of the successful participation of R&D institutions and firms in the 5th EU Framework Programme.

That shows the large centres Graz, Ljubljana, Trieste, account for the highest share of participations in the CORINNA regions while smaller locations such as Győr, Udine or Klagenfurt contribute considerably lower volume. At regional level Styria ranks highest in terms of successful programme participations, followed by Slovenia and Friuli-Venezia Giulia. Thorough analysis shows a further phenomenon: of all participants in the 5th Framework Programme, only Styria exhibits a high share of industry participation, thus indicating once again the well-developed relations between industry and science in the region.

Specialisation Patterns in R&D

R&D-Infrastructure

The existing R&D infrastructure in the regions of CORINNA forms the main basis for the identification of commonly shared scientific specialisation patterns. The prevailing scientific profiles of the individual organisations can be regarded as a qualitative indicator and thus show—on an aggregate level—competencies for each region. In addition, indications of interregional competencies can be derived from R&D. It has to be noted that these findings are not comparable with a quantitative analysis of scientific output such as that obtained using bibliometrics. Lack of resources precluded such an approach here. Nevertheless, tentative results concerning common properties and skills in R&D were obtained.

It is still possible to synthesise qualitative data on R&D specialisation. A look at Table 6 shows the R&D specialisations on a nominal scale. The rows reflect the partner regions of CORINNA while the columns indicate the prevailing scientific field.

Table 6: Regional R&D Competencies in the CORINNA Space

	Slove-nia	Styria	Carin-thia	Burgen-land	West Trans-danubia	Friuli-Venezia Giulia
Mechanical- and Process Engineering	•	•	•	•	•	•
Civil Engineering	•	•	•	•	•	•
Physics	•	•				•
Materials Sciences	•	•				•
Environ. Science / Engi-neering	•	•	•	•		•
IT / Software Engineering	•	•	•	•	•	
Microelectronics	•	•	•			
Micro / Nano Analytics	•	•	•			•
Computer based Simulation	•	•	•	•		•
Surface Science / Engineering	•	•	•			•
Genetics / Microbiology	•	•				•
Medicine / Pharmacology	•	•				•
Forestry / Wood Science			•		•	

Source: JR-InTeReg

First of all, there are clear regional disparities in scientific specialisation. While Slovenia and Styria cover all areas, this is not the case for Burgenland and West Transdanubia, owing to their rather modest endowment with research facilities. Friuli-Venezia Giulia only lacks competencies in microelectronics and IT and software engineering—all other competencies show the same patterns as in Slovenia and Styria. Carinthia lacks scientific strength within physics and materials sciences as well as in life sciences and pharmacology, owing to its lack of adequate theme related regional R&D infrastructure.

Second, it can be easily seen that there exist two fields of science that are present in all regions: i.e., mechanical and process engineering and civil engineering can be regarded as common strengths, because of the university departments or applied research organisations specialising in these fields present in all regions. These two fields, therefore, form a common scientific knowledge base for the geographical space of CORINNA.

In addition, another three strong fields of science can be discovered in five out of six regions: environmental science and engineering is present in all regions except West Transdanubia, IT and software engineering is found in all regions with the exception of Friuli-Venezia Giulia, and computer based simulation prevails in all regions except for West Transdanubia.

Relative Patent Specialisations

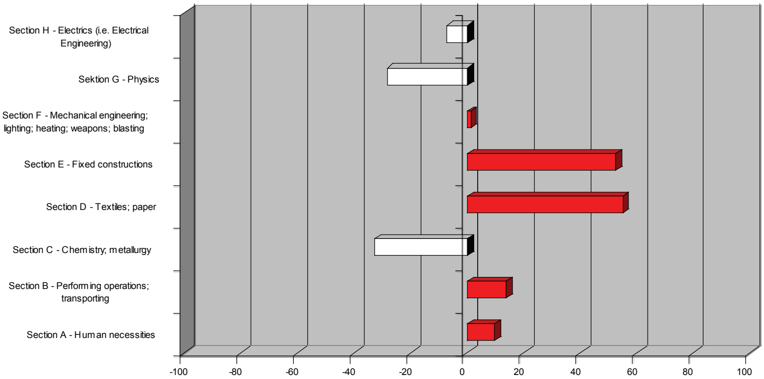
A quantitative analysis of patent applications can also help to reveal scientific specialisation patterns since patents reflect the production of newly applicable scientific knowledge. The relative share of patent applications from the CORINNA space in EU-25 EPO patent applications was computed, using the relative world trade share (RWS) indicator. The RWS is defined as

$$RWS_{ki} = 100 \tanh \ln\left(A_{ki} / \sum_k A_{ki} \right) / \left(\sum_i A_{ki} / \sum_{ik} A_{ki} \right)$$

with k = country; i = product (Grupp 1997, p. 212).

It calculates the share of a given country's patent applications in one patent class (section) of the EU-25's patent applications of the same patent class (section) and sets this in relation to the country's share of EU-25's total patent applications. Due to logarithmising and the application of the tangens hyperbolicus, the RWS is a symmetric measure whose values are limited to the range of +100 to -100. A positive RWS value indicates a specialisation for the respective patent class (section) (Grupp 1997, p. 212). Figure 13 presents the patent related specialisation patterns of the CORINNA space according to their revealed comparative advantage in terms of patent sections compared to the EU-25 countries, on the basis of average values of EPO patent applications from 1999 to 2003 (values for 2003 are provisional).

Figure 13: EPO Patent Specialisation Patterns of the CORINNA Space vs. EU-25 Countries, Average Values 1999-2003



Source: JR-InteReg, Eurostat

As can be seen, the CORINNA space reveals on the one hand, rather high relative specialisations in the sections »fixed constructions« and »textiles and paper,« and on the other hand, only moderate specialisations in the sections of »human necessities«

and »performing operations; transporting.« No relative specialisations are revealed at the aggregate level for the sections »chemistry; metallurgy«, »electrics (i.e., electrical engineering).«

Since patent sections provide information at a very aggregate level, a deeper analysis at the level of IPC classes is helpful for identifying relative specialisations in R&D in the CORINNA space. Table 7 thus presents the specialisation index values at the level of those IPC classes that correspond to the specialised sections identified in Figure 13. Only IPC classes with high relative specialisations (RWS index values above 50) are taken into account.

Table 7: IPC Classes with high relative specialisations in the CORINNA space, Average Values 1999-2003

ipc		CORINNA
a21	Baking; edible doughs	81
a41	Wearing apparel	72
a43	Footwear	64
a44	Haberdashery; jewellery	83
a47	Furniture; domestic articles or appliances; c	75
a63	Sports; games; amusements	68
b02	Crushing, pulverising, or disintegrating; pre|	82
b07	Separating solids from solids; sorting	92
b21	Mechanical metal-working without essential	89
b22	Casting; powder metallurgy	85
b26	Hand cutting tools; cutting; severing	84
b27	Working or preserving wood or similar mate	76
b44	Decorative arts	62
b61	Railways	93
d06	Treatment of textiles or the like; laundering;	68
d21	Paper-making; production of cellulose	79
e01	Construction of roads, railways, or bridges	53
e04	Building	68
e21	Earth or rock drilling; mining	70
f17	Storing or distributing gases or liquids	85
f25	Refrigeration or cooling; combined heating	55
f26	Drying	66
f27	Furnaces; kilns; ovens; retorts	76

Source: JR-InTeReg, EUROSTAT

As can be seen particularly high relative specialisations can be spotted in:

- Section 'a', in »baking; edible doughs.« and »haberdashery; jewellery.«
- Section 'b', in »Crushing, pulverising, or disintegrating; preparatory treatment of grain for milling,« »Separating solids from solids; sorting,« »Mechanical metal-working without

essentially removing material; punching metal,« »Casting; powder metallurgy,« »Hand cutting tools; cutting; severing,« and »Railways.«

- Section ‘f’, in »Storing or distributing gases or liquids«.

Regional Technological Capabilities and Specialisation Patterns

The major aim of this part of the chapter is the identification of existing technological specialisation patterns in the regions of CORINNA. In addition to scientific activity, regional technological capabilities present in industry form a second, complementary part of a regional knowledge base and, with the associated know-how and skills, add up to the overall knowledge base of a region (Leydesdorff / Fritsch 2005). The identification of specialisation patterns in this domain thus helps define themes for common priorities in the CORINNA region.

The following discussion is divided into two sections. Section one gives a general comparative overview of the existing industry structure in the geographical space of CORINNA and places special emphasis on the notion of high-, middle and low technology industries, as defined by the OECD and EUROSTAT. The second section shows the existing clusters and interfirm networks in terms of both their geographical distribution and their core business and thus aids the identification of their technological knowledge base.

High-Technology Industry

The share of high technology industry in a country or region provides a starting point for the assessment of prevailing technological capabilities (Scott 1994). Table 8 shows the absolute values for high-, medium- and low technology industry in the CORINNA regions in 2003 and also indicates the changes from 1996 to 2003.

Table 8: Employment in High-, Medium- and Low Technology Branches, 2003

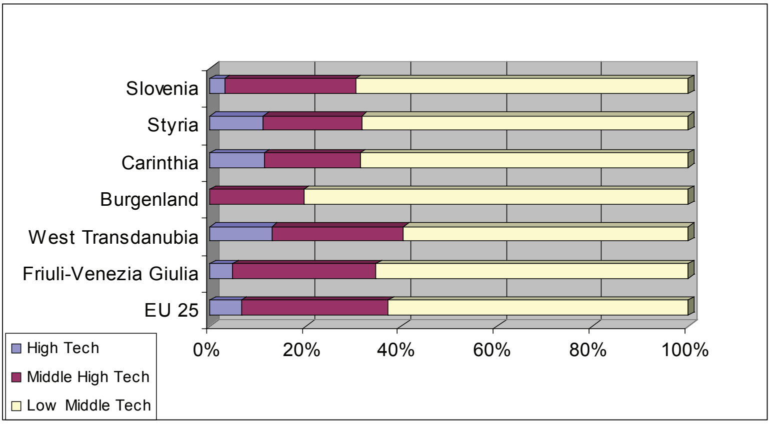
	High Technology		Medium High Technology		Low Medium Technology	
	change 1996 - 2003	Value 2003 in Td.	change 1996 - 2003	Value 2003 in Td.	change 1996 - 2003	Value 2003 in Td.
EU 15	-0,8%	2.023,6	-5,7%	9.621,7	2,3%	18.850,2
Friuli-Venezia Giulia	4,1%	6,4	-32,0%	40,7	14,7%	89,0
West Transdanubia		17,6		37,9		81,6
Burgenland	-5,0%			3,8	-2,0%	15,4
Carinthia	2,5%	5,2	54,2%	9,2	-15,9%	31,6
Styria	-3,3%	12,7	20,6%	23,6	-6,0%	78,4
Slovenia	-10,7%	8,1	-37,5%	72,1	7,1%	184,1

Source: EUROSTAT, JR-InTeReg

As can be seen, all regions except Carinthia and Friuli-Venezia Giulia faced a decline in high technology employment for the period under observation while Carinthia and Styria had large employment gains in branches associated with medium high technology, such as the automotive or machinery and equipment sectors. All regions with the exemption of Friuli-Venezia Giulia and Slovenia faced a decline in employment in the medium- and low technology industries.

Figure 14 presents the prevailing employment structure in the manufacturing sector for 2003 in the CORINNA regions, again using the classification high-, medium- and low technology industries. A comparison with the average value for the EU-25 is also provided.

Figure 14: High-, Medium- and Low Technology Industry as % of Employment in Manufacturing, 2003



Source: EUROSTAT, JR-InTeReg

As can be seen, West Transdanubia shows the highest shares of employment in high technology sectors, largely due to strong foreign direct investment in the field of electronics. Styria and Carinthia also exhibit shares of high technology above the average for the EU 25. This is due to a strong company presence in the field of microelectronics. Burgenland has no such industries and both Friuli-Venezia Giulia and Slovenia remain far below the level of the EU 25 countries. As for medium high technology industries, no region in the CORINNA space shows shares above the EU 25 average while medium low technology, with the exception of West Transdanubia, is more present than in the EU 25 countries.

Clusters and Interfirm Networks

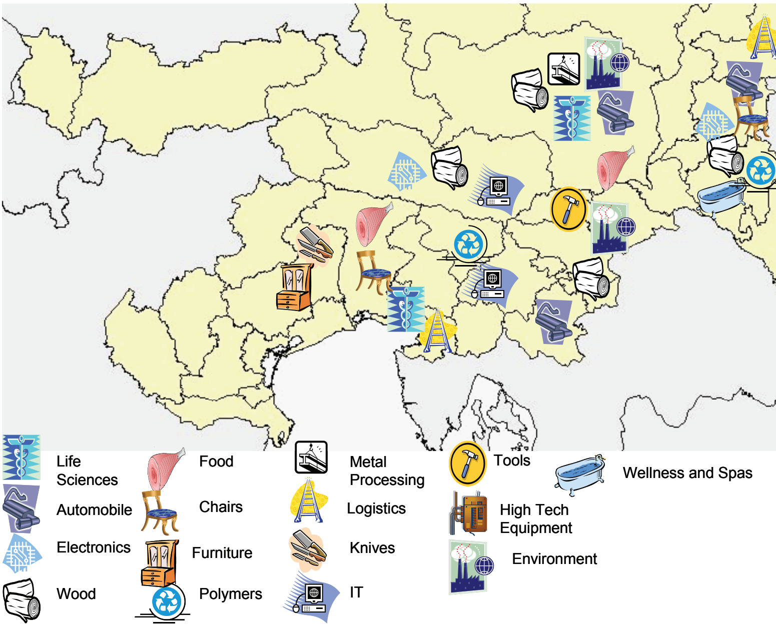
In the context of this paper, clusters are understood as networks of firms, intermediaries, and institutions in R&D infrastructure that are centred around common product themes such as automotive, wood, or environmental technologies (Porter 1990; Hartmann

2004). All partners are interlinked through various projects but also share informal methods of knowledge transfer. Interfirm networks share the same properties as clusters but are smaller in size (Balling 1997).

Clusters and interfirm networks have become a common property of all regions within CORINNA. Thus, the technological specialisation patterns of the CORINNA space can be qualitatively derived from an analysis of these clusters and their corresponding core competencies. To this end a thorough and exhaustive collection of clusters and networks has been made in order to provide relevant information on prevailing technological endowments and skills.

Figure 15 shows schematically the spatial distribution of cluster and network activities in the CORINNA space. The icons depict the core business or activity of the clusters while the position on the map indicates the geographical location. It has to be noted that some of the clusters, like the Slovenian Logistics Cluster, are not spatially concentrated but spread across the whole country.

Figure 15: Industry Clusters in the CORINNA Space, 2005



Source: JR-InTeReg

Clearly, all regions of CORINNA are rather richly endowed with regional or national clusters or cluster initiatives. Slovenia in particular is host to a huge variety of clusters. Styria, too, shows a dense system of networks.

Table 9 provides a more systematic overview of the clusters and networks spotted during the analysis of the regional/national templates provided by each partner. The rows show the technology behind the core competency or business of each cluster while the columns indicate the hosting region. A solid black dot indicates the presence of a cluster/network in a region, brackets indicate an affiliation of firms or networks to a cluster in a neighbouring region, while a black dot with white rings stands for a network that is currently under development.

Table 9: Clusters and Interfirm Networks According to Their Core Business

	Slovenia	Styria	Carin-thia	Burgen-land	West Trans-danubia	Friuli Venezia Giulia
Automotive	•	•			•	
Wood / Furniture	•	•	•	•	•	•
Electronics	•	(•)	•	(•)	•	
Information Technology	•		•			
Environ-mental Technology	•	•		•		
Renewable Energy	•	•		•		
Metal / Metal pro-cessing	•	•				•
Plastics	•					
Life Science / Bio-technology		•				•
Food		⊙			•	•
Tourism	•	•		•	•	
Tool making	•					
Logistics	•					

	Slovenia	Styria	Carinthia	Burgenland	West Transdanubia	Friuli Venezia Giulia
Textiles	•					
Heating, Airconditioning	•					⊙

⊙ Cluster/network under development, • existing cluster/network, (•) affiliate to cluster/network

Source: JR—InTeReg

Despite the huge population of networks and clusters within the CORINNA space, only a rather small quantity of core technologies is available for the formation of a joint technological knowledge base in all or most of the partner regions:

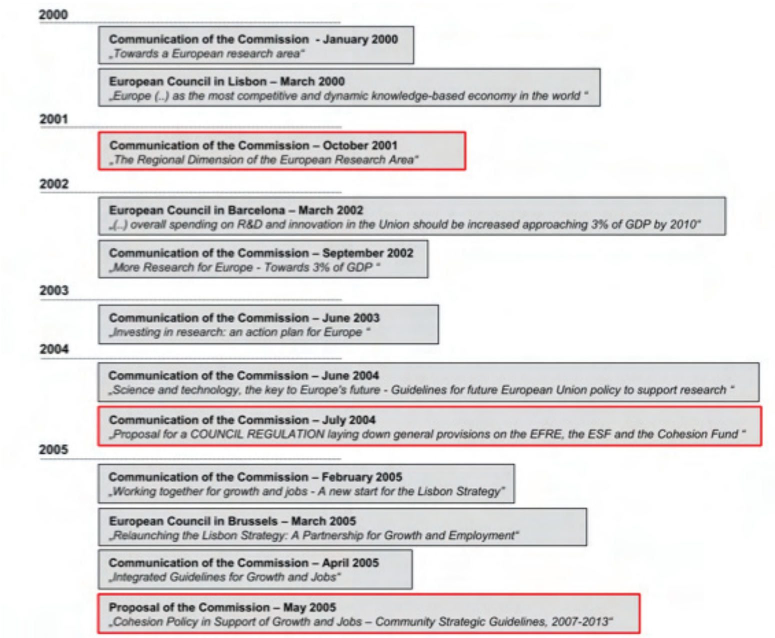
- Wood/Furniture is the only technological competency that can be spotted in all partner regions. The wood clusters specialise in both wood processing and in the production of furniture. Some of them, e.g., the chair cluster of Manzano, are dominant in the world market.
- Electronics as a core competency of clusters can be identified in five of the six regions analysed. It needs to be noted that in two regions (Styria and Burgenland) such clusters are only present via an associative network with the Carinthian microelectronics cluster. Friuli-Venezia Giulia offers no clusters or networks in this technological field.
- Environmental Technology / Renewable Energy is present as a core technology of clusters or networks in three of the six regions analysed. Burgenland, Carinthia, Slovenia, and Styria host such clusters or network initiatives. This is not the case for Friuli-Venezia Giulia, Carinthia and West Transdanubia.
- Tourism: Although not normally associated with technologies or cluster activities, tourism nevertheless forms the core

business of clusters or networks in four of the six CORINNA regions analysed. Relevant activities exist within this field even at interregional level (comprising Burgenland, West Transdanubia, Styria, and Slovenia), e.g., The European Spa World programme.

Regional Innovation and Technology Policy—Common Issues

Only during the last years has regional innovation policy become an issue at EU level. Previous to this it remained firmly in the domain of regional governments (European Commission 2001). Figure 16 shows the evolution of the EU framework for regional innovation policy. As can be seen, discussion started with the notion of the regional dimension of the European Research Area and has since led to a proposal for fostering the issue of regional innovation through programme planning in the EU cohesion policy for the period of 2007 to 2013.

Figure 16: Evolution of the Issue of Regional Innovation Policy in the EU



Source: JR-InTeReg

Regional innovation policy is thus to become part of the EU regional structural policy and will clearly influence the future portfolio of funding at regional level in the old EU member states (European Research Advisory Board 2005).

The aim of the following discussion is, therefore, to give an overview of the currently existing innovation and technology policy framework in the CORINNA space. On the one hand, an investigation into similar patterns—in the shape of joint policy issues—is undertaken, on the other hand, also a qualitative analysis of the existing gaps and shortcomings is carried out.

The discussion is divided into two sections. The first section delves into the issue of cluster policies prevailing in all partner regions, while the second section is devoted to a concise analysis of regional R&D policies.

Cluster Policies

Cluster policies are a common issue in all partner regions of CORINNA. As has been shown, clusters are already forming a key element in the portfolio of regional technological competencies in the whole geographical CORINNA space.

Table 10: Cluster Policies in an Interregional Comparison

Region/Country	Policy Approach	Policy Level involved	Cross Border Perspectives
Slovenia	Top down analysis of potential core industries, bottom up call system for proposal of cluster development	National government issuing the calls, self supporting management structures at cluster level	None at policy level, bottom up cooperation at cluster level
Styria	Top down initiation of clusters based on preceding economic analysis on cluster potential	Regional government and regional economic promotion agency, self supporting management structures at cluster level	None at policy level, bottom up cooperation at cluster level
Carinthia	Top down initiation of clusters with the exemption of the microelectronics cluster (firm based initiative)	Cluster policy is agency driven at regional level, self supporting management structures at cluster level	None at policy level, bottom up cooperation at cluster level
Burgenland	Bottom up initiation of networks with technology centres as development nodes	Cluster policy is agency driven at regional level	None at policy level, bottom up cooperation at cluster level

Region/Country	Policy Approach	Policy Level involved	Cross Border Perspectives
West Transdanubia	Cluster initiation through a top down approach by national development plans	National government issuing national development plan and providing basic funding, operation support at regional level by Pannon Business Initiative	None at policy level, bottom up cooperation at cluster level
Friuli Venezia Giulia	Bottom up for traditional industrial districts (i.e. Italian Model), top down for the new Public Private Partnership model of technological districts	Regional government supporting industrial districts, national and regional government initiating technological districts, self supporting management structures at cluster level	None, neither at policy level nor through bottom up initiatives

Source: JR-InTeReg

Table 10 gives a schematic overview of the currently existing regional policy frameworks for clusters in the CORINNA space. While the rows indicate the relevant region, the columns provide information on the policy approach used (top-down or bottom-up), the policy level involved (national or regional), and on the consideration of cross border activities at policy level. A thorough reading of the table reveals the following patterns and issues:

- All of the above mentioned regions have policy frameworks for regional cluster policies (with the exception of Slovenia where—because of the relatively small size of the country—no national/regional distinction exists). Cluster policies generally include regional governmental institutions or agencies. As the term cluster can be defined more or less narrowly, there are differences between the regions with respect to what may or may not be considered cluster policy.

- There is a tendency towards multiplication of issues: there seem to exist some »trendy« areas for cluster development that every region tries to develop, e.g., automotive clusters, microelectronics clusters or wood clusters. But the question has to be raised whether the geographical proximity of so many similar cluster initiatives could lead to over-resourcing—especially for those cluster initiatives that are initiated later and/or have fewer comparative advantages. Institutionalised cooperation between regions could thus lead to better cluster policies where more focus is given to the comparative advantages of specific regions (OECD 2001a).
- No form of institutionalised trans-border cluster cooperation exists. To our knowledge, there are not even any plans for international or interregional cooperation on cluster policies among the CORINNA partners. This is surprising, given that the business sectors and, therefore, clusters, are not bound by geographic borders (European Trend Chart on Innovation 2003). »Given the limited number of trans-border initiatives, the next step in cluster policies could be to explore how to move regional cluster activities across borders to benefit from complementary competences and economies of scale« (European Trend Chart on Innovation 2003, p. 28).
- For policies to be effective, both existing clusters as well as potential clusters need to be evaluated with respect to their (potential) strengths and weaknesses, their chances of future survival, their synergies with the surrounding business structures, potential for interregional cooperation, etc. Also, opportunity costs have to be taken into account (i.e., once money and other resources are spent on one project, they are no longer available for other projects). As far as the clusters covered in the CORINNA framework are concerned, no such evaluation has yet been started, neither by regional nor by national policy actors.

- Some clusters will fail to establish themselves as economically viable in the short or long run. Therefore, thought should be given to possible alternatives for the region (»not placing all eggs into one basket«). Even successful cluster developments will end at some points. If a region is too specialized in one area it becomes vulnerable (Hartmann 2004). History provides examples of this—e.g., English 19th century cloth producing cities (Manchester) or 20th century steel producing cities (Sheffield) are still struggling today with their one-dimensional heritage (Tichy 1997).

R&D Policies in an interregional comparison

Table 11 presents a schematic overview of the currently existing innovation policy framework in the partner regions of CORINNA. The rows show the regions involved while the columns indicate the three dimensions of qualitative analysis.

‚Policy issues and needs' refer to gaps that have to be addressed by technology and innovation policy while the ‚existing policy framework' focusses on the question of whether the regions involved do actually have their own regional agenda for innovation and R&D. ;Strategy and development plan' indicates whether coherent policy documents exist at regional level or are currently being drawn up.

Table 11: R&D and Innovation Policy in an Interregional Comparison

Region/ Country	Policy Issues and Needs	Existing Policy Framework	Strategy and Development Plans
Slovenia	Strengthening industry science links in particular to SMEs in order to improve their competitiveness, improving of the commercialisation of R&D results; Need for continuity in the policy framework: There are too many structural changes in the region's economic policy (each election brings a new government that changes everything the previous government has done).	National policy framework—regions exist only as statistical entities	Innovation and R&D is addressed in the development and planning documents associated with cohesion policy; within the SLORITTS project, a national innovation strategy with derived umbrella projects has been worked out.
Styria	Diffusing innovation and R&D from leading enterprises to SMEs in order to improve competitiveness of SMEs; Development of long-term strategic perspectives for the existing R&D infrastructure (Competence Centres); Using the concept of bottom up regional R&D networks to develop emerging fields and to influence decisions at national level.	National policy (Competence Centres, regional innovation etc.) is setting the agenda. Regional policy actors (Government of the Province of Styria, Economic Promotion Agency) are mainly co-financing programmes at national level	Research Strategy Styria 2005plus and the new Technology Policy Concept are forming the basis for the new programming period and also for regional funding schemes.

Region/ Country	Policy Issues and Needs	Existing Policy Framework	Strategy and Development Plans
Carinthia	Development of technical department of the University of Klagenfurt and of regional R&D infrastructure; Strong need for a coherent policy and governance system.	National policy (Competence Centres, regional innovation etc.) is setting the agenda. Regional policy actors (Government of the Province of Carinthia, Carinthian Economic Promotion Fund) are directly funding the development of the University of Klagenfurt and topical research institutions while also co-financing programmes at national level	Currently no single strategy plan but various relevant documents such as Giudelines Technology Fund Carinthia (1999), Future Dialogue Economy Region Carinthia (2004); various innovation policy programmes are carried out under the umbrella of the Technology Fund Carinthia
Burgenland	Regional R&D infrastructure development: Technology centres and University of Applied Sciences; Informal vertical priority setting in the field of Energy and Environment; Upgrading of technology level of regional firm base; Maintaining momentum of development after losing Objective 1 status	National Policy (competence centres, regional innovation etc.) is dominating. Regional institutions (Economy Service Burgenland) are currently mainly involved in operative actions	Currently no coherent strategy plan for and associated programmes in innovation policy is existing

Region/ Country	Policy Issues and Needs	Existing Policy Framework	Strategy and Development Plans
West Transdanubia	Regional R&D infrastructure needs to be strengthened at regional level; Absorptive capacities in the business enterprise sector need to be developed as a complementary measure. Strengthening of the regional institutional framework, as innovation policy is in Hungary still a very centralised affair: regional agencies need an upgrading with regard to their degree of freedom in policy issues	National policy is dominating Ð main programmes (e.g., Cooperative Research Programme) and funding schemes exist only at national level. Regional institutions (West Pannon Development Agency) are both active in operative actions and development planning.	A regional technology foresight has been carried out; also regional innovation policy concepts are under way for the new programming period.
Friuli Venezia Giulia	Strengthening industry science links in particular to SME in order to improve their competitiveness, improving of the commercialisation of R&D results; Intra-regional disparities need to be addressed: while Trieste is almost crowded with R&D institutions the other regions are lacking such an endowment. Technology level and innovation performance of (low tech) industrial districts has to be improved facing globalised competition-	National policy is influencing to an increasing extent the regional level through programmes (e.g., Technological Districts). At regional level agencies are mainly involved in operations actions Ð capacities for long-term planning are lacking at the moment.	Currently no coherent strategy plan for and associated programmes in innovation policy is existing.

Source: JR-InTeReg

A comparative analytical view of the table reveals common characteristics on the policy side of the respective innovation systems, and also shows those issues for innovation and technology policy that are present in all regions. With regard to regional governance the following issues and challenges can be spotted:

- A variable geometry with respect to regional innovation policy frameworks prevails: An institutionalised approach to interregional innovation policy is made difficult by the varying levels of authority existing among the partner regions. While Slovenia is only present at national level, Friuli-Venezia Giulia and the Austrian regions have a regional policy framework (albeit strongly influenced by the national level). West Transdanubia has to struggle with a highly centralized system of governance and is thus limited in its degrees of freedom with respect to policy decisions. Thus, it would appear that no institutionalised framework for future joint actions in CORINNA is likely to evolve soon. Instead, a voluntary approach to allow for various adjustments should be envisaged.
- There is a need for coherent long-term strategies: With the exception of Slovenia and Styria all other regions lack well defined long-term plans or strategies for regional innovation policy. Thus, planning is very likely to occur in these regions on an unsystematic ad hoc basis. In order to establish a functioning system of governance (planning, implementation, assessment), there needs to be an increased demand for strategic plans. A long-term plan would also offer possibilities for creating better mutual understanding of interregional innovation policy issues, as is intended within the CORINNA initiative.

With regard to existing gaps and the necessity for public intervention, the following issues were also raised as a result of the qualitative analysis:

- Strengthening the innovation and R&D capacity among SMEs: All regions of CORINNA are struggling with a weak

R&D and innovation performance for SMEs. This holds true even for Styria, which has a god score in terms of activity in private sector industry, or for Slovenia, which occupies a good position in public sector R&D. Therefore, the issue of addressing SMEs and broadening the innovation peak of industry is envisaged in all the partner regions of CORINNA. A cross-border dimension could be based on the need of firms for structured information on the availability of R&D and technologies beyond the borders of the respective regions.

- Improving science/industry links: All regions are suffering in varying degrees from the current weak links between industry and science. While for some regions, such as Styria or Carinthia the provision of national schemes for public private research partnerships (such as the Austrian Competence Centre Programme) has somewhat improved the situation, the overall challenge still remains, especially for those sectors less prone to innovate. The concept of public private research partnerships could provide a solution to this problem as such schemes are present at national level in all partnering regions.

Proposed Policy Priorities

The proposal of priorities for the CORINNA project is a key element of the work in the associated network of partners. It provides input to regional policy makers involved in the project and also provides the possibility for thematic coordination beyond the project constraints.

There is also a strong policy rationale for priority setting within the geographical space of CORINNA: Firstly, the region lacks large metropolitan areas with their associated positive externalities and has thus to compensate for this. The development of critical mass could help here. Secondly, priority setting should provide coherence through thematic coordination of cross-border activities, and thus take the prevailing national or regional priorities in existing programmes and development plans into account. Thirdly, new priorities should build upon existing strengths as all regions have »traditional« scientific and technological competencies that need to be further addressed in order to ensure future competitiveness. Fourthly, priorities should help bridge the gap between industry and science as future structural change can be seen mainly as knowledge driven (OECD 2001b). In addition to all this, all regions exhibit problems in terms of SME innovation performance, and these clearly need to be addressed as well.

Table 12: Convergence in Regional Priority Setting in the EU

Nord-Pas-de-Calais	x	x	x	x		x
Basque Country	x	x	x	x	x	x
Nordwest-England	x		x		x	x
Baden Württemberg	x	x			x	
Catalonia	x	x	x	x		x
Alsace	x	x	x		x	
Öresund -Region	x	x	x	x		
6. Frameworkprogramme	x	x	x	x	x	
5. Frameworkprogramme		x	x			

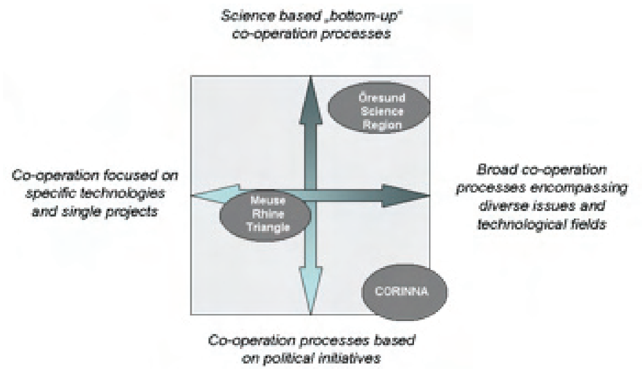
Source: JR-InTeReg

The process of priority identification needs to be treated with care. For a selection of EU regions, Table 12 shows priorities that have been set in the framework of regional research and technology plans or strategies. As can clearly be seen, there is a strong tendency towards convergence in the selected research themes or technology fields (Hartmann / Steiner 2007).

An even stronger picture emerges when priorities from the 5th and 6th Framework Programme of the EU are also included in the comparison. This tendency for convergence implies that most regions are specialising in the same R&D activities and are thus foiling the intended development of distinct regional competencies.

Priority setting should, therefore, be reasonably broad, and allow for high degrees of freedom via a bottom up process in the generation of projects (see Figure 17).

Figure 17: Priority Setting as a Bottom Up or Top Down Process



Source: JR-InTeReg

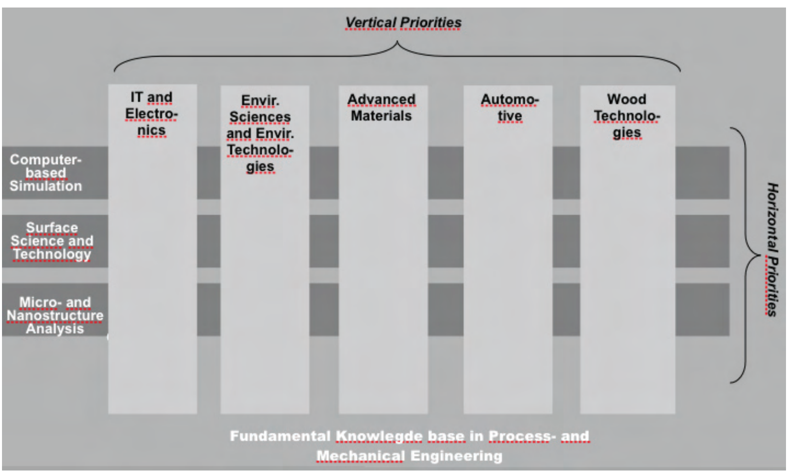
Thematic Priorities

Vertical priorities refer to thematic fields that are characterised by clearly identifiable boundaries and properties. They are related to well established technologies and/or fields of science and are also characterized by vertical linkages in the value chain of knowledge production (OECD 2005).

Horizontal priorities, on the other side, can be defined as thematic fields that are lacking any clear boundaries. They interlink vertical fields of science and technology and can thus also be referred to as »hyphen-technologies« that bind different competencies together (Boekholt 2003). Such horizontal priorities are in play in several fields of science or industrial activity and also link both mid- and high tech industry sectors to research and development (OECD 2005).

Figure 18 gives an overview of the proposed vertical and horizontal priorities for the CORINNA project. The proposed priorities combine competencies in science and industry and can thus be regarded as interregional knowledge bases. As can be seen, three levels of priorities exist:

Figure 18: Potential Horizontal and Vertical Thematic Priorities for CORINNA



Source: JR-InTeReg

- On a basic level (background), an »ultimate« horizontal strength and priority can be spotted: mechanical and process-engineering. On the one hand, this plays a key role in vertical fields such as environmental technologies or new materials. On the other hand, it also forms important elements in horizontal fields such as nanostructure analysis or surface science. This knowledge base reveals one basic property of the CORINNA space—that its scientific competencies are derived from a very strong knowledge base in engineering.

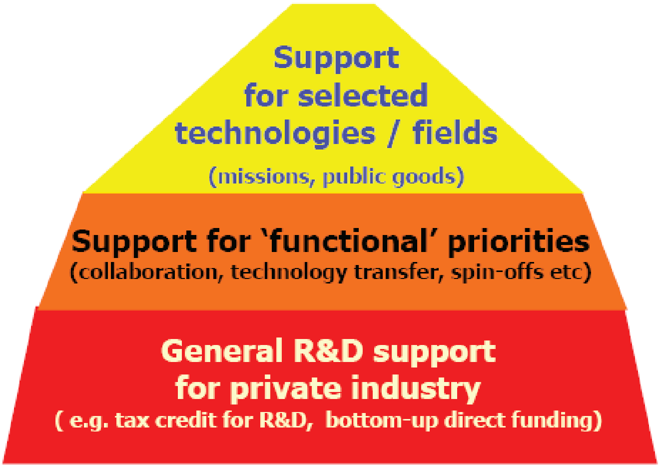
- On a second level (dark grey rows), the horizontal priorities can be seen. They form the »glue« between the vertical fields of strength prevailing in the CORINNA space. Computer based simulation is as important in automotive engineering (e.g., virtual crash tests) as it is in advanced materials (simulation of iron casting) or environmental technologies (simulation of the convection of heat in new buildings). Surface science plays an important role both in the field of new materials and of wood technologies and is also a key issue in electronics or mechanical engineering. Micro- and nanostructure analysis adds an additional dimension in measuring and testing within all vertical technological and scientific priorities and also serves to add an emerging field to the portfolio of proposed priorities.
- On the third level (light grey columns), the proposed vertical priorities are presented. They are not only based on strong knowledge bases in R&D but refer at the same time to strong regional industry clusters or networks. The automotive sector has become one of the main drivers for economic development in the CORINNA space in the past ten years and is also endowed with strong regional competencies in R&D. The subject of advanced materials adds to traditional strengths in the field of basic metals and metal processing present in all regions but depends on innovation if it is to maintain its position. New composites, joining of exotic materials, surface treatment and design are topics that could help here. IT and Electronics have been the thematic core for regional industry clusters for some time, and will augment the field of automotive and mechanical engineering in the future. Environmental sciences and technologies comprise, on the one hand, such subjects as cleaner production and end of pipe technologies, and on the other hand, also include biomass, renewable energy, and process engineering of renewable resources (i.e., bio catalysis). Wood technology is mainly cluster-based in the CORINNA space but is at the same time strongly linked to the topic of process-engineering.

Functional Priorities

Functional priorities refer in this document to those generic priorities that address existing market or system failures in national or regional innovation systems. They focus on interventions of public bodies necessary to overcoming existing failures and can be seen as complementary to thematic priorities (OECD 2005).

Figure 19 shows a model for the co-existence of functional and thematic priority setting and also explains the differences between the two concepts. While thematic priorities concentrate on the support of selected technologies (be it in the provision of public goods or in missions such as the fostering of renewable energy), functional priorities focus on the support of generic issues such as academic spin-offs, technology transfer or the fostering of collaboration between industry and science. Both concepts have to be seen in addition to the more undirected general R&D support for industry, e.g., through indirect instruments such as tax credits, or bottom-up direct funding.

Figure 19: A Model for the Co-existence of Functional and Thematic Priority Setting



Source: JR-InTeReg

Functional priorities addressed within CORINNA, like their vertical counterparts, need to have a commonly shared cross-border perspective. Thus the problems they approach should be present in all partner regions of the CORINNA space. Taking these basic requirements into account, two functional issues can be identified:

Focussing on »Clustered Systems«

Clustered systems can be understood as networks of firms, intermediaries and R&D institutions that share common objectives and project portfolios. They can link up members both at regional/national or interregional/cross-border level. Typical examples of such clustered systems are the project networks that have been developed within the framework of programmes such as STRAPAMO or CIR-CE of the Austrian Federal Ministry for Economics and Labour. Focussing on the promotion of clustered systems as a functional priority is recommended for two reasons:

First, the geographical space of CORINNA lacks any large agglomerations with associated positive externalities. Thus the necessity of building up a critical mass of actors for future innovation and technology policy actions needs to addressed. Clustered systems could strongly help compensate for this deficiency by promoting the formation of strong interregional multi actor networks.

Second, clustered systems could help to strengthen science industry links and thus lead to a better R&D performance in industry. The linking of R&D infrastructure with strong and promising enterprise sectors would add to the long term competitiveness of the whole CORINNA space.

Supporting and Broadening the Innovation Peak in Industry

The partner regions of CORINNA are characterised by strong leading firms that do particularly well both in R&D and innovation while at the same time the broad mass of SMEs tends to lag behind. This peak needs to be both sustained and broadened. While the maintenance of a strong peak in R&D and innovation can be achieved by strengthening further industry-science links, enabling SMEs to improve innovation and R&D needs a different approach. Such an approach includes the following elements:

- Improving the access of SMEs on the threshold to R&D to information on R&D. Recent studies of firms show an awareness of information deficiencies in innovation activities. The provision of structured information on R&D suppliers could provide a good basic instrument to help overcome this obstacle.
- Fostering of active technology transfer on an interregional level: The creation of awareness for innovation and R&D is also nurtured by actively contacting technology transfer institutions, such as Innovation Relay Centres or technology transfer agencies of universities. The current activities of the intermediary actors need to be fostered and widened in geographical scope.

3

Damjan Kavaš

Development of Synergetic Strategies

Introduction

The key words in regional competitiveness today are innovation, networking, exchange of skills and experience, and cooperation, whether interregional or cross-border. This competitiveness lies within the reach of each territorial community, be it large or small, industrial or agricultural, urban or rural. While national boundaries, states and national economies are declining in importance, regions, agglomerations, industries, clusters, and networks are becoming more and more significant.

While knowledge-intensive activities, high technology industries, and technological innovation are central forces of development, the nature of the new innovation driven economy tends to be very uneven. This is the major contradiction of our time: the new drivers of development and wealth tend to concentrate in relatively few areas and localities. Market forces and agglomeration economies tend to cluster technological innovations in only a few islands.

In the last few years, there has been a proliferation of competing, overlapping, and sometimes ephemeral »new« regional groupings in Europe. These stand in marked contrast to the older and more ordered, stable, and formal administrative regions of Europe. It is clear that many of these new regions draw, sometimes explicitly, on the arguments encapsulated by the new regionalism, which, although profoundly questionable, continue to exert a powerful discursive pull on policy actors. It is clear that the strategies being pursued by many of these new regional entities are largely symbolic and to date confined mainly to the realms of rhetoric. But at the same time, their emergence can be seen as significant in commencing a very lengthy process of co-operation based on networks of policy actors who are attempting to transcend—and sometimes to challenge—established regional and national boundaries. Of the 146 different interregional or cross-border initiatives analysed, no less than 39 have the development of strategic spatial plans (or, more commonly but less precise, precursory »visions«) as a central or defining goal. Alongside strategic visions, however, spatial planning efforts in other instances have revolved around more workaday issues of cooperation and coordination, arguably more in accordance with the European Commission's desire to resolve the practical impediments to economic development engendered by international and interregional inconsistencies across different land-use planning regimes. Such a goal has been at the heart of many of the initiatives analysed. These all focus on border areas, and some exhibit profound qualitative differences compared to the megaregions. These latter exhibit a self-professed »global« focus and audaciously aspire to fundamentally re-ordering or re-scaling EU geography. By contrast, regional and national cross-border collaborative initiatives (some of them with relatively lengthy histories) have focussed on routine issues of intergovernmental cooperation in relation to environmental protection, heritage and tourism, vocational training, small-business support, transport linkages and other areas of activity. Only a few of them have explicit real technological content (Helsinki-Tallinn, Styria and Slovenia, Puglia & Western Greece, Cadiz, Malaga, Ceuta & Mellila, Northern Ireland, MEDOC, Inter-Mediterranean Commission) (Deas 2004).

Figure 20: The »new regionalism« in Europe

Source: Deas, 2004.

The industrial world is in the midst of a three dimensional transition: (1) New technology is being rapidly introduced and is redefining the competitive situation between incumbent firms and potential new entrants. We thus talk of entering a »New Economy«. (2) The same technology is supporting rapid globalisation of production and thus redefining the geographical distribution of production among industrial economies. (3) This globalisation is undermining the economic bases of national economies as autonomous policy makers. New regional allocations of industrial excellence are being created in their place, often transcending national borders (Eliasson 2004, p.2). The industrial world is fragmenting into new regions of industrial excellence that do not recognize national borders. The topic of proximity has been on the research agenda in economic geography for quite a while.

In the last twenty years, a strong case has been made that territorial agglomerations are growing in importance for the promotion of innovation and competitiveness. Spatial proximity probably reflects the most obvious notion in this context, although it still remains questionable to what extent it creates effective synergies in itself. Thus, although spatial proximity can be important, there are other kinds of proximity (affinity) that must be considered in order to capture the full dynamics of an innovation arena. We thus suggest the inclusion of social, cultural, institutional, and technological proximities in all relevant analysis.

There is a widespread agreement in the academic literature that knowledge, learning, and innovation are the key to economic development and competitiveness for firms, regions, and nations. The future of a knowledge-based European society thus depends to a great extent on the capacity of European countries and regions to create smart systems that will link and facilitate knowledge creation and innovative enterprises. As knowledge is Europe's greatest »natural« resource, the creation of innovative systems to ensure the full exploitation of this resource remains a major challenge for the EU Member States (The PAXIS Manual ..., p. 11). Innovation is also a central element of the Lisbon objective.

As a result of increasing internationalisation and regionalisation in the last 20 years, certain functions of the national innovation system have either been delegated—exclusively or partially—

towards the regional/local level or the European/international level or have been supplemented by these levels. In Europe, such functions have become part of a multi-level governance system, which is characterised by institutional incentives or framework conditions provided by various actors that share responsibilities over territorial levels. In the latter case, territorial levels above and below the nation-state level have not only been assigned functions formerly provided at the national level, they have also become involved through activities that complement the national framework. Consequently, the territorial reconfiguration of national innovation systems can be conceived as a process that generates new modes of coordination and new constellations of actors among established or new organisations. Such organisations still operate within an innovation system in which the national frame of reference is important—or possibly predominant. Nevertheless, the borders of such systems have become blurred—as more and more functions of the institutional environment are located across various levels.

There is also widespread agreement that innovation promotion is a crucial question in achieving regional competitiveness. In recent years, the concept of regional innovation systems has evolved into a widely used analytical framework which is often employed to generate the empirical foundation for innovation policy making.

Regional Innovation Systems and Interregional Cooperation

The rise in the popularity of the concept of regional innovation systems has been driven by the increased intensity of international competition in a globalising economy, the apparent shortcomings of traditional regional development models and policies, and the emergence of successful clusters of firms and industries in many regions around the world. One result has been the rediscovery by many academics of the importance of the regional scale and the importance of specific and regional resources in stimulating the innovation capability and competitiveness of firms and regions. Thus, it is argued that firm-specific competencies and learning processes can lead to regional competitive advantages if they are based on localized capabilities such as specialized resources, skills, institutions and the sharing of common social and cultural values. In other words, regional development ensues as competitiveness occurs in places where localized capabilities such as institutional endowment, built structures, knowledge and skills exist. The literature on regional innovation systems has provided substantial description and analysis of relationships between innovation, learning and economic performance in particular regions. The concept of regional innovation systems has no commonly accepted definitions, but usually is understood as a set of interacting private and public interests, formal institutions and other organisations that function according to organisational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge (Doloreux/Parto 2004).

The concept of regional innovation systems has emerged also at a time of a policy focus toward the systemic promotion of localized learning processes aiming to securing competitive advantage for regions. The main justification for developing specific targeted policy measures within the regional innovation system framework is to concentrate on improving capabilities and performance in local firms, as well as on improving their business environment.

The conception of innovation as a partly territorial phenomenon is to a great extent based on the »success stories« of some specialised industrial agglomerations or regionally concentrated networks of SMEs and industrial clusters. There is also growing empirical evidence that, in many cases, certain parts of learning and knowledge transfer processes are highly localised. It is increasingly recognized that important elements of the process of innovation are becoming regionalized.

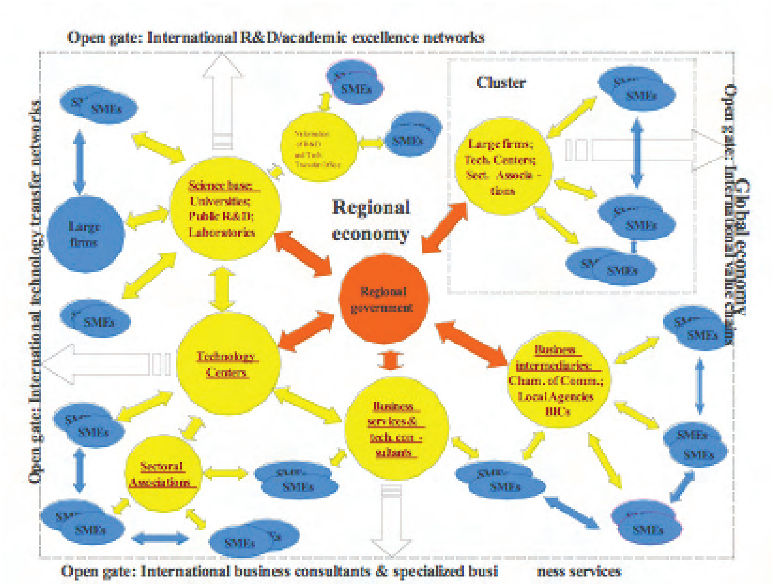
Theoretical discourse on regional development highlights a number of key features (Doloreux/Parto 2004, p. 10-11):

Firstly, innovation occurs in an institutional, political and social context. The region is the site of economic interaction and innovation, or the »mode« for regional innovation systems.

Secondly, innovation can be thought of as embedded in social relationships. These social relationships develop over time along culturally determined lines. The regional context determines the set of rules, conventions and norms that prescribe behavioral roles and shape expectations. These rules are derived from economic and socio-cultural factors such as routines, shared values, norms and trust that facilitate localized interactions and mutual understanding in the process of transmitting information and exchanging knowledge.

Thirdly, innovation can occur more easily in the presence of proximity, though knowledge intensity, regardless of geographical concentration, has been said to be a crucial dimension in such processes.

Figure 21: Open Regional Innovation System



Source: Landabaso, 2003.

Regional innovation systems are far from being self-sustaining units. Normally they have various links to national and international actors and innovation systems. We may distinguish between two important dimensions in this context:

First, with respect to the innovation networks of firms, there is a widespread consensus nowadays that local connections do not suffice in order to sustain innovativeness. In the context of intensifying international competition and accelerating technological change, extra-regional contacts which complement local ones are of key importance. External links provide access to ideas, knowledge, and technologies which are not generated within the limited context of the region.

Second, in terms of public intervention, it becomes apparent that regional, national, and European policy actors and organisations can clearly shape the development and dynamics of regional innovation systems (multi level governance). Regarding the distribution of concrete competencies between these levels, considerable differences exist (with varying degrees of political autonomy for regions) within Europe. Nevertheless, a basis pattern indicating a complex division of labour can still be found: At regional level we can often identify competencies related to the lower and medium levels of education, to incubation and innovation centres, transfer agencies and, more recently, to cluster policies. At national level in many cases we find competencies for universities, specialised research organisations, and funding for R&D and innovation, but in some federal states such as Germany, the regional states (»Länder«) are resonsible for universities. At European level there are the structural funds, the framework programmes for R&D and technological development, and the CIP.

Regions and countries nowadays interact more with the surrounding world and exchange more goods, services and ideas than was previously the case. This is especially true for small regions and small countries because of their relatively small economies. They face problems in attaining the necessary critical mass in some research fields. In order to be competitive, international, including cross-border and interregional, is needed. On the other hand, there still remain big differences among regions which influence both the capacities and the willingness of regions to cooperate at cross-border and interregional level. Differences exist due to various factors, e.g., differences in economic sector orientation, differences between metropolitan and peripheral regions, differences in assets that are »soft«, tacit, and intangible, such as knowledge and competence base, differences in institutional setting, differences due to cultural context or social capital, and differences regarding the density of regional integration policy.

Interregional cooperation represents an additional governance level. It is both important and very complex.

A number of structural factors can clearly influence the potential for improved competitiveness through synergies in a unified cross-border RIS. These include (Faugert et al. 2004, p. 61):

- Human resources (access to a wider pool of skilled labour, particularly scientists and engineers);
- Exploiting complementarities in the production structure (sectors, size of firms, entrepreneurial drive, etc.) and increased integration of production systems
- Strengthened capacity of the knowledge base (universities, research institutes, etc.) through an improved division of labour and a development of cooperation across the straits;
- Access to the capacity and expertise of innovation intermediaries (including financial intermediaries) and to their potential for becoming crossborder actors.

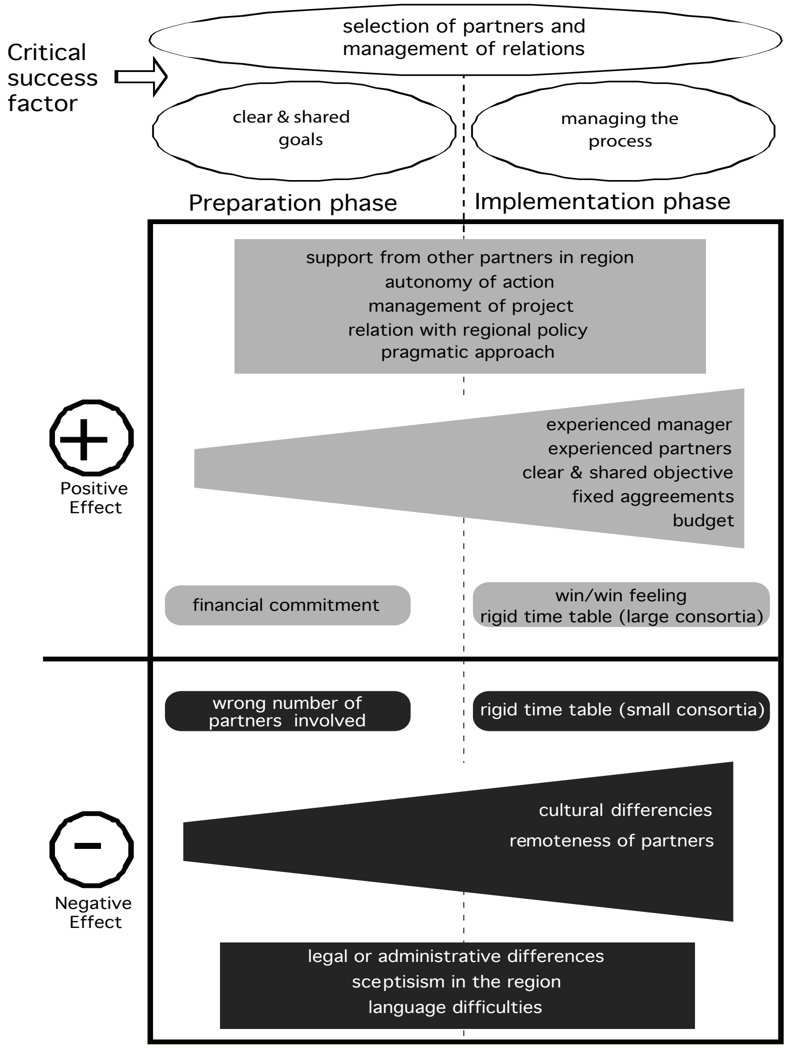
A bibliographic search suggests that the academic literature, which is rather rich in terms of RIS articles, offers few examples of cross-border RIS (Faugert et al. 2004, p. 59).

Interregional cooperation is important. One must remember that national boundaries are historical and political constructs which were not drawn up with a view towards establishing economically efficient production systems. This, of course, requires that national policy makers are willing to focus their attention and to accept the negative sides of regional adjustment and diversity. Interregional cooperation needs time to develop and requires trust between partners from different regions/states.

Interregional cooperation is very complex. Even analyses of success stories such as the Øresund Science Region show that because of the bi-national nature of a cross-border region, it may be somewhat problematic to regard the region as one collective order as is often done in regional innovation systems. It is, therefore, salutary to approach knowledge dynamics from a modified, less systemic regional »innovation arena« perspective. This term is used to refer to an innovation network of collaborating, competing, and conflicting actors, each exhibiting collective and individual interests and cultures, and having different economic and political powers at their disposal in specific socio-economic contexts. This does not exclude systemicness but does query its existence ex-post (Coenen/Moodysson/Asheim 2004). Interregional cooperation takes place in an institutional context which is shaped not only on a regional level but also on the national and EU level. Despite the prevailing tendencies towards increasing regionalisation, regions remain institutionally embedded in their overarching nation state, and these shape innovation processes in country-specific ways. The European Commission itself admits that transnational research cooperation and knowledge transfer between public research organisations and industry is hampered by three main factors: cultural differences (including language), legal differences, and difficulties in finding partners.

At EU level some experience with interregional cooperation in innovation projects already exists. Interregional activities were supported in the framework of the RITTS programme. Yet reports and analyses of case studies show that the interregional dimension of RITTS has been rather limited. The exceptions remain those few regions where the interregional dimension was important from the very beginning of the project (some Nordic projects, Canary Islands, Rotterdam). Direct interregional exchanges have remained limited. The main reasons relate to language and cultural barriers and to the marketing approach taken in most network events (Charles et al. 2000, p. 51). Concrete cooperation projects subsequently received more support from the European Commission, in particular the Trans Regional Innovation Projects launched in 1998.

Figure 22: Possible Success Factors of Interregional Cooperation in Innovation Projects



Source: Good Practice in Interregional Innovation Policy, 1999.

Experiences of Other EU Regions

There are not many interregional cooperations in Europe based on innovation promotion. For the purpose of illustration, we have chosen two of the most well-known cases, BioValley and the Øresund Science Region.

BioValley

Location and History of the BioValley Concept

As a life sciences cluster spanning three borders between Strasbourg in France, Basel in Switzerland, and Freiburg in Germany, BioValley is one of the few European biotech clusters possessing sufficient critical mass to compete with US clusters. (»BioValley« is a registered trademark.) With over 300 life sciences companies, including the global players Novartis, Roche, and Syngenta, plus 40 scientific institutions and four universities with about 280 research groups, BioValley is already one of the largest and leading biotech-regions in Europe. Cooperation is here based on a cluster approach.

The idea for BioValley started in the late 80s when Georg Endress and Hans Briner imagined the creation of a »Silicon Valley« dedicated to biotechnology in the Upper Rhine Region. The vision of becoming a European centre for biotechnology was first presented to the public at a conference held in the Château Kiener in Colmar in July 1996. In that year the implementation of the BioValley concept began.

Since then, representatives of the three nations (France, Germany, Switzerland) working in life sciences, business, economic development, and technology transfer, have been engaged in cooperation to develop and market the region worldwide. They have helped to create a network of science, industry, politics, and finance, resulting in one of the strongest biotech regions of Europe.

Bundling the power within such a cluster opens up the chance to enhance competition, fill strategic gaps, and concentrate world-class competencies in specific fields. Such an effort requires active cluster management well beyond the mere organisation of local round tables. Such management functions as network integrator and is based on unique proprietary knowledge of the cluster.

To concentrate effort and to initiate and manage dynamic growth, it is essential to set priorities in what is a very extensive field. Cluster management needs to be aware of local strengths and competencies so that individual institutions and companies, working independently in the same field, can be brought together within the BioValley cluster.

Objectives, Organisation and BioValley's Services/Activities

The main aims of BioValley are the following:

- Creation of the most attractive and successful European biotechnology region (biotech cluster)
- Support of existing and new companies
- Promotion of start-ups
- Technology transfer
- Enhancement of new alliances with (inter)national partners, by organising »Partnering Congresses«
- Networking of the players in the life sciences
- Building of a self-sustaining organisation

In order to achieve these objectives, the promotion of greater co-operation between the companies involved in the biotechnological and biomedical sectors and in the internationally respected scientific institutions associated with the universities in the BioValley area is essential. Most of the organisations have already established close links among themselves. The intention is to address not only the many pharmaceutical corporations already present in the BioValley area, but also to involve the region's numerous smaller enterprises and suppliers. This calls for the creation of a network strongly committed to the transfer of technology.

The transfer of technology should, on the one hand, help to prepare existing companies for global competition and, on the other hand, create employment in new fields of work within the BioValley region by stimulating the establishment of new businesses, particularly in association with universities.

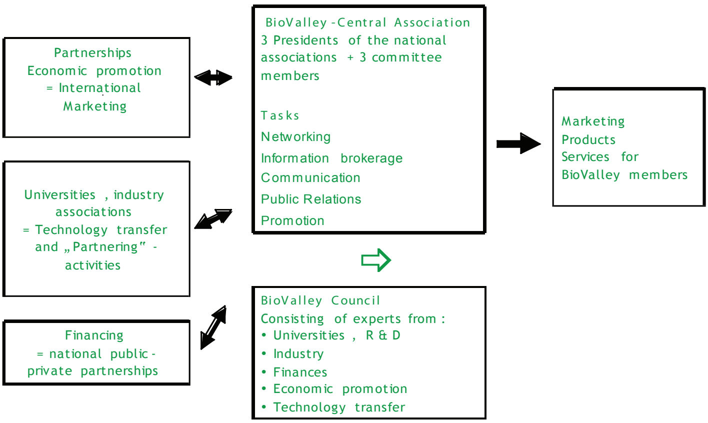
Situated in the geographic heart of Europe, BioValley specifically encourages the notion of European unity. Close collaboration between companies, research institutions, institutions promoting economic growth, trade associations, and financial service providers as well as with people living in the area forms the basis for the economic prosperity derived from biotechnology in this region. This allows for the region covered by BioValley to be competitive with other centres of biotechnology in Europe and further afield.

The BioValley initiative seeks to generate systematic collaboration between all those involved in the process of innovation. This approach is fundamental since every individual contribution is perceived as being important for the success not only of the project itself but of the region as a whole as well.

The BioValley network consists of:

- Pharma and biotechnology companies
- Companies offering services and products
- Universities and research centres
- Technology transfer agencies
- Technology parks
- Banks, investors, venture funds
- Economic promotion agencies

Figure 23: The BioValley Network



A concrete initiative was set up by the BioValley Promotion Team. In 1997, BioValley obtained a budget of €2.2 million through the INTERREG II Programme of the European Union. Creation of the legal structures of BioValley followed in 1998. These are three national associations and one central tri-national association. The next step was carried out in the period 2002-2006, when the INTERREG III European Programme granted BioValley a global sum of approx. €2.4 million for »BioValley: From Network to Tri-National Biotech Cluster«.

The BioValley initiative seeks to trigger systematic collaboration between all those involved in the process of innovation. Subsequently, the BioValley will mainly focus on establishing tri-national activities in the area of communication and marketing within the network. A brief description of the most important activities of the BioValley initiative is given below:

- The BioValley Guide compendium lists life sciences companies and public and non-public research institutions. For easy access and overview the listed companies and institutions are subdivided according to four major categories: R&D Companies, Service and Consulting Companies, Supply Companies, and Research Institutions/Organisations.

- »BioValley Journal«: Four issues per year of the BioValley Journal are published (5000 copies/issue). The journal gives information on all aspects of life sciences in BioValley and provides in-depth insight into special areas of life sciences research and applied research. It is aimed in particular at members of the association.
- The BioValley E-newsletter: This is issued periodically to provide current information on regional, national, and international events, conferences, and fairs for the BioValley members. The E-newsletter keeps members up-to-date concerning activities and developments within the BioValley area.
- BioValley Extranet: Members of the three national associations have their own platform within the BioValley website at their disposal, the BioValley extranet. The extranet provides valuable information and serves as a tool for knowledge transfer and partner searches.
- Defining the Centres of Competence: the scientific and business-related core competencies in BioValley are elaborated within the current INTERREG programme. These profiles form the basis for further marketing of the BioValley region.
- Participation at international biotech fairs: BioValley is regulary represented at international fairs, such as BioSquare, MipTec in Basel, BioExpo in Japan (Tokyo), BIO in the USA, the Biotechnica in Hannover, as well as at national trade fairs.
- Call for Projects Programme: This programme highlights bi- or tri-national partnerships of a scientific and/or economic nature. The topics for projects have to be in life sciences, economics or education. Chosen projects have to be in the BioValley area. The first round of projects had to be finalized by

December 31, 2005. Further requirements are that projects should create new jobs, promote sustainable development in BioValley, and should have positive impact on economics and cultural integration. 50 % of the requested sum has to be co-financed.

- Start-up Labelling Programme: In the context of INTERREG III, a funding programme is available for companies. Both start-up and well established companies can apply for support from this programme.
- BioValley regional events: BioValley organises networking events in all three countries. About five times per year, »regulars meetings« («Stammtische«) take place in each country. These meetings bring together companies, students, researchers, and venture capitalists. Short presentations followed by lively discussions are characteristic features of these events. Round table discussions on particular topics are also organised a few times per year. The BioValley Life Sciences week takes place once a year in October in Basel, Colmar, Strasbourg, Freiburg, and Lörrach. The focus is placed on meetings, conferences, and panel discussions which highlight the BioValley Network. The aim is to offer a platform in the BioValley region from which the strategies and impact of life sciences can be effectively presented and discussed while at the same time providing extensive audience appeal. The Annual Conference is a major event in BioValley. The aim is to allow for discussion of activities with both BioValley members and with the public, to initiate round table discussions on current topics and to present outstanding personalities from the life sciences world (»it isn't flat, it is global«). The Annual Conference drives the BioValley network and allows members and partners to actively participate in the network.

Lessons Learned

Several lessons have been learned from the BioValley development :

- A good idea needs time to develop: The idea of BioValley started in the late 80's already, but interregional cooperation started even earlier in the 70's with an interregional environmentalist network against nuclear power plants.
- The need for value added: The majority of existing organisations already collaborated before and like many other successful networks started from the bottom up.
- Critical mass is needed: As scientific excellence is a prerequisite for biotech companies, they have tended to develop in close proximity with academic research institutions such as the universities from where they emerged. Solid funding of academic research and the establishment of structures promoting commercial exploitation is, therefore, a key success factor. The presence of big pharmaceutical companies within life sciences clusters is an additional key success factor as the large companies are not only the most important customers for biotechs but are also a source of management skills and spin-off firms.
- A central coordinator is needed.

There are still many problems related to structure and organisation in BioValley. A »Centres of Excellence« study done in 2003 recognised the following areas of weakness (Capgemini Deutschland GmbH 2005):

Strategy/mission

- Unclear overall strategy and goals
- Poor visibility of work
- No momentum to promote tri-nationality
- No uniform picture.

Benefits/value added

- No clear value added for companies
- Unfocused and mainly national networking

Structure/organisation

- Complex structure
- Too many national activities
- Differences in national organisations
- No political backing

Services

- No one-stop-shop
- Overlap with existing services in the region
- No customised services for members.

Øresund Science Region

Location and History of the Øresund Science Region

The Øresund region consists of Copenhagen and Eastern Denmark on the one side of the Øresund sound, and Malmö, Lund, and other parts of Southern Sweden on the other side of the sound. It has a population of 3.5 million people. It is one of Europe's leading educational and scientific centres with 12 universities and more than 130,000 students. The largest city in the Øresund region is Copenhagen. In the year 2004, the city was ranked as the second-best EU capital to live in based on the overall quality of life. The Øresund region is a place recognised for its high return on investment in people.

The Øresund Region has many successful high-tech companies, ranging from small one-man start-ups to large international companies. There are six science parks, some of them among the largest in Europe, and the public sector is highly innovation-oriented. In fact, the Øresund Region ranks as one of the foremost regions in Europe when it comes to scientific output.

Thanks in part to the new Øresund Bridge, which now connects Copenhagen and Southern Sweden, the economies of these two areas are beginning to integrate. The Øresund is, therefore, developing one integrated regional economy, yet one regulated by the laws of two separate countries and inhabited by people who have developed different cultures and speak different languages. The new trans-national region creates new opportunities. By combining the best of Danish and Swedish research-, industry- and innovation structures, a higher degree of global competitiveness is reached. Visions are turned into reality through a structured, reliable and lasting cooperation between Danish and Swedish organisations and institutions.

The Øresund Science Region (ØSR) is a transnational initiative between Denmark and Sweden that serves to strengthen one of the most important assets of the Øresund Region: the unparalleled presence of highly skilled human resources and cutting-edge technologies, which is the result of a specialised research community and a growing number of knowledge-based, market leading companies. The Øresund Science Region was established in the year 2001 by the Øresund University.

Objectives, Organisation and Services/Activities

The Øresund Science Region's vision is to develop the Øresund Region into one of Europe's most attractive knowledge-based economic growth centres. The goals are the following:

- Create a regional competence centre based on four targeted scientific areas: biotech/biomedicine, IT, food science, and environmental sciences.
- Create optimum conditions for a positive regional growth spiral.
- Create new exciting jobs with companies and universities in the region.

The Øresund Science Region is a crossborder triple helix network organisation, bringing universities, business, and industry together with local and regional authorities. It combines the force of six regional research and innovation platforms, three emerging cluster organisations, and a number of regional coordination bodies. It is funded by 14 universities, the private and public sector, and by specific project funding.

The key players are the following:

- Øresund University
- Øresund Business Council
- Øresund Committee, Region Skåne and Greater Copenhagen Authority
- Foundation for Technology Transfer in Lund
- Øresund Research & Development Committee
- Øresund Network
- Copenhagen Capacity and Position Skåne
- Relevant Swedish and Danish Ministries

The board of the Øresund Science Region consists of six university presidents, six industrial representatives and six regional chairmen, vice chairmen, and city mayors.

The Øresund Science Region has two overall objectives. Being an umbrella organisation, ØSR first and foremost focusses on present challenges and future developments in areas of general interest to the existing four platforms. Yet the ØSR also has a broader responsibility for securing future initiatives and for further consolidating cooperation between universities, business, and the public sector.

To achieve these goals, the Øresund Science Region aims to:

- Establish state-of-the-art scientific clusters and networks;
- Stimulate new knowledge in areas where the Øresund Region can be competitive on a global scale;

- Develop and secure an innovative environment and an efficient commercial structure;
- provide global branding and marketing of the Øresund Region as a high-tech region, securing sustainable economic growth while maintaining a high ethical and humane standard;
- promote integration across the borders of: disciplines, academia, industry, the public sector, Denmark and Sweden, the Øresund Region and other regions in the world;
- be a catalyst for creating a worldwide inflow of students, scientists, capital, and companies into the Øresund Region.

The work of the Øresund Science Region is not directed by governmental planning but by the involved parties themselves. The Øresund Science Region is a bottom-up response organised by universities, the business sector and the public sector in the Øresund Region. The companies and institutions in the ØSR are also the stakeholders, thus strengthening the whole organisation and making it more flexible. The Øresund Science Region works closely with its partners in the region: i.e., with local and regional authorities, companies, industrial organisations, agencies for marketing and branding, and with institutions for research and innovation.

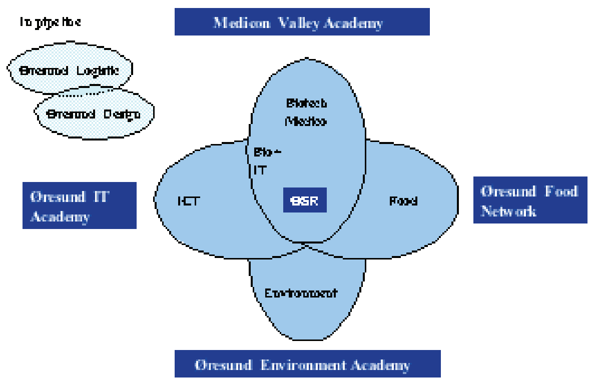
The initiative is one quarter financed by public funds and three quarters by private and other funds.

As already mentioned, four initial scientific target areas have emerged for the Øresund Science Region: Medico/Biotech, IT, Food Science, and Environmental Sciences.

Four unique organisations were created to deal with these regional target areas on an operational level. They are called »platforms«, where universities and the private and the public sector meet and develop their respective areas within their framework. Medicon Valley Academy works within the medico/biotech area, Øresund IT Academy within the IT area, Øresund

Food Network within the food sector and Øresund Environment Academy within the environmental sector.

Figure 24: Øresund Science Region



Lessons Learned

The Øresund Science Region is a transnational region that is creating new and exciting opportunities and is based on a bottom-up approach involving universities, the business sector and the public sector. By combining the best of Danish and Swedish research, industry and innovation structures (achieving critical mass), a higher degree of global competitiveness is achieved. Regional minorities, which face no cultural or language obstacles to cross-border cooperation, provide an additional impulse for ØSR.

However, some studies (Coenen/Moodysson/Asheim 2004) and also an evaluation performed by Technopolis show that here is a gap between theory and practice. For example, in the case of the Øresund Contracts as instruments for cross-border R&D cooperation, implementation was unwieldy and the networks created were inefficient as a result of the following factors:

- The contracts were launched too quickly to establish new networks;
- Rigid rules requiring reciprocity across the Øresund made networks hard to construct and sometimes too big to be inclusive;
- Swedish institutes were barely present in Skåne, so their participation was difficult;
- Universities play different roles in Sweden and Denmark;
- There are few cross-border institutions and those that exist are weak;
- Regional governance differs strongly;
- Øresund contracts were »parachuted« in from the national level, bypassing both the regional networks and regional authorities.

The programme clearly caused additional activity—but with only six projects in a 3-year horizon, results were insufficient. Nevertheless Øresund Contracts provided a unique source of cross-border funding and allowed networks with clear objectives to make technological progress.

Although the Øresund region follows a clear-cut branding strategy, »region building« is far from complete, as is shown, for example, in the fact that even the definition of the region has not yet been accomplished. Cross border differences in laws and institutions (e.g., in taxation rules, labour law, traffic regulations, opening hours) hinder regional development in this regard. Therefore, a cross-border »Øresund feeling« does not really exist. Maybe this could lead to an »Øresund paradox«, in that although the branding strategy is accepted worldwide as best practice, it is not grounded in the region itself, and a regional (cross border) identity is still missing. In this regard, the Øresund region has not yet fulfilled expectations in terms of cross-border linkage formation. Creating a regional identity seems to be the biggest challenge for the Øresund region in the years to come. It will presumably take decades to devise functioning institutions, and generations to create a sense of belonging and a social fabric that underly the development of all societies (Welter/Kolb 2006, p. 52).

Interregional Cooperation in the Field of Innovation in the CORINNA Region

The CORINNA region consists of small regions in international terms. Interregional and cross border cooperation could thus help them to fulfil their strategic objectives, where innovation and innovation policy are seen as pivotal for tackling structural economic change. In addition to close traditional cultural links, the regions of the countries involved share many other priorities and interests: they are striving for sustainable economic development, they all have relatively strong commercial ties with each other, and they all have to compete in the »Europe of regions«.

Interregional cooperation in the CORINNA region already has a long history.

As a prominent example, the Alps-Adriatic Working Community was founded in Venice on the November 20, 1978. The founding members were: Bavaria, Friuli-Venezia Giulia, Carinthia, Croatia, Upper Austria, Salzburg (active observer), Slovenia, Styria, and the Veneto. Upon signing the »Joint Declaration,« the informal, amicable relationships between the border regions were transformed into an organisation with clearly defined tasks and aims. Today the Alps-Adriatic Working Community counts 13 members: Baranya, Burgenland, Friuli-Venezia Giulia, Carinthia, Croatia, Lombardy, Upper Austria, Slovenia, Somogy, Styria, Vas, the Veneto, and Zala. The Alps-Adriatic territory covers a total area of 190,423 km² and is home to about 26 million people.

Many cross-border projects have been financed by EU funds (especially PHARE), but only a few of these have been devoted to cross-border or interregional innovation promotion. There is also a great deal of overlap among the projects implemented so far.

One of the most important projects related to interregional innovation promotion was TriCo (Trilateral Cooperation between Slovenia, North-East Italy and Austria, with Germany, Hungary and Croatia as observers). This was a regional initiative for the support of research and technological development in the Alpis-Adriatic region. Scientific and technological regional cooperation in the framework of the TriCo initiative started in 1998. It was based on the traditionally well-established partnership among the founding institutions from the three countries in the area between the Alps and Adriatic Sea. The founding partners of the TriCo initiative were:

- Slovenian partners: the Slovenian Ministry of Science and Technology, the Jožef Stefan Institute, and the Slovenian Innovation Relay Centre FEMIRC (now IRC);
- Italian partners: the AREA Science Park from Trieste and IRENE—Italian Relay Centre North-East
- Austrian partners: BIT Bureau for International Research and Technology Cooperation (now part of FFG), the Austrian Federal Ministry of Economics and Labour, and the Austrian Federal Ministry for Education, Science, and Culture.

One of the principal aims of the TriCo initiative was to foster cooperation among industry, the technology sector, and the research institutions in the region. This was achieved by performing regular R&D brokerage events of project proposals, technology requests/offers as well as by knowledge and technology transfer to the industry in the selected area, mostly in line with open calls in EU Framework Programmes.

There are several competing projects in the region. Many of them were completed in the last two years. There is no synergy between them (they exhibit considerable overlapping, similar objectives and content). Currently the main projects in the field of innovation promotion are the following: DIANE (Direct Investment Agency Net), BAER (Building a Common Region), TESKA (Technology Transfer of Renewable Energies to Slovakia with the Aim of Cross-border Business Cooperation with Austria), TEC PARK NET (Science and Technology Park Co-operation in EU-Future Region), INNAC (Interregional Innovation Academy Carinthia), GRIP (Governance of Regionally Integrated Projects using Innovative Tools), HICO (Hi-tech Integrated Co-operation for Cross-border Economic Growth and SME Competitiveness Increase), INDE (Information Development), MAREMA—Best Practice in Managing Regional Managements, REGINS (Regional Standardised Interfaces for a Better Integration of Regional SMEs in the European Economy), TRATOKI (Transregional Toolkit for Micro Enterprises), VAW (Value Added Wood), PRIMe (Primorska Enterprise), NOVAREGIO, and MATRIOSCA-AAP. Projects were/are primarily financed by the INTERREG programme. It is important to mention two Austrian funding programmes: STRAPAMO (Formation of Strategic SKT-partnerships with Central and Eastern Europe) and CIR-CE (Cooperation in Innovation and Research with Central and Eastern Europe).

Proprosals on Future Interregional Cooperation in the Field of Innovation Promotion in the CORINNA Region

Starting Point

Despite spatial proximity there were various political, institutional and historical factors (e.g., socialism versus capitalism, strong centralised states in the case of Slovenia and Hungary, world wars) that hampered interregional cooperation in the CORINNA region. The situation has improved considerably over the last few years, especially as a result of the EU enlargement.

At the moment, several important preconditions for successful interregional cooperation in the field of innovation promotion have already been met, i.e.:

- All regions involved are part of the EU.
- There are examples of cooperation between companies and research organisations at interregional level, but they are not well documented and, therefore, not systematically supported and co-financed.
- Interregional innovation instruments exist.
- Cooperations between educational and research organisations exist.
- The objective of »European Territorial Cooperation« is linked to the Lisbon Agenda.

On the other hand, many difficulties still exist which serve to hamper interregional cooperation in the field of innovation promotion:

- Different institutional levels exist: the level of the state in the case of Slovenia and that of provinces or regions in the case of other partners.
- There are different regulations, policies and support programmes. These differences are to a large extent related to different institutional levels.
- Surprisingly, there is little knowledge about competencies in neighbouring regions.
- Innovation policy is primarily the responsibility of the EU member states. Thus, provinces (regions) cannot act independently (they are not authorised to do so and lack financial resources). The degree of freedom in policy setting at regional level is very limited.
- There are considerable socio-economic differences between the regions involved.

- There are relatively few interregional innovation instruments: e.g., CIR-CE, STRAPAMO.
- The existing INTERREG and the past PHARE CBC programmes have/had no strong innovation dimension.
- There are competing and complementary projects in the area, but no synergy.
- Language difficulties are also a problem.

As a result, the intensity of interregional and cross-border cooperation (CBC) of the partner regions in technology & innovation lags behind comparable European regions both on the administrative and on the company level.

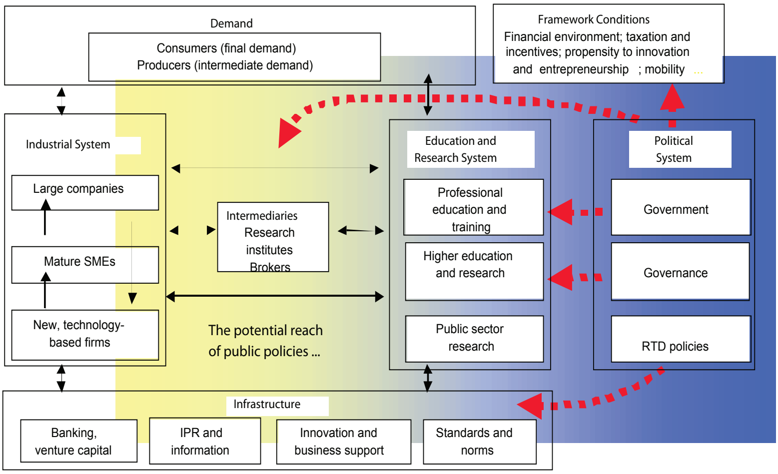
Three basic questions for interregional cooperation need to be considered:

- WHO WITH WHOM?
- HOW?
- WHEN?

WHO WITH WHOM?

The starting point is the national/regional innovation system. National systems of innovation (NIS) are constituted by elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge. A national system encompasses elements and relationships, either located or rooted inside the borders of a nation state. The most significant factors of such a system are the relationships mentioned. As these develop between the actors and institutions within a single system, they create a multitude of heterogeneous economic environments, the implication being that there is no single best way of stimulating an economy by using the national system of innovation. There are, however, common elements to each NIS that can be treated in a similar manner despite national differences (Golden/Higgins/Hee Lee 2003).

Figure 25: National Innovation System



Source: Collins, Arnold, 2005.

It is possible to identify six elements that are important for inter-regional cooperation in the field of innovation promotion. On the basis of the figure 25 the following table can be drawn.

Table 13: Possible Actors Cooperating Interregionally in the Field of Innovation Promotion

	Com-panies	Educa-tion	Re-search	Infra-struc-ture	Inter-media-ries	Go-vern-ment
Companies	2	1	2	2	2	1
Education	1	3	2	2	2	2
Research	2	2	3	2	2	2
Infrastructure	2	2	2	3	3	2
Intermediaries	2	2	2	3	3	3
Government	1	2	2	2	3	3

Note: Possible extent of interregional cooperation:

3: large

2: middle

1: small

Companies seek the most efficient and economic locations and focus on their core business. Inevitably they must look for partners in product development and buy the technologies they do not possess. There are differences between:

- Large companies: more global and more innovative,
- SMEs: locally oriented, especially as regards cooperation in the field of R&D. Therefore, the impact of regional and national innovation policies is very strong. Smaller companies particularly benefit from cooperation and collaboration because they each represent only a small part of the value chain.

Some companies are already cooperating with research organisations in the neighbouring regions, but at the moment there exists no comprehensive scheme for cooperation between research organisations and industrial partners in the CORINNA region. It is very difficult to get information on informal contacts for reasons of their confidentiality.

Education and research organisations are internationally oriented.

Considerable cooperation exists between several universities:

The University of Ljubljana signed a cooperation agreement with universities in Klagenfurt, Trieste, Udine, and Graz (KFU).

Cooperation exists at many levels: between the University of Maribor and universities in Styria; in the form of a Rectors' Conference of the Alps-Adriatic Universities and of projects like ALADIN—Alpe Adria Initiative Universities' Network—Cooperation in e-Integration Research & Teaching in the Region (TU Graz, Rijeka, UBW Munich, Corvinus University Budapest, Trieste, Novi Sad Business School, TU Kosice, Maribor). However, despite very broad international activities of faculties, there exist only few signed agreements with faculties in neighbouring regions and countries.

Consider the case of West Transdanubia: The Széchenyi István University in Győr has several international cooperations with German, Austrian, Slovakian, Czech, Polish, Russian universities and institutions. Most of the cooperation involves only student or professor exchange. In the CORINNA region, the number of cooperating partners is very limited. The University of West Hungary in Sopron focuses cooperation on Germany, Austria (especially Vienna) and Slovakia. However, it has connections all over Europe, mainly student and professor exchange. Most of its Austrian relations are outside of the CORINNA region. The Berzsenyi Dániel College in Szombathely, the Pannon University's Faculty of Georgikon in Keszthely, the Budapest Business School's College of Finance and Accounting in Zalaegerszeg, and the University of Pécs' Faculty of Health Sciences in Zalaegerszeg and Szombathely all have a wide range of cooperation with institutions in the CORINNA region, especially with Slovenian and Austrian universities.

Formal cooperation also exists between research organisations (such as the cooperation between Jožef Stefan Institute and Joanneum Research in Graz), and there are many informal links between researchers from different research organisations. Despite the many existing links, there is still a question of intensity. (In some regions, e.g., in West Transdanubia, there are no technical research institutions outside the universities.)

Organisations representing »infrastructure« (technology parks, technology centres, …) cooperate on the level of projects, such as TecParkNet. Cooperation is often only bilateral.

Some intermediaries cooperate in the EU context (IRCs, APRE), others on the level of projects (RDAs), such as MAREMA.

At the level of government, different institutional levels present a major obstacle to interregional cooperation in the field of innovation promotion. This is a problem of multi-level governance.

HOW?

There are many different forms of interregional/international cooperation. According to the World Investment Report 2005, there are three main categories of innovation internationalisation (see table 14). In the first category, national enterprises, transnational corporations (TNCs), and individuals are engaged in the international commercialisation of technology developed at home. The second category relates to domestic and international technical and scientific collaboration among private and public institutions, including domestic firms and TNCs, universities and research centres. International innovation by TNCs is the third category. The TNC is the only institution that, by definition, can control and carry out the process of innovation within its boundaries across the globe.

Table 14: Taxonomy of Internationalisation of Innovation

Category	Actors	Forms
International exploitation of nationally produced innovations	Profit-seeking (national and transnational) firms and individuals	Exports of innovative products Cession of licenses and patents Foreign production of innovative goods internally designed and developed
International techno-scientific collaborations	Universities and public research centres	Joint scientific projects Scientific exchanges, sabbaticals International flows of students
	National and transnational firms	Joint ventures for specific projects Production agreements with exchange of technical information and/or equipment

Category	Actors	Forms
International generation of innovations	TNCs	R&D and other innovative activities both in home and host countries Acquisitions of existing R&D units or greenfield R&D investment in host countries

Source: World Investment Report 2005.

It is important to build the whole process slowly and not to »parachute« forms of interregional cooperation in from the top, which only serves to bypass both the existing networks and relevant authorities (regional, national). The diverse national contexts in which the partners operate should not be overlooked. It is an open question what kind of activity fits an existing framework: We need to know where regional innovation systems might look for common, strong activities (functions), where only exchange of information is needed, and where we could discuss mixed approaches. This is a question of the relation: competition cooperation. At least the following forms of interregional cooperation are possible:

- Exchange of information: interregional working groups, joint events (conferences, fairs, …)
- Pilot projects
- Development of policy instruments (financial support for interregional R&D, mobility of researchers, …)

WHEN?

Interregional cooperation requires time to develop because it takes a long time to build up trust. This makes it all the more important to start as soon as possible because interregional cooperation is a long term process. It is crucial when analysing regional/national innovation systems to recognize the multiple and interrelated layers by which institutions tend to work. The components which are located at higher levels of this hierarchy are more permanent and durable (e.g. norms and values) whereas those at lower levels can be changed more quickly (e.g., policies).

Proposals on Future Interregional Cooperation in the Field of Innovation Promotion in the CORINNA Region

All regions are seeking to improve their position in the innovation economy, advance their innovation performance, and increase their share of innovation and high tech activities. There is no universal formula for achieving this goal. It is clearly not possible for a region to simply replicate a standard model of successful knowledge-based regional development. Even the most successful regions go through successive waves of growth, decline, and restructuring, shaped by changing products, technologies, and innovations.

There is a tendency for increased interregional competition, often leading to the parallel establishment of highly overlapping institutional settings within neighbouring regions and sub-optimal duplication of support effort. To avoid the disadvantage of setting up specific facilities or developing expertise, which could also be available in a neighbouring region, coordination of support efforts seems to be necessary. It is important here to place the emphasis on interregional cooperation and learning. Incentives are necessary to initiate the sharing of support institutions and to stimulate trans-regional networking among support organisations such as universities and research institutes. In addition, the formation of regional partnerships could increase the leverage of innovation policy so as to reach those regions that are not yet involved in knowledge-intensive growth. Some of the topical areas include: innovative small and medium-sized enterprises (SMEs) and clustering; human capital development; and innovation policy formulation and evaluation.

On the basis of our knowledge, the following SWOT analysis was prepared.

Table 15: SWOT Analysis of Interregional Cooperation in the Field of Innovation Promotion

Strengths	Weaknesses
• Structural linkages and historical, social, and economic ties • All countries involved are EU Member States • Many R&D and educational infrastructures and potential poles; initial experience in cooperation between R&D institutions, universities; some technological fields of common interest • Common technological fields and sectors exists (e.g. automotive industry, ICT, environmental technology, wood and furniture industry, material sciences, etc.)	• Region characterised by small »sub-regions« with no strong EU-scale agglomerations (only the Ljubljana area is recognised as metropolitan growth area) • Disparities in economic development throughout the region • In general, sub-critical mass and lack of international visibility with regards, to »excellence of knowledge« (R&D, education) • Inadequate cooperation and internationalisation of SMEs • Huge differences in governmental structures (e.g. federal vs. centralistic) • Low knowledge about competencies of neighbour regions • Necessary R&D supporting physical infrastructure missing in some regions (West Transdanubia, Slovenia) • Language barriers
Opportunities	**Threats**
• Financing out of EU funds possible (especially ERDF) • Synergies based on interregional cooperation • »Europe of regions« stimulates interregional cooperation	• Historical, political, and cultural differences could hamper interregional cooperation

The CORINNA project tries to develop the regions' innovation system by stimulating interregional innovation promotion by:

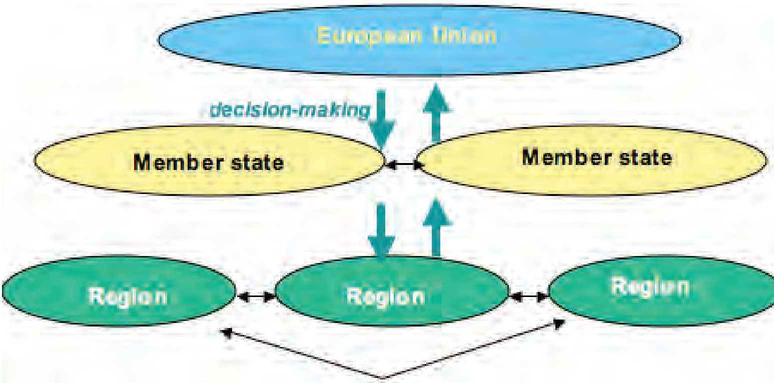
- Increasing mutual knowledge of the partner regions ‚innovation' systems, policies & strategies,
- Stimulating cross-border and interregional cooperation in fields of common technological strengths or complementarities,
- Developing best practices for promoting regional innovation capabilities.

There is considerable potential for an »interregional collaboration space«, but as already mentioned, in reality the present intensity of interregional and cross-border cooperation of the partner regions in innovation promotion, in our opinion, still lags behind comparable European regions both at administrative level and at company level.

Transnational and interregional collaboration which is not part of a long-term structural alliance is relatively unattractive for both the public and the private sector due to the added complexities which such collaboration entails (see Draft Report on the Outcome of the: »Public Consultation ...« 2006, p. 2.). This needs to be taken into account if naive regional policies are to be avoided.

Despite the present tendencies toward increasing regionalisation, regions remain institutionally embedded in their overarching nationstate, and this shapes innovation processes in country-specific ways. Most of the activity related to innovation promotion thus needs to be taken at national level. An additional important governance level is the EU level, where many incentives (programmes) are implemented (FP7, CIP, …). Also, transnational and cross-border programmes promoting cooperation in the field of innovation promotion have a much longer tradition than interregional cooperation.

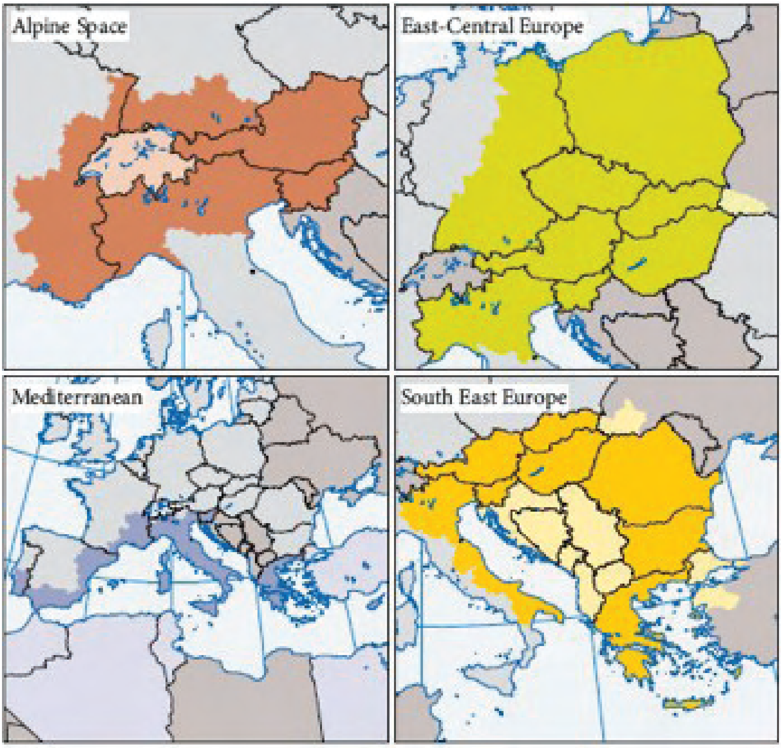
Figure 26: The Problem of Multilevel Governance



It is clear that interregional cooperation in the field of innovation promotion complements activities implemented at other governance levels.

One of the most important instruments for cross-border and transnational cooperations in the next programme period will be the operative programmes for the transnational cooperation areas. From the 13 transnational cooperation areas, two fully cover the CORINNA space: Central Europe and South East Europe, while two others partly cover it: Alpine Space (only West Transdanubia is not covered) and Mediterranean (Hungarian and Austrian regions are not covered) (see Fig. 27). However, while the operative programmes of transnational cooperation areas have not yet been finalised and accepted, the proposed priorities can be very important inputs for the interregional priorities of the CORINNA regions. In fact, the European Commission defined innovation as one of the most important areas of the future programmes (others were environment, accessibility, and sustainable urban development) in line with the Lisbon and Gothenburg processes. Regarding innovation, the programmes have to concentrate on the establishment and development of scientific and technological networks and the improvement of regional R&D and innovation capacities.

Figure 27: Transnational Cooperation Areas and CORINNA Regions



Source: Inforegio, 2007

However, despite the transnational cooperation priorities, defining the interregional priorities for the CORINNA space is not easy. There are areas where a deeper understanding of the issues and regional collaboration—or joint action—would strengthen the innovation performance of the region. The majority of them are related to the exchange of information and experience (benchmarking).

We propose the following set of activities, grouped into the following areas:

- Human resource development: Human capital development spans a wide range of topical areas—including education, collaboration between science and industry, research exchanges, entrepreneurship, etc. Because there are differences between the innovation systems of the regions involved (obstacles to cooperation) and because cooperation of universities is already on-going (e.g., through the Bologna process), we propose to focus activities on cooperation of research organisations, and on networking with the focus on SMEs (see table 16).
- Focusing on SMEs is relevant since engaging in R&D collaboration is becoming important for their competitiveness but they normally have only limited access to collaboration opportunities and are, therefore, one of the main targets for public R&D support (see table 17).
- Other activities which can also contribute to improving interregional cooperation in innovation include dissemination and promotional activities, research studies, etc. (see table 18).

The primary target groups should be regional—i.e., local decision-makers and bodies in the fields of education, research, knowledge-transfer, technology, labour-market, regional development. These include local and regional public authorities, regional development agencies, chambers of commerce, SMEs; universities, tertiary education, organisations, associations, technology transfer institutions; R&D facilities, research institutions, regional centres of R&D excellence; regional innovation agencies, incubator houses; cluster organisations as well as all groups (stakeholders) affected by interregional cooperation.

Activities should go beyond specific interests and be of a real cooperative character and mutual benefit.

Table 16: Human Resource Development

Activity	Form	Justification
Mobility of researchers	Special scheme: There are EU and national schemes supporting mobility of researchers, therefore there is no need to develop a new scheme, but existing national ones could take into account regional criteria. Schemes are running which promote bilateral exchange, but there exists a lack of knowledge of this possibility, so it is necessary to further promote the existing schemes in each region. Special placement mechanism (fund, web portal) for researchers from one region to cooperate with a company in another region.	Mobility of researchers, both geographical and between sectors, must be enhanced. From a point of view of acquiring new knowledge and skills and of finding new applications, both transnational mobility and structural mobility between academia and industry are essential. The mobility of researchers is an important indicator for the internationalisation of R&D. It is important to exchange know-how and experience through interregional two-way exchange of research staff. This allows the sharing of experience and knowledge. Establishing transnational networks between appropriate tertiary education and research institutions could improve the mobility of researchers.

Activity	Form	Justification
Innovation management training for SMEs	Training seminars for SMEs. At the beginning, innovation courses could be carried out in English and afterwards mother languages could be used.	The competency of enterprises to market new products and/or services, to keep their processes up to date technologically and organisationally, etc.—in other words to be innovative—depends to a high degree on their employees, their competency, and knowledge. The great importance of training, further training, learning, human resource development, etc. should not be neglected—nevertheless there are many SMEs that do not focus enough on these areas.
Improving human capital	Special common educational programmes on innovation.	Developing human potential in the field of research and innovation, in particular post-graduate studies and training of researchers and networking activities between universities, research centres, and businesses in the CORINNA region could improve the human development potential and the competitiveness of the region.

Table 17: Networking Focussed on SMEs

Activity	Form	Justification
Foster cooperation of clusters, networks, and technology platforms—second level clustering	Supporting exchange of knowledge and experience (missions, events) Preparation of joint projects (small grants)	Technology platforms (primarily for large firms), networks, and clusters are positive tools to help especially SMEs—and other companies, universities and research institutes—to develop critical mass and a better ability to access funds, spread information and knowledge, and reach their innovative and commercial potential. Various forms of networking are promoted in many parts of the CORINNA region. There is ample scope for structured benchmarking and learning among these cluster- and other initiatives, drawing on the example of the NORDIC CLUSTER ALLIANCE launched in the Baltic Sea Region. More cooperation could increase the effectiveness of the many investments currently made in different cluster- and other initiatives throughout the CORINNA region. Supporting the establishment and development of transnational clusters in key competence areas is also important. Stimulating technology transfer and knowledge exchange mechanisms, in particular in disadvantaged areas of the CORINNA region.

Activity	Form	Justification
Permanent network of supporting organisations	An annual conference, technology specific workshops, seminars, joint projects	Support organisations play a very important role in the promotion of innovation. It is important to share knowledge and experience on a permanent basis. There is also a relatively well developed infrastructure in the CORINNA region in the field of business locations, technology parks, incubators, and science parks. Cooperation regarding the further development would make sense in particular in creating networks and cross-border cooperation in order to facilitate the access to information, to new partners, and to new markets for their clients and tenants. Standardisation of technology park services could be promoted.
Cooperation of research institutes, especially in the fields where the CORINNA region has technological strengths	Grants for: Small joint projects, Preparation of joint projects for EU funding.	Cooperation of research institutes could contribute to the future development of the CORINNA. It is important to focus on market technology demand and less on basic research. Putting into practice the cross border cooperation of technology transfer institutions.
Setting up and intensifying the application oriented cooperation between the research system and companies, especially SMEs	Grants for joint projects, company missions	The innovation capacity of SMEs is stated to be much lower than that of large companies; therefore, it will be very important to establish qualified and fitting frameworks to motivate SMEs for innovation activities or to bring them closer to the results of R&D activities.

Activity	Form	Justification
Improving the governance of innovation policy	A benchmarking forum (benchmarking and exchange of good practice, including the exchange of public officials dealing with innovation policy)	Motivations for policy benchmarking and exchange of good practice are: To understand where improvements have to be made; Understand factors influencing the performance of policies; Learning from »best practices« or »good practices«; Setting standards and targets for performance. Taking part in the process is already helping to learn. At the moment projects which focus on policy and benchmarking are challenged by a lack of interest or capacity constraints of the target group. Promoting actions on the diffusion of technological and innovation results as well as on the importance of regional innovation systems could be helpful.

Activity	Form	Justification
Implementing interregional cooperation between public and private (regional) players in innovation	Grants for joint projects	Innovation is more accurately described as a process through which knowledge can be translated into new products, services or processes, including those of the public sector. In this context, public-private partnerships should be established. Interregional cooperation should contribute to improving the innovation governance understood as the organisational capacity to recognise, to foster, and to manage innovation and to cooperate for it, in both the private and the public sector. Links between public authorities and financing institutions are also important to develop capacity in financial engineering for innovation across the cooperation space

Table 18: Other Activities

Activity	Form	Justification
Studies	Grants for studies	Analyses show that there are fields in the CORINNA region that are related to well established technologies and/or fields of science and are also characterized by vertical linkages in the value chain of knowledge production. Additional studies should explore possibilities to build interregional networks that could represent a sectoral region in the future (e.g., as bioregion). Setting up exchange and coordination mechanisms for innovation approaches and policies across the CORINNA region between key players of the innovation system is needed.

Activity	Form	Justification
Creation of a common information source for innovative projects (common calls, common awards, etc.); A more active technology transfer (TT) approach with a web service (information exchange, TT services).	Web portal, fair	There is a need for exchange of information in the CORINNA region. There is a need for an adequate mechanism including a special fair; (At the moment there are specialised fairs as InnovAction in Udine, Hevreka in Ljubljana, but a great part of these events is carried out in national languages. There is a possibility that part of a fair is devoted to an interregional topic). A more active technology transfer (TT) approach with a web service (information exchange, TT services) could be supported. It is important to look at how to transfer and process information within the network and use best practices from past projects. It is important to encourage the use of ICT to create better interregional communication and cooperation between the different actors of regional innovation systems.

Activity	Form	Justification
Dissemination and promotional activities	Participation at conferences, seminars, media…	It should be important that different actors and players in the CORINNA region get information from the several international conferences, seminars, workshops regarding issues of innovation, R&D, or individual technologies taking place in the neighbouring regions. Support for the participation in such kinds of events in other countries could contribute to improve the intensity of interregional cooperation.

The list of joint activities just proposed is based on:

- Analyses of the region (innovation systems)
- Outputs of the Interregional Expert Groups of the CORINNA project
- Existing projects in the region
- Experience of other regions in the EU
- Framework positions at EU level (new financial perspective 2007-2013).

Innovation-friendly framework conditions have become even more important as competition between business locations has intensified. The increasingly mobile production factors capital, management, and highly qualified manpower now punish bad economic policies more quickly than ever. In this age of globalisation, therefore, policymaking has become more relevant to the success of (inter)regional development than ever before.

As regards implementation, there are two possible approaches:

- A »step by step« approach in developing interregional cooperation, where cooperation starts with the simplest activities;

- A »big bang« approach, where a comprehensive set of activities is implemented.

Based on present experience, a »step by step« approach seems to be more successful. The activities proposed above could primarily be financed out of the following sources:

- The European Territorial Cooperation objective: transnational and cross-border cooperation programmes are the main financial source of existing interregional cooperation currently taking place in Europe.
- Public sources (national, local): co-financing transnational cooperation and cross-border cooperation programmes and financing of selected activities

There are additional open questions related to the institutional setting required to optimise the efficiency, effectivenes and sustainability of interregional cooperation at political and technical level, based on existing bilateral and multiregional structures.

The heterogeneous institutional setting in the CORINNA region and the diverse nature of the experience gained in the field of cooperation so far point to a need to achieve close and coordinated collaboration among different administrative levels. Because innovation promotion is only one of several policy fields, we propose the following options:

- Linking proposed activities in the field of innovation promotion to other projects, such as MATRIOSCA-AAP, where the institutional setting between partner regions is agreed.
- It is possible to link proposed activities in the field of innovation promotion to the European Group of Territorial Cooperation (EGTC), once it is established.
- Continuing the CORINNA project in its current form (a steering committee could play the role of the coordinator of agreed activities).

The design and setting of the most suitable forms of institutional cooperation depend on activities jointly agreed by the parties concerned, on harmonisation of interests, a common time frame, and on the practical requirements of the chosen operations.

Conclusions

The key words in regional competitiveness today are innovation, networking, exchange of skills and experience, and cooperation—whether interregional or cross-border. This competitiveness lies within the reach of each territorial community, be it large or small, industrial or agricultural, urban or rural. National boundaries, states, and national economies are declining in importance—on the other hand regions, agglomerations, industries, clusters and networks are becoming the decisive units.

Innovation-friendly framework conditions have become even more important as competition between business locations has intensified. The increasingly mobile production factors capital, management, and highly qualified manpower now punish bad economic policies more quickly than ever. Therefore, policymaking has become more relevant to the success of (inter)regional development than ever before.

The CORINNA consists of relatively small regions/nations; therefore, interregional and cross-border cooperation could help them to fulfil the objectives described in various strategy papers, since. In addition to the existing close traditional cultural links, the regions of the countries involved share many other priorities and interests: they are striving for sustainable economic development, they all have relatively strong commercial ties with each other, and they all have to compete in the »Europe of regions«.

Interregional cooperation in the CORINNA region already has a long history, but the intensity of interregional and cross-border cooperation of the partner regions in technology & innovation lags behind comparable European regions both on the administrative and on the company level. Despite spatial proximity, various political, institutional, and historical factors have served to hamper interregional cooperation in the CORINNA region to date. The situation has improved considerably over the last few years, especially as a result of EU enlargement. At the moment, there are still many difficulties hampering interregional cooperation in the field of innovation promotion. These includes different institutional levels: the state level in the case of Slovenia and the provincial or regional level in the case of other partners. There are different regulations, policies, and support programmes, to a large extent related to different institutional levels.

In the paper we assess the possibilities of interregional and cross-border cooperation in the field of innovation promotion and attempt to answer the following basic questions:

- Who could/should cooperate with whom?
- How (what kind of activities)?
- What is the relevant geographical area (interregional, cross-border)?
- How are projects to be financed (Structural funds, national programmes, regional programmes, CIP, FP7, …)?

There are areas where a deeper understanding of the issues and regional collaboration—or joint action—would strengthen innovation performance of the whole region. The majority of these are related to the exchange of information and experience (benchmarking) and are based on networking, mobility of researcher and other activities such as the creation of a common information source for innovative projects.

It is clear that interregional cooperation in the field of innovation promotion complements activities implemented at other governance levels.

Part B

Governance

4

Georg Panholzer

The Emergence of the European Research Area and its Implications for the Regional Level

In 2000, the European Union decided to create the »European Research Area« (ERA). The overall goal, according to EU Research Commissioner Busquin, was to make the ERA »in the research sector what the single market has been for commercial exchanges« (Busquin 2001, cited in: Banchoff 2002, p.4)

The ERA concept went clearly beyond mere reform of the EU Framework Programme for RTDI; in fact, the visions expressed in the Commissions communication »Towards a European Research Area« (European Commission 2000), which was the official core document in the beginning of the ERA process, could be seen as a change of paradigm: The traditional fragmentation of the European RTDI governance system was to be overcome. It became clear that European RTDI policy, consisting of first 15—and then 25, and now 27—independent national(istic) RTDI policies, existing in parallel not only to each other, but also to the European Community‘s RDTI-policy (with the framework programme as its main instrument) needs to be coordinated in such a way that all agents see themselves as part of a greater picture.

From the very beginning of this process, coordination necessities were identified, not only between various national and community levels, but also in connection with regional policy levels (European Commission 2000 and 2001). In many cases, regions are becoming players in RTDI policy, and the impact of national (and community) instruments is felt within a concrete regional context and within a particular regional innovation environment.

The ERA process may be seen as part of the so-called Lisbon/Barcelona process, which aims to make Europe the most competitive global economy. RTDI (3 % of GDP expenditure in RTD has been formulated as the commonly accepted input target) is viewed as the most important engine to help Europe achieve this ambitious goal. Obviously, the Lisbon/Barcelona goals are to be seen as a European response to the challenges of globalisation. Common efforts of all levels—local and regional, national and community—are necessary, and the Lisbon/Barcelona targets have started to influence also the regional level. The European Union's structural policy is a most important instrument in this context, and complementarity between EU research funds (framework programmes) and structural funds are clearly required (CREST Working Group 2007).

The challenges for national states in the era of globalisation are very different from those in preceding periods. Unsuccessful national policy can now endanger national economic activities to a far stronger extent, due to the fact that big economic players make their decisions from a multi-country, i.e., global perspective. Viewed from a global perspective, »nations« appear to be more and more in the situation of »regions«, having to accept a steadily growing number of framework conditions without any possibility direct intervention. Globalisation is characterised by a »competition of locations«, and as the term suggests, localisation decisions are not only influenced by national framework conditions (in fact, the potential influence at this level is shrinking, as described above), but also by local conditions. These comprise the whole set of infrastructural, educational, economic, and innovative capacities. This is why the regional and local perspective has even become more important in the era of globalisation. National and transnational RTDI policy has to take this into account.

It is, therefore, the common task of community, national, and regional policy makers to join forces in order to create optimum systemic conditions at local/regional level, in order to maximise attractivity and complementarity, and to minimise fragmentation and duplication.

The CORINNA Project: Derivation and Embeddedness

The roots of the CORINNA project date back as far as 1997, when the so-called »TriCo« (short for: trilateral cooperation) initiative was founded. Full association of the Central and Eastern European Countries in the European Union's Framework Programme was not yet complete in this period, and Austria was still a relatively young EU member. It became clear that the (at that time) EU association countries should be considered as important potential partners for Austrian companies and research institutes within the European Union's Framework Programme for RTD. A joint active approach was sought both by Austria, Slovenia, and by North-Eastern Italy—i.e.; Friuli-Venezia Giulia—which was in a similar situation. The result, TriCo, was merely a loose interest group without any formal (or project-borne) backbone and consisted of the following organisations: The Federal Ministry of Economics and Labour, and the Bureau for International Research and Technology Cooperation (being responsible for information and assistance for potential applicants in the EU-Framework Programme) in Austria, the Ministry of Science and the IRC in Slovenia, and the AREA Science Park Trieste as a local hub for RTD cooperation as the Italian partner. Operationally, the TriCo group, by means of discussion, tried to identify the topics of most common interest in the Framework Programme, and it selected concrete calls which would offer the opportunity for common projects to be submitted. Around the opening date of the respective commonly selected call, a trilateral »brokerage event« was organised, inviting the potential applicants from the three countries/regions (Austria, Slovenia, Friuli-Venezia Giulia) to present their project ideas and to match them to form the basis for cross-border consortia. This design of the TriCo initiative was put into practice during the whole period of FP5 (1998-2002) and a bit beyond, starting with a »FP5 TriCo launching event« (thematically open) in Slovenia in 1998, but then concentrating on themes like environmental/energy technologies, information society technologies, agrofood/applied biotechnology, and city technologies. The success of these brokerage events in terms of the common FP-projects (being submitted in the call currently open) generated was rather limited (but at least a small number of projects were initiated on each occasion). Nevertheless, many new contacts and partnerships were formed during the course of these events, resulting not only in R&D cooperation, but also in new customer and service relationships. Between 100 and 200 participants from the three countries/regions (companies and research institutes, including administrative staff) took part in each of the events. The new structure of FP6—concentrating on bigger projects (Integrated Projects, Networks of Excellence) and implying that big consortia across Europe needed to be formed—was certainly a strong argument against a mere prolongation of the TriCo brokering; the level of awareness on EU framework programmes was raised significantly during FP5 (and the TriCo initiative undoubtedly contributed to this process), and the »icebreaker«-function of the TriCo initiative became unnecessary. It also became more and more clear that a more profound approach (more than mere FP brokering, based on short discussions amongst the members) was needed. This required a thorough analysis of the (potential and real) common strengths of the cross-border regions. Finally, it was also clear that activities needed to be enlarged to engage Hungary, which was an important partner in the region and had already been an »invited country« at some of the later TriCo events but never a formal partner.

If such a new framework, being strongly rooted in an analysis of the respective innovation systems, was to be put into practice, a programme was needed in order to be able to finance the work to be done. This quickly led to the INTERREG IIIC programme as an appropriate source of co-funding. The main »obstacle« was that this programme was strongly focussed on regional not national actors and activities. This was not a problem in the case of Slovenia or Italy (because Slovenia had no formal »regional level« at that time, and for Italy only the FVG region was involved), but it was a challenge for the Austrian side. The Austrian Federal Ministry of Economics and Labour, one of the former drivers of TriCo, approached the Federal States of Styria, Carinthia, and Burgenland, and suggested the idea of participating in a »new, strategically oriented and scientifically rooted TriCo initiative,« co-financed by the INTERREG IIIC programme. Although, in terms of project design, the main input of a future project was to come from the regional level, the integration of the national level remained an important element for the Ministry; it was required that the common project understanding should comprise »national-regional« coordination. To achieve this, the Ministry was prepared to bear a share of financial burden. Furthermore, the »national« research promotion agency FFG (the former BIT had meanwhile been integrated into the FFG) was also to be a partner in the new consortium. A similar solution was proposed to the newly integrated Hungarian side: here, West Transdanubia was to become a regional project partner, the »national« Hungarian Science and Technology Fund (TéT, fulfilling a function parallel to the BIT/FFG) was also to be integrated. In addition, the national governments of Hungary, Austria, and Slovenia were to be integrated into the steering committee of the new project, together with the governments of the regions involved.

This concept finally proved to be successful, leading to the submission—and later selection—of a common INTERREG IIIC project with the name CORINNA (Cooperation of Regions for Innovation). The project tried to identify common strengths and complementarities of the common cross-border region on the basis of a thorough analysis of the respective innovation systems. It then developed strategies which are intended to make better use of the common potential.

The CIR-CE Programme

The Central and European region is economically most important for Austria. The commitment of Austrian enterprises is very strong: The emerging new markets of the region are not only favourite export destinations for goods and services, but also in terms of foreign direct investment Austria plays a major role. In practically all Central and South-East European countries (except Poland), Austria ranks among the three leading foreign investors and tops the list in a number of South-East European states.

A glance at EU Framework Programme statistics shows that Austrian interconnections with Central and East European countries are significantly more developed than those of comparable countries (Schuch 2005). Looking deeper, FP5 or FP6 statistics revealed that in R&D cooperation with Central and Eastern/South Eastern Europe, public research institutes (RTOs) and universities were dominant, whereas the role of enterprises, and particularly SMEs, was relatively limited (Schuch 2005).

In the first one to two years of the new millennium, this picture led to the conclusion that there must be strong potential for research and technology-oriented cooperation across these borders, offering specific opportunities for SMEs. At that time, the idea emerged of exploiting the particular win-win potential between Austria and Central and South Eastern Europe by means of a new call-based programme. In the first stage, in 2002-4, a »pilot action« with the title STRAPAMO (»Formation of Strategic S&T-partnerships with Central and Eastern Europe«) was put into practice. A total of € 1 million was distributed to twelve pilot projects (with a funding of around € 80,000 per project on average).

The experience from the pilot phase was positive (Harringer, Mayr, Schuch 2004), and the activity proceeded to its main phase: The funding programme »CIR-CE« (= Cooperation in

Innovation and Research with Central and Eastern Europe) was designed, and a first and a second call with 14 and 13 projects proposed for funding in 2005 and 2007, respectively, were carried out, distributing around € 2 million in the first, and around € 2.7 million in the second call.

The particular »CIR-CE win-win situation« was seen to consist of the following aspects (BMWA 2005):

- Optimized combination of know-how- and factor cost components in the internationalised production chain = better common position in the world market
- Increased complementarity of research/testing/technology capacities (non-duplication)
- Newly emerging »growth poles« (in Central/Eastern/South Eastern Europe) need stimulative external inputs
- Participation in the rapid growth of Central/Eastern/South East European »growth poles«
- Market aspects
- Specific opportunities for the SME sector due to geographic proximity

All these aspects (ideally in combination) were to be addressed by the CIR-CE projects, and the so-called »clustered systems approach« was a basic philosophy of the programme (BMWA 2005): The latter views ideal growth as taking place within groups of actors (innovation through cooperation), and not in isolated enterprises. These »clustered systems« are formed by large and small enterprises, research institutes, and corresponding intermediaries (Hartmann, Schrittwieser 2001). The idea was to build up strategic axes between systems (i.e., their players) in Austria and in the partner country(ies) in order to commonly identify and exploit the combinatory potential, with R&D-oriented companies being directly involved in all projects.

Whereas the STRAPAMO pilot phase had only one project category, in the CIR-CE phase there are now two main project categories: »network projects« and »innovation projects«. Network projects primarily address »technological intermediaries« (such as: centres of competence, cooperative research institutes, technology-oriented clusters, technology parks, etc.) as project coordinators (with usually a equivalent institution in the partner country and at least three companies both on the Austrian and on the partner country's side—though with a limited role in the network projects). They do not yet finance RTD activities as such but play a preparatory and investigative role (covering activities such as quality control, standard investigation, technological feasibility etc.), so that at the next level real technology cooperation (RTD cooperation between companies and with research institutes, new technology transfer solutions, etc.) can take place, which is rooted in a strategic basis. This next level is also taken up by the »innovation projects«—with the company sector (ideally: SMEs) as the driving force (often in cooperation with research institutes).

The CIR-CE programme is not isolated in the Austrian funding landscape but systematically addresses the aspect of »eastern internationalisation« of other national funding programmes and initiatives (e.g., Competence Centre Programme, protec-netplus programme for technological networking amongst SMEs, prokisprogramme for upgrading SME-oriented cooperative research institutes, the regionally rooted cluster initiatives, etc.). CIR-CE addresses that company segment in particular, which is very inclined towards R&D. Though many of the CIR-CE project partners already had a strong international orientation before these projects, around 50 % of the project partners are—at the time of CIR-CE application—predominantly active within the national context (Dall, Schuch 2006). The CIR-CE programme, therefore, strongly contributes to widening the area of activity of Austrian SMEs.

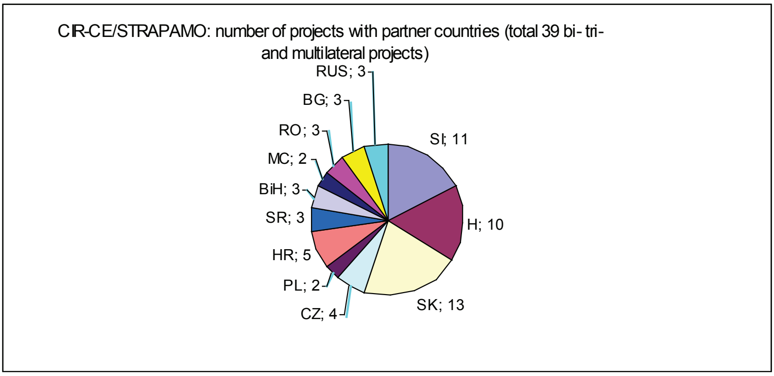
A most important facet of the CIR-CE programme is the fact that part of the public funding is mandatorily dedicated to the

Central and South East European partner institutions (companies, research institutes, intermediaries), so that CIR-CE is a real cross-border programme—though driven by one country, namely Austria, but with foreign project partners in each of the projects. (For one partner country, a maximum 25 % of the public funding goes to the partner country, a minimum 15 %; if there are several partner countries: a maximum 40 % of the funding goes to the partner countries.) In a certain sense, the STRAPAMO activities (being then taken up by the CIR-CE programme) can be seen as forerunner activities for the ERA-Net movement, which started soon afterwards in the year 2003.

The CORINNA Region in CIR-CE

A look at the full set of STRAPAMO and CIR-CE projects shows that Slovenian, Hungarian, and Slovakian partners appear to be the most important partners for Austrian project proponents (see fig. 28).

Figure 28: CIR-CE/STRAPAMO Projects According to Partner Countries



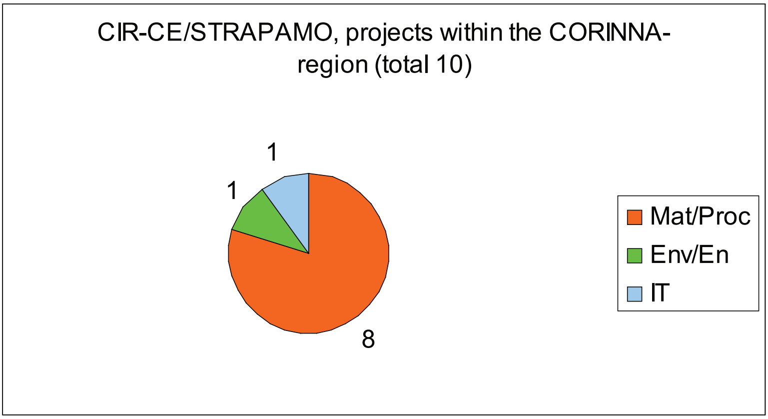
Whereas the figures on cooperation with Slovenia are stable at a high level (47 Slovenian partners involved in eleven projects, three of which are »innovation projects«), the cooperation figures with Hungary are less convincing: Hungary was an active partner in the previous STRAPAMO phase, but Hungarian involvement in the second CIR-CE call is almost negligible (it is only involved in one network project). The fact that there is no Hungarian involvement in any innovation project is certainly a point of concern.

The CORINNA region covers only parts of Austria (Styria, Carinthia, and Burgenland) and Hungary (Western Hungary). The high level of collaboration between Styria and Slovenia is eye-catching: no less than nine projects (out of a total of 39 CIR-CE and STRAPAMO projects) involve partners from Styria and Slovenia (with 47 partners involved on the Styrian and 35 on the Slovenian side). Half of the projects (19 of 39) are coordinated by project leaders from the Austrian CORINNA region—15 from Styria, three from Burgenland, one from Carinthia. (For comparison: 15 projects are coordinated from the Austrian CENTROPE region, and the remaining five projects are coordinated by the Upper Austrian/Salzburg region; Tyrol and Vorarlberg have not been involved as coordinators so far.) Western Hungary is involved in three projects with twelve partners, though two of these projects are with Austrian partners from the CENTROPE region, and not the CORINNA region. It might be concluded that Western Hungary (with Győr in the north as the capital) is more linked to the CENTROPE region than to the CORINNA region. (Remark: West Trandanubia and Burgenland are parts both of the CENTROPE and the CORINNA region.) Looking at the projects with non-CORINNA countries coordinated by partners from the Austrian CORINNA region, it becomes obvious that there is a strong axis from the CORINNA region to the Western Balkan countries (Croatia, Serbia, Bosnia-Herzegovina, Macedonia): All five projects (!) with this region are coordinated by partners from the Austrian CORINNA region. It can be concluded that both the (non-Austrian) CORINNA region (in particular: Slovenia) and the Western Balkan region are promising partners for the Austrian CORINNA region in the field of RTDI. Looking at the abovementioned coordinating institutions with the Western Balkan countries, it can be stated that these institutions already appear to be strongly linked with the non-Austrian CORINNA region, so that CIR-CE can be used in order to enable the next step towards the Southeast. This argument is further strengthened by the fact that there are two more projects (in addition to the five projects with the Western Balkans and the nine projects with Slovenia) involving both Slovenian and Western Balkan partners. It should be mentioned that in the second CIR-CE call, two projects from the Austrian CORINNA region with partners from the Eastern Balkan countries have arisen (there was no such project before); both of these projects additionally involve either Slovenian or Western Balkan partners, so that this might be taken as a sign for a bridging function of the Slovenian/Western Balkan region with respect to the Eastern Balkans.

In conclusion, it can be said that while cooperation with Slovenia is strongly developed, Western Hungary does not appear to be a very strong cooperation partner in the field of RTDI. Furthermore, it seems obvious that the strategic cooperation area for CORINNA needs to be further enlarged towards the South East.

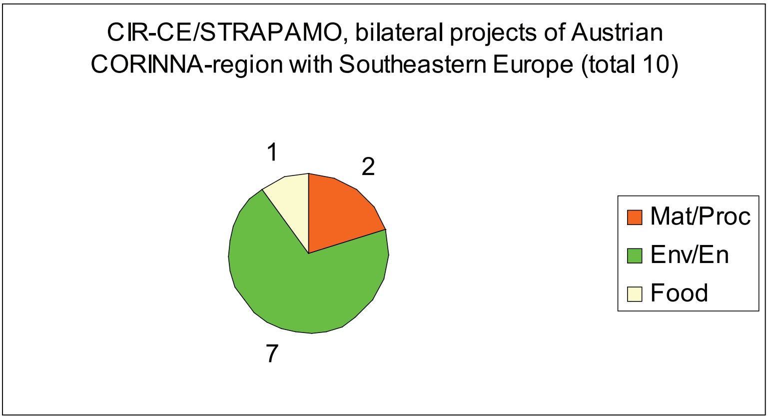
Of course, the basis of these findings is not broad. Nevertheless, there is some representativeness in this CIR-CE/STRAPAMO sample that supports the broader picture.

Figure 29: Technology Focus of CIR-CE/STRAPAMO Projects within the CORINNA Region



Such analysis is, of course, rather incomplete without looking into the subject areas of cooperation (see fig. 29). Looking at the ten projects (nine projects coordinated by Styria, one by Carinthia) within the CORINNA region, it becomes very obvious that the field of material and process engineering (including the automotive sector) is very dominant; eight of these projects belong to this technological field. The only IT-project in the sample deals with IT for the automotive sector. It is surprising that only one of the projects deals with environmental/energy-related issues.

Figure 30: Technology Focus of CIR-CE/STRAPAMO Projects with South East European Partners



Looking at projects coordinated by the Austrian CORINNA region only with non-CORINNA partners, the opposite picture appears (see fig. 30): Seven out of ten projects deal with environmental/energy-related issues; only two of the projects are in the field of material/process engineering (including automotive). (In addition, there is one food-oriented project). But this picture diverges once the six projects coordinated by Austrian CORINNA-partners are considered, which involve both CORINNA partners (from Hungary and Slovenia) and partners from non-CORINNA countries/regions. Five of these projects (three of them with South Eastern Europe) belong to the material and process engineering category (incl. automotive) and only one of these projects deals with environmental/energy-related issues.

Mirroring these results with the »potential horizontal and vertical thematic priorities for CORINNA« (see Chapter 2), it can be said that, firstly, practically all of the projects with partners from the CORINNA region deal with the topics identified in the analysis (with the exception of one food oriented project). They all belong to the so-called »ultimate horizontal field« of mechanical and process engineering. Not all of the identified »second-level priorities« appear in the CIR-CE/STRAPAMO sample, but the sample underlines the importance of advanced materials, the automotive sector, IT/electronics, computer-based simulation, and, of course, environmental/energy-oriented technologies.

From the point of view of the Austrian CORINNA region, the results in connection with South Eastern Europe should also be taken into consideration. The clear dominance of environmental/energy-oriented technologies shows that there are vast cooperation opportunities in this field, and that these opportunities are well used by the Austrian CORINNA region. Furthermore, it shows that in the materials/automotive/engineering field, Slovenia seems to play an important »bridging« function for Austrian CORINNA partners, which is not the case in the field of environmental-/energy-oriented technologies (where direct partnerships between Austria and the South Eastern target areas are being built up).

In conclusion, it can be said that the CORINNA sample strongly coincides with the findings of the CORINNA study. In the next chapter, we take a short look at collaboration in other programmes.

Slovenia, Hungary and Austria: Some Statistical Evidence from Other Programmes

The focus of the following short analysis is on those programmes which in terms of their goals and the types of collaboration which they finance are closest to the CIR-CE programme. These programmes are: a) EUREKA, b) the SME-specific measures in the Framework Programme (»CRAFT« and »Collective Research« in FP6), and c) the SME-oriented ERA-Nets, in particular the horizontal ERA-Nets ERA-SME and CORNET.

EUREKA can be considered as a forerunner initiative in the field of transnational, industry-oriented S&T collaboration, and it still plays an important role in this field. Almost all Central and East European countries, including Hungary and Slovenia, were integrated into EUREKA at a very early stage of their EU accession process. The major advantage of EUREKA is its thematically open bottom-up approach. A major disadvantage was always the fact that EUREKA was totally dependent on the availability of national financing and the willingness to commit to EUREKA-projects. This was by no means mandatory once a project had achieved EUREKA status. Recently, EUREKA has aimed to overcome these drawbacks by starting an initiative according to article 169, called EUROSTARS, with common calls and committed funds by the participating countries. Austria, Hungary, and Slovenia participate in EUROSTARS, which has been launched in early 2008.

The present analysis deals with the »traditional« EUREKA projects (there are also thematically oriented cluster and umbrella projects within EUREKA, but as the involvement of the Austrian-Slovenian and Austrian-Hungarian axes is relatively limited, these project types will not be considered here). Austria is strongly involved in EUREKA, with currently 66 ongoing projects (and 210 finished since 1996). Taking the size of the country into account, Slovenia is currently even more deeply integrated into the EUREKA system, with 63 ongoing (and 69 finished) projects. Hungary is a bit less involved, but still well integrated, with 24 ongoing (and 55 finished) projects. Looking at the axes with Austria, it is again very obvious that there is really strong collaboration between Slovenia and Austria. There have been no less than 42 joint projects, of which 13 are still running. With Hungary, there have been 18 collaborations, four of which are still running. This picture becomes even more impressive, once one realizes that no less than 15 of the projects with Slovenia have been bilateral Austrian-Slovenian projects (not involving any other country) and six of these are still running. There is no purely bilateral project between Austria and Hungary.

Once again, it is of interest to look at the specific area of collaboration. The field of industrial manufacturing/material research is a main area of collaboration. Three of the six bilateral projects between Austria and Slovenia deal with this field (and four of the 13 ongoing projects). A second focus can be identified in the field of IT/electronics with five projects currently ongoing (of the 13 current projects). It is also interesting to note that there is not a single bilateral Austrian-Slovenian project amongst these. Obviously, in the field of IT/electronics, Austrian-Slovenian cooperation tends to be embedded in bigger networks, whereas manufacturing/material research seems to be a strong bilateral issue. There is, by the way, no current project with Hungary in the field of ICT. Energy technology is a topic with both Hungary and Slovenia (one ongoing project each; and two (of the four) ongoing projects with Hungary are in the health/biotech-sector—(which is a sign of Hungarian strength in the field).

In the SME-specific measures of FP6 (CRAFT and Collective Research), all three countries are quite well integrated, with Austria having been involved in 84 projects in total, Hungary in 57 and Slovenia in 26. There were 13 projects with common Austrian-Slovenian involvement (see fig. 31) and also 13 projects with common Austrian-Hungarian involvement (see fig. 32).

Figure 31: Thematic Focus of Austrian/Slovenian CRAFT Projects

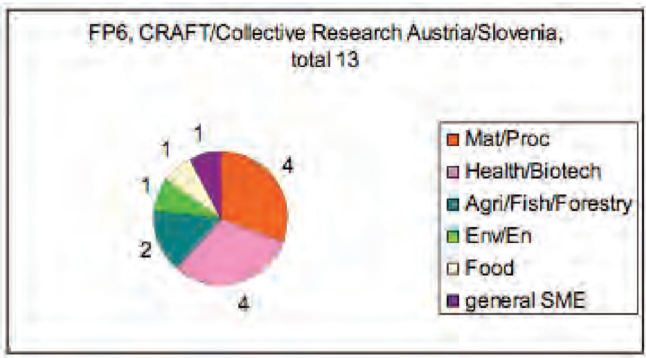
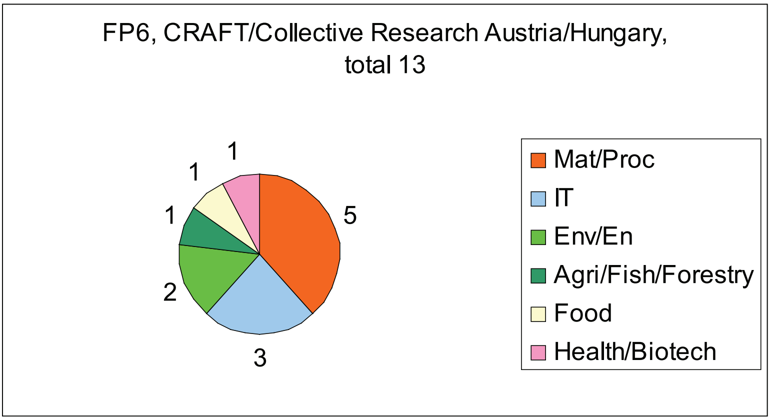


Figure 32: Thematic Focus of Austrian/Hungarian CRAFT Projects



There were five projects with Hungary and four with Slovenia in the field of manufacturing/material research, so again this sector is quite dominant with both countries. It is surprising that the health/biotech-sector—which usually is a particular strength of Hungary (though not of Western Hungary) is equally dominant in cooperation with Slovenia (four projects), whereas there is only one project in this field with Hungary. In contrast, there are three projects with Hungary in the field of ICT (and none in this field with Slovenia), two energy-related projects with Hungary (none with Slovenia), and there are two projects in the field of agricultural research with Slovenia (and only one with Hungary).

Finally, a short glance at the projects of the first SME-relevant ERA-net calls needs to be made (for further background and details on the ERA-Nets, see next section). Austria and Slovenia are actively involved in both ERA-SME and CORNET, and both countries have already actively participated in the pilot calls. Hungary, on the other hand, is participating in ERA-SME, but has not yet actively participated in a pilot call; Hungary is not yet involved in the CORNET network, but is about to get involved in the second CORNET phase. By its nature, pilot calls are of a small dimension, so the sample of projects is too small to draw any statistical conclusion. Nevertheless, a short look at the successful common projects (two common projects in CORNET and three common projects in ERA-SME) again shows that the majority of the projects (both CORNET-projects and two ERA-SME-projects) belong to the field of manufacturing/materials research (including simulation elements and packaging); there is one further ERA-SME-project in the field of energy technologies.

It is clear from the above that—without exception—the field of manufacturing/material/process technologies is a clear common strength of Austria and Slovenia in particular, whereas the cooperation pattern with Hungary in these programmes is a bit less developed and a bit more diversified. The topics of ICT, health/biotech, and energy/environment, and to some extent agricultural research/food might also be regarded as further fields of common importance, as evidenced by the cooperation pattern found within the instruments under observation (EUREKA; CRAFT, Collective Research; ERA-SME, CORNET).

Governance in Austria in the Field of RTDI and National-Regional Coordination Mechanisms

The importance of research, technology, and innovation has risen significantly in Austria within the last few years. Not only has the respective national budget risen remarkably (particularly by means of the so-called »Technology Initiatives« 2001-3, 2004-6, 2007-9 and the »Jubilee Fund«/«Jubiläumsfonds«), but also at federal state level, the RTDI-topic has been receiving much stronger priority. As a consequence, the need for coordination has risen. To a certain extent, the situation of the regional states within Austria is somewhat comparable to the position of member states in the EU.

Nevertheless, the main source of finance for RTDI purposes stems from national—and not regional—resources. In 2007, total RTD expenditure of the federal government amounted to € 2.13 billion, whereas the corresponding expenditure of the federal states accounted for a mere € 350 million (Österreichischer Forschungs- und Technologiebericht 2007). There is a tendency for regional activities to complement those driven and financed at national level. In a number of cases, regional financing fulfils a top-up function for nationally funded projects, and in other cases, the exploitation/innovation phase is financed by the regional level (whereas the R&D-phase is primarily funded by national sources—with or without a top-up mechanism). In recent years, though, several federal states have also started their own RTDI promotion activities.

Collaboration between the national and the regional level can be demonstrated by describing the biggest Austrian industrial research promotion fund, the bottom-up oriented (i.e., thematically open) »basic programmes« of the Austrian Research Promotion Agency (FFG). This fund has an annual budget of € 309 million (Forschungs- und Technologiebericht, 2007), and each year more than 900 new projects are being financed. The individual grant given by the »basic programme« is dependent on the research intensity of the project, but in any case does not fully reach the limits set by European state aid rules. This means that there is room for additional intervention at federal state level. Such topping-up-mechanisms are used in practically all federal states. Carinthia and Burgenland are examples for »traditional topping up«; the funds stem from the regional economic promotion agencies. In the Styrian case, there is a closer communication between the »basic programme« of the FFG and the Styrian decision-makers (particularly in the Styrian Promotion Fund, SFG). This includes communication even before the final decision within the »basic programmes« is taken. Styria tops up those projects which are in line with »regional strengths/priorities«. Upper Austria might be seen as a forerunner for maximum integration between national and regional mechanisms: The Upper Austrian top-up is not managed within the region in fact, the FFG has been directly entrusted to manage the Upper-Austrian top-up fund, which, of course, significantly simplifies the process. Vienna, on the other hand, is least connected with the »basic programmes« in terms of topping-up. So far, only projects of start-up enterprises have been topped up by regional Viennese technology funds.

There are a number of programmes on the national side which aim at improving research and innovation structures (including impulse centres, cooperative research institutes, etc.). These »structures« also comprise—in a broader sense—structural networks of various kinds. The abovementioned CIR-CE programme is one of these structural programmes at national level, and the protec-programme, aiming at similar cooperation only at national level, would be another one. On the other hand, the building up of structures important for the regional innovation systems is also fostered at regional level. Cooperation and complementarity between the national side—which selects the best country-wide programmes—and the regional level—which acts according to regional need and not primarily to excellence criteria—is clearly necessary. In principle, this cooperation functions smoothly. Cluster initiatives, for instance, are usually carried out and promoted at regional level, and only in particular cases—and in competition with other players and institutions—can these clusters be selected for funding at national level (e.g., clusters can participate in CIR-CE or protec-net-plus).

Of course, at regional level, EU co-financing from structural programmes plays an important role—in the past periods depending on whether a particular project is located in a target area or not. The technology orientation of these programmes is continuously rising, and both national and regional schemes can be co-financed.

Technology-oriented funding by means of the schemes of the Austrian Economy Service AWS (the central Austrian funding institution in the field of economic promotion and the counterpart to the FFG, which covers »research oriented« promotion instruments—obviously, there is an overlap in the technological field…) usually provide for co-financing between these federal funds and the corresponding regional funds. In many cases, these projects are further co-financed at EU level (ERDF/structural funds). As a rule, it can be said that bigger investment projects are funded by a combination of national and regional resources, whereas smaller projects are funded by the regional level (in both cases including ERDF co-funding if the project is carried out in a target area).

In general, across all thematic levels, the Austrian Conference on Spatial Planning (ÖROK) is the coordinating body between the federal level and the federal states (and it comprises also the communal level). All topics where financial and systemic coordination is required are discussed in this forum. Formally, all heads of the federal states and all federal ministers are members of this forum. The main discussions at political level take place in the so-called »Conference of Representatives« (of the ministers and the heads of the federal states). A yearly programme is elaborated. The most important sub-committee is that on regional economy. This sub-committee—and the ÖROK in general—has gained significantly in importance since it has become the secretariat of the board for the structural funds. It has become the central communication platform between the EU/structural funds and all Austrian authorities involved. Organisationally, the ÖROK is—also in terms of location—strongly interlinked with the Federal Chancellery. The whole Austrian discussion process on the new programme proposals is channelled via the ÖROK. The federal states level and the federal level are equal partners in all ÖROK affairs. Concerning the structurall funds programmes, the main responsibility lies, of course, with the regions themselves. Concerning territorial cooperation,the federal chancellery plays a general coordinating role, because usually more than one federal state is involved in a cross-border programme. As a result of the Lisbon/Barcelona process, the innovation- and RTD-oriented topics have gained significantly in importance. ÖROK is also responsible for a comprehensive strategy process (in all fields of regional policy), and one of the seven sub-workshop series launched in 2005 dealt exclusively with the topic of innovation.

Furthermore, currently the findings of a comprehensive cluster survey financed by the Federal Ministry of Economics and Labour (Clement, Welbich-Macek 2007) are being introduced into the ÖROK process (via the »ÖROK-Atlas«).

Once more it needs to be clarified that the field of cluster policy is strongly developed in Austria and is driven at federal state level; In international comparison, Austria‘s cluster activities are remarkable (Clement, Welbich-Macek, 2007) and, in general, also show a strong future-orientation by integrating R&D (thus building bridges between industry and science, providing technology transfer, etc.) into their core set of activities. There is a well-developed cluster policy in Styria (Hartmann 2007), with the Styrian automotive cluster as flagship, plus several other promising cluster initiatives which have recently emerged. In Carinthia, there is particularly pronounced cluster activity in the field of ICT (of course, Infineon's semiconductor production in the province plays a flagship role), and in Burgenland, very promising cluster-like approaches in the field of renewable energies/bioenergy have been developed (this competence is shared with Eastern Styria). So, there is fruitful potential for cross-disciplinary R&D-collaboration, within the Austrian CORINNA region, e.g., in the development of ICT-solutions for the dominant material/process/automotive sector and in developing solutions using renewable energy (and low-energy solutions) within this sector. It may be added here that recent studies emphasize that an important prerequisite for the success of Austrian cluster initiatives is the further development of cluster links to research institutes (competence centres might play a particular role in this process), Clement, Welbich-Macek 2007) and that in general cluster management needs to see itself as a permanent transmitter of knowledge. If this is absent, »petrification« (i.e., absence of future-oriented development) may result (Hartmann 2006). The building up of transnational strategic partnerships is, therefore, a logical element on the overall »learning agenda« of regional clusters, given the realities of globalisation and the ERA.

The explicit consideration of such activities via the ÖROK process will lead to better visibility and comparability of the various cluster effects and their activities. Several aspects, including the Cluster-oriented aspects, are of course of direct relevance to cross-border related issues such as the strategic identification and combination of regional strengths across borders.

It is a very clear sign of the positive role played by the ÖROK in the context of the EU structural funds process that the operational programmes of eight (out of nine) Austrian federal states were the very first ones to be accepted by the European Commission under the new programming period 2007-13.

Transregional Cooperation and Beyond

Before looking at transnational (cross-border and beyond) cooperation activities and mechanisms, it should be once more clearly stated that regionally driven transnational activities need to be well rooted in the local regional innovation system, and only by taking into account the respective regional basis, meaningful transnational/cross-border activities can be developed. Transregional activities in the field of RTDI are always related to the identification and exploitation of complementarities. Regional settings are thus decisive for transnational cooperation patterns; as described above, these patterns derive both from regional planning activities (which take place, of course, at regional level) and from the project level, where such projects are often, financed at national level.

The central instrument for putting transnational/cross-border activities in place at regional level is the territorial cooperation programme (Target 3, previously: INTERREG). The federal states are responsible for the design of the programmes, and there is again a permanent coordination with the national level. In some fields (e.g., tourism, labour market) there is permanent co-financing by the national level; in the RTDI field, such co-financing only takes place in exceptional cases. As described above, transnational activities require embededdness with respect to their own and the partner regions‘ strengths, so that complementarisation effects can take place. This is also why the national level of activities needs to be considered in the cross-border strategies of the regions. There is a certain risk of considering only those mechanisms, instruments, institutions, and pieces of information, which are created or steered by the regional level itself, and to ignore those elements of the regional innovation system which are created or steered by the national level. This risk might be even higher in the case of non-cross-border transnational cooperation at regional level (CADSES, ALPINE SPACE, INTERREG IIIA, nowadays Transregional Cooperation Programmes Central Europe, South East Europe), because there are not only two regions as in the case of cross-border cooperation. (It might be easier also to consider national aspects if only two regions are involved). In the case of the transnational projects, five to ten regions are involved, and the danger of becoming locked into a mere perpetual exchange of regional best practice is even increased, while the importance of national (and also Community) level instruments in achieving common project goals is easily overlooked. This does not necessarily mean that the national levels need to be directly involved in all projects. It only implies that the regional levels should not exclude national instruments from the discussion, as they may be of decisive importance for the respective region and thus impact on collaboration strategies elaborated between the participating regions.

In the future, the requirements for cross-border cooperation will become significantly more demanding, as the lead partner principle applies. Another major change is that even in cross-border cooperation, a call-based system will be introduced with different project ideas competing with each other. This will, of course, require good coordination between the national and the regional level (in the process of project selection) particularly in those fields with intensive co-financing by the national side.

In total, it can be stated that the Lisbon/Barcelona goals have a strong influence on the new territorial and transnational cooperation programmes. The domain of RTDI (including cluster and network formation) is far more pronounced than in the previous INTERREG phases. These programmes clearly exemplify the effects of the Lisbon/Barcelona agenda: RTDI activities are nowadays an extremely important element of regional policymaking.

In transregional cooperation, of course, the transnational instruments of the national and community level also have to be taken into account. Much is taking place at Community level (EU framework Programme, etc.). The ERA-Net concept, which is a very relevant coordination mechanism at national (and regional) level—with direct and indirect implications for the regional level,—will be dealt with in the next chapter. Recent studies show that particularly for the high-tech sector, international sources of knowledge have become even more important than national/ regional sources (Tödtling, Lehner, Trippl 2006). Therefore, the high relevance of the EU framework Programme and national R&D Coordination mechanisms (ERA-Net) is indisputable for the high-tech segment of the regional players. The medium-tech sector, on the other hand, relies more on external inputs from actors in the value chain—the more value chains are organised across borders, the more inputs may also stem from international sources. The massive activity of Austrian enterprises in Central and South East Europe is, of course, a clear sign for a strong cross-border element of the value chains in this region.

To conclude this section, let us again have a look at CIR-CE and its effects on regional planning in the field of RTDI. It has been outlined above that Styria is, so far, the most successful federal state for CIR-CE applications. Let us again remind ourselves that CIR-CE can be understood as an »Eastern Enlargement« module for existing instruments within the Austrian innovation system or, more exactly, for concrete regional actors within that innovation system, who apply—together with a group of companies (or driven by a group of companies)—for CIR-CE funding. In total, Styrian players have so far received approximately € 2.5 million from STRAPAMO/CIR-CE for transnational collaboration purposes, no small sum in the context of transnational collaboration.

The systematic collection of information and data within CORINNA may also have contributed to the strong perception of its activities in Styria. It is, though, interesting that the »CORINNA region« has not been mentioned in any of the applications (explicitly as CORINNA), whereas there are a number of applications from the CENTROPE region, which explicitly outline their embeddedness under the CENTROPE umbrella. The Styrian applicants appear to feel well integrated in the Styrian internationalisation strategy, which considers CIR-CE as one important instrument. There seems to be no awareness, however, of being part of a broader CORINNA region. CORINNA may show positive integrative effects in the future on the basis of the investigations and coordinations taking place, but it has not developed into a recognisable label as was the case with CENTROPE.

ERA-Nets and their Regional Implications

Putting the ERA concept into practice was (and still is) a real challenge. In the era of globalisation, it has become clear that European fragmentation is a major drawback in global competition, since it implied that European economies saw each other as competitors in nearly all fields. Thus, a new perspective was required: An intelligent combination of resources by fostering different but combinable specialisation patterns can both improve the position of the participating countries in global competition and reduce the perception of competition between these countries. This is, of course, particularly true for future oriented aspects of economic policy—such as the field of RTDI. But how could the »my-own-playground mentality« in national RTDI policymaking be overcome? How might an element of mutual adjustment in national policymaking be implemented, while at the same time national interests are safeguarded?

The original policy tools proved ineffective. The instruments which were available from the beginning—the »Open Method of Coordination« (OMC) and Coordination (at programme level) according to Art. 169—have been positioned too much at the extreme points of »necessary commitment«. Whereas OMC attempts were too non-committal, coordination According to Article 169, on the other hand, required commitment to a very high extent, which was unrealistic and thus unworkable.

During 2001 and 2002, a new approach was developed—the ERA-Net. The idea was to address the programme level (programme owners and programme managers = agencies). In contrast to coordination according to Article 169, the ERA-Net projects financed not only the »common-call phase« (as does Art. 169), but also (and particularly) the prior learning & development phase (i.e., comparative analysis of programmes, identification of best practices and obstacles). As a typical bottom-up approach, ERA-Net did not foresee a particular mode of common (or combined) calls (as does Art. 169), but there was plenty of open space for creativity. In addition, it should not be forgotten that ERA-Net projects (as typical coordination actions) were 100% financed by the Framework Programme; so it constituted a totally new source of financing for the usual public applicants. Not surprisingly, the agency sector turned out to be the driving force, being able to connect with corresponding agencies from other countries in totally EU-funded projects—which also meant a certain degree of independence from the programme owners, on whom they had previously been totally dependent. The programme owners' (usually ministries) perception of the ERA-Net scheme was far more mixed. There was strong reluctance in the beginning particularly in bigger countries, whereas the administrations of (technologically advanced) smaller nations tended to perceive the opportunities more positively, as in small countries transnational cooperation appears more »natural« than in bigger nations. The cautious approach of the ERA-Net scheme—not requiring too much commitment at an early stage, but enabling an intensive learning (and decision) phase, together with 100% EU funding, made it quite easy for the respective decision makers in the ministries to give a green light to ERA-Net participations, and very soon the bigger nations realized that they could not stand aside from this process. It also needs to be mentioned that the ERA-Net scheme did not only foresee the »Coodination actions« to be carried out. These could also be prepared by smaller-dimensioned »specific support actions« involving fewer countries.

The first ERA-Net call was launched in December 2002, and meanwhile around 70 ERA-Nets have been established.

From the very beginning, the ERA-Net scheme was not only designed for national coordination, but also left the door open for regional coordination. The scheme was designed for »…national and regional programme funders and programme managers…« (European Commission, 2004a). Even though it might not have been fully clear to the Commission, which role the ERA-Nets could play for the regional level, there was openness for »learning«. The response from the regional players to the ERA-Net scheme was mixed—in a double sense: Firstly, there was a group of regions, which were strongly independent within countries even in the field of RTDI policy (Flanders in Belgium might be the most prominent example). These engaged like nations in the ERA-Net scheme, so that they were equivalent partners for the national agencies and governments from other countries. Secondly, there was a good number of proposals driven by the regional level only; these proposals were submitted as ERA-Nets, but »programme coordination« (with the aim to launch common calls) was not as much a point of project focus as it usually was.—This was, on the one hand, due to the fact that most of the participating regions in this proposal type did not have enough regional autonomy (and so could not behave as »programme owners« and »programme managers«), on the other hand, regional issues (structural policy, regional innovation systems, etc.) tended to outweigh those issues typical for the ERA-Nets (in short, excellence achieved through coordination).

To put it briefly, it can be concluded that regions with a very high level of political autonomy even in the field of RTDI policy were able to establish themselves as »normal« players within the ERA-Net scheme together with the »national players« as their partners. Those regions with a lower level of autonomy were forced to formulate their proposals according to their own intervention potential, and this was typically at the regional development policy level, and not at the excellence-driven level of RTDI policy. Consequently, such proposals—considered in contrast to the »typical« ERA-Net-proposals—did not meet the »genuine« ERA-Net criteria (which have turned out to develop very fast), and therefore these projects were treated negatively during the evaluation process.

It has been described above that the autonomy of Austrian federal states in RTDI policy making is somehow limited—though the degree of independence (and the level of »own« initiatives also in the RTDI field) has been rising over the last few years. Therefore, it can be said that Austrian federal states are still not typical partners of an ERA-Net project. Should a region very strongly shape its (regional) policy instruments (including: regional promotion schemes towards fostering excellence—i.e., belonging to the top RTDI performers in this specific RTDI issue), such a region—as an independent player—could be considered as a partner in an ERA-Net. But this is not the usual case, neither in Austria nor in many other comparable European countries.

At project level (projects of nationally coordinated ERA-Nets) there is, of course, always a relation to regional aspects, particularly if »project baskets« (instead of single projects) are considered. Every project is, of course, rooted in the behaviour of concrete players in certain regions.

Conclusion: Combination of Programme, Project and Structural Level as an Important Aspect of Multi-Level Governance

The CORINNA region is a multi-country cross-border region with a relatively high degree of heterogeneity in terms of partner R&D intensity. The degrees of autonomy at regional level (in the field of innovation policy and in general) are also quite diverse. However, at the same time a good set of similarities can still be detected: There is no big »metropolitan area« in this region, functioning as a »natural attractor« for science and industry with easily available masses of consumers and qualified personnel. There are common technological strengths shared among the regions, which range across borders in various fields, and therefore a lot of combinatory potential can be drawn on.

On the basis of such a situation, there are in principle two extreme points of view. The first one would be that of »dangerous competition« within the local small cross-border area. It is quite logical that for direct cross-border projects such as CORINNA, this competitive aspect is perceived more strongly than in projects which comprise various regions in non-adjacent areas across whole Europe, fostering the exchange of »practice in regional innovation policy.« Such cross-European (to a certain extent strategic, and probably to a larger extent erratic) partnerships are typical for most INTERREG IIIC and »Regions of Knowledge« projects.

It can be said that in direct multi-country cross-border projects, there are »competitive threats« but also »complementary chances«. It is more challenging to investigate the regional strengths, potentials, and weaknesses in a neighbouring cross-border region because this does not only lead to an »exchange of good practices« and to »learning spillovers« for the regions (as in the case of most trans-regional projects across whole Europe), but also automatically leads to improved positioning in relation to the neighbouring regions. Such an exercise is only meaningful if the regions (and states) involved are interested in finding out their »combinatory potential« within the mix of regional settings in the common cross-border region and in drawing policy conclusions to foster such complementarity. The second extreme point of view thus invites us to perceive the common cross-border region as a region with pronounced potential for synergies—in terms of available expertise, factor cost components, infrastructures, etc.

Small cross-border regions such as the CORINNA space comprise regions with very diverse historic and economic backgrounds. This leads to extensive diversity in the regional patterns of development and innovation systems but also creates substantial potential for a more »complementary« instead of »competitive« point of view.

Exploiting such potential for complementarities in a relatively small multi-country cross-border region will be of particular benefit for small and medium-sized economic actors, because for them—in contrast to the multinational players—geographic distance still matters (and will do so in the future). The ability to perceive »complementary opportunities« on each side of the borders can also foster the positioning of these enterprises in relation to their »multinational« competitors, which is particularly relevant to SME dominated countries such as Austria and the CORINNA region in general.

A balance needs to be found in the field of innovation policy against this delicate background of »direct competition« vs. »synergetic potential.« Many chances would be missed if the decisions were merely based on the »competitive« perception. However, in order to take advantage of »synergetic potential« as an engine for strategic decisions, a high level of information, both in terms of quantity and quality, and mutuality of perceptions amongst the participating regions are required.

This information basis needs to focus on structural elements (to a strong extent steered and developed by the regional level itself) as well as on aspects related to the »project« (and »programme«) perspective. The latter is to a far lesser extent within the steering autonomy of the region, as the financing for the projects (of the enterprises and institutes within the region) stems from programmes which are in most cases financed by either the national or even the Community level, and the strategies lying behind these programmes are also predominantly formulated by national or Community levels. While for transnational cooperation patterns across Europe, the Community level is most important, for common multi-country, cross-border regions such as the CORINNA region, the current ongoing process of »national coordination« (via ERA-Nets and Art. 169 coordination) is probably even more important: These activities are directed towards projects for smaller consortia as is the case for Framework Programme projects, so that there is more room for consortia solely (or predominantly) made up of actors from the common region.

Bottom-up oriented programmes play an important role in the identification of strengths, because the »non-strengths« are naturally selected out during the evaluation process. At a later stage, such projects patterns can be the basis for thematically focussed programme solutions, being based on those identified strengths. »Structural development« (in terms of infrastructures, publicly fostered cluster development, etc.) must be strongly rooted in the »project output and potential« of the actors involved. So again, close coordination between the various policy levels is required and information from the project level (concerning the project mix) is an important source for decision making.

An investigation into transnational cooperation patterns can provide useful insights into »natural« complementarities. Yet further analysis is necessary in order to match these patterns with regional strengths, find competent answers concerning which combinatory potentials are already being made use of and which still need to be exploited, and to identify the reasons for non-exploitation. The answers then form the basis for appropriate policy decisions. The role of infrastructures must be considered also from a cross-border point of view, and the obstacles preventing optimal use of infrastructure in cross-border activities need to be identified. Instead of structural and infrastructural duplication, complementarity—even at infrastructural level—should be the goal, and particularly across borders.

The CORINNA project aimed to take these necessary information requirements into account, so that a reliable basis for synergetic policy decisions in the participating regions and countries could be made available. This also included an explicit consideration of the multi-level governance systems in the regions and countries involved.

5

Michael Azodanloo, Markus Gruber

The Adjustment of Regional Innovation Policy to the EU Framework: RTDI in Structural Funds Programmes 2007-2013

Introduction

The concept of the European Research Area (ERA) has launched a new era in European RTDI policy. It aims at overcoming the currently fragmented European research and development system and at improving horizontal and vertical coordination. The regional level plays an important role in this concept. In »Towards a European Research Area», the European Commission demands a real »territorialisation of research policies» and increasing involvement of the European structural funds in RTDI policy (EC 2000). Appropriate conditions for consistent regional RTDI policy within the frame of the EU structural funds programmes were first laid down in the reform of the structural funds for the period 2007 - 2013 and in the commitment to the Lisbon process. The improved profile of RTDI in structural funds programmes, on the one hand, and an increased significance of European territorial cooperation, on the other hand, provide several opportunities for fostering local and regional innovation systems and their interregional cooperation. Thus, the idea of the ERA can be supported not only by the framework programmes for research, but also more effectively than in the past by appropriate EU regional policy instruments.

Regional innovation in the context of EU Policy

At the beginning of the 1980s, the innovation policy agenda in the European Union was almost exclusively dealt with within the

Framework Programmes for Research and Development. Regions were only considered gradually. This was primarily expressed in a strong focus on the provision of regional instruments for innovation development, access of SMEs to innovation development, and the forming of (regional) networks. One reason for this gradual integration of regional matters was the growing sensibility towards significant regional disparities and the concentration of innovation (cf. »island of innovation»; Hilpert 1992). Step by step, actions were developed which focussed on capacity building or on the strengthening of innovation capacities (Regional Innovation Strategies—RIS, Regional Innovation and Technology Transfer Strategies—RITTS, Regional Technology Plans—RTP), on regional activities supporting the development of an information society (Regional Information Society Initiative—RISI) as well as on the transfer of knowledge between regions (see Regions of Knowledge; etc.).

In 2000, the concept of the European Research Area emphasised both the role of the regions in RTDI policy and the necessity to link Structural Funds with RTDI policy (e. g. EC 2000). However, this conflicted with the commitment of the Structural Funds to balance economic development across regions (»equality goal«). The equality goal led to the exclusion of economically strong regions, i.e., those with a basis for research and development and innovation in Structural Funds programmes and consequently led to a focus on less developed regions. This—besides its inflexibility—was a major impediment to the development of coherent regional innovation systems within the Structural Funds programmes in Austrian regions. Attention was placed on local strengthening of investments rather than on the implementation of a coherent innovation strategy (cf. results of evaluations by ADE/ZENIT 1998, Gruber/Sturn, 1998, Regional Consulting 2002, Hesina et al. 2004, Gruber/Zumbusch 2005).

In the context of territorial cooperation, the community initiative INTERREG was implemented to reinforce cross-border and transnational cooperation and the exchange of knowledge. By virtue of its positive impact on community value added, INTERREG has been upgraded constantly over the past years. In the period 2000-2006, RTDI was already considered in these programmes to a limited extent although the dominating issues were, without doubt, aspects of socio-economic, environmental, or spatial development. Last, but not least, the ongoing criticism of this discrepancy led to a reform of European regional policy and a change of paradigm in development after commitment to the Lisbon process for the period 2007-2013.

Structural Funds—Change of paradigm for 2007-2013

As a consequence of the growing incoherence of the European Unions' regional policy approach and of the readjustment of the Lisbon process (Kok 2004, Europäische Kommission 2006) the Structural Funds were adapted and linked to the Lisbon strategy. One third of the Community budget is now allocated to cohesion policy. In addition, greater focus was placed on the importance of growth and employment, when the need for greater coherence between local and regional strategies was seen to be essential (cf. EC 2006). The reform means that cohesion- and structural policy is to be considered an integral part of the Lisbon strategy. »European Regional Competitiveness and Employment» is set as an objective. The »equality goal« is now pursued only on the European level: 81 % of the funding of the Structural Funds is concentrated on less developed regions (objective of »convergence«). The former concept of demarcation of small economically weak areas has been abandoned. Thus, the eligible area with respect to »Regional Competitiveness« now comprises the whole federal territory of Austria.

The community initiative INTERREG provided high »European value added«. Therefore INTERREG has been upgraded to help meet the objective of »European Territorial Cooperation« via programmes for transnational, interregional and cross-border cooperation. The linking of Structural Funds to the Lisbon strategy has also led to an improved profile of RTDI actions within the territorial cooperation programmes.

A strategic multi-level governance process is being adopted: the strategies of Lisbon (competitiveness and innovation) and Gothenburg (sustainability) form the political umbrella, while the concretisation of content for the Structural Funds is being pursued by the Community Strategic Guidelines on Cohesion, and subsequently by the National Strategic Reference Framework (NSRF) at national level. Finally, the »Operational Programmes« have to consider all these guidelines as well as the actual needs of the regions.

Structural Funds in the period 2007-2013

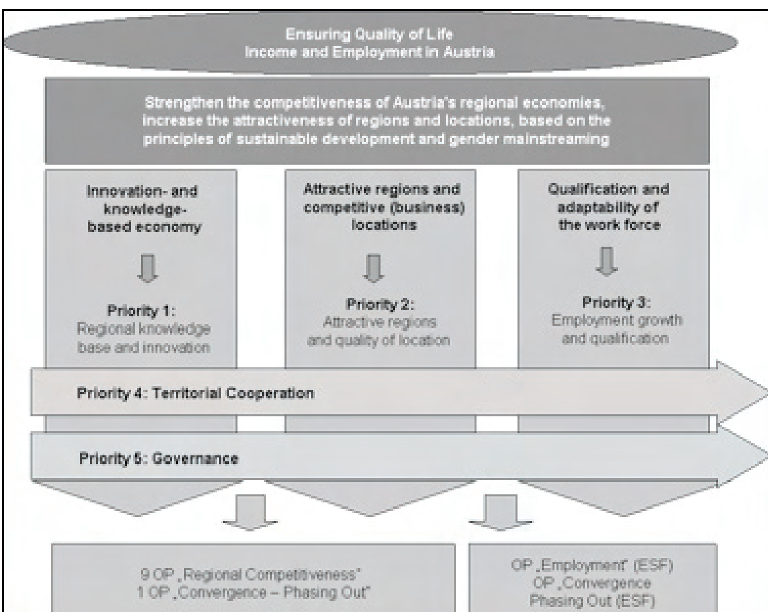
Community Strategic Guidelines on Cohesion 2007-2013

The Community Strategic Guidelines on Cohesion form a policy framework which the EU commission has provided for the member states and the regions. The cohesion guidelines aim to substantiate the Lisbon strategy for EU structural policy. They cover three priorities: (i) making Europe and its regions more attractive places in which to invest and work, (ii) improving knowledge and innovation for growth, (iii) provision of more and better jobs. Measures to promote cross-border, transnational, and interregional cooperation where appropriate, complement the three priorities indicated above. As a consequence—the EU Commission concludes—closer cooperation across EU regions should help speed up economic development and the achievement of higher growth (EC 2006).

National Strategic Reference Framework (NSRF)

Within this multi-level governance approach, the National Strategic Reference Framework STRAT.AT (see Fig. 33) substantiates the cohesion guidelines and forms the Austrian reference framework for the ERDF—and ESF—related operational programmes and it also serves the objective of »European Territorial Cooperation.« The general development strategy of STRAT.AT aims at the widespread introduction of the concept of a knowledge-based society and economy. New patterns of growth, using the linkages between knowledge and access to new markets, particularly with new member states, will strongly spur economic development in Austria. This strategy is founded on a concept of innovation which strongly supports and includes non-technology aspects.

Figure 33: National Strategic Reference Framework Austria—STRAT.AT



Source: ÖROK (2006)

Operational Programmes at Regional Level

At regional level, the operational programmes finally substantiate the interventions of the European Regional Development Fund (ERDF) and the European Social Fund (ESF). The Austrian operational programmes concentrate on the innovation-oriented priority 1, »regional knowledge base and innovation.« With respect to financial means, priority 2 is of minor weight. The STRAT.AT priority 3 of the NSRF—which is oriented towards labour market policy—was relocated to the national programme »Employment« as well as to the ESF-programme »Convergence-phasing-out.« The federal states of Southern Austria, which form part of the CORINNA region, have developed strategies within the framework »Operational Programmes« specific to their respective context, which can be characterised as follows:

Styria: With a total volume of € 287 million public funding, 50% thereof ERDF, the structural funds programme »Regional Competitiveness Styria 2007-2013« has the largest volume of all Austrian programmes. The programme aims at (i) supporting industrial core branches, (ii) developing new growth paths, and (iii) strengthening the innovation capability of SMEs. Focus is placed on branches such as human technology, environmental technology, nano-technology, and creative industries. All in all, it is innovation-oriented and demand-driven. Approximately 90% of the projects are related to the Lisbon target. The share of demand-driven enterprise development is about 70 to 75% of Lisbon-related measures (figures based on thematic codes in operational programmes). More supply-side-oriented measures such as co-financing of the Austrian Competence Centre Programme or the promotion of research institutions in the extra-university sector are financed mainly by national sources.

Carinthia: Carinthia uses the modified framework of the Structural Funds to build-up a basis for regional research and innovation. The objective is to create (sectoral) regional innovation systems in competence fields such as electronics, IT/software, or sustainability and thus reach a critical mass to provide for »self-dynamism of development.« The strategy is—in contrary to the Styrian strategy—more supply-oriented and concentrated on the development of RTDI capabilities, which are mainly localised in the central region. Instruments such as the funding of professorships, of research infrastructure, of research institutions as well as »Lakeside Labs« that support basic research oriented projects aimed at the building-up of IT competence are being implemented. Parallel measures include the strengthening of innovation capability of the enterprise sector in order to generally increase the number of innovating enterprises and those with research and development activities. Approximately 97% of funding is related to the Lisbon targets.

Burgenland: Since Austria joined the EU, the whole of Burgenland has had access to EU development funds as an objective 1 region and/or member of the »Convergence—phasing-out programme.« With regard to RTDI, it has to struggle with a low level of enterprise R&D and a deficient endowment in terms of research and development infrastructure. However, the Objective 1 programme, together with the dynamism resulting from the fall of the Iron Curtain and the eastward enlargement of EU, provided for a significant leap in economic development. The technological infrastructure facilities were improved significantly. On the one hand, the present programme »Convergence 2007-2013—phasing out« leads to a significant reduction of investments in infrastructure for the trade, industry, and tourism sectors and in technology infrastructure (i.e., restrictions to demand-oriented expansions of technology-centres and IKT-infrastructure). On the other hand, an increasing focus is being placed on innovation in all areas. This is indicated by significantly increased public funding of innovation and research and development projects, i.e., from 5% in the previous programme to approximately 20% in the programme for 2007 - 2013. As a whole, 85% of public funding are dedicated to Lisbon-relevant activities.

Table 19: ERDF-Related Operational Programmes 2007-2013—Focus of Activities

Styria	Carinthia	Burgenland
Research and development on an inter-company level	Access to innovation services, consultancy, and networks	Development of industrial research projects in all areas of technology as well as pre-competitive development projects
Strengthening of players in the innovation system (including clusters and networks)	Acquisition of knowledge and innovation	Centres of competence and clusters: definition, networking, and utilisation of regional strength in Burgenland
Research and development in enterprises	Build-up of research and competence centres and linking of enterprises to them	Soft measures for innovation capability, access to technology (application) and market access
Development of innovation in enterprises	Research and development infrastructure	New positioning, new business areas for SMEs
Promotion of entrepreneurial spirit	Basic research projects with a long-term market perspective.	Strengthening of capital resources structure
Acquisition of know-how and knowledge management for innovation	Technology oriented business infrastructure	
	Venture financing	
	Research and development in enterprises	

We can thus conclude that the integration of the Lisbon-Agenda with structural funds policy improves the profile of the regional RTDI measures in Austria's regional development programmes. RTDI policy measures have gained in terms of internal coherence and quantity within the Structural Funds programmes, and a shift from more general economic development activities to RTDI-related measures can be observed. Cross-country comparison of the allocation of Lisbon-activities (earmarking) reveals that Austrian ERDF-related Structural Funds programmes (EC 2007) occupy a leading position.

Above all, the new framework conditions provide an opportunity for the implementation of a coherent regional RTDI strategy. However, in order to obtain real benefits from these new framework conditions, there is a need for greater acceptance of risk and flexibility in implementation (especially from the side of the European Commission and the funding agencies), for improved understanding of governance, and a shift towards more active project development by the players involved in the programme.

Internationalisation and Innovation

Internationalisation and Regional Innovation

Research on innovation emphasises the need for the simultaneous co-existence of significant intra-regional cohesion and external openness of innovation systems (e.g., Bathelt/Malmberg/Maskell 2003). Hence, the question arises whether the Structural Funds framework supports such requirements. The rationale behind intervention should be the linking of the programmes »Regional Competitiveness» with programmes of »Territorial Cooperation,« in order to stimulate the interaction and exchange of knowledge between systems of innovation in neighbouring regions and regions across Europe.

In general, regions have developed different strategies of internationalising economies or research and development activities. A specific »good practice« approach has been set up by Styria. The Styrian government together with the Chamber of Commerce and the Federation of Industry founded the »Internationalisation

Centre Styria« (ICS) aiming at the internationalisation of the economy as well as at »institutional internationalisation.« The ICS performs an advisory role in a wide range of areas: Styrian companies are supported in their export activities; and Styrian SMEs and Institutions are encouraged by the ICS to internationalise. The ICS highlights various opportunities for companies and is responsible for (i) territorial cooperation (incl. EU projectdevelopment and national cofinancing for Styrian institutions and companies), location marketing (incl. fields of strength and presentation of locations), (ii) project development (incl. cooperation exchanges, EU information), (iii) regional internationalisation strategy—RIST (incl. project development, project acquisition, project financing and business centres), and (iv) export service (incl. market development and new exporters).

Complementary Strategies for Territorial Cooperation

Since the member states defined cross-border cooperation as an important source of European added value, the community initiative INTERREG has been revalued in terms of the European objective »European Territorial Cooperation« in order to support cross-border, transnational, and interregional cooperation. The programme supports a wide range of intervention activities and targets. However, one can also observe an increasing focus on Lisbon priorities:

Cross-border cooperation: The relevant programmes for the CORINNA regions of Austria are »Austria—Italy«, »Slovenia—Austria«, and »Austria—Hungary«. The programmes are in general directed towards a Lisbon (»competitiveness and innovation«) and Gothenburg (»sustainable development«) priority. Although the contents of the programmes are quite »broad« in the sense of including a variety of socio-economic-oriented measures, an increasing orientation towards RTDI can be observed. The objectives of the programmes are directed towards: e.g., SME development, development of thematic fields of strength, shaping the framework for a knowledge based economy, research and development, or human resources and the labour market (see Tab.20). The enlargement of the eligible area and the inclusion of agglomeration areas (e.g., the central region in Slovenia and middle-sized towns in Northern Italy) open up new potentials for cross-border RTDI strategies.

Table 20: Operational Programmes »Territorial Cooperation—Cross-Border 2007-2013«

Slovenia-Austria	Austria-Italy	Austria-Hungary
Priority 1 »Competitiveness, knowledge and economic cooperation«: • Activity: SME development: E.g., establishment of cross-border production chains and networks, company and cluster oriented innovation system (such as technology transfer, consulting services, B2B-activities, cleaner production centres…) • Activity: Framework for knowledge-based economy E.g. Cooperation between universities and non-university institutions, involvement of companies in the cross-border research and innovation process, in particular in fields such as nano-technology, ICT, software, human technologies, etc. • Activity: Thematic fields of strength E.g., Cross-border cooperation of industrial clusters. In particular, extension of the existing eco-technology networks across the border	Priority 1 »Economic relations, competitiveness and diversification«: • Activity: Support of SME E.g. support for services (demand side) and the supply of services (supply side) e.g., for product and process innovations, promotion activities, technology transfer, searching for partners, co-operation and clusters, etc. • Activity: Research & Development E.g., collaborative research and development-projects, exchange of researchers, fostering cooperation between research and development centres, universities, improving access to ICT, support for clean technologies • Activity: Human resources and labour market E.g. joint training and education programmes	Priority 1 »innovation, integration and competitiveness«: •Activities: • Research and development activities in research centres • Research and development infrastructure (including physical plant, instrumentation and high-speed computer networks linking research centres) and centres of competence in a specific technology; • Technology transfer and improvement of cooperation networks between small and medium sized businesses (SMEs), etc.; • Advanced support services for firms and groups of firms; • Services and applications for SMEs (e-commerce, education and training, networking, etc.)

Source: Operational Programmes 2007-2013 Slovenia—Austria, Austria—Italy, Austria—Hungary

Transnational cooperation: Out of more than ten transnational cooperation areas, of interest for CORINNA regions are: South East Europe, Central Europe, and Alpine Space. All these programmes offer a wide range of opportunities to link RTDI services and innovation systems of regions in general by: (i) network building with respect to supporting innovation activities of mainly SMEs, providing services in technology-oriented sectors, supporting technology transfer, (ii) developing networks aiming at improving the »innovation-environment,« or (iii) knowledge generation and know-how transfer (see Tab. 21).

Table 21: Operational Programmes »Territorial Cooperation—Transnational Cooperation 2007-2013«

South East Europe	Central Europe	Alpine Space
• Activity: Develop technology & innovation networks in specific fields (e.g., developing transnational partnerships around research, technology and innovation centres and agencies, increasing the internationalisation level of research, technology and innovation facilities, etc.) • Activity: Develop the enabling environment for innovative entrepreneurship (e.g., networking of SME support facilities, pooling expertise in networks to help SMEs diagnose and solve issues associated with innovation processes, etc.) • Activity: Enhance the framework conditions and pave the way for innovation (e.g., setting up exchange and coordination mechanisms for research, technology, and innovation approaches and policies, improving the common governance at regional and local level with respect to innovative entrepreneurship, etc.	• Activity: Enhance framework conditions for innovation (e.g., supporting the establishment and development of transnational clusters in key competence areas, creating and strengthening institutions for technology transfer, etc.) • Activity: Establish capabilities for the diffusion and application of innovation (e.g., stimulating technology transfer and knowledge exchange mechanisms, fostering access to scientific knowledge etc. • Activity: Foster knowledge development (e.g., creating new and improved existing transnational educational and training networks in higher education or life-long learning, etc.)	Priority 1: Promotion of the alpine space as a competitive and attractive living and economic space in the scope of a polycentric spatial development in the EU • Activity: Mutual knowledge and common perspectives (e.g., develop networks and exchange of best practice between different alpine actors). • Activity: Competitiveness and sustainable development: achieve intensive co-operation in the fields of research and development, innovation and technology transfer between cities and their rural neighbourhood as well as between SMEs and innovation centres; Priority 2, Activity: Perspectives and analyses, e.g., increase the knowledge about the possibilities of, the acceptance for, and the use of modern information technology for all social, labour and cultural groups of the alpine space

Source: Operational Programmes 2007-2013 Southeast Europe, Central Europe, Alpine Space

Interregional cooperation: Interregional cooperation supports cooperation of European regions in sharing knowledge, experience, and good practice. Two main priorities are targeted: »innovation and knowledge economy« and »environment and risk prevention«. The programmes »Regional Competitiveness« and »Convergence—phasing-out« also aim at interregional cooperation, so that the focus is no longer restricted to a purely regional perspective. All these projects thus facilitate integration into international networks, exchange of experience and the transfer of knowledge.

We may thus conclude that drafted and executed programmes reveal that the RTDI profile has improved in the »Territorial Cooperation« programmes compared to the period 2000-2006. In general, the »European Territorial Cooperation« programmes provide opportunities to create projects complementary to the programmes »Regional Competitiveness« and/or »Convergence—phasing-out« and thus support international connections of innovation systems and, generally, internationalisation at both the enterprise and the institutional level.

Summary and Conclusions

The new framework conditions of European structural funds provide new opportunities for the implementation of a consistent regional RTDI policy in the European programmes. A change of paradigm was necessary, as was the transition from the »equality goal« towards a strategy of potential-oriented competitiveness, in order to permit the integration of central regions that are economically strong and important in innovation policy. This has facilitated the integration of structural funds into RTDI policy, which is a basic requirement of the ERA-concept.

The strategies of the three Austrian federal states Styria, Carinthia, and Burgenland show different points of focus and reflect their differing initial conditions. The new framework conditions provide an opportunity for the implementation of a consistent regional RTDI strategy within the EU programmes as well as for the build-up of RTDI capacity. The programmes no longer merely focus on the isolated, local strengthening of investment, but provide for the implementation of a complete innovation strategy. In principle, vertical coordination is supported via multi-level-governance structures.

The »European Territorial Cooperation« programmes offer a manifold range of possibilities, complementary strategies for inter-regional, transnational and cross-border cooperation, which all provide significant impulses for the linking of regional innovation systems and the flow of knowledge. A »variable geometry« in the design and integration of innovation systems thus becomes possible. This enables more flexible area-institutional cooperation in line with the strengths of the regions and their relevant themes (although many issues concerning implementation procedures are still open).

However, it remains to be seen whether the projects funded under the »Territorial Cooperation« programmes can actually adopt a complementary position to the projects funded under the »Regional Competitiveness« programmes and whether the re-orientation towards the development and implementation of »productive projects« (preparing investment-oriented projects), as formulated and expected by the Commission, can be achieved in reality.

6

Tivadar Lippényi

Regional Dimensions of Innovation Policy: Lessons from a New EU Member Country

Hungary in a World Driven by Innovation

Hungary's aim should be to take up international participation on levels and areas that produce the highest added value. Hungary should develop in a direction where it can be competitive not because of cheap labour, but by producing and marketing intellectual added value while offering growing salaries. Special emphasis should be placed on sectors showing the highest growth potential and best market opportunities. The Hungarian economy should be set on a development track based on knowledge and innovation. In order to improve the innovation capacity of the economy, the national innovation system should be enterprise-friendly and economy-oriented. The first and second national development plans, under which an unprecedented amount of development will be supported until 2013, are designed to ensure maximum utilisation of national resources.

Innovation and R&D Policy in the 1990s

The present and past administrations have implemented numerous positive measures, including the Act on the Research and Technology Innovation Fund, and the Act on Research and Development and Technological Innovation. The importance of these two acts lies with the fact that—for the first time since the transition to democracy in 1990—these measures free R&D and innovation policy of the traps of annual budget-fights and finally enable long-term financing and planning in the sector.

The aforementioned measures, on their own, are far from being sufficient to increase Hungary's competitiveness at the required rate. Indeed, in the past fifteen year the R&D sector was characterized by a constant lag behind government objectives, thus the present situation is more than alarming. The R&D sector struggles with the legacy of the transition period, which was characterized by spontaneous transformations, hasty implementation and abolishment of superficial measures, and a total lack of continuity and transparency. The situation appears even graver once we consider the fact that since 1990, the sector's institutional framework has constantly been changing, which has unequivocally hindered the integration of R&D policy into mainstream administration, effective implementation, and the sector's participation in the decision-making mechanisms of government.

Let us look at where we started from. Compared to local and international conditions, science in Hungary had achieved substantial results and received considerable support until 1987. This support was amply represented by the prestige of science and the volume of public funding provided to science. Unlike in the developed world, however, this relative generosity had almost no effect on the economy. Since innovation was not fuelled by demand, scientific results were only represented by high citation indices, relatively good research conditions, and high standards in research institutes compared to other satellite countries. During the transition period, however, the establishment of global market conditions did not create a demand for marketable innovation, but led to a gradual downsizing of the previous strengths. Knowledge as an asset was pushed into the background. Following the collapse of the national industrial sector, technology-based professional knowledge was mainly converted to brokering, trade, and the representation of multinational companies entering the market.

This was in part caused by a lack of suitable mechanisms for transforming the societal role of intellectual life, knowledg and scientific research so as to meet modern requirements. All this put scientific research in a dire position. The gravity of the situation was well represented by the fact that between 1991 and 1996, more than 80% of research and development resources were lost (the latter suffering the greater loss). Big industrial companies lost their previous markets and could not successfully enter new ones. This was partly caused by the iron curtain as the embargo policies of the developed world forced Hungarian industry into a development dead end. Modern technologies and materials were inaccessible for developers because of the embargo, so they had to apply inventive constructions and more complex solutions to develop equipment. This sort of replacement worked mainly in the markets of the satellite countries, but only until the markets were liberalised. Following market-liberalisation, these constructions became old-fashioned, complicated, and, for the most part, unmarketable. Ruined industrial companies as well as the industrial research network behind them were unable to come up with new development and innovative solutions, so they became bankrupt with dramatic speed. Most of them were liquidated by the second half of the 1990's, and the majority of research and development professionals adopted individual survival strategies.

Several representatives of technological and natural sciences issued warnings, but substantial change only started in 1997 with the beginning of the reform in higher education. In 1997-1998, the annual funding through the National Research and Development Programme exceeded the average of the previous years by a factor of five, and measures were introduced to provide quality oriented institutional and individual support (normative and project funding for R&D, Act on Hungarian Scientific Research Fund (OTKA), the introduction of the Széchenyi-professorship, etc).

Efforts to devise suitable funding structures proved transitory. The pace of research and development spending slowed down in 1998 and 1999, although the decrease was not driven by economic factors, as GDP grew dynamically from 1997. The government failed to realise the underlying dangers, as scientific achievements did not follow the negative financial trend. Among the most important indicators of scientific activities, the number of publications grew from 2500 to 3770 from 1990 to 1999, and the proportion of Hungarian scientific publications grew from 0.44% to 0.52% of all scientific publications in the world. Regarding citation, the National Science Indicators on Diskette (Philadelphia) registered an increase from 0.23% to 0.40% in the given period.

The Széchenyi Plan was launched in 2001 to improve the situation of science, setting for 2002 a goal of spending 1.5% of GDP on R&D. That goal was however missed, and only 1.04% was realised, mainly because of a lack of corporate innovation.

The efforts to save underfinanced research units (mainly universities, higher education institutions, institutes of the Hungarian Academy of Sciences) finally proved successful: the HAS network managed to avoid the fate of industrial institutes.

The Situation of the National Innovation System

The elaboration and implementation of a modern national system for research and technology policy have been going on for five years now. The main goal is to make R&D and innovation boost companies' competitiveness as directly as possible. This is not merely a question of financing. It is much rather a question of our national innovation system, the effective transfer of knowledge, the willingness and skill of Hungarian companies in innovation, and society's awareness of the role and importance of innovation. It is important to create a regional innovation system. In the European Union, the advancement of the competitiveness of regions has been regarded as the main objective of regional policies for years, and as one of the most important instruments in harmonic development and cohesion.

The significant improvement of innovation capacity is one of the key elements in the development of the regions. The creation of an effective regional network of innovation institutions is thus crucial. This is an entirely new element in the range of national R&D institutions, and its introduction is justified by two main points. The first is the necessity to make Hungarian R&D less concentrated on Budapest and to provide possibilities for development for other regions. The second is the need to use the development resources provided by the EU effectively. An institutional network will of course not do by itself. Creative and innovative people are also needed in order to make good use of the possibilities provided by the institutional background. In order to mobilise the creative and entrepreneurial spirit, however, much more courageous decentralisation is necessary.

The Development of Scientific Research

Since 2000, the number of R&D units has grown by a total 22.3%, from 2,020 to 2,516. More specifically, the number of R&D institutes has grown by 38.8%, the number of higher education research units by 14.6% and corporate R&D units by 41%.

Table 22: Number of R&D Units and R&D Employment (FTE) by Sector

	2000	2001	2002	2003	2004	2005
R&D institutes and other research units*	121	133	143	168	175	201
Scientists and engineers (heads)	4,653	4,657	4,622	4,741	4,693	4,959
R&D units at higher education institutes	1,421	1,574	1,613	1,628	1,697	1,566
Scientists and engineers (heads)	5,852	5,938	5,999	5,957	5,902	5,911
R&D units of business enterprises	478	630	670	674	669	749

	2000	2001	2002	2003	2004	2005
Scientists and engineers (heads)	3,901	4,071	4,344	4,482	4,309	5,008
Total	2,020	2,337	2,426	2,470	2,541	2,516
Scientists and engineers (heads)	14,406	14,666	14,965	15,180	14,904	15,878

Source: Central Statistical Office, Hungary.

R&D institutes and other research units include the research institutes of the Hungarian Academy of Sciences, other public research organisations, and units operated, e.g., at clinics, libraries and archives, as well as private non-profit research organisations, e.g., foundations.

Table 23: R&D Employment, 1988-2005 (FTE)

	1988	1992	1995	1998	2001	2004	2005
Total R&D personnel	45,069	24,192	19,585	20,135	22,942	22,826	23,239
of which RSE staff	21,427	12,311	10,499	11,310	14,666	15,180	15,878

Source: Central Statistical Office, Hungary.

In 2004 the government created a new institutional system in 2004 to implement the Barcelona objectives and to promote long term stability and corporate R&D spending. The most important element of this system is the Research and Technology Innovation Fund managed by the National Office for Research and Technology. Apart from micro and small enterprises, all companies have to pay 0.25% of their corrected net income into the fund. From 2006 the contribution will be adjusted to 0.3%.

Since the year 2000, the number of patent-applications has dropped by 1.5% to 4,810, including a 6.7% drop in Hungarian applications to 756 compared to 2000. The number of patents granted has also decreased to 1,379, a 15.2% drop between 2000 and 2003.

The weakest point of the Hunagrian innovation system is the potential shortage of human resources for R&D and innovation. The ratio of science and engineering graduates among people aged between 20 and 29 years is 4.8%, only 39% of the EU-25 average. The share of working age population with tertiary education is below the EU-25 average: 16.7% vs. 21.9%, but Hungary is »catching up« in this field. In life-long learning the participation of the Hungarian population is low: 4.6% (HU) of the population aged 24-65 years, as opposed to 9.9% (EU-25) in 2004.

Innovation in the Business Sector

In the business sector, innovation does not receive direct public R&D spending; it is mainly carried out through importing materials, spare parts, investment, and intangible assets. While in public R&D spending Hungary is only slightly behind the average of the EU-15, high-tech seed and venture capital is very scarce. The latter is the best indicator of a country's ability to integrate new knowledge into its everyday routine, whether that knowledge stems from national or international R&D activities.

Hungarian researchers and research institutes boast great results in international R&D cooperation networks, whereas the role of SMEs is only occasional and insignificant. The new knowledge and technology created by international projects is hardly utilised in Hungary. It is mostly foreign companies that make good use of the knowledge of Hungarian researchers, and Hungary's share of the benefits of intellectual products is not proportionate to its investments.

The activity of the majority of SMEs in R&D and innovation is very weak. According to a 2003 survey by the Hungarian Innovation Association, 2000-2500 companies are involved in innovation and receiving new knowledge (other estimates put that figure at 4000). There are few noteworthy spin-off enterprises, and technological incubation is still underdeveloped. The seed capitalmodel is not functioning and there are no mechanisms to connect venture capital and innovative enterprises. There is a missing cultural link. This could be rectified by the evaluation of technological and business opportunities and risks, in order to connect innovators complaining about a lack of resources with investors complaining about a lack of projects. This missing link is a serious deficiency in the development of technology-intensive SMEs.

Table 24: Share of Innovative Enterprises Indicating Cooperation with Specified Partners (Percentage of All Innovative Enterprises)

	1999-2001	2002-2004
Other enterprises within the enterprise group	5.1	9.6
Suppliers of equipment, materials, components, or software	26.8	26.6
Clients or customers	24.8	20
Competitors or other enterprises in sector	10.9	14.2
Consultants*	14.6	13.9
Private R&D organisations	13.7	
Higher education organisations	21.6	14.6
Government or public research institutes	8.6	6.4

** Cooperation with consultancy firms and private R&D organisations has been merged in CIS4.*

Source: Central Statistical Office, Hungary.

Insufficient corporate innovation in Hungary is rooted in conflicting individual and company interests, limited financial resources, and the dysfunctionality of the structural framework. The main factors hindering innovation in Hungarian SMEs are the following:

- SMEs do not have the crucial financial resources necessary for successful R&D activities
- Before the innovation fund was created, only 5% of R&D budg-

et resources went directly to enterprises, with 95% ending up in state-financed research units. In theory, that 95% should be utilised by the economy, something we do not see at all or only on a small scale

- The administration and accounting system for public financial contributions is rigid and complicated.
- The institutional background of innovation in Hungarian regions is complicated, un-coordinated, with many overlaps, and in many cases there is a lack of cooperation between organisations operating in the same field.
- The Hungarian banking system cannot manage intellectual added value assets linked to intellectual property, which are becoming a determining factor in the economy. Therefore, it is especially difficult to finance the growth of enterprises engaged in knowledge-intensive activities, typically struggling with a lack of capital.
- Venture capitalists in Hungary are unwilling to invest in innovative enterprises (which are in many cases start-up companies).

Innovation in the Regions

Hungary is a small, centralised country. The capital, Budapest, is the political, economic, educational, cultural, and transport hub. A very high share of GDP is produced in Budapest, and thus the weight of the region of Central Hungary, consisting of Budapest and the surrounding Pest County, is excessively strong: 44.6% of the GDP.

The country is composed of 19 counties, which do not have any decision-making power on higher education or STI policies. They are too small to act as catalysts of regional development. For this reason, these counties have been organised into seven statistical-planning regions. Decision making authority was plan-ned but the legislation proposed failed due to the resistance of the main opposition party. So these seven regions are recipients of development funds but do not have local governments. In the new government structure, the Ministry of Local Government and Regional Development has been made responsible for the supervision of regional and rural development tasks in order to centralise and more efficiently coordinate these tasks. Further ministries and government agencies are also active in this field to a varying extent, e.g., the Ministry of Economy and Transport, and the National Office for Research and Technology.

Seven Regional Development Councils (RDCs) and their operational and coordinating organisations, Regional Development Agencies (RDAs), have also been set up, as stipulated by the law on regional development and planning, to devise and implement regional development strategies, including a »chapter« on innovation issues. In more detail, their responsibilities include regional development, coordination of economic development, and reconciliation of central and regional interests.

RDCs have two principle sources of funding for research and technology development: a contribution from the central government budget as well as 25% of the Research and Technological Innovation Fund, to be spent on promoting RTDI activities at regional level. The Research and Technological Innovation Fund currently supports two important schemes aiming at regional innovation systems: the regional knowledge centres at universities and the Regional Innovation Agencies (RIAs).

A major task for the seven RDCs in 2006 was to finalise the regional development strategies and the related operative programmes for 2007-2013, i.e., to be implemented during the second national development plan, co-financed by the EU and national sources.

As for regional disparities, two Hungarian regions (Northern Hungary and Northern Great Plain) were among the ten poorest ones in the EU-25, while GDP per capita in Central Hungary is just 4% below the EU-25 average. Major foreign-owned firms, however, are located outside the central region, too, and they are buying parts and components from local suppliers in their vicinity and establish links with nearby higher education institutes. For example, 11 of 19 of the existing Cooperative Research Centres (HU_49, replaced by HU_55 since 2004) are located at the Universities of Debrecen, Gödöllő, Győr, Miskolc, Pécs, Sopron, Szeged and Veszprém. Thus, one can speak of emerging regional RTDI clusters.

There is a great discrepancy among the innovation and research capacities of Hungarian regions, stemming mostly from the separate locations of investments and university cities such as Debrecen, Miskolc, Szeged, Pécs, Győr or Veszprém.

The regional distribution of scientists and engineers, as well as that of the R&D expenditures is skewed to such an extent that the difference among the six remaining regions is dwarfed by the huge gap between Central Hungary and any other region. Central Hungary is the only region with a higher share in total R&D resources than in GDP, which means an even greater concentration in R&D.

Table 25: Regional Distribution of GDP, R&D Employment and Expenditures, 2005

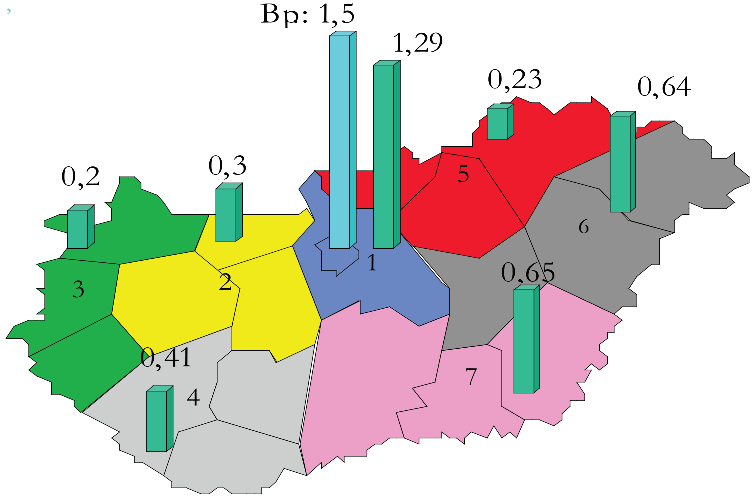
	GDP*	R&D expenditures	R&D employment (FTE)	… of which RSE personnel (FTE)
Central Hungary	44.6%	69.4%	63.4%	65.1%
Northern Great Plain	10.0%	9.0%	8.4%	8.0%
Southern Great Plain	9.3%	7.3%	9.1%	8.2%

	GDP*	R&D expenditures	R&D employment (FTE)	… of which RSE personnel (FTE)
Central Transdanubia	10.5%	4.8%	5.0%	5.1%
West Transdanubia	10.3%	3.4%	4.2%	4.2%
South Transdanubia	6.9%	3.2%	5.8%	5.3%
North Hungary	8.4%	2.9%	4.1%	4.1%
Total	100.0%	100.0%	100.0%	100.0%

** 2004*
Source: Central Statistical Office, Hungary.

The north western part of Hungary has successfully attracted direct investment. Thanks to imported technologies, the innovation situation in the region is favourable, but there is still little homegrown innovation because of insufficient R&D capacities. The capital and the larger university cities in the eastern region (which has low innovation capacity) do have important research centres, but with the exception of Budapest, these institutions have not yet been successful at becoming the innovation centres of the given region. The central role of Budapest is also highlighted by the geographical distribution of the number of researchers, as 61.6% of researchers and developers work in Budapest.

Figure 34: R&D Spending in % of GDP, 2004



Source: Central Statistical Office, Hungary

The deficiencies of the Hungarian innovation system have a negative impact on the competitiveness of the national economy. National and regional institutional framework and network structures (such as innovation centres, technology transfer centres, technology incubation houses) that link R&D institutions and companies are missing or underdeveloped, and there is little exchange of professionals between public research units and companies.

In recent years, integrating action based on wide-range cooperation has taken place, such as the National Research and Development Programmes or the Cooperative Research Centres. Hungary's funding system is increasingly focussing on supporting cooperative research activities. Priority should be given to promoting SME participation in such programmes, while their financial resources should be increased in order to create a »critical mass« of SMEs that would strengthen efficiency. Along with increased spending, monitoring and evaluation systems should be introduced to supervise appropriate, expedient and effective use of financial resources.

Regional University Knowledge Centres—
Péter Pázmány Programme

The main goal of the »Péter Pázmány Programme« is to establish Regional University Knowledge Centres (RUKC) based on existing university competencies to exploit research and development results in close cooperation with the industrial sector.

The aim of the programme is to establish professional and regional centres of excellence in cooperation with companies and other research organisations in order to manage innovative projects focussed on research and development at an international level. These research centres cooperate effectively with the industrial sector and stimulate the technological and economic development of the regions.

The task of the supported knowledge centres is to transform R&D results into marketable new products and technologies.

Starting in 2004, the National Office for Research and Technology announced a call for proposals to establish and support the operation of regional university knowledge centres. After the first call in 2005 and 2006, new regional knowledge centres were established country wide.

Table 26: New Regional University Knowledge Centres in Hungary

Supported Knowledge Centre	Region	Year
Research and Development in the Foodchain Regional Knowledge Center, Budapest	Central Hungary	2004
Cellcommunication Knowledge Centre, Budapest	Central Hungary	2004
Transportation Informatics and Telematics Knowledge Center, Budapest	Central Hungary	2004
IT Innovation and Knowledge Center, Budapest	Central Hungary	2005
E-Science University Knowledge Center, Budapest	Central Hungary	2005
Regional Knowledge Centre for Environmental Industry Based on Natural Resources, Gödöllő	Central Hungary	2005
Szentágothai János Medical Knowledge Center, Budapest	Central Hungary	2006
Advanced Vehicles and Vehicle Control Knowledge Center, Budapest	Central Hungary	2006
Information Security and Environment Security Know-ledgde Centre, Veszprém	Central Transda-nubia	2004
Regional Knowledge Centre for Material Science and Technology, Dunaújváros	Central Transda-nubia	2004
FOOD-ENERG Regional Knowledge Center, Nyir-egyháza	Northern Great Plain	2004
GENOMNANOTECH Regional Knowledge Centre, Debrecen	Northern Great Plain	2006
EGERFOOD—Regional Knowledge Centre, Eger	North Hungary	2005
Regional Knowledge Center for Knowledge Intensive Mechatronical and Logistical Systems, Miskolc	North Hungary	2006
Environmental- and Nanotechnology Regional Know-ledge Centre, Szeged	Southern Great Plain	2005
Neurobiological Regional Knowledge Center, Szeged	Southern Great Plain	2006
MEDIPOLIS Regional Knowledge Center, Pécs	South Transda-nubia	2005
Regional Knowledge Center for Vehicle Industry, Győr	West Transda-nubia	2005
Regional Knowledge Center for Forest and Wood Utilization	West Transda-nubia	2006

Source: National Office for Research and Technology, Hungary.

In 2006 an evaluation of the existing programme underlined that the concentration of the resources was quite efficient. Some results from the first two years of operation of the centres established in 2004 and 2005 are now listed below:

- The programmes involved more than 800 researchers.
- Number of PhD students: 273
- Number of publications: 900
- PhD dissertations: 33
- New products: 57
- Newly introduced services: 38
- New technology transfers: 73
- Number of patents: 11
- Newly established companies: 13

Regional Innovation Agencies as New Instruments at Regional Level

Regional Innovation Agencies (RIAs) were set up in 2005 to coordinate and organise the regional innovation processes, offer innovation services, and integrate them into an overarching system. The RIAs operate as networks, based on partnership among interested partners. These agencies have to improve cooperation between the different organisations, coordinate funds available for innovation, generate additional funding, and promote the creation of national and international innovation networks. The main strategic goal of RIAs is to develop an innovation-friendly environment at regional level and to

- strengthen regional innovation clusters;
- strengthen regions' competitiveness by supporting R&D and innovation projects;
- strengthen firms' competitiveness, especially that of SMEs operating in regions;

- facilitate regional cohesion;
- provide a complex array of innovation services in the region.

A new scheme, called »Gábor Baross Programme«, supporting regional innovation networks was launched in 2005. It was devised at national level, but it addresses the challenges of the different regions. Actually, it is composed of seven rather different regional calls, each tailored to the needs of a given region. Furthermore, the planning process is driven by the RIAs: they formulate their own programmes according to the specific needs and priorities of their regions.

The main element of the programme was the foundation of a regional innovation agency network in every region. Since the end of 2004, the network has been helping cooperation between R&D and entrepreneurs by providing information on establishing an innovation network and by supporting the use of innovation services.

The »Innocheck Programme« aims to support the innovation initiatives of small and micro-sized enterprises through the enlargement of regional innovation tools via the introduction of the support system of innovation services. The main goal of this scheme is to promote the demand for innovation services by providing vouchers to micro- and small enterprises that need these services.

After the first year of operation, many innovative SMEs understood that the scheme is not a traditional grant, and use of innovation services in the region began to increase. In the third year of operation, among the projects completed the success rate is higher compared with traditional grants. The programme was able to attract many of those SMEs who had not previously applied for support from the innovation fund. By mapping the actors of innovation in the region, the programme also helps to identify the R&D providers, bridging institutions and consultants who provide high quality services. Innocheck supports more then 15 innovation services. These can be grouped into 6 sections:

- License and technology transfer purchasing
- R&D services
- Incubation services
- Technological services for prototyping, measurements and quality control
- Project management services and innovation marketing services
- Intellectual property rights services

The programme will be continued in 2008 with some modifications based on feedback from the final evaluation in November 2007.

Table 27:Innocheck Supports by Regions

Region	Number of proposals	Eligible proposals	Success rate %	Value of vouchers million HUF
Central Hungary	223	65	29,1	1 209
Central Transdanubia	80	30	37,5	487
Northern Great Plain	124	32	25,8	463
Northern Hungary	76	44	57,9	805
Southern Great Plain	112	26	23,2	542
South Transdanubia	117	40	34,2	657
West Transdanubia	73	18	24,7	327
Total	805	255		4 490

Source: National Office for Research and Technology, Hungary.

The Regional Innovation Development Programme was established on the basis of a proposal by the Regional Development Committee (RFT). It serves the innovation goals of the decentralized regional division of the Research and Technology Fund. Generally, the following main themes are targeted by the specific regional sub-programmes of the scheme:

- Support for technology and knowledge transfer
- Support for product and service innovation
- Creation of regional innovation clusters
- Support for SMEs and spin-off companies
- Development of R&D and innovation infrastructure.

Experience: The Innovation Challenge of the 21st Century

There is no development without innovation.

A competitive society is one that has an ability to adapt to new challenges, to learn and to apply knowledge. A competitive economy is characterized by risk-taking and innovation, resulting in new enterprises, new investments and the creation of new, competitive products, services and processes. Governments need to provide support for such processes with conscious, predictable, and coordinated policies.

Technology and innovation performance have become a key element of economic growth in developed countries over the past two decades. This general trend, however, was only barely reflected in the economic policy of Central and East European countries (including Hungary), where economic trends accompanying the transition to democracy favoured more convenient solutions, or at least ones that seemed more convenient at the time.

Yet technological development is not only a question of economics. It should also help improve the quality of life, or in other words, the »quality of society.« This is not possible without growth in a competitive economy. This is a necessary, but not sufficient condition for increasing prosperity. Indeed, it is only one method for achieving prosperity. Decision affecting the future can be judged on the degree to which they support a fair distribution of the surplus generated by growth, i.e., on the extent to which they promote human development.

The HDI (Human Development Index) is one common means of assessing the quality of life. Its three main indicators can not be separated from the innovation performance of a given society. Research and development and innovation need to be strengthened to improve gross national product per capita, educational performance (literacy and the proportion of educational levels), and life expectancy (or, in a different approach, healthy life expectancy) in a country.

It is impossible to tell the future global direction of research and experimental development, that is, the main trends for research. Therefore, when drawing up strategies, we set out to answer the »how« instead of the »what«.

The knowledge-driven economy affects the innovation process and the approach to innovation. The old fashioned idea that innovation is based upon research and interaction between companies and other actors is being replaced by the current social network theory of innovation. In the knowledge-driven economy, innovation has become the key for competitiveness. Thus, organisations large and small have begun to re-evaluate their products, their services, even their corporate culture in an attempt to maintain competitiveness in today's global markets. At the same time, organisations in both the public and the private sector have launched initiatives to develop the methodologies and tools to support entrepreneurship and the management of innovation in business. Higher education establishments, business schools and consulting companies are developing appropriate methodologies and tools, while public authorities are designing and setting up education and training schemes aimed at disseminating best practice among businesses of all kinds.

Yet innovation takes many forms. In addition to traditional technological innovation, there is innovation through new business models, new ways of organising work, and innovation in design or marketing. Managing and exploiting to best effect all these different kinds of innovation represent a major challenge for businesses today.

7

Aleš Mihelič

National Governance and Interregional Cooperation—Key Issues and Challenges

Science and technological development are closely linked to the development of society. There are many factors that are influencing the governance of science, technology and innovation at regional, national, interregional and supranational level.

At the beginning, I would like to briefly describe the environment which is defining the development of support mechanisms and reactions of the governments at local, regional or national level. A comprehensive analysis was done by the OECD. Here I am summarizing the main conclusions from that study. Details and further information can be found in the original reference OECD study (OECD 2006 a,b). In the continuation I am exploring possible options for interregional cooperation. Then the success of the CORINNA INTERREG science and technology cooperation approach is examined from the national policy maker's point of view, and some hints for further development in the area of interregional and supranational R&D and innovation policy development are presented.

Key Influencing Factors

Several years of economic growth have influenced the investment in science, technology, and innovation. Although the pace of growth has varied across the main regions in the world, business investment has increased and consumer spending has grown overall, most notably in the United States. This has increased the demand for innovative products, processes, and services, and with it the demand for scientific and technical knowledge.

Prospects for further expansion of investment in science, technology, and innovation are bright, although a number of risks remain. In spite of the real economic growth, a number of concerns regarding trade imbalances, rising energy costs, and other factors could undermine growth prospects and affect future investment in science, technology and innovation.

The pace of recovery has been weakest in Europe, where only a few countries are on track to meet the R&D targets reflecting the improved economic conditions of the recent years. Recent rates of growth in R&D spending have been highest in the United States (4% a year between 2002 and 2004), followed by Japan (2.1% a year between 2000 and 2004) and the EU-25 (2.3% a year between 2000 and 2003). R&D intensity reached 3.13% of GDP in Japan, and 2.68% in the United States in 2004, compared to 1.79% in the EU-25 in 2006, where only a few countries are on track to meet their R&D targets of 3% of GDP. The lower R&D intensity in Europe relative to the United States and Japan is partly linked to cyclical conditions but is primarily due to structural factors. These include the make-up of Europe's business sector, in particular the small size of its information technology manufacturing and services sectors, as well as a business climate which in several EU countries does not yet adequately encourage private investment in research and innovation.

In Europe and the United States, recent gains were driven primarily by government expenditure; whereas in Japan and other Asia-Pacific nations, industry has been the main engine of growth. Government R&D expenditure rose from 0.71% to 0.83% of GDP in the United States and from 0.62% to 0.63% of GDP in the EU25. OECD wide industry R&D funding, in contrast, declined between 2000 and 2004 from 1.43% to 1.40% of GDP, with the steepest declines in Sweden (3.0% to 2.6% of GDP) and the United States (1.91% to 1.7% of GDP). In contrast, industry-financed R&D climbed from 2.17% to 2.34% of GDP in Japan and from 1.73% to 2.14% of GDP in Korea. Industry funding in the EU-25 as a percentage of GDP has remained relatively flat since 2000.

Business and governmental R&D expenditures are expected to grow in the future. Also more generous government tax incentives for R&D could further boost business R&D spending. Venture capital is also contributing. Benefiting from increased government funding, public-sector research has grown in importance, rising from 0.63% to 0.68% of GDP between 2000 and 2004 as countries aim to enhance knowledge creation. R&D in the service sector is gaining in relation to manufacturing from year to year. Now it comprises one quarter of total business R&D in the OECD, and more than one-third in Australia, Denmark, the United States, Canada, the Czech Republic, and Norway. Recent innovation surveys also indicate that the share of innovative firms in some service industries—financial intermediation and business services in particular—exceeds that of manufacturing.

Multinational enterprises are driving the globalisation of R&D, especially in Asia, where an ample supply of talent and growing markets offer new opportunities. Accompanying these shifts in financing and performance of R&D is the rapid globalisation of science, technology, and innovation. In most countries, the share of R&D performed by foreign affiliates has increased as multinational enterprises have acquired foreign firms and establish new R&D facilities outside their home country. In Hungary, Ireland, the Czech Republic, the United Kingdom, and Australia, this share exceeded 40%.

Recent policy initiatives aim to enhance the attractiveness of these countries to foreign and domestic investment by improving their domestic innovation capabilities. Policies to foster innovation have grown in importance.

Reform of universities and public research institutions remains a priority, but funding mechanisms and quality assurance are also increasingly important. Funding models are also evolving. Public support to business R&D is being streamlined and increasingly recognises the role of small firms in innovation. Innovation policies focus on collaboration and take on a more regional dimension.

In keeping with the growing interest in better links between science and industry, a number of countries have introduced or expanded public/private partnership programmes for innovation. Cooperation in international R&D is also increasingly supported due to more globalised value chains. Issues of human resources are taking on greater urgency on the policy agenda, as demand for human resources in science and technology has increased in all countries.

Workers in professional occupations related to S&T represent between 25% and 35% of total employment in the OECD countries, and growth in employment in these occupations continues to outpace overall employment growth. The number of researchers—an important subset of science and technology professionals—expanded from 2.3 million in 1990 to 3.6 million in 2002. Smaller economies such as Finland, New Zealand, Spain and Ireland have made the largest gains in employment of researchers, whereas demand has increased more slowly in Germany, Italy, and Central and East European countries. Overall employment of researchers is greater in Japan (10.3 researchers per 1000 labour force) and the United States (9.3 per 1000 labour force) than in the EU-25 (5.8 per 1000 labour force). Government incentives for business R&D also provide direct and indirect support for job creation in research-intensive occupations. In addition, some countries are reducing labour taxes to encourage firms to hire young PhDs. Furthermore, to enhance the attractiveness of research careers, several countries have increased the amount of stipends/fellowships for PhDs and post-doctoral researchers.

While globalisation of business R&D has long been associated with the customisation of products and services for local markets and the exploitation of knowledge generated in the home country, multinational companies' strategies appear to be changing. While the R&D intensity of foreign affiliates remains below that of domestic firms in most countries, there is greater interest in establishing research and development capabilities abroad. Firms increasingly set up foreign R&D facilities to tap into local sources of knowledge and pools of local expertise that they can exploit globally. Recent surveys suggest that location decisions are determined more by the quality and availability of skilled human resources than by costs.

Policy has yet to catch up with the globalisation of innovation. Most governments recognise that the best way to benefit from global innovation networks is to strengthen domestic innovation capabilities and develop local talent. At the same time, countries have put in place targeted policies to respond to specific challenges posed by globalisation. Several countries use R&D tax incentives to attract and retain foreign R&D investment, while others are helping firms to identify foreign partners or, as in the European Commission's Framework Programmes, foster international collaboration in research. Still others, such as Australia, offer fellowships to encourage greater international mobility of researchers, or, like Ireland, provide incentives to encourage expatriate researchers to return. As yet, few countries have determined how best to adapt national policy frameworks to a more global innovation system, but small, open economies such as Finland and Ireland appear to be leading the way.

Technology licensing markets are of growing importance. They improve the efficiency of innovation systems and are growing more quickly in the United States than in Europe or Asia. Well-functioning technology licensing markets are an increasingly important part of an effective innovation system as they represent important channels for diffusing inventions—and the knowledge embedded in them. Licensing is also increasing the efficiency of innovation processes by putting inventions in the hands of those best capable of commercialising them. High-technology sectors, including information technology, chemicals (including pharmaceuticals) and machinery account for the vast majority of all domestic and international transactions. Expansion of licensing markets is limited by a number of factors. Most notable is a lack of information about licensable technologies and potential licensing partners. While a number of private-sector intermediaries aim to fill this need, gaps remain, especially because expertise is limited and often sector-specific. In addition, considerable difficulties remain for estimating the value of patented inventions.

Continued international cooperation is also needed to improve evaluation practices and benchmarking. It is important to encourage wider and more in-depth exchanges between officials in charge of evaluation to share information on methodologies for conducting evaluations as well as for ensuring their impact on policy making. The ERA-Nets of the EU 7th Framework Programme are an excellent example.

Another important task is to improve practices and methodologies for assessing the impact of the introduced measures. By measuring the impact more regularly and by comparable indicators, the efficiency of public investments could also improve dramatically.

Interregional Cooperation—What are the Options?

The influencing factors explained in the previous chapter show that technology diffusion is not a uni-directional highway. It is rather a network of different channels, allowing different intensities of communication and cooperation.

The initiatives for technological diffusion and technological cooperation can be sector specific, regionally based, or directed toward the improvement of the innovation environment as such. The latter also include the introduction and use of tools for benchmarking and comparison (see Tab. 28).

Table 28: Options for Interregional Cooperation

	Type of the programme	Goal
Level 1: Improved adoption and implementation of specific technologies	• Technological • Institutional • Sectorial • Demonstrational	• Diffusion of specific technology to a wider group of users—collective research • Transfer of knowledge from public research institutions and university • Diffusion of technology in specific sector • Demonstration of practical use of technology
Level 2: Improved absorption capacity for new technologies in companies	• Technical assistance • Information networks	• Assistance for companies to identify their technological needs and proper solutions • Access to information about available knowledge and technologies
Level 3: Building of companies, own innovation capacity	• Support for R&D projects • Technology roadmap • Diagnostical tools • Benchmarking • University-industry cooperation	• Building of capacity for own technological development • Planning of future strategical technological investments • Support to companies for innovation driven leadership—organisational change • Transfer of best practices • Upgrading the company knowledge level

One can classify diffusion and cross-border science and technology cooperation also according to the main goals and concrete operative purposes:

- R&D offer- (knowledge-) driven,
- Demand-driven,
- Network-driven,
- Infrastructure-driven.

R&D offer- (knowledge-) driven science and technology cooperation is based on transfer and commercialisation of technologies and knowledge being generated mainly in the public sector in basic research, applied research or technology programmes. In the large majority of cases, the research that seeks commercialisation was partly supported by public funds. The main actors for this type of knowledge dissemination are universities, technology centres or public research- or technology agencies.

The demand-driven approach was very rare at governmental or regional level in the past. This approach was mainly used by individual companies in order to obtain missing knowledge and technologies. With the emergence of technology platforms,— national and European ones,— the demand driven approach becomes more important. The partners,(i.e., companies, research centres, and universities) in technology platforms identify the areas and research topics which are relevant for further growth of the companies and the future development of the technologies. Also technology and market niches could be clearly derived from the strategic research agendas of technology platforms. The results of the demand-driven approach should be technology specific enough so that the final users can implement them in their products, processes or services. Demand-driven programmes are also establishing mutual trust between the customers.

The third approach to technology diffusion is based on networking. EUREKA, ERA-Nets, pôles de compétitivité, technology districts, »bio regions« are the most well known examples of such an approach. In regions with many existing institutions and a wide range of public and private users and generators of knowledge and technologies, this kind of approach leads also to the development of intermediary institutions which help to facilitate the technology transfer. These institutions can have physical structure, but they could also be virtual ones, using modern information and communication technologies. A very good example of such an initiative is the information portal developed within the

CORINNA project. This portal enables the identification and cooperation of partners in the CORINNA region.

The fourth type of a strategy for diffusion of knowledge and technologies is the systematical creation of research infrastructures. The policy attention is here focussed not on individual companies or networks of companies, regions, or specific sectors, but rather on the technological infrastructure of national interest. Excellent examples are the national competence centres and public research institutes in Slovenia and the K-plus and K-ind Centres in Austria.

It is clear that governments and regions use all four models simultaneously. Only the specific emphases define the characteristics and competitiveness of the national innovation systems. The countries with more developed innovation systems tend to emphasise the last two diffusion approaches, while the countries and regions with a somewhat weaker technological base tend to use the direct support through offer- or demand-driven technology diffusion approaches.

The ease of communication which we are witnessing now, enables also wider cooperation. In this sense, the interregional approach is more and more important, since it enables specialisation, greater focussing and attaining critical mass. Companies are using this kind of cooperation to complement their own knowledge also with the knowledge and infrastructures of neighbouring or networked regions.

The Success Story of CORINNA's Interregional Science and Technology Cooperation Approach

Technology (by definition tangible—material technical assets and technical procedures—and intangible—know-how on methods of transformation of resources into economic benefits) is one of the factors with a fundamental impact on the business performance of commercial entities; and on the macro level it is one of the factors of economic growth. Currently, it is the most important factor for all countries, and is even restrictive for the most developed ones. A typical feature of less developed countries or regions is that they are using other factors not in an optimum manner, and for this reason they can achieve best business results and economic growth primarily through the better use of non-technological factors.

The pace of knowledge development is very fast. Knowledge generation and transfer are not limited within the borders of a state or a region. Scientists are aware of this fact already for a long time, but industry is only in recent years really discovering that there is also a global market for knowledge. Cross-border and interregional cooperation of companies and research institutions is therefore essential and very welcome.

The national technology policy defines the national aims in the area of technology and the means applied by the state to achieve them. The state is more directly responsible for technological development in the area of energy (rational use), environmental planning, defence, conservation of cultural and natural heritage, and in transport and communications. It bears somewhat less direct responsibility for technological development in independent commercial and other entities, aside from its interest arising from expectations that technological progress will bring new added value to the economy and revenues to the state. The national technology policy is, therefore, an element of the national development strategy and a part of the industrial or any other sectoral policy of the state. The same is true to some extent also for regions.

The regions and countries involved in the CORINNA project are at first glance relatively different in size, development, tradition, etc.. Yet when one studies innovation policy development, the goals of their policies and the expectations of companies that act on the global market, these regions seem to be relatively similar. Therefore, I would put as the main contribution of the INTERREG project CORINNA that it identified the players, strategies, and policies in the CORINNA member regions and countries. From the identified strategies and policy specifics, the strengths of the regions were identified, leading to the creation of a database that is presenting the main innovation players,— i.e., research institutions, technology centres and companies in the region. All this will lead to a further increase of R&D demand and to better cooperation in the future.

Future Perspectives

Experiences from the past show that in order to really increase interregional R&D cooperation, also a more active approach is needed. I see a lot of possibilities in organising common networking events, presentations of R&D results and achievements of regions, and brokerage events targeted to specific technologies or industrial sectors.

All this will allow better understanding and knowledge of each other, which is the first prerequisite for good cooperation. Cooperation will also allow better specialisation and rationalisation of efforts. The CORINNA region is small enough to stimulate and foster cooperation rather than competition and duplication of R&D efforts for already discovered research results.

As a small economy, Slovenia will have to substantially increase its global marketing in those niches where it achieves profitable competitiveness. This intention is making technological development a more pressing condition with regard to other production factors whose promotion, from the point of view of the state, is subject to industrial and general development policies. For this reason, the need for importing diverse technologies will be growing in the future.

For policy makers the future challenge will be the assessment of impacts of regional and national innovation policies, the comparison of results, and the development of stimulating policy measures, which will allow development of synergies and specific competitive advantages for networked innovation players.

8

Roberto Cosolini

Research and Innovation in Friuli-Venezia Giulia

1—Foreword

Friuli-Venezia Giulia, recently defined as »the Italian region of the future« by the magazine Foreign Direct Investment, is faced today with a series of challenges. This calls for a clear mission for a future where the region can be »the centre of the new Europe, promoting and integrating diversity, creating knowledge and innovation, enhancing the quality of life of its inhabitants and its visitors, ensuring new development and new enterprises.«

This mission, as outlined in the Strategic Plan 2005-2008[1], defines a direction for the future. A future that brings together the main challenges of our time in history, envisaged continuous development in science and technology, acceleration and globalisation, a progressive demographic transformation, and the need to adopt the logic of internationalisation.

Three crucial aspects emerge from this logic, characterising the vision of Friuli-Venezia Giulia and corresponding to economic development, social cohesion, and development sustainability. They can be summed up by a few key words:

- Creating a knowledge-based economy,
- Increasing competitiveness,
- Producing high-quality economic and social development.

[1] Pursuant to art. 13 of the Regulation on Regional Administration Organisation, approved with Reg. Pres. Decree no. 277/Pres of 10 September 2004, the Regional Strategic Plan, divided by Central Directorates, is drawn up according to the government programme and defines for the duration of the mandate the strategic guidelines and objectives and the general policy guidelines at regional administration level.

In order for the region to quickly become a more appealing territorial system offering a high quality of life in Central Europe, it is essential to take action in highly innovative, competitive areas, such as biotech/biomedical, ICT, and logistics, and thus promote the development of existing economic excellence.

Research and innovation represent one of the strategic levers that can boost the processes outlined above. Innovation, intended as a permanent process, as the ability to interpret change—involving the participation of policymakers, the business community, and the regional society—becomes technological, cultural, and political innovation at one and the same time.

While this paper will focus mainly on the issue of research and innovation for economic competitiveness, it is only fair to stress that the regional government regards innovation as pivotal in pursuing a balance between development and cohesion and between growth and sustainability, and therefore makes its presence felt in policy-making in the fields of employment, welfare, education, and the reform of public administration.

The connections among the various objectives indicated above and the strategic levers of research and innovation are being guided by a number of reference documents and particularly by the Lisbon Strategy, EU regional policy, the National Strategic Framework, and regional legislation on research and innovation. Their scope of application is supranational, national, and regional, respectively.

The description of regional policies on research and innovation below, following a short context analysis, will be carried out according to the main guidelines of the documents listed above.

2—Context Analysis: The Regional Economic and Production System and Demographic Trends

The region Friuli-Venezia Giulia can count on a number of assets that represent a marked strength for the development of innovation-oriented strategies.

Globalisation and the crumbling of barriers to the east as well as the mobility of people and information make for an easier dissemination of knowledge. The regions geopolitical lay-out is at the heart of a system of relations that paves the way for sustained development in the near future in terms of both territorial and institutional-organisational elements. Its lively entrepreneurial culture with leading companies characterized by a marked attitude toward innovation and sectoral drive, its highly competitive businesses with great potential for growth, the presence of a system of structures and competences for high-level research, cultural and linguistic pluralism, the high standard of living, all represent further elements that can promote the development of innovation-based strategies.

A few statistical figures indicate that the regional economic system is amongst the richest in Western Europe, with a slow-paced but constant growth in the production of wealth per capita: per capita GDP in Friuli-Venezia Giulia in 2005 amounted to € 23,060, as against a national GDP of € 20,980, corresponding to an annual increase of 1.52% compared to Italy's -0.04%.

In the territorial economic system of Friuli-Venezia Giulia, the tertiary sector contributes significantly to the creation of added value, in line with the national average and higher than average in the Italian North-East: 70.3% as against 65.1% in the North-East and 70.4% in Italy as a whole.

The industrial sector contributes 21.6%, compared to 25.4% in the North-East and 21.6% in Italy. In 2005, the GDP of the manufacturing sector of Friuli-Venezia Giulia increased by 1.7% across the region, whereas in Italy it recorded a decrease of 1.7% .

Friuli-Venezia Giulia counts approximately 100,000 active enterprises. More specifically, at December 31 2006, the figure reached 102,397, with a contained drop compared to the same date of 2005 of -0.1%, net of agricultural businesses in the past few years. The latter have experienced a reduction in number and an increase in the average size, while active enterprises have increased by 0.5%.

The largest increase was recorded in businesses in the fields of real estate, rentals, informatics, up by 4.0%. A 3.2% increase compared to December 31, 2005, was recorded by the enterprises operating in the fields of production and distribution of electric power, gas, and water. These represent 0.1% of all active enterprises. In 2006, the number of construction businesses grew by 2.6%, accounting for 14.9% of all active enterprises.

Commercial and repair businesses, the largest group of active enterprises (23.9%), have decreased compared to 2005 by 0.8%. Manufacturing businesses, representing 12.2% of all enterprises, recorded a drop of 1.4%. These figures indicate the persistence of the negative trend already detectable at the onset of the period under examination and are in line with the processes of sectoral restructuring, which lend to the elimination of less efficient businesses.

A break-down by legal entity indicates that corporations in the region amounted to 13.9% of all active businesses at the end of 2006. Partnerships accounted for 19.5% of the whole. Compared to 2005, 4.9% increase was recorded among the former, while one-man businesses, representing 64.9% of regional businesses, have decreased by 0.9%. These figures confirm that the trend of the regional entrepreneurial sector in the last few years is towards more structured forms and set-ups and away from family businesses.

In terms of size, the average regional business operating in the industrial and services sector[2] in 2005 employed[3] a staff of 3.8. This is above the national average but the sector, just like the rest of the country, is faced with serious difficulties as a result of EU enlargement, which has resulted in a general increase in production.

[2] Calculated according to information contained in the Statistical Archives of Active Business Enterprises (Archivio Statistico delle Imprese Attive—ASIA) of ISTAT. Not directly comparable to the figures indicated in the archives of the enterprises registered in the Registrar of the Chambers of Commerce, in that the two adopt different definitions of »active enterprises.«

[3] The last year for which ISTAT has made data available on the average size of Italian businesses.

The innovation index recorded in FVG, as calculated by the European Innovation Scoreboard, proves particularly interesting: in Friuli-Venezia Giulia it has reached 0.59% as against 0.36% in Italy and 0.58% in Germany.

In the field of technology, the technological balance of payments, indicating the technological demand and supply in Friuli-Venezia Giulia, recorded at the end of 2005 a credit balance of 25.44%, as against 10.9% for Italy as a whole.

In the field of R&D, a few indicators have emerged as most significant: 1) R&D operators, indicate the quality and quantity of investments in R&D and in specialised personnel; 2) incidence of public spending in R&D, indicating the incidence of funds devoted to R&D by the public sector; 3) the number of spin—offs created by universities. This allows for measurement of the connections between public research and private enterprises; 4) patent intensity, indicates the ability to turn R&D investments into industrial products and processes; 5) the number of business settlements in the regional technology parks, can be used to assess the use of facilities made available in technology parks for regional production activities.

As regards the indicator under item 1), a positive trend has set in and is growing, and proves higher than the national average. The ratio between the number of operators per 1000 inhabitants increased from 3.15 in 2002 to 3.49 in 2004, while the national average decreased from 2.87 in 2002 to 2.82 in 2004.

As regards the indicator under item 2), public expenditure on R&D by the public administration and the universities as a share of GDP remained substantially stable in the period 2002—2004, with only slight growth from 0.63% to 0.64%, as against a national average that is noticeably lower (0.57% in 2002, and 0.56% in 2004).

The number of spin-offs created by regional universities, represented by the indicator under item 3) was 6 in 2004 and 8 in 2005.

As regards the indicator under item 4), the number of patent applications submitted by residents compared to the overall population of residents increased in the region over the period 2003—2006, from 9.60 per 10,000 inhabitants to 10.19, somewhat lower than the national average for 2006, at 11.08.

As regards the indicator under item 5), the number of businesses that have settled in the parks has increased over the past few years. In 2005, 82 enterprises were present the in Area Science Park in Trieste, seven in the Technological Pole in Pordenone, eleven in the Luigi Danieli Park in Udine and 16 in Agemont in Amaro.

One more element to be taken into account in terms of innovation strategies to be adopted pertains to demographic trends. In a country characterised by both progressive ageing of the population and a renewed inclination to have children—thanks to the higher birth rate recorded in regions where immigrants are particularly numerous and where the balance of migration is positive—Friuli-Venezia Giulia is among the most attractive regions (7.8 ‰). A higher rate of attractiveness is recorded only for Emilia Romagna (10.4 ‰) and for the Province of Trento (8.4 ‰). Nevertheless, Friuli-Venezia Giulia remains one of the regions with the largest elderly population, with a consequent mortality rate higher than the national average (excluding the resident immigrant population) structurally characterised by a marked prevalence of younger age groups.

Data regarding the education level among the inhabitants of Friuli-Venezia Giulia in 2005 indicate that 9% of the population above 15 years of age hold a university degree, in line with the national average of 9.1%, while the percentage of inhabitants with a secondary school degree—34%—is higher than the national average of 31.9%. The level of youth participation (19-25 year) in university education compared to the overall population is higher than the national average. In 2005, the percentage of university graduates with respect to the youth population was 47.4% in the region, as against 42% in Italy; in 2004, the rate of university applications was 41.8% in the region as against 39.3% in Italy. The rate of computer literacy (calculated according to the number of families who own a PC, families who have Internet access, people who have accessed the Internet in the past three months) remained a few percentage points higher in the period 2002—2005 than the national average.

3—The Framework of Reference for Regional Research and Innovation Strategies: the Lisbon Strategy

The Lisbon strategy represents the framework for the identification of priorities in decision-making in the European Union and in individual member states. The Lisbon strategy's objective is for Europe to become »the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.«

The indicators—which allow periodic assessment of progress towards the achievement of the objectives—concern various thematic areas and cover innovation and research in terms of qualitative development of employment, the economic situation in terms of evaluation of the economic context, and employment in terms of increasing participation and employment opportunities. Based on a mid-term evaluation and on a comparison of the state of the art in Friuli-Venezia Giulia with respect to the other EU-27 and EU-15 countries, the national average, the Italian North-East, and the bordering areas of Carinthia and Slovenia, it appears that the region's per capita income, calculated in terms of purchasing power parity (PPP) standards at market price, was higher in 2004 than the EU-27 average and the national average. The regional employment landscape in 2005 shows a positive trend; employment rates continue to grow, remaining above the national average, with the exception of employment among 55-64 years-old.

As regards innovation, the region devotes 1.1% of its GDP to R&D, in line with the national average, and yet only one third of the objective for 2010. Private investment in R&D remains, nevertheless, rather limited, having reached only 42.6%, as against an Italian average of 47.3% and the EU-15 average of 64.5%, and compared to the 2010 objective of 66%. Significant progress was made in the field of permanent education, with an index of 6.6% of adults who show interest in training and education programmes, halfway to the 2010 objective.

With reference to employment, closely connected to innovation, recent regional figures indicate that the employment rate in 2006 was 64.8%, with projections for 2008 of 67.7% and 69.6% for 2010, almost on a par with the Lisbon objective. This is a significant result, given that regional employment has been going through a difficult period in the last few years. This result is in good part attributable to the growth of female employment, which has been supported by policies favouring equal opportunities, conciliation, affirmative action towards women, and thus dissemination and promotion of the principles of corporate responsibility. Special support actions for principles of good employment, one of the foundations of the Lisbon Charter, will be focussed on the pursuit of policies to stabilize temporary work relations. Over a period of two years, thanks to the initiatives undertaken by the Region, this has allowed 2,500 temporary workers to acquire a more stable and qualified employment status.

4—The Framework of Reference for Regional Research and Innovation Strategies: European Programmes

EU regional policies are aimed at promoting territorial competitiveness and cohesion. This is possible thanks to the adoption of tools such as regional programmes, national sector programmes, operational agreements among administrations at various government levels, and other instruments defined by special regulations.

The EU's regional policy revolves around the two key concepts of solidarity and cohesion and, as regards the programming period 2007-2013, is based on a strategy shared at national and regional level and on the integration of funds (ERDF, ESF, EAFRD, FAS), as well as on the ability of each territory to pursue the objective of the three C's: »Convergence«, »Competitiveness,« and »Cooperation.«

The Friuli-Venezia Giulia region currently benefits from the two objectives »Regional and Occupational Competitiveness« and »European Territorial Cooperation.« The former is funded by ERDF and ESF, the latter by ERDF.

In particular, with reference to the programme »Regional and Occupational Competitiveness«, one axis is devoted to innovation, research, technology transfer, and entrepreneurship. The aim of the axis is to implement the revised Lisbon strategy to »ensure a more stable and long-lasting growth and create new and better jobs.« Specifically, the region intends to establish a stable competitive advantage by supporting a reduction of development disparities and by intervening, not in »low-innovation sectors« but rather in »enterprises with low innovation skills,« so as to help them embrace new ideas and new methods in their products and business models. It thus appears crucial to support research and innovation as strategic levers in promoting the growth and competitiveness of the regional economic system. The expected impact on small and medium enterprises, from disseminating technological knowledge to intensifying research activities and promoting the growth of innovation, consists mainly in greater competitiveness and a consequent greater attractiveness of the local area. This objective is to be pursued by supporting the scientific and technological foundations of the entrepreneurial fabric, enhancing the level of knowledge of enterprises and strengthening technology transfer from research institutes to the production system, while fostering at the same time new research contexts that look promising, such as biotechnologies, nanotechnologies, information and communication technologies.

The region is also engaged in the promotion and the enhancement of the use of research, innovation and technology transfer stemming from the activity of research and technology transfer institutes. Support is provided to research projects with a marked impact on the regional production structure, and dissemination of research results is facilitated through specific forms of collaboration with enterprises.

Another objective consists in supporting the processes of transformation and/or strengthening of the production system, so as to contribute to the consolidation of the regional entrepreneurial fabric—which, as outlined in the foreword, comprises mostly micro-businesses, and family-run small and medium enterprises facing generational renewal. These receive help with management skills and strategic planning. The aim is to orientate entrepreneurial choices towards the adoption of new organisational solutions and the introduction of innovative production processes and products by developing managerial skills and a strategic vision. This favours the adoption of IT technologies and the application of research results carried out by the relevant technological bodies and institutions, either in subsequent pilot projects or within the companies themselves. This promotes an increase in factor productivity and enterprise growth, both in traditional regional economic sectors and in emerging ones.

Such policies also serve to strengthen the internationalisation of businesses, production diversification, growth and investment in innovation, and help promote business start-ups and spin-offs.

Under the programme »European Territorial Cooperation,« Friuli-Venezia Giulia has the opportunity to participate in eight programmes funded by Structural Funds in cross-border, transnational and interregional contexts (Regional Operative Programme Italy—Slovenia; ROP Italy—Austria; ROP IPA Adriatic Cross-border; ROP Alpine Space; ROP Central European Space; ROP South East European Space; ROP Mediterranean; ROP Interregional).

As regards the themes envisaged by »European Territorial Cooperation,« particular relevance is attached to innovation. In this context great interest lies in the creation of transnational platforms in fields of common interest among the partners for the development of research, development and innovation activities, dissemination of best practices, exchanges of experience and results, and improved cooperation between public and private actors. This is expected to result in the creation of a network at transnational level, the development of long-lasting methods and forms of collaboration in the field of R&D, application of innovation across various strategic sectors, and the creation of a »Knowledge Innovation Community« to promote cooperation among European technology institutes. Cross-border and transnational cooperation focusses on the field of innovation in health and welfare, where past experience has been excellent, with the aim of enhancing the competitiveness of highly innovative enterprises and the improvement of the health and welfare systems in Europe. Another desirable guideline would be the creation of locally based specialized centres that would produce over a period of three to five years new technologies, new technological products, new management and selection, creation and transfer methods for human resources coming from the regional territory and from other highly specialized areas, so as to effectively support the industrial development in the areas of interest.

5—The framework of reference for regional research and innovation strategies: the National Strategic Framework

It seems appropriate to point out that the framework of rules and instruments of the Italian regional policy was revised with the new programming period of EU funds 2007-2013, and is now based on a comprehensive medium-term strategy both in terms of EU StructuralFunds and national funds for under-used areas (Fondo per le Aree Sottoutilizzate—FAS).

The National Strategic Framework 2007-2013 (NSF), approved by the Inter-Ministerial Committee for Economic Planning (CIPE) in December 2006, contains the strategic guidelines for the overall regional development policy in Italy for the years to come, where, as outlined above, two funding channels converge: EU Structural Funds (SF) with the required national co-funding (Rotating Fund), and the resources of the »Fund for Under-used Areas« (FAS) to be added to the standard sources that provide funding for the development of the country as a whole.

The NSF strategy identifies four macro-objectives within which ten thematic priorities have been selected, among them also one specifically focussed on research and innovation, aimed at developing knowledge circuits. It places particular emphasis on the promotion, enhancement and dissemination of research and innovation for competitiveness and economic growth, and clearly identifies the objective of strengthening and promoting the whole field of research, cooperation networks between the research system and the business world, as well as the growth of scientific and technical skills and knowledge in the production system and institutions.

Table 29: Macro-Objectives and Thematic Priorities of the National Strategic Framework

Developing knowledge circuits
Improving and promoting human resources
Promoting, enhancing and disseminating research and innovation for competitiveness
Enhancing the quality of life, security and social inclusion across the territory
Energy and environment: sustainable and efficient use of resources for development
Social inclusion and services for the quality of life and territorial attractiveness
Strengthening production sectors, services, and competition
Promotion of human and cultural resources for development attractiveness
Networks and connections for mobility
Competitiveness of production and employment systems
Competitiveness and attractiveness of towns and urban systems
Internationalisation and modernisation
International opening and attraction of investment, consumption and resources
Governance, institutional capacity and competitive and effective markets

Based on this action plan programme, a comprehensive regional policy will be defined in a strategic-operational plan that will identify general and specific regional objectives, including those in the field of research and innovation.

The strategic documents will, therefore, provide a framework of reference for institutional programme agreements and for the consequent framework programmes. In this sense, the institutional programme agreement defines the conditions under which objectives of the regional policy programming in the context of institutional cooperation are to be obtained.

One significant institutional programme agreement was signed on May 9 2001 between the government and the region Friuli-Venezia Giulia—pursuant to article 2, par. 203, of Law 662/1996—to regulate the joint planning of public investments in the region, aimed, firstly, at reducing the social and economic gap among the under-used areas of the region and the rest of the country. This instrument, intended to promote the process of economic and territorial development, provided a framework within which to define the objectives and the areas of intervention for investment, among other things, the resources allocated to under-used areas as set out in L. 208/1998 pertaining to the Ministry for Economic Development, and allocated annually by CIPE.

The agreement signed in May 2001 identified those development actions to be undertaken in the regional territory that require joint state-region action. These are:

- Improving the transport and communication systems;
- Promoting natural and environmental resources;
- Promoting human, cultural, and historical resources;
- Developing local, industrial, and tertiary production systems;
- Improving the quality of towns, local institutions, collective life, and security.

To implement the agreement of May 2001, Friuli-Venezia Giulia drew up between March 2003 and July 2007 fifteen framework programme agreements that call for the participation of the region, the Ministry for Economic Development and the relevant public administrations, according to the fields of interventions envisaged by the various agreements.

Furthermore, a framework programme agreement (FPA) was signed for the field of research, followed by three integration acts. With the FPA on research, the parties have undertaken to strengthen the sectors/clusters offering scientific excellence and thus encourage the generation of critical mass in the regional research sector through the investment of public funds. This contributes to the socio-economic development of disadvantaged areas in the medium-long term and takes into account specific territorial characteristics. The support for activities of scientific and technology parks offers a means to consolidate research activities and serve society by providing a comprehensive strategy system. It acts as an instrument to promote specialisation, complementarity, dissemination of knowledge, and the integration of the worlds of research, business, and universities in the regional territory. The analysis of the project took into account the environmental context, as characterised by the co-existence of a few strengths and weaknesses of the regional system. These include the presence of leading companies with strong expertise; the presence of strategic crisis models; the tendency to isolation and delocalisation of the actors; favourable geopolitical and economic lay-out; the presence of under-exploited infrastructures; the existence of centres of excellence; a development strategy that is only partially defined; the presence of strategic and differentiated assets, such as research centres and advanced service enterprises, and, finally, an inadequate focus on market integration and development. The defined strategy as well as the focus on the environmental context have led the region to target fields of intervention such as molecular biomedicine, the naval/nautical sector, and timber/furniture.

In addition to the framework programme agreements in the field of research, agreements were reached with the state in areas of regional competence and interest that represent the government's commitment towards the region. In the field of innovation and research and development, the following seem particularly relevant:

Udine as the »town of innovation,« with the support of the Science Park of Udine and the consolidation of »InnovAction—Global Fair of Knowledge, Ideas and Innovation«;

Trieste as the »town of science and research,« through the consolidation of cooperation between the national Ministry of

Universities and Research and the Research Area—Sincrotrone and a commitment to support the candidacy to host the Thematic Expo of 2012;

Innovation and research projects in the centres of excellence of the regional system, such as the Oncological Centre in Aviano and the Burlo Garofolo Scientific Medical Care Institute in Trieste;

Projects to be implemented in the regional territory to promote the use of renewable energy sources, also through the creation of a centre of excellence in the field.

The Friuli-Venezia Giulia region is soon to complete the »Single Programming Act« (Documento Unico di Programmazione—DUP). This contains the strategic guidelines and the objectives to be pursued, using resources from the fund for under-used areas allocated for the period 2007-2013, as described within the comprehensive framework of resources devoted to the EU's cohesion policy.

Following the drawing up of the DUP, the Region will be called on to share its territorial development choices with the national government. This will be the object of the new institutional programme agreement and will likely envisage a continuation of the actions in favour of research and innovation already contained in the previous programming period.

6—The framework of Reference for Regional Research and Innovation Strategies: Regional Legislation

The regional strategies for research and innovation stem from Regional Law no. 26 of 10/11/2005 »General Regulation in the Field of Innovation, Research and Technological Development.« The overall objective consists in ensuring the qualitative social and economic development of the regional community through policies that support the development and promotion of research activities, the spreading of innovation, knowledge and competence transfer towards business enterprises, research and innovation centres, the welfare system, and public administration. Actions to be undertaken in the field of innovation were firstly defined by Regional Law 11/2003 »General Regulation in the Field of Innovation«, resulting from the awareness that innovation is strategic for the development and competitive growth of the regional system. The aim of this law was to ensure the social and economic development of the regional community by promoting a policy of innovation rooted in the processes of interaction among enterprises, research centres, universities, and civil society and to provide more active and effective connections among all actors interested in the transfer of knowledge. R.L. 11/2003 stemmed from the awareness of being at a starting, and not at an end point, and that the whole area of innovation is subject to rapid change.

For these reasons the regional administration decided in 2004 to carry out a detailed analysis of the status of the regional economy and its possible development with two separate studies:

The »Strategic Policy Paper on the Manufacturing Sector in the Region FVG,« the results of which were published in January 2004, and the Monitor Group Project.

The former led to the identification of traditional weaknesses in the competitiveness of small and medium enterprises (SMEs) in the region, as well as of the instruments of industrial policy required to strengthen the sector. In 2005, R.L. 4/2005 was approved to promote the competitive development of SMEs and can be seen as a first reaction to the main weaknesses identified in the study. Law 4/2005 envisages the introduction of innovation elements in the region's industrial policy by implementing medium-long term actions aimed at facing a number of problems of a structural nature in our economy. The law, which encompasses both small and medium enterprises as well as industrial districts and consortia for industrial development, identifies and promotes the network system already present in the region, since this is believed to be an undisputed source of competitive advantage. The aim is to overcome the traditional weaknesses of the SME's in the region, i.e., their inadequate size and capitalisation levels, a rather closed top management structure, inadequate management levels, lack of genuine internationalisation processes, and a tendency towards market protection. What is envisaged is a policy to fund the »purchase of intelligence« on the part of the companies: not through indiscriminate funding but by allocating funds based on strategic consultancy services that can help enterprises in setting up projects for their competitive development.

As regards the second study, Michael Porter's company Monitor Group was appointed to carry out an in-depth study of the competitive and innovation factors with the highest potential for the region. The Monitor Group study clearly highlighted that the competitive model in several traditional sectors was going through a period of crisis and that many enterprises required change—at times radical— of their internal structure and their traditional approach to the market. The competitive advantages identified included the presence of a skilled work force and the availability of research facilities across the regional territory.

The weaknesses identified were:

8 Limited interaction within the system, in particular with research institutes and universities.
8 An inadequate skilled workforce for the future.

The study suggested there was a need to:

- Provide funds and incentives for innovation;
- Guide and coordinate scientific research;
- Develop a connection between research centres and enterprises;
- Promote the dissemination of knowledge and innovation and the transfer of the culture of innovation to the economic and social fabric.

The studies indicated the need to promote a wider concept of innovation, including promotion events, activities, and initiatives that go well beyond those previously identified as technological innovation. Such a wide definition of innovation was translated into the aims and principles of the new Regional Law no. 26/2005, mentioned above.

The Regional Law on innovation, LR 26/05, by envisaging a number of actions, sets out to achieve important results in the field of innovation. Its goals are:

- To support enterprises and the services sectors of public concern in the regional community. The law envisages the promotion of a context that is favourable to innovation and the adoption of new technologies, and the targeted use of the instruments of the education system;
- To support the regional production system, by promoting participation in an international dimension open to the dissemination of technologies and knowledge;
- To support enterprises, universities, research centres, science parks, and the financial system by creating incentives for co-operation in the context of an integrated system comprising research, training, and innovation;
- To support development of human capital by promoting high levels of innovation as a strategic factor.

The main lines of action can be summed up as follows:

- Direct support through funding for research and innovation activities for the development of knowledge;
- Promotion of human capital;
- Promotion and dissemination of innovation.

Under the first line of action— direct support through funding for research and innovation activities for the development of knowledge—potential beneficiaries of funding include enterprises. In this case the demand for and supply of research and innovation will benefit from the direct funding of basic and applied research activities, technology transfer in favour of subjects operating in the regional territory in sectors where the region can boast of examples of excellence and critical mass and where the systemic impact of such activities is judged to be significant.

Specifically, the promotion of innovation in the industrial structures of the region is supported through subsidies to industrial enterprises, also in the form of consortia or associations, for applied or industrial research projects, and for activities in pre-competitive development aimed at creating or improving new products, production processes, and services, the implementation of new production methods, or company re-organisation.

In addition, other funds are available for industrial or applied research projects in technologically advanced production sectors that require a large or highly skilled workforce.

With a view to internationalisation, the region makes funds available also for the drawing up of feasibility studies and research projects submitted to the national government or the European Union, to benefit from the incentives that these institutions provide in the fields of research and development. Such projects can have a noticeable systemic impact on the regional industrial production.

Special attention is devoted to small and medium enterprises. The region envisages funds to be given to SME's—even SMEs in the form of consortia and associations—for applied research projects and activities for pre-competitive development. This is to promote product patenting and the acquisition of brands, patents, rights of use, licenses, know-how, non-patented technical knowledge, and innovation aimed at the production cycle or the products themselves.

Under the first line of action, potential beneficiaries also include operators in the field of innovation supply. The law envisages the provision of funds to those charged with the managing of science and technology parks, and the implementation of projects on innovation, research, technology transfer, and precompetitive development activities in cooperation with enterprises or other agents with a significant systemic impact on production, welfare, and public administration.

The law also promotes scientific research projects, and applied or industrial research having a marked systemic impact on production, welfare, and public administration and also promotes dissemination of research results through the allocation of funds to universities, public research bodies, and other eligible agents (consortia, associations, foundations).

Further actions to support the creation of innovation districts and networks complement the above forms of intervention.

The regional innovation network is intended to be an instrument for the development of cooperation and interaction between the world of research and the world of production. Through framework agreements it also serves to promote the transfer of innovative knowledge from research and technology transfer centres, via centres for innovation and universities, to the regional production system.

The creation of a special commission is envisaged, made up of representatives of regional universities, public research bodies, centres for research and technology transfer, and centres for innovation (mostly owned by the state), as well as of the chambers of commerce of each province.

The districts of innovation and high technologies are intended to develop the regional economic system through the strengthening of collaboration between research and enterprises and between the scientific and production system. The district must therefore represent an aggregation of different local subjects characterized by a considerable ability to develop research and development activities, innovation, and technology transfer, production and services with high technological content and marked systemic impact. This requires an effective system of inter-industrial relations that include the tertiary, financial, and public administration sector, the ability to attract, welcome, and create innovative enterprises, as well as to function as an incubator for a territorial innovation process of vast breadth.

The present Technological District of Molecular Biomedicine is the result of a memorandum of understanding between the Ministry for Universites and Research and the Region of Friuli-Venezia Giulia signed in October 2004. In the field of molecular biomedicine, Friuli-Venezia Giulia can boast of scientific structures with competences and human resources characterised by a high level of international excellence and high technological specialisation. The district is characterised by a scientific potential in the field of high-quality bio- and nano-technologies, the participation of private, industrial, and financial partners that allow the creation of new products and new enterprises in the district in the medium- to long-term.

The naval and nautical technological district is currently being defined. Its governance structure represents a concrete example of the promotion of a virtuous circle of the entrepreneurial type, created by the actors operating in the field, and is aimed at enhancing the ability of agents to develop inter-industrial relations and wider interests, even on a larger territorial dimension.

Under the second line of action, »promotion of human capital,« special attention is being devoted to the promotion of training, high specialisation, and the employment of human resources present in the sectors of production, welfare, and public administration. In this case, support is envisaged for the exploitation of knowledge through actions aimed at the promotion of the regional »mobility of talent,« both incoming and outgoing, through forms of interaction between enterprises and the research system, as well as through »enhancement« via specific training projects in innovation in order to develop the regional potential to the full,

Support is provided to the university system also by indirect actions to promote, on the one hand, the integration of regional universities and to improve their attractiveness at national and international level. The right to education represents an integral part of this strategy and is becoming more and more of a guarantee not only for the fulfilment of essential needs, but as an instrument necessary for the creation of a regional environment rich in student opportunities.

The regional university system includes the Universities of Trieste and Udine and the International School for Advanced Studies (SISSA) and is regarded as a competitive asset for the development of Friuli-Venezia Giulia. Several actions will be funded through the regional fund for the university system. When the system becomes fully operational, the initiatives granted priority in this sector are those that will see the participation of the three regional universities in terms of complementarity, specialisation of educational programmes, and international promotion of the regional university system. Priority will be given to the strengthening of the technology transfer structures and to didactic and research initiatives of economic relevance. Such measures will, however, need to be supported significantly through co-funding.

Nevertheless, it must be stressed that the region's actions in the field of education are far-reaching and aim at increasing the rate of knowledge of the community as a whole. This is designed to consolidate social cohesion, and to increase employment, development, integration, and investment opportunities for human capital, which are seen as being fundamental to enterprises in a new era of knowledge.

Actions relate generally to providing support to the system of advanced education (university, business schools, post-graduate courses defined in cooperation with the business sector), promoting the enrolment of youth in scientific-technological university courses, fostering permanent education for employed workers and lifelong learning for the entire active population, dissemination of ICT knowledge among the citizenry, promoting an entrepreneurial culture in schools and universities based on the conviction that an entrepreneurial spirit in youth is crucial to ensuring future continuity for businesses and the creation of new enterprises. In addition, new education »poles«, integrating schools, vocational centres, universities, research centres, and enterprises are to be set up to help coordinate education programmes in a few targeted sectors, such as marine economics, mechanics, ICT, and tourism.

Under the third line of action, »promotion and dissemination of innovation,« the region sets out to promote initiatives in favour of a culture of innovation through a range of support tools that require the participation of other institutional and private subjects or direct implementation. It also envisages the promotion of activities and results in the field of regional research and innovation, favouring a dialogue with others outside the regional territory. The most successful initiatives supported by the Region include:

• The Regional Innovation Award

The award, established in 2004, is and now in its fourth year. It represents an annual event aimed at celebrating enterprises, non-profit entities, and public administrations in the region based on innovations they have introduced in their development process. The award aims at identifying the best innovative products, processes, services, or methods (best practices) at regional level, offering them as success stories for emulation among public and private operators, and thus instil an attitude of dialogue and best practice (benchmarking).

On the whole, the innovation award aims at consolidating the belief among participants that through widespread innovative actions, Friuli-Venezia Giulia can count on its own future development.

Participation in the project truly offers a learning experience in enterprise excellence and innovative practice. Best practices of innovative actions are shared between the winners of the award and the other participants, while media coverage is ensured by the Region.

• FVG Innovation Project

This project is divided into two sections. The first consists of a conference circuit aimed at a large audience (students, young entrepreneurs, education system) while the second is aimed at businesses and consists in a number of workshops to create within an enterprise professional figures whose task is to constantly encourage a vocation towards innovation.

• InnovAction

InnovAction is one of the initiatives pursued and supported by the Region to create an ever closer bond between enterprises and the world of research, to promote and to disseminate innovation throughout the region. This »Fair of Knowledge, Idea and Innovation« has become an effective springboard for the spreading of a culture of knowledge and the innovation of products, processe and markets, aimed at providing new momentum to entrepreneurial competitiveness in an international context. Its exhibition space is made up of enterprises (from various European countries), research centres, universities, science and technology parks, and business incubators.

The fair is structured into three exhibition areas: the »Square of Knowledge,« allowing for knowledge sharing through workshops, seminars, discussion groups, and interactive laboratories; the »Square of Ideas,« where supply and demand of innovative ideas meet, where buyers, partners, or sponsors can find ideas that have not yet been translated into innovation, and the »Square of Innovation« where demand and supply of innovation meet, where new products, processes, and services already available on the market or in an advanced phase of prototyping are presented.

As this short analysis indicates, there is an effort under way to replace the traditional competitive factors that marked our development (production cost flexibility, low value of the Italian currency before the Euro). These are no longer viable with the ongoing rise of knowledge in its widest possible sense: new technologies, comprehensive business innovation, human capital, close integration between the research system and the entrepreneurial world.

GDP growth higher than the national average and that of several European countries as well as the increase in employment indicate that the path being jointly pursued by the regional government, enterprises, and the EU is bringing about positive results. These are constantly monitored and serve as a yardstick for future developments.

Part C

Regional Competencies and Issues

9

Eduard Sturm, Kristine Zumbusch

Regional Case Study Carinthia

A First Glance at the Region of Carinthia

Carinthia is the southernmost province of Austria, lying south of the main crest of the Alps and bordering Italy and Slovenia. Difficult access, a location peripheral to the Austrian and the European centres, a lack of large city centres, and structural disadvantages were important factors hampering the Carinthian development over past decades. Much improved access during the recent decades as well as the changed geopolitical scenery as a result of the EU enlargement have created new impetus and challenges for the region. Nowadays, the region of Carinthia is well positioned at the interface between the dynamic spaces of Northern Italy and Southern Germany, on the one hand, and South East Europe, on the other hand.

Figure 35: The Region of Carinthia [Kärnten, Koroška]

Area	9,536 km²
Population	559,404 (2001)
Eight Administrative Districts	Spittal a.d. Drau, Hermagor, Villach-Land, Villach-Stadt, Feldkirch, St. Veit a.d. Glan, Klagenfurt-Land, Klagenfurt-Stadt, Völkermarkt, Wolfsberg

Currently, Carinthia produces 6% of the Austrian GDP. In relation to its population this corresponds to 83% of the Austrian average and 95% of the EU-15 average. The Carinthian economy, mainly based on small and medium sized enterprises, seems to be on the way to successfully managing structural change. The growth rate of regional employment has been able to keep up with the national level in the last few years: decreasing employment in the more traditional sectors of the regional economy (textiles, leather, metal processing, construction) has largely been compensated for by expanding sectors with a greater intensity of human capital and technology. Nevertheless, no noticeable catching-up process with respect to the average Austrian GDP per capita has yet been observed.

At the same time, the low R&D rate stimulated an ambitious catching-up process in the previous decade. In 2004, the regional R&D rate was 2.1% of the regional GDP (the comparable figure for Austria as a whole was 2.2%), which is a significant rise from 1.1% in 1998. RTD expenditure is dominated by the business enterprise sector. It accounted for 89% of the total RTD performance in 2004 (Austria: 67%); also the increase in the R&D rate was largely due to this sector. The strength of the business enterprise sector is based on the strong position of the semi- conductor/electronics sector and especially of Infineon Technologies, Austria's second largest RTD company. Broadening the regional base of innovation and strengthening the regional R&D capacities, including public and private research, are the main issues of the regional RTDI policy.

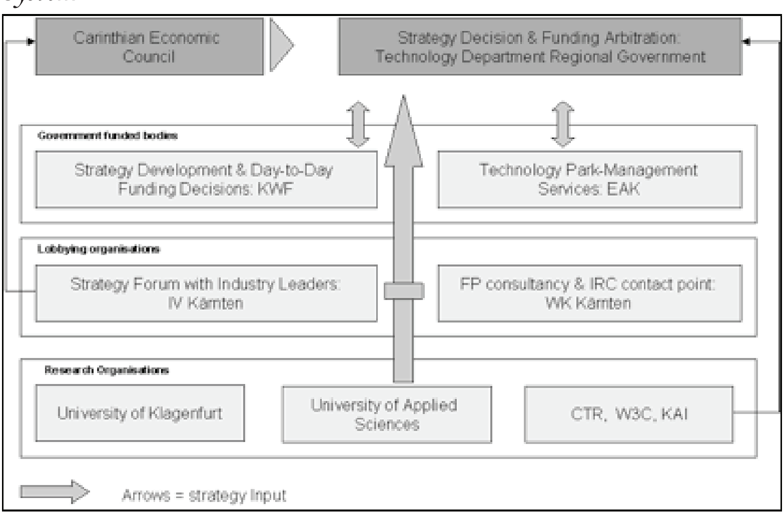
Regional RTDI Governance and Policies in Carinthia

Regional RTDI Governance

Due to the Austrian federal constitution, Austrian regions such as Carinthia enjoy considerable freedom in specific policy fields. However, for many years research and innovation policy has predominately been shaped at national level, especially by ministries, by the consultative Council for Research and Technology Development, by the Science Council, and by the three main funding agencies. It was only during the last decade that the Austrian regions, including Carinthia, began to become more actively involved in this policy area, and regionalisation of innovation policy is now taking place.

Due to the great diversity between the regions, coordination mechanisms between the national and the regional level are challenging, and a clear model of multilevel policy interaction is still missing. Yet basically coordination takes place on the basis of concrete programmes or projects whereby the national level seems to have taken a leading role over the last few years, both in terms of financial contribution as well as in setting the agenda (Jörg 2004).

Figure 36: The Institutional Setting of the Carinthian Innovation System



Within the Carinthian government, the governor himself is responsible for regional technology and innovation policy and is supported by the Government Office for Economy and Finance, by the consultative Carinthian Economic Council, and by the region's R&D-funding authority, the Carinthian Economic Promotion Fund (KWF). The KWF is the main agent responsible for executing the government's technology policy strategies. It devises appropriate funding guidelines and contributes substantially to the design of the regional RTDI policy by specific feedback mechanisms. Other institutions that shape regional R&D policy are (i) the Carinthian Development Agency (Entwicklungsagentur Kärnten/EAK), which manages the regional technology parks and offers networking and consulting services; (ii) the regional Federation of Industry (IV Kärnten), a lobbying organisation especially of Carinthia's larger firms, including some of Austria's largest R&D organisations; (iii) the regional Chamber of Commerce (WK Kärnten). Systematic as well as informal coordination between the different governance actors is assured.

In general, the process of setting innovation policy in Carinthia is top-down, but adjusted according to the inputs of lobbying organisations, key industrialists, and local politicians. While the top-down processes, often enriched by inputs from renowned experts, in principal allow room for visionary concepts and openness, implementation is dependent on securing support from strong stakeholders and on respecting specific local interests.

The Carinthian Economic Promotion Fund (KWF)

As the KWF is the only economic promotion institution of Carinthia able to grant funding, its role in regional RTDI policy is considerable. The principal goals of the KWF are to improve the innovation capabilities of small and medium sized enterprises, to support company and inter-company business development, and to promote high-tech projects. The annual funding budget of the KWF is about € 45 million, provided by the regional government and co-financed to a small extent by the EU. The budget includes about € 10 million in funding from a technology fund. Although the direct financial support of company R&D is open to all sectors, in practice a strong focus on electronics, mechanical engineering, and software has emerged, followed by funding for the chemical industry and the processing industries of wood and minerals. To a somewhat lesser extent, KWF funding goes into specialised research infrastructures such as regional competence centres. In the future, applied academic research in the region will increasingly receive funding. The intention is to build up a unique knowledge base as well as promote self-organising systems in specific fields.

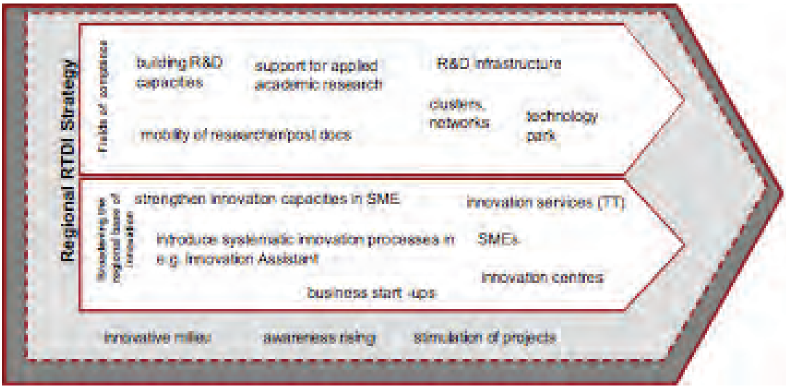
The Carinthian Development Agency (EAK)

The EAK—Centre for Innovation & Technology—is a development agency established by the Province of Carinthia. It has the multidisciplinary task of supporting and monitoring innovative, cooperative, and settlement projects initiated by companies in Carinthia. According to this mission statement, it is an intermediary partner for entrepreneurs, companies, and public institutions in the region. Core competencies of the EAK encompass the management of technology centres, consulting, one-stop-shop services for companies interested in foreign direct investment, and location marketing for Carinthia. Programme development and management is carried out in an autonomous fashion, although it has to be coordinated with the regional government officer for economics. The strategic orientation of the EAK has changed several times since 1999—initially showing a clear focus on pure technology park management, location management, and cluster development, there is nowadays a stronger service orientation for companies in general (IHS Kärnten 2006). Recently, resources for EAK were cut significantly by the regional government, and cluster- and network management has been abandoned.

Regional RTDI Policy Priorities and Strategies

The Carinthian RTDI scenery comprises many contrasts: On the one hand, the region's public R&D infrastructure is quite limited, yet on the other hand, Austria's second largest company in terms of R&D expenditures is to be found in the region. During the last few years, efforts were strengthened towards expanding public R&D infrastructure in the region. Some new (cooperative) institutions (CTR, W3C, KAI, Lakeside Labs) have been founded, but most of them are still very young, and their integration and contribution to the regional innovation system has to be proven yet. The initial positive impact of private R&D activities in Carinthia is also open to question, as private R&D efforts are mainly undertaken by only a few large companies. The small size of most Carinthian firms—also of those doing R&D—limits their capacity for strategic innovation projects and systematic innovation processes. Due to the relative smallness of the region, the fragmentation of the existing RTDI activities, on the one hand, and their limited scope, on the other hand, hamper the international visibility and development dynamics. With respect to these challenges, regional RTDI policy thus focusses first on the strengthening of the (public as well as private) RTDI capacities in Carinthia and on »designing« a regional innovation system. In terms of the regional programme for the EU Structural Funds period 2007- 2013 with its strong focus on technology and innovation, the strategic orientation of the Carinthian RTDI policy can be summarized as: developing specific fields of competence and broadening the regional base of innovation.

Figure 37: The Regional RTDI Strategy



The predominant strategy lies in the development of fields of competence in Carinthia. In these fields company, inter-company and joint measures combine to attain critical mass in specific domains. The question of specific higher education for these fields is also addressed. Regional R&D policy focusses on developing a technical faculty at the University of Klagenfurt and trying to leverage its impact with the on-campus Lakeside Science & Technology Park. Major fields of competence are the electronics sector, software and ICT, and the »sustainable technologies« sector (renewable energies, environmental technology, process technology). Above all, a connection is being sought between these different technologies and with further areas of technology (such as transport/logistics), as well as with approaches from the humanities and social sciences, thus producing a more integrated approach. As a complement to the fields of competence, regional fields of strength such as engineering plant construction and, wood processing and businesses with a strong orientation towards value creation, growth, exports, and the environment are all considered to be capable of development. Fields of competence are distinguished by fields of strength in their technological positioning and their stronger R&D potential in Carinthia, while fields of strength display high economic significance but lack important R&D assets in Carinthia.

The focussed efforts for specific regional fields of competence are to be complemented by a broader approach involving a strengthening of the regional base of innovation. This means that companies are to be actively won over to continuous and systematic innovation-, training-, and cooperation processes. Soft measures of training and consultancy will be actively targeted at companies with initial experience in innovation processes. In addition, broad offers of awareness building will address all regional companies so far lacking in significant innovation activities. This also requires a clear targeting of measures according to different types of companies. The core target group comprises the »threshold businesses« which are to be actively addressed and in the longer term will be linked to the development of systematic innovation, further training, and cooperation activities.

Major RTDI Related Programmes and Instruments in Carinthia

In Austria, programmes and instruments for RTDI policy are implemented both at federal and regional level. Coordination is primarily based on concrete programmes, with the federal government taking a leading role both in terms of financing and in setting the agenda. A wide range of programmes and instruments are implemented by organisations at federal level, such as FFG, AWS or FWF. Tab. 36 reveals the existence of a substantial number of instruments applied both at national and regional level. To some degree an overlap exists: In particular, initiatives concerning technology transfer, start-up loans, and measures for single-company RTD projects exist at both levels (see also ERA WATCH 2006a).

In Carinthia, regional RTDI related programmes and instruments are mainly provided by the KWF. In recent years, the KWF has introduced instruments aiming at the extension of public and semi-public R&D capacities, e.g., by co-financing competence centre programmes, sponsoring professorships at the University of Klagenfurt or by funding applied academic research at the recently launched Lakeside Labs. Thus, a shift towards public and collaborative R&D infrastructure support can increasingly be observed. Yet the main share of the region's RTDI budget is still given to subsidising single companies and their research and innovation activities.

Table 36: RTDI Instruments and Programmes

Area	Instruments at federal level	Instruments at regional level
Support of public R&D capacities	Financial support for scientific projects via FWF; K-programmes / COMET: building long-term cooperative research initiatives between public institutions and private companies; Thematic R&D programmes: fostering RTD projects between Austrian companies and research organisations in selected thematic priorities; FHplus: creating and enhancing RTD capacity at universities of applied sciences;	Temporary support of professorships at University of Klagenfurt; Co-financing of K-programmes / COMET; Lake Side Labs: financial support for applied academic research in specific fields of IT; R&D-infrastructure: Support for equipment and R&D laboratories.
Financial RTD measures for the private sector	FFG basic programme: bottom-up support for RTD projects carried out by industry; Thematic R&D programmes: see above.	R&D projects in enterprises: mainly co-financing of FFG basic programme within the limits of competition policy.
Technology and knowledge transfer	protec-2002-plus: Motivating SMEs to develop new products (mainly in collaborative projects); RegPlus: regional cooperation projects implemented by Impulse Centres.	Carinthian Technology Fund: support for initiatives of mutual interest of several companies, improving regional innovation system; Innovation Assistant: supporting labour costs and provision of a training programme for academically educated young researchers.

Promotion of creation and growth of innovative enterprises	AplusB: support for start-ups of scientists; Start-ups: Financial support for high-tech start-ups Seed-financing: pre-seed- and seed financing for start-ups.	Start-up Loan: Innovative financing for technology-oriented enterprises; Co-financing of AplusB-centre »build!«
Creation of an innovation- and entrepreneur-friendly environment	RegPlus: see above; protec: see above; CIR-CE: Integrating technology-oriented SMEs in cross-border networks	Establishing science, technology, and innovation parks, e.g., Technology Park Villach or Lake Side Park Klagenfurt Carinthian Technology Fund: see above, including the support for cluster building; Company and project development: financial support for counselling and training measures.

Regional R&D Competencies

As already outlined above, the public research infrastructure of Carinthia is quite limited. R&D expenditure for public research and private non-profit research was only 10% of the overall R&D expenditure in Carinthia in 2004. For many years, only the University of Klagenfurt undertook basic research activities in the region. The founding of the regional University of Applied Sciences and—most recently—the IT-focussed Faculty of Technical Sciences of the University of Klagenfurt has greatly enriched the innovation system. In the last few years, the institutional setting and the focus on applied research and innovation issues has become much more dynamic, mainly induced by a national funding programme for competence centres (see Tab. 36, RTDI instruments and programmes).

Overview of Major R&D Institutions in Carinthia

The regional University of Klagenfurt is the dominant public R&D institution within Carinthia. Founded in 1970, the main study programmes were established in the years 1973-78. Today, the university is organised in four faculties (Cultural Science; Economics, Business Administration and Informatics; Interdisciplinary Research and Continuing Education; Technical Sciences) with altogether about 40 departments and research groups. In 2005, the university employed around 60 full professors and around 270 other researchers. In the past, the lack of a technical faculty was long seen as problematic. Today, the Faculty of Technical Sciences (1000 students) with its focus on information technologies is particularly well-linked to the Lakeside Software & Technology Park at the southern end of the campus and has opened up important varieties of collaboration.

Besides the University of Klagenfurt, the Carinthia University of Applied Science (FH Kärnten) is the most important regional player in research and higher education. Its main focus is on engineering, business, health sciences, and socio-economics. Founded in 1995, it was changed into a non-profit private foundation at the beginning of 2002 and is mainly financed by the federal government, the province of Carinthia, and the towns where its different degree programmes are located. The Carinthia University of Applied Science actually hosts three study programmes in applied research: (i) civil engineering and architecture, (ii) healthcare, economics and social work, (iii) IT and electronics.

In addition to these two higher education institutions, Carinthian Tech Research (CTR) was founded in 1997 as a public research institute in Villach. It was the first »Competence Centre« within the national funding scheme of nationally/regionally co-financed contract research (K_plus). CTR's shareholders are the Federation of Carinthian Industry, the Carinthian Development Agency (EAK), the City of Villach, and the German Fraunhofer Society for Applied Research. As a partner for industry-oriented contract research and development, its activities focus on delivering innovative solutions to problems in automation and process- and quality control. So the main fields of research are: optical sensors and imaging, smart automation and simulation, and microsystem technology. CTR currently hosts a staff of 35 R&D engineers in electrical engineering/electronics, physics, mathematics, mechanical engineering, mechatronics and telematics.

The WOOD Carinthian Competence Centre (W3C), also founded under the Austrian competence centre programme K_plus, is a subsidiary of the national competence centre WOOD Comet and is committed to the basic principles of »sustainable development» and its application in technical innovations. In Carinthia, 22 scientists are doing research on natural fibres & knowledge based production, spectroscopic applications, surface technologies, and production and logistics.

The regional Competence Centre for Automotive and Industrial Electronics (KAI) was founded under the Austrian K_ind scheme that co-finances research in centers owned by consortia of businesses and universities, again using both national and regional funds. KAI links leading Carinthian companies with university institutes and other Austrian companies in the electronics and automotive sector. Its work focusses on issues in electronics relevant to partner companies. KAI employs 16 researchers in electronics, who cooperate closely with the technical universities of Vienna and Graz as well as with the universities of Leoben and Klagenfurt.

The youngest among Carinthia's research institutes are the Lakeside Labs at the University of Klagenfurt. They cover basic to applied research in IT the field of self-organising, networked systems.

Short Discussion of Regional Fields of Competence with Consideration of Public Technology-oriented R&D

As already mentioned, to date the following sectors show all the necessary characteristics for regional fields of competence: (i) electronics, (ii) software, information, and communication technologies, and (iii) environmental technologies (renewable energies, environmental engineering, process technology).

(i) Electronics is the most important sector of the Carinthian economy with high R&D activity in the enterprise sector, mainly driven by large multinational companies. Institutions in higher education (Carinthia University of Applied Sciences) and collaborative research organisations, e.g., the Carinthian Tech Research (CTR) or the Competence Centre for Automotive and Industrial Electronics (KAI), form a regional knowledge base.

(ii) In the IT and software sector, R&D and educational activities are performed at the University of Klagenfurt (with its recently founded technical faculty) and the Carinthia University of Applied Sciences. The Lakeside Science & Technology Park bridges the scientific and the private business sector, with the Lakeside Labs as hub for contract research.

(iii) Concerning technologies for sustainability, collaborative research is being undertaken at the WOOD Carinthian Competence Centre. Some regional companies active in renewable energy and environmental technologies are leaders even on a European scale, but R&D in the business sector is still very limited.

Leading Sectors and Enterprises in Carinthia

Significant concentration in the production sector are found in the field of electronics, mechanical engineering, food processing, metal production and processing, wood processing, and in materials and chemistry. Traditionally, especially the construction sector is of high importance in the region of Carinthia. Despite its high employment shares in mechanical engineering and electronics, the production sector in Carinthia is characterized by levels of human capital and technology orientation inferior to the Austrian average. Employment losses in the production sector, especially in its traditional branches, have been above average (2001-2005: Carinthia -2.4%, Austria -1.7%). By contrast, some sectoral branches, in particular technology-oriented ones such as chemistry (Carinthia +2.5%, Austria +0.5%) or electronics (Carinthia -0.5%, Austria -3.7%), have been able to show a more favourable development than the Austrian average. The regional employment share of the service sector is still beneath the Austrian figure (Carinthia 68.5%, Austria 70.3%). While tourism has traditionally played a significant role in the regional economy, the existence of corporate services (economic services) has still been below average. However, the last few years have shown stepwise structural change in the regional service sector as employment has risen above all in the field of corporate services.

Carinthian Leading Sectors and Their Main Enterprises in Terms of R&D

A strong technology segment has developed in electronics, where concentration tendencies around Villach, supported by cluster-oriented policy efforts, have created a certain critical mass. Other strong technology segments are to be found in the ICT and software sector around Klagenfurt. The future economic and innovation impact of this sector will depend crucially on its ability to develop contacts with other new fields of technology (transport/logistics). As mentioned above, mechanical engineering is also of great importance for the region and its innovation system. The share of employment in electronics and mechanical engineering is particularly important (higher than at national level), and regional development in these sectors is considerably more dynamic than at national level.

The electronic (semiconductor) sector is by far the most important sector for Carinthia in terms of R&D. In the year 2005, about 5,800 persons in the region were employed in this field. The sector is characterised by a strong contrast between a small number of very big enterprises, on the one hand, and a huge number of very small enterprises, on the other hand. Its R&D activities are clearly dominated by Infineon Technologies, Austria's second largest R&D company. The corporation's worldwide headquarters for automotive and industrial components is located in Villach, with more than 600 researchers working on all kinds of power semiconductors but also on chips for communication equipment. The importance of the electronic sector for Carinthia is further emphasized by some other larger companies active in R&D, such as Flextronics Althofen, Vishay BCComponents Austria, WILD Austria, AT&S Klagenfurt, SKM, CMS Electronics, and Micronas Villach.

Second in the region to the semiconductor/electronic sector in terms of R&D is the mechanical engineering sector, employing altogether about 4,500 persons. Figures for this sector have not changed significantly over the last few years; it appears to be characterized by an amazingly stable development. Mechanical engineering companies are relatively big compared to the Carinthian average but relatively small for mechanical engineering companies in Austria. Most of them are classified as medium sized companies. The sector's firms in the province manufacture a wide range of products. Most active in R&D are SEZ, a producer of spin-etchers (a unique piece of equipment for the semiconductor industry), and Philips DAP Klagenfurt, a development house for domestic appliances and personal care devices. Smaller companies of the sector doing significant R&D are Urbas, which focusses on small and medium sized biomass power plants, MAI International and Atlas Copco, producing plastering machines and tie back anchors, and Hirsch Servo, producing machinery for plastic packaging.

Carinthia's software sector, employing only about 1,000 persons, comes in third place in terms of R&D, with many companies focussing on business applications such as CRM and workflow systems. While significantly lagging behind the national average in terms of employment share (0.48% compared to 0.9%), regional employment in the sector has increased rapidly. Over the last years, and even after 2001, when other sectors faced severe problems, the regional software sector has enjoyed positive development.

The importance of the sector is thus mostly based on its dynamic and continuous growth over the last years, which has so far exceeded regional and national tendencies. Nearly all companies with a stronger presence in the province are SMEs, most of them are very small but expanding. Uniquare may be mentioned as Carinthia's strongest firms in software R&D, producing banking software; PCS is developing clinical software, and addIT, a Siemens affiliate, is offering infrastructure services, IT outsourcing and specific business solutions.

Other sectors of high economic importance for the region are (i) wood processing, (ii) chemistry and plastics, and (iii) energy and environment. Several other companies important for the regional economy are active in non-metallic mineral processing. Out of these sectors, the following six firms deserve particular mention as they show significant R&D activities: Rappold Winterthur is a producer of abrasives technology; FunderMax is one of Austria's leading firms in wood-composites; Heraklith (recently KNAUF) manufactures light weight construction materials from wood, magnesite, cement, flax, or mineral wool; Treibacher Industrie has a centur-long history of research in rare earths; Chemson is one of the world's leading providers of PVC and glass additives; GREENoneTEC/KIOTO is Europe's biggest producer of solar panel systems, and is continually expanding its expertise and R&D activities.

Regional Clusters in Carinthia

In Austria in general, cluster policy plays a prominent role in regional innovation policy. In Carinthia, too, network and cluster-building has long been a key issue for regional policy makers. It is not surprising that in Carinthia the first cluster initiative was formed in electronics. The »[micro]electronic cluster» (me2c), with approximately 60 members, is the only cluster which was set up by a bottom-up, industry-led initiative. Subsequently, the Network Wood Carinthia (Netzwerk Holz Kärnten) and networks for environmental technologies and plastics were founded. These networks were to a large extent stimulated top-down by cluster and network management by the regional development agency EAK.

The [micro]electronic cluster is an example of active cluster management, and has successfully expanded its ties to other regions in Austria, Slovenia, and Hungary. Unfortunately, overextension of activities led to financial problems, and the organisation had to be terminated. A continuance of the cluster initiative in a new organisational context is currently under way.

At the same time when me2c ran into troubles, top-down cluster- and network-development has been given up by the EAK. For the time being, the development of new clusters is not on its agenda. Only the wood sector has so far managed to reorganise its network. Thus in general, cluster policy has lost ground in Carinthia in recent years. There are still some bottom-up initiatives, such as a software and internet cluster driven by the chamber of commerce, but their focus is more on inter-industry than on science-industry relations. Consequently, there is a lack of intermediary organisations (cluster managements) that could act as anchors for collaborative project development and as a »portal« for both enterprises and innovation policy actors. As the region of Carinthia is quite small, and some of its neighbouring regions have several important and well developed cluster organisations, a future challenge will be to integrate regional companies and capacities into existing organisations and thus to form interregional or cross-border network relations.

Summary and Conclusions

Economic trends show that Carinthia has begun to successfully manage structural change. Sectors making intensive use of technology and human capital, such as (micro-)electronics or software and information technologies, have gained momentum, and regional efforts to strengthen research and development activities were supportive of structural change (see also ERA WATCH 2006a). The R&D ratio has increased at an amazing speed from 1.1% to

2.1% (GERD) within six years, but this growth tends conceal two issues: (i) a strong concentration of R&D activities in one sector (semiconductors/electronics) and in one multinational company (Infineon Technologies); (ii) low capacity of the public and non-profit private R&D sector. Thus, while its private sector is rather active in (mainly incremental) R&D, the regional economy still lacks basic research capacity. The new regional university of applied sciences, the technical faculty of the University of Klagenfurt, and the evolvement of cooperative research institutions such as CTR, W3C, KAI, and Lakeside Labs have all served to greatly enrich the regional technology-oriented R&D-scenery. Yet as already mentioned, most of these institutions are very young and their integration and contribution to the regional innovation system still has to be proven. Furthermore, the institutional setting remains fragile: The Faculty of Technical Sciences at the University of Klagenfurt is so far based on temporary, sponsored professorships, and also the cooperative research institutions are only financed temporarily. Thus, the existence of these institutions is not safeguarded in the long-run.

The shaping of regional innovation systems is a long-lasting and challenging process. Stability and continuity are crucial to success in the regional RTDI policy framework, as they enable regional actors to expand their knowledge base and RTDI capabilities. A crucial point for further technological and economic dynamic is whether the existing structures will be able to attract students, researchers, and new companies from outside Carinthia and to generate international visibility for R&D in Carinthia. A further challenge is to foster interregional cooperation with the neighbouring regions in Slovenia and Italy. It is precisely because Carinthia is a small region that such cooperation is needed. Otherwise, the lack of sufficient market size and areas of cooperation are severe hampering factors for developing international visibility and creating critical mass.

10

Marija Breitfuss

Regional Case Study Styria

Introduction

Figure 38: The Region of Styria

Name: Styria [Steiermark, Štajerska]

Area: 16,392 km²

Population: 1,183,303 (2001)

Administrative divisions: The state is divided into 16 districts (Bezirke [Bruck an der Mur, Deutschlandsberg, Feldbach, Fürstenfeld, Graz-Umgebung, Hartberg, Judenburg, Knittelfeld, Leibnitz, Leoben, Liezen with the subdistricts Gröbming and Bad Aussee, Mürzzuschlag, Murau, Radkersburg, Voitsberg, Weiz], and a Statutarstadt [Graz].

Source: Wikipedia

Characterisation of the Region

Styria is a dynamic region in the heart of Europe, bridging Middle, Southern and Eastern Europe. Small and medium sized companies are the backbone of its economy. Styria has a long tradition of heavy industry but has recently also become known for its successful cluster and networking policy. The automotive cluster ACstyria is a frequently imitated model of economic development. The main areas of economic interest are human technologies, nanotechnology, materials, environmental technologies, and the wood industry. Investment in research and development is another important pillar of regional development strategies. According to international rankings in R&D, Styria is one of the top 25 regions in Europe. The fostering of cooperation between science and business, mainly via competence centres, university spin-off programmes, and technology transfer centres, has largely contributed to this success (http://www.steiermark.at/cms/ziel/5046966/DE/).

Demographic and Economic Data

Styria (Steiermark), in the Southeast of Austria (see Fig. 38), is one of its nine federal state. With about 1.18 million inhabitants (1.1.2005), it is the fourth most populated province in the country. Some 30% of its citizens live in the capital Graz.

In 2002, regional GDP was EUR 27.6 billion, i.e., about 13% of Austrian GDP. Regional GDP per capita reached EUR 23,300, which is only 85% of the Austrian avarage value. Styria's average annual growth rate between 1998 and 2002 amounted to 2.8% p.a., which is in line with GDP growth in Austria. However, growth rates in Styria were more volatile: while the state reached an above-average growth rate in 1999 (5.0%) and 2001 (3.6%), growth slumped to a mere 0.6% in 2002 (Statistik Austria 2006). From a European perspective, Styria's regional GDP per capita is above the EU-25 average (index: 109 in 2003) but below the EU-15 value (88 in 2001, latest available year) (Eurostat 2006). Unemployment in Austria is relatively low by European standards: the unemployment rate of 4.9% in 2004 was well below both the EU-25 (9.2%) and the EU-15 (8.2%) rate. Styria is doing even better in this respect with a rate of only 3.7% (Eurostat 2006). Most employees (62.8%) work in the services sector, particularly in trade and business services, even though this sector is less prominent in Styria than in Austria as a whole (67.3%). On the other hand, industry (22.0%) and agriculture (6.1%) play a more important role than in the national economy (19.5% and 5.0%, respectively). High expenditure for R&D as a percentage of GDP (GERD) is a distinctive feature of Styria. With a GERD of 3.3% of GDP (2002), investment in R&D is clearly above the national

(2.1%), the EU-25 (1.9%) and the EU-15 (2.0%) level. In absolute terms the state achieved a GERD of € 907 million (2002), which accounts for 19% of Austrian GERD (Eurostat 2006).

Governance and Policies

Governmental Structure

Federal State of Styria

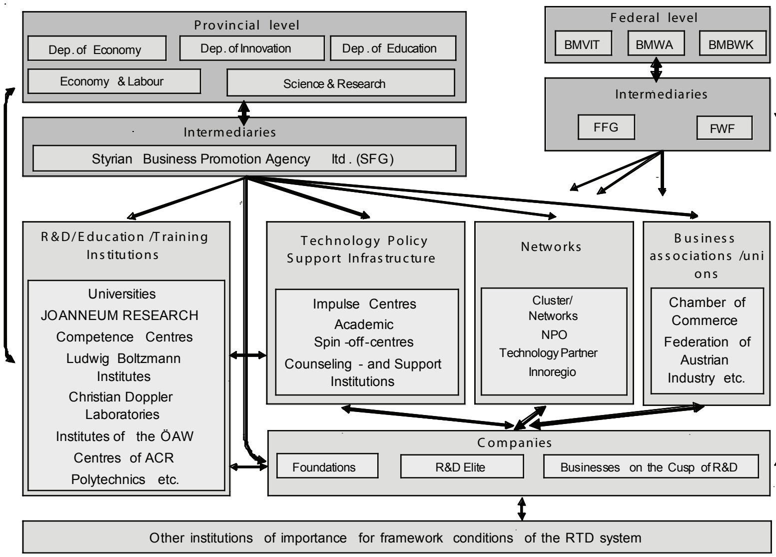
The main responsibility for the regional technology policy (agenda) (http://www.steiermark.at/) is borne by the provincial government and distributed among different authorities. Policy tasks cover the design and development of technology policy, strategic orientation and planning, overall decision making, evaluation of programmes, integration and coordination within the federal STI system, and lobbying for local R&D interests.

Fig. 39 shows the institutional map of the Styrian STI system; it differentiates between three levels: policy level, agency level, and performance level. Flow of funds (lines) and ownership are used to illustrate the basic interrelations between the players. The coordination of the federal R&D policy is done by an intergovernmental steering committee of the public bodies. In addition, the Ministry of Economics and Labour has recently established the »Platform Innovation« to provide relevant stakeholders at the policy level with a discussion forum for the development of new policy concepts and innovation strategies.

Styrian Research Council

The major objective of the Council is the strengthening and adjusting of Styria's position in the framework of the Lisbon Agenda and the Barcelona objective. Thus, the Council gives recommendations with regard to the design and prioritisation of the Styrian RTD policy.

Figure 39: Map of Key Institutions of the Styrian STI System



General Remarks on the Evolving Provincial STI System

Four groups of policy relevant institutions in the field of STI can be differentiated in Styria:

- R&D infrastructure with an active role during the process of technology development and/or training (e. g., universities, professional schools, JOANNEUM RESEARCH, competence centres);
- Institutions, which cover indirect technology promotion measures and support functions (Impulse Centers etc.);
- Institutions, which in the context of networking initiatives of companies also fulfil different technology policy tasks;
- Institutions, which have the responsibility for the formulation and implementation of regional technology policy (provincial government, ministries and departments, SFG, etc.)

At present, financial as well as infrastructural matters lie mainly in the realm of the provincial authorities. These include:

- Development and safeguarding of economic core branches by thematic coordination between basic and applied R&D, as well as between science and business;
- Orientation of regional STI policy to bundle and coordinate initiatives and resources in order to achieve structural transparency;
- Facilitating of thematic »tuning« of the regional STI system (e.g., technology and science infrastructure, such as education and training facilities, specific research institutions);
- Dealing with new issues;
- Dealing with questions relevant to overall society.

Regional RTDI Policy Priorities

The main documents for regional RTDI policy in Styria are a) the Research Strategy 2005 plus (Forschungsstrategie 2005 plus), b) the newly developed Technology Policy Concept (Technologiepolitisches Konzept Steiermark) from 2005, which is based on the Guidelines of Technology Policy (Technologiepolitische Leitlinien) from 1995, and c) the concept Regional Competitiveness for the EU Structural Funds Period 2007—2013 (Regionale Wettbewerbsfähigkeit für die EU-Strukturfonds-Periode 2007-2013).

The overall objective of the Research Strategy 2005 plus (Land Steiermark 2004) is to support a »knowledge-based growth path« in order to safeguard and foster growth and competitiveness. The strategy implies maintaining a lead over Austria in terms of R&D expenditure. In the context of the Barcelona target, this would mean a GERD of 3.5% of GDP by 2010. Moreover, Styria wants to establish itself as »the research location within the EU-14 Future Region», entailing close ties to neighbouring regions and their institutions.(Beginning in 2002, the EU Future Region initiative started to create transregional cooperation, including Styria, Burgenland, and Carinthia in Austria; Slovenia; Croatia; Veneto and Friuli-Venezia Giulia in Italy; Györ-Moson-Sopron, Vas, Zala, Somogy, Tolnaa and Baranya in Hungary.) Its profile is to be centred on Styria's engineering core competencies. A number of strong points have therefore been identified for support (materials research; automotive and machinery; human technology; ICT, media and electronics; energy technology; environmental technologies; building services, engineering and construction materials; nanotechnology; chemical and process engineering; computer simulation and mathematical modelling). In addition, measures to increase internationalisation, improve human capital, and broaden the regional business research base are envisaged. Four fields of action have emerged from these objectives:

- Strategic focus: Setting a strategic focus on scientific fields of strength in order to achieve a critical mass and international visibility;
- Governance: Strengthening coordination and self-regulation of the regional research system;
- Horizontal measures: Fostering the regional research base through a) internationalisation, b) support for the human capital base, c) assistance to regional firms in order to strengthen their positions as demanding customers, d) promotion of interface management between regional institutions;
- Accompanying measures: Improving the framework conditions for research, and supporting a 'research-friendly' attitude in other policies.

Similar objectives are stated in the Technology Policy Concept (Land Steiermark 2005b). It recommends the transition of Styria from a technology receiver to a technology provider. Therefore, it aims to position Styria (especially Upper Styria/Graz) as an innovation centre and to strengthen its leading position as a research location. In addition to the Research Strategy, it also includes strengthening Styria's position as a production location, especially in niche markets with low-volume, flexible, and demand-oriented products and system integration.

The Regional Competitiveness Concept (Land Steiermark, 2006b) is based on the Research Strategy 2005 plus and the Technology Policy Concept. It forms the basis for programme funding by the European Regional Development Fund (ERDF) for the period 2007—2013. The explicit objective of the concept is to strengthen competitiveness and thereby safeguard long-term growth and employment while taking account of the principles of sustainable development (Land Steiermark 2006b, p. 34).

RTDI Related Major Programmes and Instruments

Regional Programmes

The action programmes are offered by the economy promotion agency SFG and are customised business support- and finance packages for Styrian enterprises. In accordance with the four pillars of the work of SFG (skills development; regional and inter-regional networking; technology, innovation and research and development; and entrepreneurial spirit), these programmes are designed to accelerate the growth and development of Styrian enterprises. The focus is mainly on supporting R&D activities of SMEs, innovative start-ups, spin-offs, and technology transfer. The support schemes offered can roughly be divided into two strands of measures: (1) consulting services and (2) support of projects. The core R&D programmes are complemented by programmes aimed at skills development that strengthens the adaptability and adjustment of companies to structural change and »creative destruction«, and at infrastructural improvements in order to support entrepreneurship. Therefore, all programmes are designed to foster applied research in specific strengths of the Styrian economy and thereby attract more highly qualified employees, ultimately leading to an enhancement of industry structure.

Regional Instruments

The main regional policy instruments that have an impact on RTDI are effective in the following domains:

- Regional Structural Change: One of the most important instruments for the promotion of structural change (and entrepreneurship) is the establishment of 28 »Impulse Centers« (technology parks, incubators, innovation centres). These centres provide office space, advice, and training, and agglomeration advantages through co-location with firms from the same industry, etc.
- Internationalisation of regional firms: An Internationalisation Centre Styria has been established to foster the internationalisation of regional SMEs. The focus is on neighbouring Sout East European regions and on global markets.
- Entrepreneurship: The SFG started a qualification programme for entrepreneurs in 2003. In 2004, the provincial government initiated »gruenderland.st« (Entrepreneurial Province Styria), a programme that provides advice and training for potential entrepreneurs and promotes an entrepreneurial attitude in schools and universities.
- SMEs: To maximise the growth potential of regional SMEs by improving access to the capital market, the provincial government—via the SFG—offered assumptions of liability (max. € 60,000) and created the Styrian Technology and Growth Fund. Other aspects of the SME initiative are entrepreneurship programmes, an SME placement foundation for the training of unemployed people to meet the demands of SMEs, and financial support for professional training.
- Qualification of human resources: In addition to the above mentioned qualification programmes, there are several other programmes such as Qualification in Networks (specific training courses initiated by a network of firms—2005: € 0.3 million), Qualification of skilled personnel (funding of external

training—2005: € 3.1 million) and Triality 2006 (targets dual vocational training and offers additional inter-firm training—€ 2.4 million).

- Technology and innovation: In addition to the commissioning and implementation of the main strategic documents, the provincial government has agreed on the Styrian Employment and Growth Package 2005, a financial package worth € 55 million which aims to attract firms, promote the extension of regional firms (especially in the R&D domain), and encourage 28 cluster and network initiatives. It has also started a »Broadband Initiative«, supported by € 7 million to help improve broadband infrastructure. Furthermore, the TeleReg programme promotes ICT in Styrian companies. One of the objectives is to initiate clusters and networks using ICT by providing maximum funding of 50 % (with a cap of € 100,000) and for consultancy 25 % of the project costs. Another measure has been the participation in the national NANO Initiative.
- Tourism: SMEs in the tourism sector have access to the Tourism Promotion Fund, which allocates € 3.5 million (2005) to quality improvements, infrastructure and energy saving measures, etc. (Aumayr et al. 2006; Ploder et al 2004, 2005).

Overview of Major R&D Institutions

Intermediary Institutions—The Styrian Economy Promotion Agency (SFG)

At the beginning of the 90's, the Styrian Economy Promotion Agency (SFG, Steirische Wirtschaftsförderungsgesellschaft, http://www.sfg.at) was set up by the public authorities to serve as an intermediary policy institution. The realisation and implementation of the strategic defaults is mainly done by the SFG. The SFG covers the definite design and management of the programmes needed to meet the strategic targets of the government.

Funds and Agencies

Within Styria, there are several different funds promoting R&D. These funds have been developed in compliance with the federal ministries, the needs of privat management, the Future Fund Styria, and the SFG.

The agencies are closely linked to Styrian universities and the Centre for Applied Technology.

R&D Funds and Agencies in the Styrian region

- Future Fund Styria, (www.zukunftsfonds.steiermark.at)

  Target Group: Academic and non-academic research organisations, companies

- Styrian Economy Promotion Agency (SFG)

  Core Competencies: Skills development, regional and interregional networking; technology, innovation, research and development; entrepreneurial spirit

Transfer Institutions

Over the last few years, transfer institutions have been established over the last few years around the big Styrian universities to further promote the dialogue between research and business.

Transfer Institutions within Styria:

- Technology Transfer Department of the Research and Technology House of the Graz University of Technology
- Institute for External Affairs, University of Graz
- Institute for External Affairs, University of Leoben
- Centre for Applied Technology (ZAT)
- APS Graz
- Technology Transfer Centre Leoben (TTZ)
- Technology Partner Styria

R&D Performers

Both R&D- and training facilities have clearly been enlarged since the middle of the 90's and thus since the implementation of the first explicit technology policy in Styria. Compared to other Austrian provinces, Styria enjoys a strong knowledge base, both academic and applied. For example, Styria has (after Vienna) the second highest density in terms of universities. The recent establishment of two new universities of applied sciences adds to the existing intensity in university R&D choice.

University of Graz (Karl Franzens Universität Graz)

The University of Graz was founded in 1585. It has five faculties with 2,237 employees (including 1,269 academic staff) and 21,261 students (2004). The research landscape of the University of Graz (http://www.uni-graz.at) is dominated by biosciences, nanosciences, and the subject area of South East Europe. Various disciplines in the natural sciences participate in EU networks of excellence.

Medical University of Graz

When the Universities Act 2002 became effective in that year, the former Faculty of Medicine within the University of Graz became an autonomous unit, the Medical University of Graz (http://www.meduni-graz.at). The University has three faculties and 5,373 students. Right from the beginning, emphasis was laid on networking and cooperation (with the clinical and pre-clinical sector as well as with the University Hospital). At present, independent pursuit of respective objectives is being encouraged, but after a certain stage of development, interlinking of results in a phase of implementation is intended.

Graz University of Technology (Technische Universität Graz, TU Graz)

The synthesis of research and high level teaching represents a fundamental philosophy at Graz University of Technology (http://www.tugraz.at) and is maintained through all areas of basic and applied science and engineering. As one of the leading universities in central Europe, TU Graz with its seven faculties and 8,279 students (in 2004), is part of a worldwide network of cooperating universities, research institutions, and industrial partners.

University of Leoben (Montanuniversität Leoben, MUL)

The University of Leoben (http://www.unileoben.ac.at) is a technical university with a special focus on mining, metallurgy and materials. The university has 22 departments and approx. 2,500 students and is specialised in the fields of: plastics engineering, materials science, metallurgy, mining engineering, petroleum engineering, industrial environmental protection/disposal/recycling, etc.

FH Joanneum—University of Applied Sciences

With currently 19 highly specialized degree programmes and two postgraduate study programmes in the fields of business and technology, information engineering, mobility, media and design, public health and social services (http://www.fh-joanneum.at) is one of Austria's leading universities of applied sciences.

FH Campus 02 (Business University of Applied Science)

The underlying concept of Campus 02 (http://www.campus02.at/) focusses on the objective of representing a »centre of competence for entrepreneurial thinking.«

In 1996, the first two study courses in applied business started in Graz. Since then, the number has grown to four part-time study programmes (Automation Technology, IT and IT-Marketing, Innovation Management, and Accounting and Controlling) and two full-time programmes (Marketing, and Accounting and Controlling).

Public Research Institutes/ Private Research Institutions

Public and private research institutes are well developed in Styria. They promote a variety of research programmes and interests and thus play an important role in addition to that of the universities within the region.

Public/Private Research Institutes within the Styrian region

- JOANNEUM RESEARCH (http://www.joanneum.at) is a non-university, non-profit research organisation and is one of the largest Austrian research institutions. Owned by the federal province, it is active in the field of applied research and development for trade, industry, and administration.
- Austrian Foundry Research Institute (ÖGI) (http://www.ogi.at/) is a non-university research institution, offering high-quality services in R&D, technological consulting and material testing.
- Ludwig Boltzmann Society (http://www.ludwigboltzmann.at/) is one of the biggest and most important private agencies for research mainly in the field of science; it aims to give

qualified individuals opportunities to do research outside universities. Institutes located in Styria: Institute of Homeopathy, Institute of Medical Informatics and Neuroinformatics, Institute of Technical Self-Help, Institute of War-Consequences, Institute of Science Research.

- Christian Doppler Research Association (CDG, http://www.cdg.ac.at) is a non-profit organisation that aims at promoting development in the areas of natural sciences, technology and business as well as at economic implementation and utilisation. It enables talented scientists in renowned research centres to achieve high-quality research and knowledge transfer in line with the demands of the CDG member companies. 12 laboratories are located in Styria.
- Research Center Seibersdorf—branch office TTZ Leoben (http://www2.arcs.ac.at/S/STTZ, http://www.arcs.ac.at) is the largest application-oriented information enterprise in the country and an important player at regional level. Services offered at TTZ are: technology transfer, quality assurance ISO 9000, organisational development, consulting and environmental management according to EMAS and ISO 14000, product/process evaluation, patent information.
- Austrian Cooperative Research (ACR, http://www.acr.at) is an important platform for applied non-university research, development and innovation and assists mainly small and medium sized enterprises. In Styria, the Austrian Foundry Research Institute (ÖGI) in Leoben and the Centre for Electron Microscopy (ZFE) Graz belong to the ACR.
- AEE—Consortium of Renewable Energy is an independent association of five organisations with the purpose of promoting efficient use of energy and resources and the development of technologies and strategies that lead to quick and broad use of solar technology as a basis for an ecologically compatible energy supply for the future. One of the partner organisations is located in Gleisdorf, Styria.

Competence Centres

Competence centres are establishments and/or joint ventures with a proven track record in research and development in areas of technology where there is a demand and willingness to work together on the part of industry and the scientific community. Their purpose is to advance, develop, and transfer application-oriented technological knowledge.

After the closure of the 1st call of the COMET programme (which is the follow-up programme of the competence centres programmes K_plus and K_ind/K_net, and includes the centres of the types K2, K1, and K-Projects), Styria is participating in the following competence centres.

K2-Centres within the Styrian region and with Styrian participation

- K2-Mobility-SVT (Sustainable Vehicle Technologies)
- K2-Centre »MPPE–Integrated Research in Materials, Processing, and Product Engineering«

K1-Centres within the Styrian region and with Styrian participation

- K1-Centre ONCOTYROL (Centre for Personalized Cancer Medicine in Tirol)
- K1-Centre »Pharmaceutical Engineering (CCPE)«
- K1-Centre ABC&RENET
- K1-MET Competence Centre for Excellent Technologies in Advanced Metallurgical and Environmental Process Development
- K1-Centre evolaris–evolaris next level
- K1-KNOW-Centre

K-Projects within the Styrian region and with Styrian participation

- K-Project AAP–Advanced Audio Processing
- K-Project holz.bau–holz.bau forschungs gmbh
- K-Project MacroFun–BioEngeneering of Macromolecules
- K-Project »Multifunctional Plug & Play Facade«–MPPF

K_plus Centres within the Styrian region and with Styrian participation

- Kplus Polymer Competence Center Leoben GmbH (PCCL)

K_ind Centres within the Styrian region and with Styrian participation

- Large Engines Competence Center (LEC)

K_net Centres within the Styrian Region and with Styrian participation

- Softnet Austria Competence Network
- Waterpool Competence Network (coordinator: Joanneum Research)
- Aviation Technology (coordinator: Austrian Research Center Seibersdorf–not located in Styria, but involvement of MUL)

Regional RTDI Related Fields of Strength

»Fields of strength« are business sectors in which Styria has already established a solid basis but where still much potential remains to be developed. There are currently eight fields of strength in Styria, which are mirrored by SFG support schemes: automotive, wood, metal/materials, ecological technology, nanotechnology, human technology, IT, mechanical and plant engineering. Besides fostering entrepreneurship and innovative capacities of the regional economy, an important objective is the development of networks and clusters according to the research priorities of the Styrian STI system. For many years now, the main focus has therefore been on internationalisation, and enterprises as well as regions are being supported in their effort to position themselves on the international market.

Leading Sectors

Leading Sectors in the Region

The existing knowledge base strengthens the innovation potential of the Styrian economy. In particular, the industrial sector appears to be largely responsible for high economic growth since the second half of the 90's. The dynamism is mainly due to a few, rather traditional sectors. However, it should not be forgotten that this growth effect partially represents a delayed catching-up process, which now seems to have slowed down (Zakarias et al. 2003). Styria thus stands on the threshold of a new structural challenge, involving: a change towards new fields of technology and—as in Austria altogether—a role change from »technology taker» to »technology giver». This is considered a prerequisite for maintaining the growth dynamic. The structural change of the past was based mainly on existing knowledge. However, the future calls for the development of a much stronger knowledge base. Thus, greater recognition of the economic importance of the STI system and its location and innovation politics will be indispensable. As already mentioned, Styria occupies a particularly strong position in terms of the range of its technology, innovation, and R&D, both regarding the level (status) and the change (dynamic). This is confirmed by recent statistics. In some areas Styria is above the Austrian average.

The Province of Styria not only promotes business diversity but also concentrates on economic fields of strength. As was already mentioned. there are currently eight such fields in Styria, which are also supported through grants: automotive, wood, metal/materials, nanotechnology, IT, ecological technology, human technology, and mechanical and plant engineering.

Fields of Strength and Related Strategies of the Styrian Economy

- Automotive industries (ACstyria)

  Strategy: (i) Styria as center of excellence recognized worldwide in automotive development; (ii) desire to become first partner for development and production of drive systems, small series, niche product and individual solutions, (iii) Styria as an intellectual impact centre for questions of mobility and as an internationally established training centre for producer-independent training, (iv) creation of high profile for interdisciplinary problem solutions, the employment of the latest material technologies and a comprehensive total vehicle authority including for styling; (v) becoming a component of the automotive region South East Europe, within which a coordinating and prominent role is to be achieved.
- Wood/Paper (Holzcluster Steiermark)

  Strategy: (i) positioning of Styria as a high-tech area in wood processing by intensification of R&D activities in the forestry and timber sector, (ii) internationalisation and interregionalisation by, among other things, positioning Styria as a European region for wood in relation to adjacent countries, (iii) stabilisation of an internationally competitive economic structure in the wood industry by increasing the degree of entwinement, (iv) stabilisation of the entrepreneurial spirit, (v) guaranteeing future-oriented qualification structures in the forestry and timber sector, further emphasis on custom-made future-oriented training.

- Metal/Materials (Material Cluster)

  Strategy: Styria, in particular Upper Styria, should aim at evolving as an internationally recognized high-tech region for materials. Hence interdisciplinary processes should be strengthened, and active support for solutions in the automotive and aviation industry should be provided. Also, the attractiveness of the materials industry for a new generation of employees (engineers, skilled workers) is to be increased in order to secure growth potential; specific, targeted measures (with partners) in location management are to raise the attractiveness of Styria as an operating location (detailed positioning and strategies are still in development).
- Ecotechnology

  Strategy: Institutionalisation of the network Eco&Co in the context of cluster development is planned. The emphasis is being put on ecological construction and reorganisation as well as on associated advisory service achievements, renewable sources of energy, and economic conversion to such sources.
- Nanotechnology

  Strategy: The emphasis is on design and production of multifunctional surfaces on the basis of nano-structured layers in cooperation with the Austrian Nano Initiative (NANOCOAT) and on the implementation of the projects »Nano Health« and »Integrated Organic Sensor and Optoelectronics Technologies«. Further concrete need for action was identified in the intellectual capital report »NANONET Styria 2003«: A special education for graduate students (»Graduiertenkolleg«) is to ensure a new generation of researchers, and planning security is to be given by a »Master Plan Nanotech.« Establishment of a »one-stop shop« and further network development are also planned.

- Human technology

  Strategy: As part of the project development company human. technology styria GmbH, an extensive strategy development and positioning process is going on at the moment.

  Objectives cover: Establishment of Styria as a relevant location on an international level, increase of company formation and spin-offs, increase of company innovation strengths and competitive abilities in cooperation with the existing knowledge base, support of initiatives for the improvement of intellectual value added via knowledge creation and its economic utilisation.
- Information-/ Telecommunication Technologies/ Electronics (TIME)

  Strategy: The fields of telecommunications and information technology are very heterogeneous: Contents range from the design of microelectronic hardware components and satellite communications to coding technologies. This heterogeneity is also reflected in the networking activities. Strengths can be observed in the field of knowledge-based infrastructure (academic and non-academic research) although this is less true for the private sector. In the private sector, the focus lies on electronic devices. Companies are well linked internationally with a lot of ongoing R&D.
- Mechanical and plant engineering

  Strategy: Engineering and plant construction forms a traditional cross-sectional topic and represents a Styrian »core competence.« Training and research bases are present. The sector has been a driver of Styrian economic development, evidences a high R&D share and a high degree of human capital.
- Chemical and process engineering

  Strategy: The field of chemical engineering and process engineering was identified in the Styrian research strategy as a scientific field of strength with very good regional anchorage and intense interrelations. Cooperation between the individual institutions and company-based R&D already have a long tradition.

- Computer-based simulation and mathematical modelling

  Strategy: Computer simulation and mathematical modelling was also identified in the Styrian research strategy as an emerging scientific cross sectional subject, with greater scientific and industrial potential than that of chemical engineering and process engineering.

Clusters

The Federal State of Styria's Technology Policy Concept 1995, with its clear cluster-oriented promotional policy, formed the starting point for the broad implementation of regional cluster policy in Austria. Promotion is financed during the initial three year period. Where sufficient potential is identified, independent organisations under participation of the State of Styria are formed.

The cluster must thus aim to be financially independent over the long term. So far the ACstyria and the Wood Cluster Styria (http://www.holzcluster-steiermark.at) have been transferred into a self working group. In other clusters the institutionalisation process is still going on.

The main driving force behind the establishment of cluster policy was the need to cope with regional structural and economic change. The decision concerning which technologies should be the thematic centre of a cluster is in most cases based on scientific research and on the strengths of the regional economy. The existing clusters are developed on the basis of regional or local political initiatives (e.g., the Automotive Cluster was clearly a political decision for investment).

Clusters and networks are understood as being more or less close cooperations of enterprises operating in different sectors with the aim of grouping or complementing all value chain activities.

Clusters within the Styria region:

- Automobile Cluster Styria (number of companies ~186)
- Wood Cluster Styria (number of companies ~70)
- Materials Cluster
- human.technologie.styria (number of companies ~200)
- Eco & Co (number of companies ~600)
- NanoNet Styria

Leading Enterprises in the Region

The region's productive capacity is characterised by the presence of specialisation poles in traditional manufacturing sectors (machinery and equipment, iron and steel, car production and equipment, wood and paper), by the leading role being played by some firms on the international stage, and by a rapid increase in industrial expertise in high growth-rate sectors such as biomedicine, diagnostics, information technologies, microelectronics, and nanotechnologies. Some leading firms are:

- AVL List GmbH, Graz (powertrain engineering), web page: http://www.avl.com
- Andritz AG, Graz (machinery and equipment); web page: http://www.andritz.com
- EPCOS OHG, Deutschlandsberg (electronic components); web page: http://www.epcos.com
- Magna Steyr AG, Graz (car Industry, car equipment); web page: http://www.magnasteyr.com
- Austrian Energy & Environment AG, Raaba / Graz (environmental engineering), web page: http:// www.aee.co.at
- AT&S Austria Technologie & Systemtechnik AG, Leoben (electronics); web page: http://www.ats.net
- voestalpine Bahnsysteme GmbH, Leoben (rail systems); web page: http:// www.voestalpine.com/bahnsysteme

Summary and Conclusions

Assessment of the Regional Innovation System

In conclusion, Styria's RIS possesses a strong knowledge base. It hosts several (traditional) universities and RTOs and offers an active innovation elite in industry. In terms of R&D expenditure, Styria ranks among the top 15 European regions and achieves an above (Austrian) average number of patents. Due to its engineering tradition, scientific fields such as materials technology, mechanical and automotive engineering, and energy research are strong. In addition, a number of modern fields such as environmental research and technology, nanotechnology, IT, life sciences, and mathematical modelling have become recent strengths. In the mid-1990s, the regional government of Styria was the first provincial government in Austria to initiate a provincial technology policy. Ever since, RTDI has been high on the political agenda and several instruments (e.g., cluster policies) were implemented fairly early and successfully. The constant focus on RTDI has produced several coordinating organisations which try to enhance the governance of the regional RTDI system. That said, the influence of the provincial government on RTDI policies is fairly limited, and consequently the most important measures are implemented by the national government (sometimes in consultation with the provincial governments).

Challenges and Chances in the Near Future

As regards the objectives of the Lisbon Strategy, Styria had already achieved some of the major targets set for 2010 by 2002. For example, GERD was as high as 3.67% in 2002 and BERD accounted for two thirds of GERD. On the other hand, domestic business enterprises financed only 32% of all R&D expenditure. More business enterprise spending may be found in the 31% funding from foreign sources (excl. EU), but available statistics only provide aggregate figures for international organisations and businesses.

It has been shown that these achievements have only partly resulted in favourable economic activities (e.g., GDP per capita and productivity are still below the Austrian average). Hence, several challenges still need to be met to develop a sustainable regional knowledge economy.

The three most important challenges for Styria's knowledge economy are:

- to broaden the basis of innovative companies and tackle the innovation deficit among SMEs in particular;
- to increase the low number of business services (especially knowledge-intensive business services, whose absence might contribute to low innovativeness among SMEs);
- to overcome reliance on traditional sectors of medium technology, as this makes the regional economy vulnerable to price competition.

Policy-makers seem to be aware of the challenges and have designed several (more or less) well targeted instruments. Assessment of the effectiveness of these measures has been limited to a number of general remarks, since a detailed programme-outcome evaluation is beyond the scope of this project. Nor is it clear how effective some of these measures are, since their impact will only be revealed in the medium to long term.

As regards the way forward with respect to achieving the objectives of the Lisbon Strategy, Styria would seem to be well positioned. In fact, it has already achieved some of the objectives, and the main policy documents at regional level, namely the Research Strategy 2005 plus, the Technology Policy Concept, and the concept Regional Competitiveness for the EU Structural Funds Period 2007-2013, explicitly address most of the relevant issues.

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Johann Binder, Thomas Schneemann

Regional Case Study Burgenland

Introduction

Burgenland is located in the east of Austria. The area of Burgenland is 3,966 km² large, and it has a population of about 277,000 inhabitants. Agriculture plays a significant role: 49.8% of the area are used for agriculture and forestry; about 8,2% of the working population are active in this sector. Behind Lower Austria, Burgenland is the second largest wine-growing region of Austria and contains 36.1% of Austriaś overall wine-growing area with four major wine regions: Lake Neusiedl, Lake Neusiedl Hills, Central Burgenland, and the South.

Figure 40: Map Austria (Burgenland)

Since the beginning of the 1990s, Burgenland has become one of the fastest-growing regions in Austria. This development has been particularly dynamic since Austria became a member of the EU and Burgenland was acknowledged as an Objective 1 region, receiving dedicated funding resources for regional development. The establishment of technology centres with links to small and medium-scale enterprises of the region serves to strengthen Burgenland as an economic location. These centres also have driven innovation within the framework of the »Innovation Network Burgenland.«

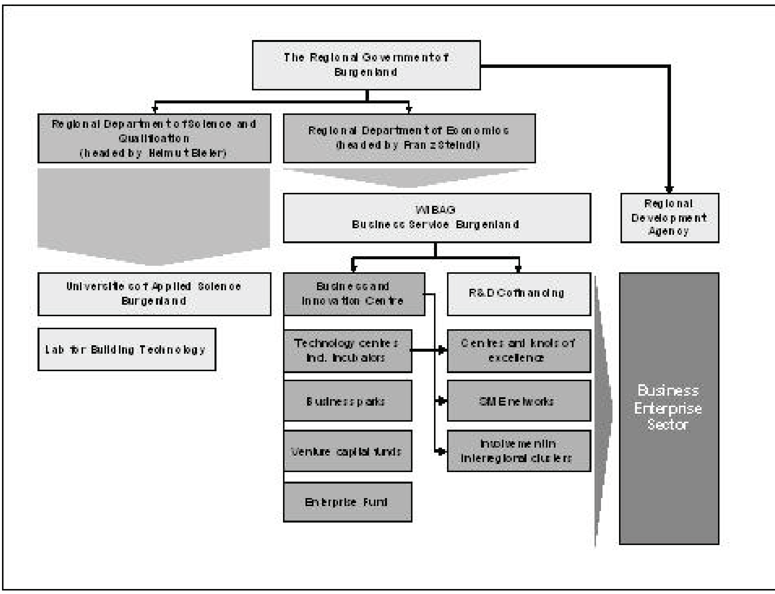
The establishment of technology centres in Burgenland has also provided a new basis for company settlement. Innovative and technology oriented companies have settled in the technology centres. This is leading to a change from a region dominated by agriculture and tourism towards a highly attractive region for research and key technologies, such as ICT or renewable energies.

Each of the six technology centres in Burgenland is dedicated to a special field, e.g., renewable energies, IT, etc. (http://www.tz-burgenland.at/).

The main areas of economic interest in Burgenland are renewable energies, electronics, information and communication technology, and business development in tourism and agriculture.

Regional Governance Structure & RTDI Policy Priorities

Figure 41: Institutional Framework of the Regional Innovation System within the Burgenland Region



Source: WIBAG, JR-InTeReg

Regional Government of Burgenland

Different sections of the local government are responsible for R&D activity. For agriculture, responsibility lies with the Department of Agriculture (Regional Minister (»Landesrat«) Nikolaus Berlakovich). The department of Minister Franz Steindl is responsible for economics and business. Responsibility for the university of applied science and other relevant higher education institutions lies with Minister Helmut Bieler. Governor (»Landeshauptmann«) Hans Niessl is the coordinator involved in planning and strategy development concerning R&D in general.

For the central coordination of all policies concerning RTDI, a technology representative of Burgenland was appointed in October 2006. In March 2007, the agency »Technology Promotion Burgenland« (TOB, Technologie Offensive Burgenland) was founded, which is headed by the technology representative. It is 100% owned by the WIBAG (see below). A major task of TOB is the creation and support of technology guidelines for Burgenland. The technology representative is also director of the Energy Agency of Burgenland and therefore also responsible for the development sustainable energy strategy, as renewable energy generation is seen to be a key technology for Burgenland.

Other agencies and organisations involved in the field of RTDI in Burgenland are:

- The Business Service Burgenland (WiBAG, http://www.wibag.at) in its present function was founded in 1994 and currently has 27 employees. It is 100% owned by the Province of Burgenland and is registered as a public limited company. WIBAG provides a tremendous impetus to local business. It is the central agency for the promotion of economic development, company relocation services, and investment management and has made an invaluable contribution to economic growth and employment in the region over the last ten years. The WiBAG's primary task is to promote the economic development of the province of Burgenland on a trust basis. WiBAG offers companies comprehensive expert information on special-purpose business grants and also helps them submit the necessary applications. It is the central agency for all investors and offers various services to companies already located in Burgenland and to Austrian and foreign companies interested in relocating there. The WiBAG is also responsible for developing and managing grants in the fields of sustainable, innovativ or technology-oriented businesses.

- BIC Burgenland—Business and Innovation Centre Burgenland GmbH was founded in 1998 and is also 100% owned by the WIBAG. BIC Burgenland is active in the participation and the support of national and international projects, the development of competence centres, and in the founding and the support of technology centres located in Burgenland.
- TIP—Patent Utilisation Ltd.—promotes the utilisation of patents developed in Burgenland. It also has an intermediary function between R&D institutions and companies in Burgenland. TIP is located in the technology centre of Eisenstadt.
- The FMB—Facility Management Burgenland Ltd. is the management company of the six technology centres of Burgenland. Its business areas cover facility management, marketing, renting, and expansion of the technology centres. The FMB is also owned by the WIBAG and was founded in 2002.

Major RTDI Programmes and Instruments

The core responsibility for international R&D cooperations/programmes lies in the hands of the WiBAG, the TOB, the Regional Government of Burgenland, the Regionalmanagement Burgenland GmbH and the University of Applied Sciences of Burgenland (UAS). The WiBAG may fund or co-finance regional and international R&D activities within the framework of the related measures of the Single Programming Document for Burgenland (SPD).

TOB and Regionalmanagement Burgenland support project proposals for regional and international R&D projects, but do not fund activities. The regional government provides co-financing for specific needs if these are of regional importance and are not covered by regional or national programmes. The UAS also participates in national or international R&D programmes.

Within the policy setting process of R&D and innovation activities, the main challenge is establishing and enlarging new or existing technology fields in the region in order to create additional business development. Business related R&D programmes are steered by the WiBAG, with co-financing programmes mostly involving in the SPD programme and related to the R&D state programmes. Programmes are evaluated periodically and if necessary, programme budgets are reallocated within the total SPD programme lines.

Usually a team consisting of members of the WiBAG, the UAS, the Chamber of Commerce and special key players in business are involved in policy making. Planning and management of company related programmes is organised by WiBAG. Concerning the UAS, the planning and management is done by the regional government.

The budget for the funding of the programmes usually stems from the regional government of Burgenland, the national budget contribution comes from the FFG, and the ERDF budget contributions from the EU.

The management of the R&D programmes for companies is done by the WIBAG. Other programmes are managed by relevant departments of the government of Burgenland. The intention is to foster leading economic branches in Burgenland, especially renewable energies, optoelectronics, new economy, environmental technologies, and biotechnology. The actions foreseen will be implemented within the funding period 2007—2013.

Regional R&D Competencies

Major R&D Institutions

The institutions described below are active in the field of R&D in Burgenland, and are involved in international R&D projects.

University of Applied Sciences Burgenland
(Fachhochschulstudiengänge Burgenland)

The University of Applied Sciences Burgenland (http://www.fh-burgenland.at/) started its R&D activities in 1994/1995. First, the research structures and facilities were established. A research laboratory was created in Pinkafeld and a project office for research management in Eisenstadt. This facilitated R&D activity related to students studies.

The institution concentrates on four research and education areas: (1) economics (with a focus on Middle- and East European countries), (2) information technology/-management, (2) energy-/environmental management, (4) health care.

In addition, there are three approved »structure development projects« of the national FHplus programme for fostering the R&D activities of Austrian universities of applied science:

- Knowledge and Management—overcoming barriers and realising synergies
- Development of infrastructure of the interface of space and health management in production processes
- International Competence Centre for Wine-Management (IKWM)

The number of approved student enrolments for the year 2004/2005 shows some of the potential of the different research and education areas:

- Economics (with a focus on Middle- and East European countries): 481
- Information Technology/-Management: 360
- Energy-/Environmental Management: 318
- Health Care: 94

European Centre for Renewable Energy (EEE)

The European Centre for Renewable Energy (http://www.eee-info.net) concentrates on consulting in relevant project management and energy concepts. Furthermore, the EEE is involved in many research- and development projects.

The favourable composition of the methane gas generated in the biomass power station in Güssing has led to much research interest. Research programmes concerning the synthesis of methane, the operation of a fuel cell, and the production of liquid fuels have already been started. A pan-European project with the participation of VW, Daimler Chrysler, Volvo, etc. deals with investigating the use of different alternative bio-fuels. The EEE is leader of a subproject for the assessment of the various technologies investigated.

Solar cooling is a further project of the EEE, with prototype equipment currently being optimised for the maturity phase. Cooperation between the operators and business and science representatives in the centre of excellence RENET Austria, Güssing, have made project extension possible.

Renewable Energy Network Austria (RENET GmbH)

The RENET GmbH Austria—Renewable Energy Network Austria is a network carrier for activities concerning renewable energy. Its objectives include:

- Research on the energetic use of biomass, to promote new technologies for the energetic use of biomass;
- Expanding the scope of related know-how in Austria with a view to promoting Austria's competitive position;
- Execution of research and development at pilot and demonstration units and solving the problems in standard usage.

Emphasis in the first two years is on the generation of power from biomass, in subsequent years it will be on further demonstration units, e.g., a biological gas facility.

The network includes REPOTEC Umwelttechnik GmbH, EVN AG, Güssinger Fernwärme GmbH, Jenbacher AG, and the Technical University Vienna (Institute for Technical Procedures, Environmental Technology, and Life Sciences).

The partners work on a set of plants operating in the energetic use of biomass. For RENET, these are key facilities in the generation of power and include:

- a demonstration unit for a biomass power station in Güssing, and
- a demonstration unit for a biomass block, combined heat and power station, in Wiener Neustadt.

The network is financed in compliance with the funding guidelines of the Competence Centre Programme for Industrial Centres and Networks (Kind/K_net) by the national Ministry of Economics and Labour (60% of funding) as well as by the federal provinces of Burgenland and Lower Austria. The remaining costs are financed by the business partners of the network.

RTDI Related Felds of Strength

Besides the companies and institutions involved in R&D activities, further strengths in RDTI related fields in the region of Burgenland include:

- Presence of a good technical infrastructure (e.g., telecommunications) for the development of technology oriented activities.
- The technology promotion initiative can be seen as a good starting point for further developments in future-oriented fields in the secondary sector and in the service sector (e.g., health tourism);
- In Northern Burgenland, relative strengths are concentrated

in the areas of electronics, control systems, materials, logistics, biotechnology and ICT (integrated communication technology);

- In Central Burgenland, the technology oriented sectors are concentrated in the field of environmental technology, and in Southern Burgenland strengths lie in the fields of energy, and environmental management, and optoelectronics.
- In Burgenland there are also education and research institutions (universities of applied sciences, schools for professional training) which are adapted to the respective regional structure.
- Also, the creation and the further development of clusters is an important factor.
- Another strength of Burgenland is the international reputation of some research- and education institutions (e.g., University of Applied Sciences Eisenstadt and Pinkafeld; Research Institute for Peace, Schlaining Castle; EEE—European Centre for Renewable Energy)

Key Enterprises

Table 31: Leading Companies within the Burgenland Region

Company	Sector	Website	Number of employees	Places
Unger Stahlbau GmbH	Planning and building of steel constructions	www.ungersteel.com	1200	17
BEWAG	Energy supplier	www.bewag.at	924	
Delphi Packard Austria GmbH	Automobile electrics and electronics	www.delphiauto.com	920	
HTP – Hich Tech Plastics	Producer of tools for injection moulding,	www.htp.at	800	6
Isosport GesmbH	Bond parts	www.isosport.com	520	
MARETO Kunststoffverarbeitung GmbH	Plastik working, manufactoring of tubes	www.mareto.at	460	
ACP – All Computer Products	IT	www.acp.at	400	
Hella Fahrzeugteile Austria GmbH	Automotive supplier industry	www.hella.at	270	
Neudörfler Möbelfabrik GmbH	Manufacturer of furniture	www.neudoerfler.com	377	
Kurbad Tatzmannsdorf AG	Health & wellness resorts	www.kuren.at	350	
SIMEA GmbH & Co KG	Manufacturing of electrical components	www.siemens.at/simea	340	
Nikitscher Metallwaren GmbH	Hot dip galvanising, powder coating, production of tools	www.nikitscher.at	300	
B.net Burgenland Telekom GmbH	Telecommunication, telephony, TV, internet	www.bnet.at	93	
Becom GmbH	Electronic & engineering manufacturing service	www.becom.at	270	
FELIX Austria GmbH	Food industy, Ketchup etc.	www.felix.at	220	
Nokia Austria GmbH	Telecommunication	www.nokia.at	80	
Swarco Futurit GmbH	Producer of traffic lights and illuminated road signs	www.futurled.com	190	
Lenzing Fibers GmbH	Fiber producer, cellulose fibers	www. lenzing.com	180	
Römerquelle GmbH	Producer of mineral water	www.roemerquelle.com	150	
eTel Austria AG	Telecommunication, telephony, internet	www.etel.at	80	
Tridonic atco GmbH & Co KG	Electrical components, LED's, light control systems	www.tridonicatco.com	55	
etaone energy gmbh	Decentralised energy systems, chp-plants, backup generators	www.etaone.com	125	5

Summary and Conclusions

In Burgenland, the responsibilities for R&D activities are not centrally directed. The core responsibilities for international R&D cooperations/programmes lies in the hands of the WiBAG, the TOB—Technology Promotion Burgenland Ltd., and the Regional Government of Burgenland, the Regionalmanagement Burgenland Ltd., and the University of Applied Sciences of Burgenland.

A technology representative of Burgenland was appointed in October 2006 for the central coordination of all interests concerning RTDI. The agency TOB, which is headed by the technology representative, was founded in March 2007. A major task of the TOB is the support of technology development in Burgenland. In 2007, the Energy Agency of Burgenland was re-established and made responsible for directing the energy strategy of Burgenland.

The following main R&D performers can be found in Burgenland:

- University of Applied Sciences Burgenland
- European Centre for Renewable Energy
- Renewable Energy Network Austria (RENET)

These organisations are active in the field of R&D in Burgenland and are involved in international R&D projects.

Short Subjective Assessment of the Regional Innovation System

The Objective 1 phasing out period from 2007 to 2013 provides a lot of resources for innovative measures and mainly offers possibilities for co-financing and additional project support. Also within the INTERREG IV programme and in the regional LEADER programme, innovative projects will be funded and strongly advertised, so that an increasing number of innovative projects and actions will certainly be implemented within the next years (period 2007-2013).

It is intended that the concentration on key technologies such as renewable and sustainable energy will generate sufficient critical mass and interregional awareness that Burgenland will be recognized as a competence region for special technologies. This should lead to additional economic growth as special target companies will find it more attractive to locate in Burgenland.

Increasing the scope of SMEs to invest in innovative projects remains a challenge. To this end a regional strategy is being prepared with a focus on »technology implementation« instead of »research and development.« This new strategic focus should help to engage more SMEs in the regional innovation process.

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Romina Kocina

Regional Case Study Friuli-Venezia Giulia

Introduction

Figure 42: Map of Friuli-Venezia Giulia

Name: Friuli-Venezia Giulia [Regione Autonoma Friuli-Venezia Giulia; Regjon autonome Friûl-Vignesie Julie, Avtonomna dežela Furlanija—Julijska krajina]

Area: 7,856 km²

Population: 1,191,588 (2003 est.)

Administrative divisions: Friuli-Venezia Giulia is divided into four provinces [Gorizia, Pordenone, Trieste, Udine] and 219 municipalities.

GDP per capita: 21.500 M €

Employment (total): 471.000 thereof 173.800 in the industrial sector

Regional GDP growth rate: 0,3 % (2002); 0,7 % (2004 est.)

Main sectors: Mechanical, Furniture, Shipbuilding, Metallurgical, Agrofood

Source: Wikipedia, tec-park.net

The Friuli-Venezia Giulia region is characterized by an excellent scientific structure, represented by national and international scientific research institutions, technology development- and high-level training organisations, and three universities. There is also a network of science parks, comprising AREA Science Park, the main multi-sector science parks of Trieste in Italy, and one of the most outstanding in Europe—Agemont, Polo Tecnologico of Pordenone, and the Science and Technology Park Luigi Danieli of Udine.

Friuli-Venezia Giulia is a border region, historically a meeting point between Eastern and Western Europe. Centuries of trading, by sea and land, and migrations of different peoples have created the conditions for the intermingling of different traditions and cultures. The cultural climate is therefore ideal for hosting and encouraging diverse activities based on intellectual curiosity and exchange. Research and development in Friuli-Venezia Giulia is a mainstay of economic activity. For an area of 7,856 km^3, with 1,191,588 inhabitants in 2003, the number of R&D institutions is proportionally much greater than in many other and larger regions.

As for the industrial structure, although large industries such as Zanussi, Danieli, and Fincantieri have an important role in the regional economy, SMEs form the greater part of the industrial picture in the region. Many SMEs are clustered in eight industrial districts, in particular in the traditional four with high levels of export: Maniago (cutlery production), San Daniele (ham production), Manzano (chair production), and Alto Livenza (furniture production). Each of the districts mentioned is an active promoter of innovation, and small high-tech enterprises are growing as providers of services for the more traditional sectors.

An important point: Friuli-Venezia Giulia has a leading position in Italy in terms of R&D investment per researcher working in the region. The R&D system is now faced with a new opportunity for planning and developing activity in the region through the Annual Regional Conference of Research Institutes.

Governance and Policies

The »Special Statute of Autonomy« of the Friuli-Venezia Giulia region distinguishes two executive components in regional government: the »President of the Region« and the »Regional Executive.«

The President of the Region is directly elected by the citizens by means of an electoral system which enables him to have a stable majority in the legislative body, the regional council.

The regional executive, which governs the region, is currently composed of ten members (regional ministers) chosen by the president of the region from members of the regional council. These may be politicians or experts in a particular sector. The regional executive performs its functions on the basis of the laws approved by the regional council and the administrative functions delegated to it by the central government.

The special statute of autonomy confers legislative powers in important areas to the regional government. While abiding by the Italian constitution and national law, Friuli-Venezia Giulia can promulgate its own laws in sectors such as the environment, health, industry, scientific research, culture, and housing.

The regional executive and the regional council together comprise the regional government of Friuli-Venezia Giulia. It has adopted many laws to support the needs of the industrial sector in the region and to supplement the national legislative and financial incentives in favour of the productive sectors. Most important with regard to R&D are the Regional Laws no. 12/2002, no. 4/2005 and no. 26/2005. With the Regional Law no. 26/2005, which replaces the previous Regional Law no. 11/2003, the regional gouvernment aims to promote innovation policy based on interactions between enterprises, research centres and universities in order to implement deep technology transfer between the actors involved.

A permanent council for innovation has been established by Regional Law no. 26/2005. Members include:

- the president of the region;
- the regional councillors;
- the rectors of the regional universities;
- the presidents of regional science and technology parks;
- the president of Friulia spa;
- the president of INSIEL spa;

- the president of the BIC Sviluppo Italia FVG spa;
- the Regional Ministry for Employment, Professional Training, University, and Scientific Research;
- the Regional Ministry for Agriculture, Forestry, Parks, Hunting, Fishing, and Mountain Area Development;
- a representative for private research bodies;
- three experts on innovation designed by the Regional Executive.

This new body serves to strengthen the focus of Friuli-Venezia Giulia on science, technology and innovation issues at the governance level.

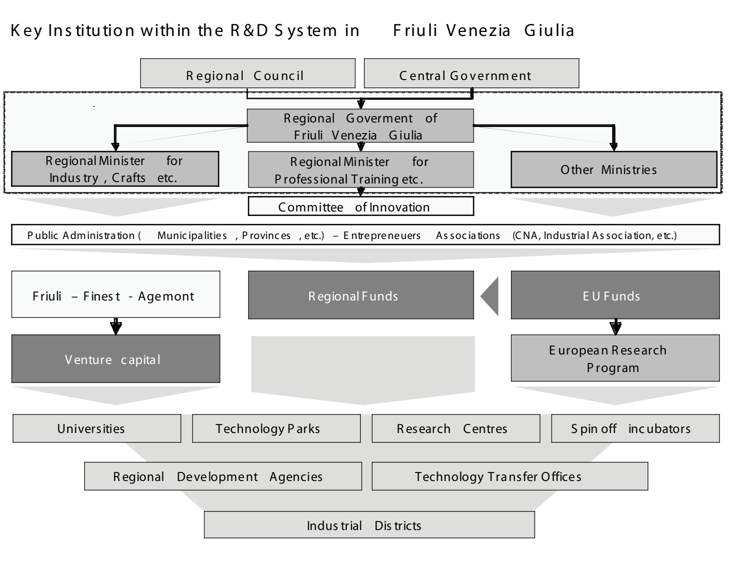
Regional Law no 4/2005 aims to promote the innovation capacities of SMEs, particularly for those with at least one location in Friuli-Venezia Giulia. It finances interventions in areas where SME traditionally are weak, and it introduces funding policy characterized by »competitive development projects« for the attainment of specific aims of development as articulated in a business plan.

Through Regional Law no. 26/2005, the regional government wants to promote the development of research activities and the experimental development and the innovation of processes and the organisation of service activities of small, medium, and large enterprises in the sector of crafts and of research and technology transfer centres. It foresees the financing of patenting processes for local products and the acquisition of brands, patents, and patent rights, licenses, and patented and non-patented know-how on innovation relating to production processes or products. This Law provides special concessions for the following activities:

- Research and training projects;
- Projects for the creation and transformation of research centres, scientific, and technology parks;
- Projects for setting up new economic initiatives;
- Technology transfer;
- Use of highly qualified research personnel.

Item VIII (»Interventions for Applied Research and Technological Innovation«) and Item IX (»Contributions for Acquiring Services«) in Regional Law no. 30/1984 (which finds application through the Regional Law no. 26/2005) are designed to fund activities regarding the execution of R&D projects and the launch, extension, and running of research laboratories promoted by industrial enterprises. They also cover activities to raise the level of technological innovation, the quality of products, and the productivity of small- and medium-sized industries through various means, including the creation and enhancement of IT systems.

Figure 43: Key Institutions for R&D in Friuli-Venezia Giulia



Source: Fiuli Innovazione, JR-InTeReg

R&D and innovation policy in Friuli-Venezia Giulia is closely connected to regional development strengths and weaknesses. There are strong competences in mechanics, shipbuilding, and telecommunications. A high concentration of research centres and universities, a high level of innovation activities and good technology transfer services to enterprises provide the preconditions for a vital R&D system. Centres of excellence in biotechnologies, GIS (geographic information systems), and nanotechnologies supplement the long scientific tradition in Friuli-Venezia Giulia. An advanced transport system guarantees close connections to the North and South of Europe with a lively exchange of goods and services, whereas the routes to the East and West are not yet satisfactorily developed. The regional administration enjoys sufficient autonomy for it to act in the economic and infrastructure fields. Still, there are some deficiencies that cannot be overlooked. Regional development is unbalanced. The industry is too heavily focussed on traditional sectors (such as wood and mechanics) and based on low added value productions. There is high investment but low employment. The technological development of the productive system is still low, and SMEs do not seem to be sufficiently market oriented. Hence, regional priorities for economic and industrial development can be stated as follows:

- International business development
- Raising industrial competitiveness
- Creation of an attractive environment for R&D and high-tech investments
- Activation of clusters of innovative enterprises and R&D organisations
- Establishment of recognisable districts.

Three main challenges have been identified in regional STI policy: (i) supporting interaction between research demand and supply; (ii) promoting and supporting competitive SME development; (iii) targeting funds for specific objectives/projects (e.g., promoting projects that support university/business partnerships).

As already mentioned above, there are two ministries involved in STI policy setting:

The Regional Ministry for Industrie, Crafts and Cooperation, Commerce, Tourism, and the Service Sector: Regional

Law no. 4/2005 enables interventions for the support and the competitive development of the SMEs in the region FVG. Through the constitution of a regional fund, the regional government provides incentives to SMEs in order to promote their capacity to innovate. Friulia spa, a holding company directly promoted by the Region, and ASDI, the Agency for the Development of the Industrial Districts, regulate start-up activities.

The Regional Ministry for Professional Training, Employment and the Professions: Its minister proposed the Regional Law no. 26/2005 for Innovation (a reformed version of the previous Regional Law no.11/2003 on Innovation). This reform is targeted at the reinforcement of the programming and implementation of a regional net for innovation and the constitution of an innovation district.

Regional R&D Competencies

Today the research and development system in the region is particularly rich and includes two universities, four science parks and many R&D institutions specialized in different sectors.

Universities

The University of Udine was founded in 1978 as part of the reconstruction plan of Friuli after the earthquake of 1976. Its aim was to provide the Friulan community with an independent centre for advanced training in cultural and scientific studies. The university currently has ten faculties: Agriculture, Economics, Engineering, Law, Foreign Languages, Education, Humanities, Medicine and Surgery, Veterinary Sciences, and Mathematical, Physical and Natural Sciences. The university is actively involved in student and staff exchange projects with the universities in the EU and is currently engaged in close collaboration with several universities from Eastern Europe and non-EU countries. Moreover, the university participates in many research projects at national and international level. The present number of students enrolled is approx. 17,000.

The University of Trieste is today one of the city's most important institutions by virtue of its role in both higher education and the development of scientific research. It has almost 27,000 students and employs 2,000 people, lecturers, researchers, contract teachers, and technical and administrative staff. The twelve faculties of the university, which celebrated its 80^{th} anniversary in 2004, represent its historical maturity and cover a wide range of disciplines in the humanities and sciences. In chronological order of foundation they are: Economics, Law, Engineering, Letters and Philosophy, Mathematical, Physical and Natural Sciences, Pedagogical Sciences, Medicine, Pharmacy, Political Science, the School of Modern Languages for Interpreters and Translators, Psychology, and Architecture. The 44 departments into which the university is further subdivided enjoy complete autonomy in the management of the pure and applied scientific research that they carry out.

Both universities have decentralised their teaching activities to Pordenone and Gorizia, and overall comprise a teaching body of almost 2,000 teachers, 22 faculties, approximately 130 degree courses, about 100 specialist degree courses, 60 specialisation schools, and more than 42,000 students.

The two universities' traditions in the sectors of science, engineering, and medicine have fostered the establishment of important scientific institutions and research centres. However, research activities of the University of Trieste often focus on industrial implications, as in nano-structured materials and environmentally heterogeneous catalysis.

Friuli Innovazione

The consortium Friuli Innovazione, Research and Technology Transfer Centre, was established by the University of Udine in 1999 in order to raise the efficiency of regional development. The consortium is a research hub which streamlines and fosters interactions between academic researchers and laboratories of the University of Udine as well as with practitioners from the business and service sectors of the Udine and Pordenone provinces.

The consortium provides a platform for enhancing and promoting technology transfer and the economic utilisation of scientific knowledge produced by universities and research centres, and employs innovative structures such as joint academia-industry laboratories, thematic incubators, competence centres, and certification laboratories. The Consortium also keeps the university abreast of innovation requirements in industry.

Currently, the consortium hosts the Research Centre for Process Pollution and Development (CRISP), which makes evaluation- and environmental studies for ISO 14001 certifications and EMAS registrations, and the Laboratory of Metallurgy and Technology of Surfaces and Advanced Materials..

In 2004, Friuli Innovazione was entrusted with the management of the Science and Technology Park of Udine »Luigi Danieli«, funded by the Regional Law on Innovation. The Park is located in the Industrial Zone of Udine, over a 30.000 sqm area, and the area is equipped for the settlement of research laboratories, mixed university-business laboratories, competence centres, industrial spin-offs, and start-ups. Within the Park, services for local SMEs are provided It also hosts a thematic incubator for research spin-off companies in information and communication technologies: Techno-Seed. Incubators offer assistance in business planning, seed and venture capital, and strategic infrastructure.

One of the most important research projects currently being developed at the science park is the grapevine genome sequence-ing project, which will definitely have considerable international impact. It stems from a fruitful alliance between renowned wine-growing and wine-producing enterprises in the Friuli region, and the plant biotechnology researchers of the University of Udine. Full sequencing is expected soon and the first commercially viable patents (in rooted vine cutting) are expected within three years.

Another important joint laboratory which capitalizes on the excellence of both the university and the economic sector is the laboratory for innovative metallurgy, surface technologies and advanced materials. Currently, it is developing three lines of research: characterisation and analysis; proof of durability; development processes.

In order to disseminate the culture of innovation and research among the many SMEs making up the finely grained texture of the local economy, the science and technology park provides the APRE-Udine help desk. APRE is the Agency for the Promotion of European Research, and provides information, assistance, and training with respect to research and technological innovation in EU programmes.

AREA Science Park

Since the opening of the first laboratories on the Carso Triestino in 1982, the AREA Science Park has established itself as one of the leading multi-sectoral science parks in Europe. Its main goal is to encourage the development of the surrounding region through the impetus of innovation and by exploiting the permanent link between research and the business world. AREA currently has over 1,500 persons working in its 70 companies, centres, and institutes. They are engaged in R&D, technology transfer, training, and specialised services. AREA houses some of the most internationally renowned R&D performers, such as the Synchrotron Light Laboratory ELETTRA, the International Centre for Genetic Engineering and Biotechnology, and the International Centre for Science and High Technology.

The park is managed by the AREA Science Park Consortium. Members of the consortium include the universities of Trieste and Udine, the National Research Council, and the leading local and national scientific institutions, as well as the Region Friuli-Venezia Giulia and the principal local authorities of the region. Within the park, the consortium is responsible for site planning, construction, equipping laboratories, plant installation, general services, and general promotion of AREA, including establishing links with external institutions and partners. It also offers help with advanced telematics, financial advice, marketing of technologies and innovation, and assistance regarding health and safety in the workplace. The consortium activities can be grouped as follows:

- Promotion of the development of the science park;
- Establishment of laboratories, research institutes and companies active in the sectors of high technologies and advanced services;
- Activities as business intermediary and support of cooperative and contract research;
- Promotion of clusters in the sectors of activity of the park with the goal of fostering synergies, sharing resources, and strengthening technologies offered;
- Development of new operational headquarters within the region;
- Exploitation of R&D activities;
- Exploitation of the economic and industrial spin-offs from research, including the creation of scientific and industrial partnerships for projects with international appeal;
- Improving the competitiveness of enterprises in the Friuli-Venezia Giulia region by providing services in technology transfer and dissemination of innovation;
- Assistance in the creation of new high-level knowledge enterprises and of spin-offs from research activities;

- Promotion and management of national and international R&D programmes and of exploitation of research;
- Advanced training for innovation of enterprises and public administrations with an orientation towards specialisation in technologies and management, and with extensive reliance on IT and telematics technologies.

Agemont

One further instrument for fostering and supporting the process of management and technological innovation is Agemont. This is an agency for the economic development of mountain regions and was established in 1989. In its function as a holding company, it can provide up to 49% of the capital of SMEs, become a financing member of cooperatives and their consortia, and provide guarantees for medium term financing.

Agemont was originally intended as a financial agency that could temporarily provide equity to companies and grant guarantees prior to mid- to long term financing; then it extended its operational activity to estate management, acquiring abandoned buildings that could be restructured and handed over to enterprises. Soon, structural support alone became insufficient and more comprehensive assistance was adopted.

With the support of the region, Agemont opened an Innovation Technology Centre in Amaro near Udine (its actual official site). This became an incubator for innovative companies that were offered an optimal environment to develop research. Actually, there are eleven high-tech enterprises in electronics, information technology, mechanics, and eye-wear industries. They can take advantage of the synergies created by their proximity to each other, of a network that links universities, research institute and other organisations, and of the availability of innovative laboratories such as electro-magnetic compatibility, rapid prototyping, etc.

Agemont is also in charge of a service centre created in 1996, intended to stimulate the local SME's to utilize advanced services in order to upgrade their ability to face the challenges of an extremely competitive environment.

CATAS

CATAS is a research & development institute with a laboratory for testing furniture and wood-based products. In the year of its foundation, 1969, CATAS set itself the aim of encouraging the technological development of Italian companies in the wood, furniture, furnishing, and related industries to become the technological point of reference for the growth and development of companies in the industry, and to contribute to improving the quality of products, offering innovative, mutually beneficial solutions. With its two operational bases in Friuli and Lombardy, CATAS is currently the foremost Italian research and development centre and testing laboratory for the wood and furniture industry.

Research Centres and Institutes

Consiglio Nazionale delle Ricerche—Istituto Talassografico »F. VERCELLI»: The Istituto Talassografico di Trieste (ITT) is one of the most ancient national institutions in the marine research field. It continues the activity of the Marine Observatory of Trieste, founded in 1841, as a section of the Imperial and Commercial Academy during the Austro-Hungarian Empire. Now, it is affiliated to the Consiglio Nazionale delle Ricerche (CNR).

ELETTRA—Synchrotrone Light Laboratory: ELETTRA is a multidisciplinary synchrotron light laboratory in the AREA Science Park, open to researchers in diverse basic and applied fields. The laboratory is equipped with ultra-bright light sources in the spectral range from UV- to X-rays and offers a stimulating and competitive environment to researchers from all over the world.

The International Centre for Genetic Engineering and Biotechnology (ICGEB): is an intergovernmental organisation conceived as a centre of excellence for research and training in genetic engineering and biotechnology with special regard to the needs of the developing world. The centre promotes international cooperation in developing and applying peaceful uses of genetic engineering and biotechnology in solving problems in developing countries. It also assists developing countries in strengthening their scientific and technological capabilities in the field of genetic engineering and biotechnology.

CISM, the International Centre for Mechanical Sciences, is a nonprofit organisation. It was founded in 1968 to favour the exchange and application of the most advanced knowledge in mechanical sciences in interdisciplinary fields such as robotics, biomechanics, environmental engineering, and other related fields (mathematics, information and system theory, operations research, computer science, artificial intelligence).

ICS (International Centre for Science and High Technology) operates under the aegis of UNIDO to promote sustainable industrial development through the transfer of know-how and technology.

Founded in 1964, the Abdus Salam International Centre for Theoretical Physics (ICTP) operates under a tripartite agreement between the Government of Italy and two UN agencies, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the International Atomic Energy Agency (IAEA). The centre is located on the coast of the Adriatic Sea about ten kilometres from the city of Trieste.

Burlo Garofolo was established in 1856 to ensure medical care for poor children. In 1968 the institute was renamed by the Ministry of Health as IRCCS. Since the late 70s, the institute has promoted, at both national and international level, innovative policies aimed at the reduction of hospital stays, appropriate use of technologies, and implementation of children‘s rights. The institute ensures clinical excellence in medical and surgical paediatric subspecialties, reproductive medicine, and perinatology it supports preclinical, clinical, and epidemiological research; and it promotes application of research findings to clinical and public health practice.

Centro Marconi Trieste: the radioelectric experimental centre Guglielmo Marconi acts as a juristic person with its head office in Rome at the University Roma—Tor Vergata, Faculty of Engineering.

Marine Biology Laboratory (LBM): Research activities mostly concern biological oceanography, marine bio-geochemistry and physical oceanography. It is also engaged in many services aiming to evaluate the environmental impact of human activity, especially in the marine environment.

The National Institute for Nuclear Physics (INFN): is the national institute in Italy that promotes, coordinates, and supports fundamental research (both experimental and theoretical) in nuclear, subnuclear, and astroparticle physics as well as in technological R&D and relevant instrumentation.

The National Institute of Oceanography and Applied Geophysics—OGS is a public research institute. OGS promotes, develops, and coordinates in cooperation with national and international institutions studies and research on the earth and its resources (biological oceanography, geophysics of the lithosphere, research centre for seismology, oceanography department, department for the development of marine technology and research).

TASC Laboratory of the National Institute for the Physics of Matter (INFM): The Laboratorio Tecnologie Avanzate e Nanoscienze (TASC) was established in 1984 at the AREA di Ricerca di Trieste. In 1988 it became the first National Laboratory of the

Interuniversity Consortium for the Physics of Matter (Consorzio Interuniversitario per la Fisica della Materia), now Istituto Nazionale per la Fisica della Materia (INFM).

Leading Sectors

Friuli-Venezia Giulia is one of the most developed regions of Northern Italy. Its economy is founded on small and medium-sized enterprises, on specialised farming and high quality tourism, and a significant inclination towards exports. The gross domestic product in Friuli-Venezia Giulia was € 26.7 billion in 2000 while in 2001 exports brought € 9.2 billion into the region, compared with imports in the same year to the value of € 4.8 billion.

The 1960s marked a turning point. Friuli-Venezia Giulia, together with Veneto and Trentino-Alto Adige, affirmed the »North-East model«, that is development based on a widespread mosaic of small- and medium-sized enterprises. Of particular note in this sense are the four traditional industrial districts in Friuli-Venezia Giulia, where enterprises specialised in a single area of production are locally concentrated: Manzano for chairs, Brugnera for furniture, Maniago for knives, and San Daniele del Friuli for cured ham. In recent years, the small- and medium-sized enterprises of Friuli-Venezia Giulia have strengthened their business relations and productive cooperation with neighbouring countries in Eastern Europe.

Alongside the small and medium-sized enterprises, in Friuli-Venezia Giulia there is a number of large enterprises in the industrial and service sectors whose products are known throughout Europe and the world: Snaidero and Zanussi-Electrolux in Pordenone, Fantoni and Danieli in Udine, Fincantieri in Trieste and Monfalcone (the world leader in the construction of large cruise ships) and Assicurazioni Generali in Trieste (one of the leading insurance companies in Europe and the world).

In Friuli-Venezia Giulia today, there are 10.5 researchers for every 1,000 inhabitants, compared with 3.3/1,000 nationally, 5.3/1,000 in the European Union, and 8.1/1,000 in the United States. These figures reflect a deep-rooted vocation throughout the entire region for study, research, and innovation, which began to take on international importance when in 1964 the International Centre for Theoretical Physics (ICTP) was established in Trieste.

Alongside the industrial sector, Friuli-Venezia Giulia has maintained a significant presence in the sectors of agriculture and animal husbandry, which specialise in the production of high-quality goods linked to regional traditions: wine, cured ham, chees and fruit. The wines of Friuli-Venezia Giulia, particularly the white wines, are especially prized and are exported throughout the world, offering an important contribution to regional exports.

One of the most important sectors of the regional economy is tourism. Friuli-Venezia Giulia is home to two well-known seaside resorts (Lignano and Grado), numerous mountain resorts for winter sports, and cities of particular historical and archaeological interest: Trieste, Aquileia, Cividale del Friuli. In 2001, Friuli-Venezia Giulia was visited by 9.5 million tourists, almost half of them coming from abroad, particularly from Germany, Austria, and other countries of Northern and Eastern Europe.

The regional authority of Friuli-Venezia Giulia has so far agreed to emphasise the following strategic areas of activity:

- Environment
- Research and Innovation
- Rural Development
- Telecommunications and Information Society
- Tourism and Culture
- Transport.

In Friuli-Venezia Giulia, industrial districts are important economic structures based on networks. An industrial district is a number of SMEs or industrial companies of the same sector which cooperate on a special topic (common marketing, common qualification, synergies) without the involvement of universities and research institutions.

All the important industrial districts in this region were generated top-down, have an institutionalised management or a common infrastructure, and follow specific objectives set by their strategy programmes. The biggest of them by size of company and employment are the chair district and the furniture district. As was already said, currently there are eight recognized industrial districts: the tradional ones for chairs, furniture, food, and knives, and the newly established districts of mechanics, coffee, digital technologie and thermo electro mechanics.

Leading Enterprises

The productive backbone of the region is largely made up of small- and medium-sized enterprises active in international economic relations, although there are a number of large companies operating in the production of capital goods (steel, industrial plants, machine tools) and consumer durables (household appliances, furniture, etc.).

The main relevant companies of the region are:

- Zanussi-Electrolux spa (world leader in electrical appliances)
- Snaidero spa (furnishings)
- Fantoni spa (furnishings)
- Fincantieri spa (world leader in the construction of large cruise ships)
- Danieli spa (iron metallurgy)
- Telit Mobile Terminals spa (phones)
- Illycaffè spa (coffee)
- Assicurazioni Generali di Trieste (insurance company)

Table 32: Important Companies in Friuli-Venezia Giulia

Company	Sector	Product services	employees	www
Electrolux—Zanussi SpA, Porcia (PN)	Mechanical	Household appliances	13,500	http://www.zanussi.it/
Snaidero SpA (Group), Majano (UD)	Furniture	Kitchen furniture	1,921	http://www.snaidero.it/html/homflash.html
Fincantieri—Cantieri Navali Italiani S.p.A., Trieste (headquarter) / Monfalcone (GO)	Shipbuilding	Ships building (cruise, transport, military ships)	9,700	http://www.fincantieri.it/
Fantoni spa	Furniture			
Danieli Group SpA, Buttrio (UD)—Headquarters	Metallurgical	Design and manufactures of machinery and plants for the steel industry	3,000	http://www.danieli.com/home.html
Illy Caffè SpA, Trieste (Headquarter)	Agro food	Coffee	500	http://www.illy.com
Telit Mobile Terminals Spa	Telecommunication	Phones	/	http://www.telit.it
Assicurazioni Generali di Trieste (insurance company)	Insurance	Financial and insurance services	/	http://www.generali.it

Source: Fiuli Innovazione, JR-InTeReg

Summary and Conclusions

Friuli-Venezia Giulia is a region with a great potential for economic development and significant competitive advantages: e.g., a favourable geopolitical position, accessibility to the most dynamic markets of Central-Eastern Europe and Southeast Asia; widespread industrial activity, a focus on innovation and internationalisation; the presence of three universities and more than a hundred research institutes of science and technology; a high quality of life.

The presence of two universities (Universities of Trieste and Udine) and the International School for Advanced Studies is strategically fundamental, along with the presence of around a hundred globally recognized research centres focussing on science and technology, in which more than 6,000 people work, giving a ratio of researchers to population equal to that of the most advanced economies.

In order to develop and use this strong research potential, new regional legislation has been passed to promote and disseminate innovation and cooperation between research institutions and enterprises in order to develop a »sense of innovation« in the territory.

The new regional legislation on innovation is intended to strengthen the network of technology clusters in order to facilitate the transfer of knowledge from laboratories to companies. The regional government also wants to use it to define concrete measures for SMEs focussing on competitive development projects.

In addition, a new organisation of the four major sectors (chairs, furniture, metal, food) has been introduced with the aim of promoting the competitive evolution of local production systems supporting the processes of innovation. The goal is to encourage the enlargement of companies, promoting new kinds of association among the micro-companies of the sectors in order to better manage activities that need coordination, such as the effective organisation of some phases of the production process, foreign distribution, collective quality branding, etc.

A huge amount of funds has been allocated for regional SMEs that want to do research in cooperation with regional research bodies, for the continuation of activities developed by science parks and other research intermediaries, and to ensure that Friuli-Venezia Giulia becomes the most innovative region, not only at national but also at European level.

Finally, one of the main competitive factors for Friuli-Venezia Giulia is undoubtedly its geographical position: European Union enlargement and the emergence of Asia as a powerful economic force on the international stage allow the region a key-role in transport, letting it act as a centre for the exchange of goods and as a logistic platform, joining the two areas of the world with the highest present growth rates.

Friuli-Venezia Giulia is the only Italian region bordering one of the new EU members—Slovenia—providing close connection to Central and East European countries, i.e., to an area of 75 million inhabitants that is growing economically at a rate of 4-5% per year.

In support of its renewed transport centrality, the region has appropriate logistic facilities, railways, and motorways available, as well as a shipping system based on three ports—one of which, the port of Trieste, can handle ocean-going vessels.

Beyond its favourable geopolitical position, dynamic industrial activity, and high-level training and research system, Friuli-Venezia Giulia is also a place where different communities, languages, religions and cultures co-exist with a maximum of mutual tolerance, producing a high quality of life for all concerned.

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Klemen Koman

Regional Case Study Slovenia

Introduction

Figure 44: The Republic of Slovenia

Name: Republic of Slovenia [Republika Slovenija]

Population: 2,019,406 (June 2007)

Government Type: parliamentary democratic republic

Administrative divisions: all together 210 municipalities, among them 11 urban municipalities

GDP (PPP): $47.01 billion (2006 est.)

GDP real growth rate: 5.2% (2006 est.)

GDP per capita: purchasing power parity—$23,400 (2006 est.)

Industries: ferrous metallurgy and aluminum products, lead and zinc smelting; electronics (including military electronics), trucks, automobiles, electric power equipment, wood products, textiles, chemicals, machine tools

Export Partners: Germany 20.1%, Italy 13%, Croatia 9.1%, Austria 8.8%, France 6.5%, Russia 4.4% (2006)

Import Partners: Germany 19.7%, Italy 18.1%, Austria 11.9%, France 6%, Croatia 4.7% (2006)

Expenditure on R&D: 1.49 % (2005)

Source: CIA World Factbook; Statistical Office of the Republic of Slovenia; Eurostat.

Brief Characterisation of the Region

There is no doubt that the historical ties to Western Europe were of great advantage for Slovenia's economic transition period. The Slovene GDP per capita is substantially higher than that of the other transition economies of Central Europe and could be taken as an indicator for regional vitality. Another factor surely influencing the good economic performance of the country was privatisation which took place at an accelerated pace in 2002-05.

Structural reforms of the business environment attracted greater foreign participation in Slovenia's economy which led to lower levels of unemployment but further measures to curb inflation and bureaucracy.

Though the GDP growth rate is rather high, a faster restructuring of the manufacturing sector in the direction of higher technology intensity is often stipulated by critics. Slovenia slipped from the 30th (in 2005) to 33th place (in 2006) among 125 countries monitored by the WEF and from the 38th (in 2003) to 52nd place (in 2006) in the business efficiency index monitored by the IMD. Government still raises its R&D expenditures to follow the targets postulated in the Lisbon strategy and to improve Slovenia‘s competitiveness. Still, a considerable proportion of employment is in medium technology sectors, and ICT investment has decreased compared to previous years.

Another obstacle for further development of the RTDI system is the lack of cooperation between the business sector and public R&D and the insufficient rate of commercialisation of research activity reflected by the low patenting intensity and new-to-firm products.

Basic Demographic and Economic Data

In terms of geographic position, Slovenia is a Central European country with an area of 20,273 km^2. It has borders with Italy (280 km), Austria (318 km), Croatia (670 km) and Hungary (102 km). Slovenia has a population of about 2,019,406 (on June 30, 2007), giving an average population density of approximately 98.8 people per km^2. Huge differences regarding density of population exist between the regions of Slovenia: in the Ljubljana Urban Region, the population density amounts to 194 people per km^2, while in the least densely populated region—Notranjska-Karst—the number of population per km^2 is only 35. Within Slovenia, substantial differences also exist in the development of the number of the population. Along with the general relative stagnation or the low total growth of the population of Slovenia, higher growth is distinctly evident mainly in the urban Ljubljana region, while other, mostly rural and border areas have suffered strong depopulation. Such development is the consequence of the uneven regional development that Slovenia has witnessed particularly in the last decade.

One of the specific features of Slovenia is its dispersed settlement structure (close to 6000 settlements) of which less than 200 have the status of urban settlements (3 percent of the total) but contain half the population of Slovenia. After the Second World War, the urbanisation rate rose from 27 percent in 1953 to 33 percent (1961), 49 percent (1981), and 51 percent in 1991—and down to 49 percent again in 2002. The negative trend in the 1990s is due to intensive suburbanisation.

Slovenia's economic structure is gradually approaching the structure of the developed market economies. According to the data of the Statistical Office of the Republic of Slovenia, in the period 1995-2005 the economic importance of the service sector increased (from a 51.5% share in GDP in 1995 to 55.2% in 2005), while that of industry (from 25. % to 24.6%) and agriculture (from 3.6% to 2.2%) decreased. The share of construction increased from 4.6% to 5.1%.

In spite of gradual deindustrialisation, the importance of industry in Slovenia remains much higher than the EU average. In 1995-2005, the manufacturing sector achieved a positive restructuring process, characterised by the increased importance of above-average capital intensive, innovative and export-oriented activities such as chemicals, metals, engineering, and the production of electrical and optical equipment, while the importance of traditional labour-intensive activities, such as the textile industry and footwear manufacturing, dropped. With these changes Slovenia reduced the discrepancies between its own structure and that of the manufacturing sectors in the EU countries with a similar industrial structure (Austria, Italy, Belgium, Denmark). However, the pace of structural changes in the Slovene manufacturing sector (measured by changes in the structure of value added and employees) was continuously slowing down in the 1990s. The dynamic of structural changes in the Slovene manufacturing sector should increase if the country is to make advances in export competitiveness.

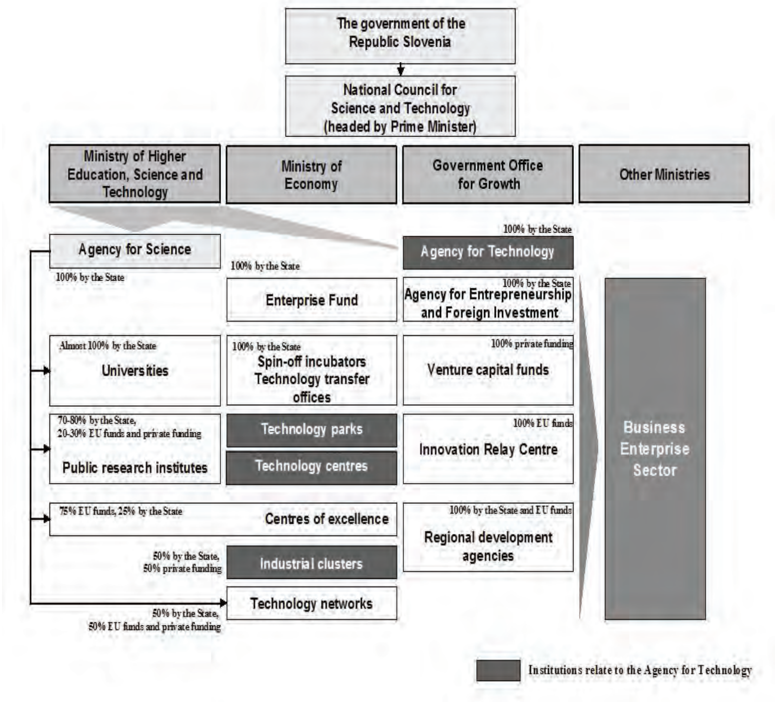
In 1995-2005, within the service sector the importance of public services increased much less (by approximately 0.7 percentage points in GDP) than that of market services (by around 3.0 percentage points). Currently the importance of public services is already at the average EU level; trade, hotels and restaurants, and transport services are close to the average EU level, while the importance of business and financial services still lags behind strongly (7 structural points in 2005, which was higher than the lag of 4.7 structural points in 1995). The increase of public services, particularly in public administration, defence, and social insurance as well as in health care and social security, has been due to Slovenia's accession to the EU, due to the restructuring of the Slovene armed forces and due to ageing of the population. The rise in the economic importance of market services was accompanied by an increased importance of market services with high value added per employee. The fastest growing activity was telecommunication and computer services, which is important for the development of a knowledge-based and more competitive economy. In spite of the considerable lag behind the EU, progress was also recorded in financial intermediary services towards developing and strengthening the importance of new services (insurance, pension funds, and ancillary services in financial intermediary services). In the year 2005, tourism in the narrower sense—effects realised by the narrow tourism sector, i.e., enterprises offering accommodation, enterprises offering food and drinks, and tourist agencies—created 3.8% of GDP, while tourism in the wider sense—effects of tourism can be detected in other activities such as trade, transport, agriculture, etc.—created 5.5% of total value added of the Slovene economy. It also represents approximately 10% of the exports of goods and services according to the 2005 data. Tourism has a high multiplying effect on other industries and stimulates regional development, but the number of tourist overnight stays was still lower than in 1985.

Governance and Policies

The Regional Governance Structure

The institutional framework of innovation policy has been evolving since Slovenia's independence and is continuing to do so. This can be ascribed to the search for the most efficient division of tasks between different ministries and strong influence of science and business communities. Fig. 45 shows the institutional map of the Slovenian Science, Technology, and Innovation (STI) System .

Figure 45: Map of Key Institutions of the Slovenian STI System



Source: IER, JR-InTeReg

The Science and Technology Council

The Science and Technology Council serves as an advisory body to the government in matters of STI policy. The Council advises the Government on the design and implementation of technology and science policy.

The Ministry for Higher Education, Science, and Technology

The Ministry for Higher Education, Science, and Technology is responsible for the science policy and most of the funding of the public research sector. After the reorganisation of the governmental structure at the end of 2004, the Ministry also took over some activities previously ran by the Ministry of Economy—nowadays it performs tasks in the field of technology development and innovation as well. In that sense the Ministry for Higher Education, Science, and Technology has a central role in the STI system of Slovenia.

The Ministry of Economy

The Ministry of Economy is in charge of entrepreneurship promotion programmes and several activities in the area of innovation policy: support for technology parks and university incubators, voucher programme (executed by the National Agency for Entrepreneurship and Foreign Investment), financial assistance to SMEs (provided via the Slovenian Entrepreneurship Fund), development of innovation infrastructure, and co-financing of employment of researchers in enterprises.

The Role of Intermediary and Facilitating Institutions within the Slovenian STI System

In the course of defining the complete Slovenian STI structure, several distinguished groups of organisations were established to implement STI policy:

1. Slovenian Agency for Scientific Research and Slovenian Agency for Technology: The Law on Research and Development (2002) provides for the establishment of two public agencies, the Agency for Scientific Research and the Agency for Technology Development. The underlying rationale is that the agencies (each in its own sphere) are responsible for a permanent, professional, and independent selection process of projects and programmes to benefit from public financing.
2. Slovene Enterprise Fund: it is a national finance institution founded with the aim of making funding for small and medium sized companies more accessible, thus speeding up their growth and development.

3. Public Agency for Entrepreneurship and Foreign Investment: Its primary task is the coordination of a promotional network for small businesses. The Agency carries out several important projects of promoting entrepreneurship and entrepreneurial culture in Slovenia and at the international level. The projects and activities target, among others, the development of business support services, the development of an entrepreneurial supporting environment, and the development of an entrepreneurial culture.
4. Intellectual Property Office: It provides for the protection of intellectual property and is responsible for including Slovenia in the international system of intellectual ownership. It is responsible for the procedures for acquiring and protecting intellectual ownership rights and provides information on intellectual property to interested business partners.
5. Technology Parks/Centres: The technology parks/centres infrastructure offers advisory services, easier access to new technologies, better transmission of R&D results and innovation into commercial use in business firms. Besides over 20 technology centres in all important industrial Slovenian cities, three technology parks operate in the country—the Technology Park Ljubljana, the Styrian Technology Park in Maribor, and the Technology Park of Primorska near Nova Gorica.
6. Association of Innovators/Researchers: It is involved in active cooperation and in promoting innovation and R&D activities in various institutions at different levels.
7. Chamber of Industry and Commerce: its activities mostly focus on lobbying the government to adjust the financial resources for R&D to give higher priority to applied research and co-financing R&D projects with a direct partner or customer in the business sector.
8. Innovation Relay Centre of Slovenia: It is part of the European network of Innovation Relay Centres. Its aim is to promote the transfer of technologies and the exchange of research results

across member countries to promote the transfer of research results into commercial practice and to provide advice in the area of innovation.

Regional RTDI Policy Priorities

The very basic priorities of RTDI policy are stated in the Research and Development Activities Act, adopted in autumn 2002. The act defines the strategic goals of the research and development policy in Slovenia, which are: a) to increase the general importance and effectiveness of research and development activities by setting up a polycentric model of scientific development and network links among research organisations in the area of science, education, and the economy; b) the creation of the conditions for the autonomous and academically independent orientation, evaluation, and monitoring of research and development activities; c) the encouragement of development centres in science, the economy, and in society generally in areas, which provide the foundations for long-term economic and social development; d) the development of human resources whilst ensuring equal opportunities for men and women, and the development of research creativity by increasing the role of science in the education of personnel, particularly at universities; e) an increase in the overall scope of funds and investments in research and development activities, which will be achieved by directing public funds into strategic development areas that will stimulate an increase in business investment; f) the accelerated promotion of international and interdisciplinary cooperation.

In recent years, the business community has focussed on pressuring the government to adjust the financial resources for R&D to give higher priority to applied research and co-financing R&D projects with a direct partner or customer in the business sector. During the transition process (1991-2004), the science and technology system in Slovenia was favouring basic and curiosity driven research compared to applied research and innovation development. This was a consequence of the practically unchanged institutional set up of public research organisations (universities and government owned research institutes), which had been well developed in the former self-management system. On the other hand, the business enterprise sector has undergone radical changes by downsizing and restructuring its R&D capacities. The political parties and larger public research institutions maintained the dominant position in policy making while was the business sector was occupied with privatisation, ownership consolidation and restructuring of intramural industrial R&D units and manpower. Only since 2000, the business enterprise sector (particularly the large manufacturing companies and a few technology based firms) has shown an increasing interest to participate in the formulation of national R&D and innovation policies. Innovation issues have been gaining importance due to the increased market demand for applied research and increased internationalisation processes of R&D activities.

A further improvement of the R&D, innovation, and entrepreneurship environment is envisaged because this objective was declared a development priority of the new Government, of the Development Strategy of the Republic of Slovenia, of the Reform Programme for Achieving the Lisbon Strategy, of the National Development Plan, and the National Strategic Reference Framework, of the mid-term R&D Programme etc. The technological lag behind the developed EU members, the need to maintain high economic growth, and a shift to a knowledge based economy may give new impetus to the fostering of entrepreneurship and innovation in Slovenia.

RTDI Related Major Programmes and Instruments

The basic document on Slovenian R&D policy is the National Research and Development Programme. It is the document which specifies the whole R&D policy, its objectives, scope, the means of financing, and the evaluation criteria. The Programme is prepared by the government and adopted by the parliament every five years. The last version was accepted by the government in September 2005 and adopted by the parliament in December 2005. This new mid-term research and development programme for the period 2006-2010 also—for the first time—determines the priority research fields and priority technologies: information and communication technologies (ICT), advanced (new) synthetic materials and nanotechnologies, complex systems and innovative technologies, technologies for sustainable economy, and health and life-sciences.

The Ministry for Higher Education, Science, and Technology as a major policy actor in the field of technology development and innovation follows four basic orientations, defined in the programmes of the Ministry: horizontal supports for R&D projects of SMEs, technology programmes for narrow technology fields, R&D infrastructure and human resources development (e.g., technology centres, technology platforms etc.), and finally, participation of the business sector in the international R&D sphere (e.g., EUREKA, which is a pan-European network for market-oriented, industrial R&D, and the 6^{th}—and from the year 2007 also the 7^{th}—Framework Programme, where the Ministry fosters SME cooperation in projects).

The other major policy actor in the Slovenian STI structure, the Ministry of Economy, presented a new official document called »Programme of Measures Supporting Entrepreneurship and Competitiveness in the Period 2007-2013«, which was amended in the middle of 2007. The programme is based on four main chapters:

a) Promoting entrepreneurship and entrepreneur-friendly environment;
b) Knowledge for business;
c) R&D and innovations in companies;
d) Promoting small and medium-sized enterprises with equity and debt instruments.

The most important initiatives of the Ministry aiming at the promotion of innovation and R&D activities in business entities are in the second and third chapter of the programme. The second chapter addresses the upgrade of the human potential within business firms for innovation and R&D by facilitating the employment of highly educated personnel, especially with S&T degrees, as well as increased mobility of research personnel from the public research sector to business units. The third chapter discusses measures to stimulate R&D investment by the business sector and proposes the establishment of a new centre for competitiveness and innovations. The key objective of this new institution would be a better coordination of the activities and measures in the field of innovation and improved networking among the stakeholders.

A complete overview of the policy instruments in Slovenia in the field of innovation can be found on the Trendchart on Innovation homepage:
http://trendchart.cordis.eufropa.eu/tc_policy_country.cfm?CO=19.

Regional R&D Competencies

Overview of Major R&D Institutions

Universities

All together, the Slovenian higher education sector comprises three public universities (Ljubljana, Maribor, Koper), one private university (Nova Gorica), and two independent higher education institutions (College of Entrepreneurship in Piran, College of Management and Business in Novo Mesto) with a total number of nearly 100,000 students.

The University of Ljubljana has more than 56,000 undergraduate and post-graduate students. A total of 22 faculties (ranging from technical fields to humanities), three academies of art, and one university college employ approximately 3,500 teaching and research staff, assisted by nearly 900 technical and administrative staff.

The University of Maribor has over 25,000 undergraduate and postgraduate students. The University consists of eleven faculties (ranging from mechanical engineering and medicine to economics and law) and one university college.

The University of Primorska is the second youngest university in Slovenia, established in 2003. It has over 4,500 students and employs more than 300 teaching and research staff in five different departments: The faculties of humanities, management, and education in Koper, the College of Health Care of Izola, and Turistica—College of Tourism of Portorož

The fourth and youngest university in Slovenia is the University of Nova Gorica, established in 2006 when the Polytechnic College changed its status to university. It is the only non-state university institution in Slovenia and has around 530 students. It comprises five different faculties: applied sciences, engineering and management, environmental sciences, Slovenian studies, and the High School for Viticulture and Enology.

Institutes

There are more than 30 public research institutes in Slovenia, covering almost all research fields, from technical to humanistic studies and economics.

- The Jožef Stefan Institute is the leading and the largest Slovenian research organisation. It is responsible for a broad spectrum of basic and applied research in the fields of natural sciences and technology. The staff of around 700 specialises in research in physics, chemistry and biochemistry, electronics and information science, nuclear technology, energy utilisation and environmental science. The basic goals of the Institute are to provide expert scientific and applied output in the form of processes, products, and consultancy, and to produce well-trained young scientists. The underlying philosophy is that these objectives can be achieved only if based on internationally competitive scientific research. With this in mind, the in-house research has been reinforced by building strong links to universities, other research institutions, and industry. Its annual budget for 2006 of approximately € 39 million is composed of 73% from the contracts with ministries, 15% from other contracts (industry etc.), and 12% from international contracts (191 multilateral and 171 bilateral international cooperation projects).

- The National Institute of Chemistry covers the field of theoretical and structural chemistry, materials science, biochemistry and biotechnology, analytical chemistry and environment as well as chemical engineering. The Institute is one of the biggest Slovenian institutes with 240 employees: 180 of them are working in research and more than 95 have PhDs. Primary activities of the Institute are basic and applied research, training and education of students, as well as activities connected to industry (24% of the total income, which was € 11.7 million in 2006, comes from market driven research projects) and international cooperation (23 multilateral and 35 bilateral international cooperation projects in 2006).
- The National Institute of Biology was founded in 1961 by the University of Ljubljana to undertake basic and applied research in biological sciences. Today, the Institute is a public non-profit organisation for basic and applied research in various areas of biology (ecology, plant and animal physiology, protection of the environment, agriculture) and medicine (molecular and genetic research, biotechnology). Contracting entities for research are foremost ministries and their agencies as a part of their performing public service, as well as municipalities and companies from various industries, notably pharmaceutical and food processing. At present, around fifty of the total of ninety employees of the Institute are directly engaged in research.

Other research institutes in the Republic of Slovenia:

- GeoZS (Geological Survey of Slovenia—www.geo-zs.si): The main objective of the institution is to provide and store geoscientific information of the Republic of Slovenia. Geoscientific information is a basis for the solution of the nation's major issues, such as health and environmental protection, drinking water supply, protection against natural hazards, urban planning, exploration and assessment of natural resources as well as planning of their use.
- The Slovenian Forestry Institute (www.gozdis.si) is a public research institution of national importance, with a comprehensive research programme focussing on biological, ecological, silvicultural, and spatial aspects of forests and forested landscape. Its basic role as a public institution is performed as part of the National Research Programme and the National Forest Development Programme which encompasses the Public Forestry Service (JGS).
- The Institute for Economic Research (IER—www.ier.si) is an autonomous research organisation with a long tradition in the field of macroeconomic and microeconomic analysis. Research fields vary from international economics, development sudies, welfare economics and human resources, through regional development/policy and sectoral studies to management consulting and business research.
- The Institute of Metals and Technology (IMT—www.imt.si) is a public research institute for fundamental and applied research in natural, technical, and environmental sciences, especially focussed on metallic materials and process technology, applicability and lifetime of metallic materials and products, surface engineering and applied surface science, vacuum science and optoelectronics.
- The Institute for Ethnic Studies (IES—www.inv.si) is a public research institution in the field of ethnic studies which investigates Slovene ethnic questions, the status of Slovene ethnic

communities and Slovenes in foreign countries, the status of migrants in Slovenia and the forms of ethnic issues (ethnicity, nationalism) in Europe and worldwide.

- The Institute of Contemporary History (INZ—www2.arnes.si/~ljinz15) is the main scientific institution in Slovenia for the study of the recent and contemporary history of the Slovenes from the middle of the 19th century onwards. The research work carried out at the Institute covers the overall development of Slovenia and Slovenes in the 19th and 20th centuries.
- The Educational Research Institute (ERI—www.pei.si) is the central research institution in Slovenia for research in education, undertaking basic research, development, and applied projects on issues of current interest in all sectors of education and related areas. The object of research is the study of social and communicational processes in the field and education with an emphasis on the Slovene context.
- The activities of the Urban Planning Institute include research and expert development work in the fields of urban and regional planning and related disciplines: methodology of programming urban development, of shaping urban form, urban geography and sociology, regional economics, applied demography with regard to town planning, forecasting, comprehensive traffic studies, planning of residential areas, planning of tourist regions, urban renewal, preservation and landscape design.
- ZAG Ljubljana (Institute for Construction—www.zag.si) is Slovenia's national building and civil engineering institute. In five departments—Materials, Building Physics, Structures, Geotechnics and Traffic Infrastructure, Metrology—it is performing activities such as certification and attestation of conformity of products, materials, and executed works; fundamental and applied research in the fields of materials and structures; research, measurements, and monitoring in the field of the

efficient use of energy and renewables; and other topic in the field of civil engineering and testing.

- The Agricultural Institute of Slovenia (www.kis.si) is a public research institution founded in 1898. In the framework of its registered activity, the Institute carries out basic, applied, and developmental investigations, advising, studies, and laboratory service, and supervision and verification of the quality of agricultural products and products used for agriculture.
- The Scientific Research Centre of the Slovenian Academy of Sciences and Arts (www.zrc-sazu.si) is one of the leading research and educational centres in Slovenia. The Centre comprises an independent network of researchers and technicians who study cultural, social, and natural phenomena, issues and practices within the framework of research groups and 17 institutes. Researchers are linked together in highly qualified and well-rounded research teams and institutes: the Fran Ramovš Institute of the Slovenian Language, the Institute of Archaeology, the Milko Kos Historical Institute, the France Stele Institute of Art History, the Institute of Musicology, the Institute of the Slovenian Literature and Literary Science, the Institute for Slovenian Emigration Studies, the Institute of Philosophy, the Anton Melik Geographical Institute, the Karst Research Institute, the Ivan Rakovec Institute of Palaeontology, the Jovan Hadži Institute of Biology, the Institute of Ethnomusicology, the Sociomedical Institute, the Institute for Cultural History, and the Institute of Anthropological and Spatial Studies.
- The Institute for Hydraulic Research in Ljubljana (www2.arnes.si/~ljhidri1s/) is engaged in many fields of hydraulic engineering (hydraulic civil engineering, hydraulic model investigations of power plants and parts of them, river correction works, ground water phenomena, field measurements, etc.) in the country and in many countries abroad. Field investigations include the observation of vibrations of movable (rubber) weirs, pressure and velocity measurement, measurements of

sediment concentration and water temperature and monitoring reservoir sedimentation.

- The Textile Institute Maribor (TIM—www.tim-tekstil.si) was established in 1949. Active research fields of the Institute include ecology (textile waste, wastewater), new products and techniques (antimicrobial treatment, intelligent textiles, technical textile, polymer composite materials, and alteration of textile waste…), an infrastructure research centre (technological centre for medical textile, transfer of knowledge into practice—industrial undertaking), projecting and consulting (elaboration of expert projects for investment decision-making).
- The Institute of Information Science (IZUM—www.izum.si) is a public institution established by the Government of the Republic of Slovenia as an information service infrastructure for Slovenian science, culture, and education. Among others, IZUM is the administrator of the COBISS.SI library information system (cataloguing system of Slovenian libraries) and the SICRIS system (Slovenian Current Research Information System, which contains information about the research organisations, research groups, researchers, and research programmes and projects in Slovenia).

Regional RTDI Related Felds of Strength

The new mid term research and development programme 2006-2010 determines the research fields and technologies of priority: information and communication technologies (ICT), advanced (new) synthetic materials and nanotechnologies, complex systems and innovative technologies, technologies for a sustainable economy, and health and life-sciences. Two preliminary studies were made (Key Technologies and Possibilities of Establishing Technology Networks, IER 2003; Technology Foresight in Slovenia 1st Phase, IER 2004) in order to prepare the analytical background for the concentration of R&D and innovation potentials within eight thematic fields which can be identified as core technological fields of Slovenian RTDI: 1. Information and communication technologies; 2. Materials; 3. Biotechnology, pharmaceuticals, nutrition; 4. Environmentally acceptable manufacturing; 5. Sustainable construction; 6. Traffic and mobility; 7. Life-long Learning; 8. Medicine—Care for the Elderly. In addition to that, eight sectors have been recognized as centres of excellence. They represent high quality multidisciplinary groups of researchers from the academic sphere and the business sector, which enable a critical mass of knowledge and sufficient research infrastructure to break through to the heights of global science and/or inclusion in the international networks of excellence: a) supercritical fluids (chemistry); b) biotechnology and pharmacy; c) materials for next generation electronics; d) nanosciences and nanotechnologies; e) environmental technologies; f) information and communication technologies; g) structures and interactions in biotechnology;h) modern control technologies.

Leading Sectors

Leading Sectors and Enterprises in the Region

Slovenian ICT companies excel in innovation and superior technical solutions in both telecommunications and information technology. Such is not merely a reference to individual projects but to enterprises that are playing a leading role in the development of technologies and solutions on the world stage, and, by way of this, these firms are of key significance in the design of strategies and the contemporary trends in info-technology. Network and data storage solutions developed by Slovenian enterprises are applied by companies the world over, including such prestigious names as Alcatel, Hewlett-Packard, Unisys, Cisc and British Telecom, and thus feature as crucial world-leading elements in the respective market niches. The IT-related fields in which Slovenian enterprises rank among the world's leading solution providers encompass: the design and implementation of communication networks; e-banking; data backup software; IT service provision; logistics. Leading enterprises in the field of telecommunications are: Iskratel, Iskra Sistemi, Mobitel, Si.Mobil, Telekom Slovenije; and in the field of IT solutions: HERMES Softlab, SRC.SI, Špica International, Actual I.T., Halcom, S&T Hermes Plus.

Large companies in the field of pharmaceuticals and chemicals have placed Slovenia among the leading countries in this sector in Central Europe, and their steps are followed by a host of small audacious enterprises—including BIA Separations, Educell, Celica, BIA—working in such specialist fields as bio chips, biochemistry, molecular biology, genetic engineering, and industrial biotechnology. The legacy of successful R&D, together with the construction of a number of new production and distribution capacities, singles out Slovenia as one of the largest providers of pharmaceuticals in the region. Slovenia's two largest companies, Krka and Lek, export nearly 90% of their production and have several facilities, plants, and research centres abroad. Following its acquisition by Novartis, Lek has been a member of the Sandoz Group since 2002. As to their achievements in R&D, the leading enterprises of Slovenia's chemicals industry—Helios, Belinka and Sava—successfully compete on a number of European markets. In 2004, this sector had an aggregate income of 2.29 billion euros, 68% of which was generated on foreign markets.

The automotive sector plays a significant role in the national economy. Despite the ongoing relocation of production facilities to more distant markets, the further development of this sector in Europe is also anticipated. Vehicles, automotive components as well as tools and equipment for the automotive and related sectors together account for nearly 19% of Slovenia's goods exports and in excess of 15% of total exports. Leading companies in the sector are: Adria Mobil, Akrapovič, Cimos, Hidria, Iskra Avtoelektrika, Kolektor Group, Prevent Global, Revoz, TCG Unitech Lth, TPV, Unior.

The Slovenian electrical and electronics industry is a vital element of the country's export mix with 70% of sales earned in foreign markets. The companies held by domestic owners such as Gorenje and Kolektor achieve excellent results in demanding markets under their own brands. Leading companies are: Gorenje, Danfoss, Eta Cerkno, Hella Lux Slovenija, Iskra Kondenzatorji.

The sector of construction and civil engineering is anticipated to grow further, particularly as a result of the efforts now being made into intensifying penetration to the markets of Southeastern and Eastern Europe. As to the domestic market, rather substantial investments are still expected in such fields as housing, tourism, energy, and ecological amelioration, as well as transport infrastructure, with particular emphasis on the national railway network. The investment project that exerts most significant impact on Slovenia's construction sector remains the ongoing motorway construction programme, which was initiated in 1994. Leading companies in the sector are: Primorje, SCT, SGP Pomgrad, Trimo, Vegrad.

In the field of logistics and transport, Slovenia has every intention to further promote and foster research work and the introduction of innovative, more environmentally friendly services. The further development of the market economy and evermore fierce competition also require the optimisation of storage and warehousing facilities with respect to information technology and logistics operations. Leading enterprises in the sector are: Aerodrom Ljubljana, BTC, Eurotek Trebnje, Holding Slovenske železnice / Slovenian Railways, Intereuropa, Luka Koper / Port of Koper, Skupina Viator & Vektor.

In the energy sector, Slovenia's largest energy companies are currently spending over 200 million euros per annum on enhancing generation and distribution capacities and pertaining infrastructure; and this trend is on the increase. Such investment is absolutely indispensable in order to ensure a reliable high-quality supply which fully meets evermore stringent environmental requirements (supply from a diversity of sources, waste management, generation from renewable resources, and consultancy as to the efficient use of energy). Leading companies are: ELES, Geoplin, Istrabenz, NEK, Petrol.

Clusters in the Region

Three pilot projects in the automotive, transport and tool making industries all started in 2001, with the state co-financing the initial phase that entails defining the clusters' structures and strategies. In 2002, 13 new cluster initiatives were supported among others in wood-processing, air-conditioning and heating devices production, plastics, high-technology manufacturing, and geodesy. The process continued also in 2003 and 2004. Altogether, today there are approximately 390 organisations involved in the 29 national clusters, with altogether more than 60,000 employees.

The majority of clusters have their own office and institutionalised management. The offices play a very important role in the development of each cluster because most clusters are characterised by a lack of trust between their members. The performance of a cluster depends to a great extent on the year of establishment. Clusters established in 2001 are the best performers.

RTD institutions are an important part of clusters, but clusters in Slovenia are dominated by large companies. The interaction between members is improving and »older« clusters already are working on common R&D projects. The main non-financial results of clusters are improved communication and transfer of knowledge between members.

Summary and Conclusions

Assessment of the Regional Innovation System

Over the years, the innovation support system has been both unstable in terms of the amounts allocated to the instruments and in terms of the concepts which were supported (from support to joint R&D projects to support to clusters and to most recent support to technology networks). Programmes were stopped with no particular argumentation, and the focus was changed depending on organisational and personnel changes in the government. The low rate of implementation of government innovation policies has always been an issue as well as improving the coordination of measures focussed on the promotion of innovation and entrepreneurship. Another drawback is the nonexistence of a systematic evaluation of innovation policy measures undertaken by the implementing actors.

Challenges and Opportunities in the Near Future

The key challenge of innovation policy in Slovenia is the building of a coherent and stable national innovation system and increasing the transparency and coordination of government-run innovation support measures. The current state of affairs with unclear distribution of responsibilities, disregard for some of the bridging institutions put in place, little coordination in introducing new measures, proposals to resolve existing problems by creating another institution(s), is not in line with the statements and objectives of the strategic documents. At the level of strategic the latter (Slovenian Development Strategy, National Research and Development Programme and the Reform Programme, for Achieving the Lisbon Strategy Goals), a common understanding prevails that research and development and increased innovation, efforts by the business sector are the key inputs for increased competitiveness and, therefore, more dynamic economic growth. This clear linkage of R&D, innovation and economic policy has not been so explicitly pronounced in the past. On the basis of such assessment, several objectives and policy priorities address the field of knowledge creation, research and development, and innovation. Problems arise in translating these objectives and priorities into specific measures and instruments in a coordinated and well-thought manner.

Existing innovation policy will continue also in the future. In reality, there is a set of challenges stemming from past experience:

- Implementation of the new policy documents, particularly in view of the fact that the past implementation record was seriously deficient in this area;
- Achievement of sufficient coordination of instruments and measures among different ministries and other support institutions to enable a smooth functioning of the national R&D and innovation system;
- Development of closer cooperation between public R&D institutions, universities, and the business sector within set priorities, applying available and new planned support measures. Additional focus should be given to the improving of human resources to support innovation activity.
- Adjusting budgetary resources to support the declared priorities sufficiently.

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András Grosz

Regional Case Study West Transdanubia

Introduction

Hungary is a small, centralized country: the capital Budapest is the political, economic, educational, cultural, and transport hub. The country is composed of 19 counties and the capital Budapest (NUTS 3 level), which are the traditional subnational level in administration with local governments. However, they do not have any decision-making power concerning education, research, technological development, or innovation (RTDI) policies. Moreover, they are simply too small to act as catalysts for regional development. It is for this reason that these 19 counties were merged into seven so-called statistical-planning regions (NUTS 2 level) in preparation for joining the EU.

Nowadays, these regions are undergoing several important development processes; however, there are no elected local governments at this level, only delegated bodies such as regional development councils which operate with limited competences and financial background, thanks to the highly centralised system. One of these seven regions is West Transdanubia, which is located in the western part of Hungary. Although the official name of the region is West Transdanubia most of the regional organisations use the name Pannonia which is the Latin name for the western part of Hungary stamming from the Roman era—instead of Transdanubia and west Pannon Region of west Transdanubia. The region consists of three counties (Győr-Moson-Sopron, Vas, and Zala) with a territory of more than 11 thousand square kilometres and a total population of 1 million inhabitants. The population is slowly declining despite moderate inward migration to the region. The region does not have a designated capital but is endowed with five county towns (Győr, Sopron, Szombathely, Zalaegerszeg, Nagykanizsa) each with 50-130 thousand inhabitants; the network of these five cities forms the basis for spatial development.

West Transdanubia is said to be the gateway of Hungary to Western Europe. It shares borders with Slovakia, Austria, Slovenia, and Croatia. Sixty-percent of Hungary‘s trade crosses West Transdanubian borders, thus the region has an emphatic transit role. The closeness to the Western European countries and their economies is very important for the region's economic development process and, of course, for its innovation practice, both at firm and regional level. It allows for wide-scale international cooperation of local companies and organisations, and thus helps improve the innovation potential of the whole region.

West Transdanubia was not among the highly industrialised regions of Hungary during the socialist era, so the crisis of collapsing industries and increasing unemployment rates following 1989 was moderate compared to other parts of the country. However, West Transdanubia did have some key sectors, which had to be modernised after the system change in 1989. The most important sectors were mechanical engineering, the textile industry, and the food industry. In the last 15 years, West Transdanubia has become one of the most dynamic regions of Hungary thanks to FDI (especially from Germany and the neighbouring Austria). In 2003, the region's GDP per capita in PPP indicator reached 69% of the EU-27 average. A series of major industrial companies have been settling in the region and provided remarkable activities in the automotive and electronics sector. Some of these foreign direct investments have been attracted by the low cost workforce, so low value-added production activities are significant in this area. This is also in line with the relative lack of R&D and results in a lack of knowledge-based economic development. Local SMEs benefit from growing industrial prosperity only at a relatively low rate (Grosz 2007).

The FDI that came to the region in the last 15 years brought new technologies, new management methods, improved the skills of the labour force, and thus contributed to innovation capacity. The region was able to adopt successful new organisational models, techniques, and development tools faster and more easily than other regions in Hungary. Industrial parks, innovation centres and incubators have been established in order to stimulate innovation, start-ups, and SME activities, and networks and cluster organisations have been founded to encourage cooperation activities. However, there is still a significant lack in the networking and management know-how needed to implement these strategies successfully.

Governance and Policies

As mentioned above, the most important governmental organisations at regional level in Hungary are the regional development councils, which are not elected but delegated bodies. Their executive bodies are regional development agencies. However, budgetary and administrative decisions are still prepared on a county level; only on certain necessary developmental and administrative issues does the regional level have decisional power.

Organisations of Governance and Development

The region of West Transdanubia has no elected body. In 1997, the West Pannon Regional Development Council was established by law. In participation with the counties Győr-Moson-Sopron, Vas, and Zala, it is responsible for regional development and town and country planning, It is made up of representatives from the counties, cities with county rights, the small regions, and of ministries. It is strongly tied to the national executive level and therefore has to follow national policy guideline. Its most important tasks are the operating of the competition systems in connection with decentralised resources, the programming and planning at regional level, and the regional coordination of the development of the economy. In December 2004, the Council introduced a new network operating model. Instead of the committee system, characteristic of the former structures, it now has only one permanent coordination committee. In addition, the Council—on the basis of various agreements—cooperates with regional authorities, organisations and committees working in certain professional fields (Environmental Protection, Higher Education, Training, Tourism, Health, Sports, Civil Issues, Marketing, Innovation). These help the Council derive expert opinions for decision making purposes.

The West Pannon Regional Development Agency (RDA) was founded as a 100% subsidiary of the West Pannon Regional Development Council (RDC) . The RDA' s main tasks are to support the work of the RDC and to implement the specific objectives set in the West Pannon Regional Development Programme. The Agency participates in establishing a future vision for West Pannonia, and is responsible for implementing the regional development programme: It carries out tasks associated with the working body of the Regional Development Council, helps and promotes the flow of regional development information in the region, supports local and small regional initiatives, and organises as well as coordinates conferences, meetings, and training programmes. The Agency does not operate as an agency in the literal sense of the word. The Agency takes part in the comprehensive, all-inclusive management of the respective projects. This includes all aspects from the establishment of the planning programme, to the monitoring of activities. Based upon the knowledge of the given situation and its own resources, the Agency decides whether to pursue direct involvement, to take up a coordinating role, or to apply a mixed approach. In the course of its activity, the Agency has established a wide level of cooperation with regional, national, and international organisations.

West Transdanubia took the lead in utilising the innovative methods of developing the economy. Three regional organisations (the West Pannon Regional Development Council, the Regional Tourism Committee, and the West Pannon Regional Development Co.) created the Pannon Business Initiative in October 2001. It aims to support the economic development of the region by encouraging investments, developing the small, and medium-size enterprises, organising events and regional forums, introducing innovative methods and other active operations. It operates within the framework of the Regional Development Agency. The Initiative was meant to serve as an example for a well-organised, harmonised, regionally integrated economic development model, and thus facilitate the general increase in the competitiveness of the entire region in the long run. The cooperative network of the Initiative can in fact be considered a loose voluntary cluster of the numerous organisations engaged in economic development (Pannon Business Initiative 2006).

The National Office for Technology and Research (NOTR) supports the innovation-based improvement of the economy, the competitiveness of the Hungarian regions, the formation and strengthening of regional innovation networks, and the decentralisation of the regional innovation incentive schemes. It has thus supported the establishment of regional innovation agencies. The Pannon Novum West Pannon Regional Innovation Agency was established by the region's innovation actors with the support of NOTR in 2005. The main task of the Agency is to implement the regional innovation strategy that was prepared in 2001 for West Transdanubia, namely to harmonize innovation processes, to encourage the spreading of knowledge, to provide and integrate innovation services, and to establish and strengthen the requisite technological innovation networks. By enhancing innovation activity, it contributes to the competitiveness of micro-, small and medium enterprises. The Agency helps to develop a more innovative environment, encourages networks, and develops new innovation services by implementing strategic objectives and activities. The Agency now operates as a consortium of different regional and national organisations representing the regional target groups. The three years funding period of the project ended in 2007, but both the national and regional policy makers are interested in continuing the operation in the future. 2008 starts another three years funding period of NOTR.

In 2005, a new body focussing on innovation policy was established: the West Pannon Regional Innovation Council. The members of the Council represent different organisations, thus a great number of regional actors are connected to the work of the Council. Task is to facilitate innovation processes, to provide professional proposals, to provide decision support for the Regional Development Council, and to control and coordinate the work of the Regional Innovation Agency.

In 2006, the Pannon Business Network was established by six cluster organisations, and after its establishment, the 23 industrial parks in the region joined the Network. Furthermore, the West Pannon Regional Development Co. (a financing institution), the regional representation of the MTESZ (a professional association), and TISZK (an integrated agent for vocational training) are all among the founders. The Network's mission is to contribute to the improvement of labour force quality and the competitiveness of regional enterprises. It aims to integrate all company groups representing the region, so as to establish a network which is efficient and representative of the regional sectors, the regional distribution of firms, and the regional company size. The industrial parks are able to represent the most important multinational companies in the region (Pannon Business Network 2006).

The economic development of the last 15 years was mainly based on factors such as low wages (but relatively skilled workforce), well developed infrastructure, tax allowances and incentives, and geographical location, closeness to the Austrian border and the Western markets. One could characterise it as a form of extensive development that is based on labour intensive inputs with a low technological base, although there are some foreign multinational companies with the highest technology and some very competitive Hungarian SMEs with state-of-the-art technologies and products (ROP 2007). Nevertheless, there is a need to transform this extensive development process into an intensive one which is based on knowledge, innovation, and R&D activities. The most important problems are as follows (see Tab. 33):

- A low level of R&D spending, only about 0.3% of GDP;
- A low level of cooperation between the business sphere and the academic sphere;
- A lack of academic and university research institutions (no traditional university);
- Highly centralised systems, no regional autonomy in innovation or R&D policy.

Table 33: SWOT of the West Transdanubian Innovation System

STRENGTHS	WEAKNESSES
• Successful transformation of the economic structure, high level of foreign direct investment • Settlement of large multinational companies, some of them with significant R&D capacities • Formation of regional cluster organisations connecting to the key sectors of the region • Establishment of a wide-range institutional network connecting to the supply side of innovation • 24 industrial parks in the region, some of them with higher level services for technology and innovation • Organisations and institutions with the required competences are engaged in the establishment and the operation of a regional innovation network • Skilled industrial workers are opened for new knowledge and stable SME sector in the region • Dynamic higher education institutions with important infrastructural background • Existing strategies and programmes give priority for innovation and cooperation	• Highly centralised system, weak regional institutions without financial independence • Weak regional innovation and R&D performance compared to the economic weight of the region • Considerable difference between the R&D potential and the income-producing capacity of the region • Low level of cooperation between the higher education and the business sphere • Fragmented higher educational system with several participants, no campus university • Business sphere, especially SMEs, are not really innovation, and R&D-oriented • Low level of cooperation between innovative large companies and SMEs • Lacking innovation oriented services in industrial parks and bridging institutions • Parallel and overlapping activities and tasks in the different supporting organisations in the region • Unsuccessful participation in national and international R&D tenders

OPPORTUNITIES	THREATS
• New resources for innovation (both national and EU) • Activities of new organisations (Regional Innovation Agency and Council) • Development of the regional knowledge base encourage the knowledge diffusion • Introduction of new innovation services • Strengthening of the cooperation between universities and business • Developments concentrate on networks, knowledge base, and innovation • Settlement of R&D oriented firms in the region • Support of R&D activities of firms in the regions • Cluster services for higher R&D activities of members • Development of technology and innovation services in industrial parks	• Lack of R&D capacities • Lack of R&D and innovation-oriented firms • Financial problems of existing cluster organisations • Problems in financing innovation activities of SME sector • Lack of skilled workforce • Low level of regional suppliers of multinationals • Bridging institutions do not consider the demand for services • Lack of decentralisation of innovation policy

Source: Own elaboration of the author.

To cope with these problems, West Transdanubia has elaborated its own Regional Innovation Strategy (RIS) in 2001 (one among the first in Hungary) so as to accord to the regional development programme (RIS 2001). The mission of the RIS is the development of West Transdanubia's innovation system. The main objectives here are:

- Creating the missing institutions in the regional innovation systems, reaffirming the existing institutions and organising them into a suitable network;
- Improving the innovation performance of enterprises with the help of specialised programmes and adequate application systems;

- Providing prominent support for those knowledge-based activities which produce high value.

Altogether, the RIS had eleven measures, and these were grouped into four priorities (see Tab. 34). However, all the regional actors knew that due to the highly centralised innovation and R&D policy system of Hungary, the region would not have the financial resources for its implementation. Any new initiative or project complying with RIS priorities in West Transdanubia had to be connected to the national policy schemes and programmes to receive financial support. The technology and knowledge-based development programme thus began. The first steps of this new development were the establishment of the regional cluster initiatives in five sectors and of some regional innovation centres in the most advanced industrialised centres such as Győr, Sopron, Szombathely, or Zalaegerszeg (Dőry / Grosz 2005).

Table 34: The Priority Structure of the RIS for West Transdanubia

Priorities	Measures
1. The improvement of the region's innovation environment.	1.1.Innovation award and premises marketing 1.2. Promotion of best practice 1.3. Interregional co-operation
2. The development of the knowledge base and the stimulation of knowledge diffusion.	2.1. Support research and development, and innovation projects 2.2. Promotion and support of innovation oriented trainings 2.3. Innovation networks, clusters, and development cooperations
3. The development of the innovation infrastructure.	3.1. Support the purchase of research and development instruments 3.2. Innovation centres and research centre cooperation network 3.3. Network development of innovation experts and consultants
4. Financing innovation.	4.1. Foundation of the regional innovation funds 4.2. Tender preferences

Source: RIS for West Transdanubia, 2001

In 2004, a technological foresight programme was prepared for West Transdanubia—again the first in Hungary—with the aims of establishing the continuous renewal of the industrial and economic structure of the region, creating the basis for greater value added in the economy and increasing the region's competitiveness (TEP 2004). Four determining key branches were identified in the region:

- Mechanical engineering (esp. automotive, electronics and mechatronics),
- Tourism (esp. health tourism and rural tourism),
- Environmental industries (environment use, environmentally friendly resources and technologies, and renewable energies),
- Knowledge industry (from vocational training to higher education and research activities).

For these four key branches, special sectoral background materials were prepared which provide insight into the most important intervention points and the direction required at both regional and national level.

In the domain of cluster policy, West Transdanubia has also been a pioneer in Hungary. From 2000 to 2007, eight so-called cluster organisations (in most cases rather networks) were established in the region to support specific sectors. Two regional university knowledge centres and two cooperation research centres operating in the two university centres of the region, were established with national funding (Grosz 2006, Grosz 2007, Pannon Business Network 2006).

On the regional level, there are only two basic sources of funding for RTDI projects: contributions from the central government budget and 25% of the Research and Technological Innovation Fund to be spent on promoting RTDI activities at regional level. However, regions have just finalised their Regional Operative Programmes (ROP) for the period of 2007-2013, which is part of the second National Development Plan (its new name: New Hungary Plan). They are co-financed by EU and national sources. However, these ROPs do not contain any measure in the fields of innovation or R&D policy. These strategic fields will be dealt with in the next period in the Economic Development Operative Programme, which cover the whole country (ROP 2007, EDOP 2007).

Since 2005, 25% of the new Research and Technology Innovation Fund is allocated to the regional level, and regions may decide on spending priorities. However, the supporting contract is signed by the National Office for Research and Technology. This is the sole notable financial source for innovation at regional level (ca. € 4 million per year). The priorities of this Regional Innovation Development Programme package are established together with the Regional Innovation Agencies according to the RIS priorities and are formulated and approved jointly with the Regional Innovation Council. The Programme supports region- specific measures with the aim of making R&D and innovation become the basis of economic development at regional level over the long run. In West Transdanubia in the last few years, the programme has focussed on the following priorities for innovation:

- The spread of new technologies and knowledge for innovation;
- Provision of special fellowship for researchers;
- Product, technology and service innovation, local development of new products and services;
- The foundation and establishment of new innovation-oriented services for stimulating clusterisation processes;
- Support for spin-off firms;
- R&D and innovation infrastructure development of innovation centres and firms;
- Improving the innovation culture via competitions, awards and public awareness campaigns.

Regional R&D Competencies

Research and development activities stimulate the economic development and improve competitiveness. At the beginning of the '90s, R&D activity in West Trandanubia was decreasing due to decreasing demand and lack of financial resources. Most of FDI in the last decade didn't include any R&D activity. However, in the last ten years, a dynamic increase has been seen in the number of research units, researchers, and research themes in West Transdanubia. Nevertheless, the research and development potential of the region lags far behind economic performance and does not reflect population share (Grosz/Smahó, 2006). In terms of R&D indicators, the region is among the weakest in Hungary. The total R&D expenditure in West Transdanubia is only 0.3% of GDP, far below both the EU and Hungarian average. The number of research units in the region is below 200, most of them are affiliated with universities and higher educational institutions, in particular with the University of West Hungary in Sopron and Mosonmagyaróvár, the Széchenyi István University in Győr, and the Pannon University in Keszthely. There are only two academic research institutes in the region—also situated in Sopron and Győr (the Geodetic and Geophysical Research Institute and the Centre for Regional Studies). Until 2005, there were no research institutions in the region really capable of serving the needs of key business sectors. In the last years, two university knowledge centres and two cooperation research centres have been established at the two universities, incorporating regional firms and addressing their respective R&D needs (Csizmadia/Grosz, 2006). These centres are establishing industry-science links in the areas of automotive industry, electronics, wood industry and renewable energy. R&D activities are not really significant within the enterprise sector, since at multinational companies most high-tech solutions, manufacturing processes, and finished parts are delivered to Hungary as part of the international trade flows (e.g., at Audi, LuK, GE, Magna, Edag). Owing to the spatial concentration of universities in the region, R&D competencies exhibit notable disparities, the main focus lying on the northern part of the region (Győr, Sopron) (Csizmadia/Grosz, 2006). The number of R&D personnel in West Transdanubia is only 1,500, the lowest among the Hungarian regions.

Overview of Major R&D Institutions in West Transdanubia

The Széchenyi István University was founded in 1968 as the College of Transportation and Telecommunication. During the 1970s and 1980s, the institution strove to satisfy the need for polytechnic-level engineering training in transportation and telecommunication. After the change of the political system in 1990, the institution and its traditional training areas focussed resources on meeting the labour expectations of the prosperous economy of the region and the demands of the multinational companies which had settled in the region. Since 2002, the institution has been operating as Széchenyi István University with three faculties: the Faculty of Engineering Sciences comprises the Institute of Built Environment and Transport and the Institute of Informatics, Electrical, and Mechanical Engineering. The Faculty operates the Interdisciplinary Doctoral School of Engineering, Modelling, and Development of Infrastructural Systems. The Regional University Knowledge Centre for Vehicle Industry and the Cooperative Research Centre for Automotive, Electronics, and Logistics are both run within the Faculty of Engineering Sciences. Both of them deal very well with the special needs of the regional economic demand for qualified human capital, and the university has very strong relationships with the business sector. This is still unusual for Hungary. From 2007, the former Faculty of Law and Economics was branched to the Faculty of Law and Political Sciences, and the Faculty of Economic Sciences. The two social science faculties operate the Doctoral School of Regional and Economics Sciences the and Doctoral School of Law and Political Sciences instead of the former multidisciplinary doctoral school.

Besides Széchenyi István University in Győr, the University of West Hungary is the other university centre in the region. After several changes the present University of West Hungary started functioning on January 1, 2000. It was actually a result of a merger between Sopron University, Benedek Elek College of Pedagogy, the former Mosonmagyaróvár Faculty of Agriculture of the Pannon University of Agriculture, and Apáczai Csere János Teacher Training College. Now it has seven faculties, four of them in Sopron, which is also the centre of the university, one in Győr and one in Mosonmagyaróvár, and finally one outside the region in Székesfehérvár. The University of West Hungary considers itself as a «green university« which endeavours to create the skills necessary to conserve and improve ecological, economical, and socially adaptable methods so as to provide a sustainable development of the quality of life and mankind. The university offers several doctoral schools. The Faculty of Forestry includes the Environmental Resource Management and Protection Cooperation Research Centre, while the Faculty of Wood Sciences contains the Regional University Knowledge Centre for Forest and Wood Utilisation. Both of them have strong business relationships especially with firms in the wood and furniture industry, and in the renewable energy sector. Besides these centres, the university operates several laboratories which support R&D activities. In the Mosonmagyaróvár Faculty, there is significant R&D capacity in agriculture and food processing. However, changes are continuing. In January 2007, the University of West Hungary and the Berzsenyi Dániel College in Szombathely decided to merge and establish a new joint university, which is expected to operate from September 2008.

Berzsenyi Dániel College in Szombathely is one of the largest colleges in Hungary and plays a significant role in the higher education system of Western Transdanubia. With a history of over 50 years, higher education in Szombathely has provided tens of thousands of highly trained professionals in the fields of education, science, and public administration alike. In its beginnings, the college focussed on elementary teacher training. Over the last few decades, the original profile has been continuously upgraded with new courses, and more than ten university level training programmes have been recognised. Its departments and scientific teams have established cooperation with various colleges and universities within Hungary and abroad. The infrastructure of the college is being constantly expanded and updated. Its research activity focusses on social sciences, so R&D activity is relatively limited.

The Pannon University was founded in 1949 in Veszprém, and located in the neighbouring region. However, the Georgikon Faculty of Agriculture of the University is situated in the town of Keszthely in West Transdanubia. Georgikon, the first regular agricultural higher education institution on the Continent of Europe, was founded in 1797. The Faculty provides graduate and postgraduate education including B.Sc., M.Sc., and PhD courses and carries out high quality research related to agriculture. It carries out extensive research work in the fields of plant protection, plant variety selection and maintenance, crop production, animal breeding and nutrition, farm management and economics. The Faculty supports a wide range of international relations, both in the form of joint research projects and in informal scientific cooperation.

Besides the largest university centres of the region, there are several other higher educational institutions in Zalaegerszeg, Szombathely, and Nagykanizsa, which are local units of different universities and colleges seated outside the region. The Zalaegerszeg unit, the College of Finance and Accountancy, was established in 1971 and now is part of the Budapest Business School. The Faculty of Health Science at the University of Pécs also has educational units in Szombathely and Zalaegerszeg. And finally, the Budapest University of Technology and Economics runs an outside unit in Zalaegerszeg while the Pannon University has a higher educational unit in Nagykanizsa. Both of them are in engineering sciences. The activity of these outside units focusses on teaching. Their R&D performance is thus very limited.

In some of the industrial and business parks in West Transdanubia, innovation and technology centres have been established to stimulate the innovation activity of small- and medium-sized firms and technology transfer. The most important one of them is the INNONET Innovation and Technology Centre, which is located in the Business Park Győr and is equipped with a modern communication equivalent to that found in similar European centres targeting start-up companies. INNONET provides a wide rage of administrative, management, and training services at reduced rates for such companies (Dőry/Grosz 2005). The Centre also tries to create important synergies between the international firms settled in the Győr Business Park and the local innovative small -and medium-size ventures. It has very good relationships with similar Austrian institutions (e.g., inEisenstadt, Wiener Neustadt, Seibersdorf) and runs several joint projects with these partners. One more innovation centre is starting its operation also in the industrial park of Sopron and Szombathely, while in Zalaegerszeg a new innovation and technology centre is under preparation which will focus on wood and furniture industries and mechatronics (Csizmadia/Grosz 2006).

The R&D competencies of the region are connected to the most important education fields of the large higher educational institutions in the region and, of course, to the key sectors of West Transdanubia, where evidence of cluster formation is becoming ever stronger. The most important fields here are:

- The automotive sector, especially in the area of Győr; focussed on the Széchenyi István University-based R&D centres and the R&D activities of a growing number of automotive firms;
- Electronics and mechatronics, mainly based on business R&D activities;
- Renewable energy and technologies, especially at the University of West Hungary, but emerging at the Széchenyi István University as well;
- The wood and furniture industry and related technologies at the University of West Hungary and based on firms in the Zala and Vas counties;

- Agriculture and food industry, based at two university faculties in Mosonmagyaróvár and Keszthely.

Leading Sectors

In terms of investment per capita, the West Transdanubia Region ranks second after Central Hungary (including Budapest as well), scoring considerably higher than the national average. The same is true for GDP, where West Transdanubia is the second strongest region within the country. The region's economic structure is well balanced; it is based on a number of pillars and ranks above other regions in terms of attracting foreign capital, the ratio of industrial investments, and industrial exports (ROP 2007).

In terms of economic performance, the industrial centres that were the most capable of attracting foreign working capital have acted as the drivers for development: Győr, Szombathely, Sopron, Sárvár, Mosonmagyaróvár, as well as Szentgotthárd and its vicinity. Dynamic economic restructuring has not taken place evenly across the region and there has been a further increase in existing regional differences (between more developed Győr-Moson-Sopron and less developed Zala) (Grosz 2007).

Almost 99% of the enterprises of the West Transdanubia Region are small or micro-businesses employing 50 people or fewer. Overall, they employ considerably more than half of the employed workforce. However, they account for much less than 50% of the GDP, and their portion of exports is even smaller (60% of all exports of the region originate from the industrial parks). It is obvious, therefore, that developing this sector may yield considerable economic growth.

In order to decrease the vulnerability stemming from the high mobility of foreign capital—i.e., if the region wants to prevent multinational companies from relocating away from West Transdanubia—and in order to sustain the region's competitiveness, it is essential that the existing economic development model be transformed. The current model relies on the attraction of foreign capital involved in low-complexity production using low-cost labour. The new innovation-driven economic development model should be based on competitively priced, skilled labour that is involved in the development and production of complex products,on continuous innovation, and on further attracting as well as internally developing R&D and innovation-oriented companies (Grosz 2006).

Corresponding with the most important sectors of the region, cluster initiatives have been launched continuously since 2000. These initiatives are aimed at promoting cooperation and interaction between companies and providing special services as well as infrastructure for the key sectors that play a dominant role in the economy of the region (automotive industry, electronics, mechatronics, wood industry, furniture industry, environmental technologies, alternative resources, health tourism, medical tourism, logistics) as well as for related and supporting industries (Csizmadia/Grosz 2006). They are based on developing a highly skilled workforce in line with the expectations of the clusters, and on providing new technology and technical infrastructure. The objective is to improve the competitiveness of the enterprises already operating in the region and to launch new enterprises. In line with strategic community guidelines, the region is consciously concentrating on achieving an economic situation which is in line with its requirements and possibilities, where the basis of growth is innovation and entrepreneurial intellectual potential (ROP 2007).

The newly established cluster initiatives aim to promote the clusterisation processes in an individual branch by stimulating cooperation among enterprises and between business and non-profit organisations (higher education, research, special services, infrastructures), by providing cluster specific services, and by accelerating the flow and spread of information. Cluster organisations in the region are important tools for creating and forming the missing elements of regional innovation systems and for improving the relationships among the different elements of the whole system. Cluster management, members, and related professional bodies, institutions, and associations possess the specific information required for the development of the given sector or cluster. They can identify the most important development directions and mobilise relevant enterprises, as well as formulate and articulate inputs for policy decision makers and development players. Cluster organisations contribute to the improvement of the innovation environment of the region by supporting cooperative activity and the spread of best practice among cluster members (Grosz 2006).

From 2000 to 2005, five cluster initiatives were established in the region, but two of them were not really successful. Experience and sector analysis led to further clusters being founded at the end of 2005. In 2006, as we mentioned before, the so-called Pannon Clusters decided to found an association, a network for the coordination of their work and activities and to intensify investment in West Transdanubia by supporting the cooperation of the 23 industrial parks in the region (Pannon Business Network 2006). Now, eight cluster organisations are operating in the region, and some of them have only 1-2 years experience:

- Pannon Automotive Cluster (PANAC), 2000
- Pannon Wood and Furniture Cluster (PANFA), 2001
- Pannon Thermal Cluster (PANTERM), 2001
- Pannon Logistics Cluster (PANLOG), 2005
- Pannon Textile Cluster (PANTEX), 2005
- Pannon Mechatronics Cluster (PANEL), 2006
- Pannon Cluster of Local Products (Handcraft Cluster), 2005
- Pannon Renewable Energy Cluster, 2006
- Pannon IT Cluster, 2007 (under formation)

These regional cluster organisations have received subsidies from the region's extremely limited, decentralised funds. In West Transdanubia, all clusters have been developed by bottom-up processes.

Most of the largest companies are active in the key sectors mentioned above. The automotive industry includes: Audi, Nemak, Rába, BOS, BPW, General Motors, Sapu, Autoliv, LuK, and Sokoro. In the electronics industry, the region has Provertha, Lite-On, Robust Plastic, Kromberg-Schubert, Delphi (Packard), Epcos, Jabil, and Villszöv. Besides automotives and electronics, there are other machine industry firms: Cellcomp, Ipartechnika, Kühne, Mofém, Wahl, and DKG. The wood and furniture industry is also very important with Velux, Lapcom, Ada, Kanizsa Trend, Swedwood, Interfa, Falco, Savaria Nett-Pack, Műbútor, and Zala Bútorgyár. Traditionally, the textile industry has been strong in West Transdanubia. However, in the last decade its importance has declined owing to processes of globalisation, and most of the large companies have now closed. The food industry is also a traditional industry of the region with Ceres, Győri Keksz, Pannon Baromfi, Pannon, Sága Foods, Heineken, Pannontej, and Zalabaromfi. In addition to these sectors, the largest companies are in the construction and construction materials industry, in electricity, gas, water, other public utilities, transportation and logistics. The majority of these companies have their own R&D units and -activities in the region, especially in the automotive and wood and furniture industries.

Summary and Conclusions

The regional innovation system (and its governance) in West Transdanubia is underdeveloped and a number of modern policy design tools (decision-making methods) have been missing at regional level (and also at national level). The most important problems in connection with the regional RTDI policy are: a highly centralised system, very limited regional autonomy in RTDI policy, dependence of regional innovation policy on the national frameworks, and no significant regional financial resources. However, several important developments have occurred in regional innovation policies in Hungary in the last years (establishment of regional innovation agencies, regional university knowledge centres, cooperation research centres, Innocheck programme, regional innovation development), but almost all the new measures have been launched by the central government. Only in very few cases have policies been designed jointly with the regional players.

At the same time, West Transdanubia lags behind in research and development. The decrease in industrial production and productivity can also be interpreted as being linked to low R&D activity. A further aspect is that the small- and medium-size companies are not able to integrate the most recent results of R&D into the production processes, i.e., participate in spin-offs. Developing small- and medium-size businesses is likely to be one of the top priorities in economic development of the region.

However, West Transdanubia can also be seen as one of the most innovative regions in Hungary. The first industrial park in Hungary was established there, the first innovation centre (excluding the capital Budapest) was also founded there. The first and most successful cluster organisations were initiated by the region, and the Pannon Business Initiative and Network, as new policy instruments, also started in West Transdanubia. The region was among the first to have its own regional innovation strategy and was a pioneer in developing a new technology foresight programme. Despite the lack of regional resources, several new, innovative measures have been launched in the last decade.

In the future, networks, clusterisation, and SMEs have to be given central priority in the development of innovation and R&D policy. The programmes of innovation centres, clusters, and other development organisations have to focus on the improvement of the innovation capacity of SMEs and the support of their innovation activity. Fostering cooperation and mutual learning are likely to be crucial measures in such a context.

The key sectors for future economic development in the region should be those identified by the technology foresight programme: mechanical engineering (esp. automotives, electronics, and mechatronics), tourism (esp. health tourism and rural tourism), environmental industries (wood and furniture industry, environment use, environmentally friendly resources and technologies, and renewable energies), knowledge industry (education and research activities), and some horizontal sectors such as information and communication technologies, logistics, and transportation. In most of these sectors, network building has already been started.

In the last 5 years in West Transdanubia, a completely new regional innovation system has been formed, including new innovation centres, new cluster organisations, new university based knowledge and research centres, a new regional innovation agency and council. To date, the most important elements for a regional innovation system are present within the region. In the next few years, the main task will be to fill out the interstices of the »hard« elements, i.e., infrastructures, organisations, and institutions, with the »soft« elements of development requirements, especially knowledge and intellectual capital formation. In addition, one of the mid term objectives is to coordinate the operation of the different elements in the regional innovation system so as to eliminate the unnecessary parallel activities.

In the last few years, the existing key players in the regional innovation system have established very good partnerships and cooperations with their Austrian counterparts especially in Burgenland, Lower Austria, and Vienna. Such cooperation has not only had a direct impact on real output, it has allowed for a sustainable knowledge transfer on innovation policy and management. In more recent years, connections to Slovakian partners have also gained in importance for regional actors.

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Regional Case Study Stuttgart Region

Introduction

Figure 46: The Stuttgart Region in Europe

Situated at the heart of the Federal State of Baden-Württemberg in southwest Germany, the Stuttgart Region comprises the City of Stuttgart (the state capital) and the five surrounding counties of Böblingen, Esslingen, Göppingen, Ludwigsburg, and Rems-Murr with a total of 179 local authorities and municipalities.

With a population of 2.7 million, the Stuttgart Region boasts a highly advanced industrial infrastructure and enjoys a well-earned reputation for economic strength, cutting-edge technology, and exceptionally high quality of life.

The Stuttgart Region is one of Europe‘s most important and most successful economic centres, well-known for its high degree of innovation, research and quality. This is not only due to leading international companies such as Daimler, Porsche, Bosch, Hewlett-Packard, or IBM, all of which have their world- or German headquarters here. There is also a healthy mix of global players and highly innovative, quality-conscious medium-sized enterprises. Both groups are strong exporters: about 50% of the sales from manufacturing companies based in the Stuttgart Region are indeed generated abroad. With a regional gross domestic product (GDP) of ca. 93 billion euros, the Stuttgart Region is one of Europe's most powerful regions.

The strong economy enjoyed by the region, therefore, provides a solid foundation for innovation and development. The region currently has the highest density of scientific, academic, and research organisations in all of Germany, and it ranks at the highest European level with regard to R&D investments by companies (approximately 6% of GDP). It also boasts the highest number of patent applications in Germany and the country‘s highest percentage of exports.

This success is based on a balanced economic structure—a mixture of major corporations, medium-sized companies, and a concentration of academic and non-academic research institutes, including for instance several institutes of the Fraunhofer and Max Planck Societies.

A few key industries drive the regional economy: automotive, manufacturing, mechanical and electrical engineering, the creative industries including information and communication technologies. In this regard, the traditional strengths in vehicle design and production and engineering live on up to today in the Stuttgart Region, the birthplace and home of Gottlieb Daimler, the inventor of the automobile. In the meantime, the »traditional« industries have been enriched with skills from the younger industry of information technology and with enthusiasm for research and development, helping to create one of the most dynamic and efficient economic regions in the world—one that is innovative in approach and international in outlook. These achievements have been incidentally recognised by the European Union, which has twice conferred its prestigious Award of Excellence for Innovative Regions on the Stuttgart Region.

Governance and Policies

The Federal Republic of Germany is structured according to a federal political system with a national level and sixteen federal states. Each of them has its own Parliament and Government, its own authorities, courts, and its own state constitution.

Today, the territory of Baden-Württemberg is divided into four administrative districts, twelve regions, 44 counties, and all in all 1,110 municipalities. Compared with the other regions of the State of Baden-Württemberg, the Stuttgart Region is a unique organisational model, having its own constitutional elements: the Verband Region Stuttgart and the Regional Assembly.

Verband Region Stuttgart and Regional Assembly

The association Verband Region Stuttgart was founded in 1994 to give the Stuttgart Region a political organisation with its own regional authority and its own directly elected representatives of the population: the Regional Assembly. This democratically legitimated body covers important regional topics and makes decisions especially in the area of regional planning policies—regional, infrastructure, landscape, traffic and transport planning—as well as business promotion, local public transport, trade fairs, and tourist marketing.

In 2004, the population of the Stuttgart Region voted for the third time according to the constitution of their Regional Assembly and elected 93 representatives for a five-years term.

The central aim of the Verband is to marshal the forces of the

179 independent municipalities (towns and city districts) within the Stuttgart agglomeration in order to enable the Region to compete effectively at the European and the world level.

The work in business promotion, tourism marketing, and the coordination of local public passenger transport is handled in collaboration with private-sector subsidiary companies of the Verband Region Stuttgart.

Stuttgart Region Economic Development Corporation (WRS)

The Stuttgart Region Economic Development Corporation (WRS, Wirtschaftsförderung Region Stuttgart) is a subsidiary of the Verband Region Stuttgart aiming to meet the Verband's responsibility for regional economic development and business promotion. Together with other shareholders like the association of municipalities of the Stuttgart Region (so-called Kommunaler Pool), non-governmental and business organisations such as the chamber of commerce and the chamber of handicrafts, the Verband Region Stuttgart founded the WRS in August 1995.

According to its statutes, the main tasks and activities of the Stuttgart Region Economic Development Corporation are location marketing, investor support, and economic development activities.

Within the location marketing department, main aims are to increase the popularity and improve the image of the Stuttgart Region as well as to provide information and increase awareness in Germany, Europe, and abroad about the existing potential and the strengths of the Stuttgart Region.

Investor support issues comprise advisory services and support services for companies that want to start or expand their business within the region or intend to move to the Stuttgart Region. The most important instrument for these support services is a so-called location communcation system (»Immobilienportal Region

Stuttgart»), which is an Internet marketplace for commercial real estate in the Stuttgart Region.

Main aims of the economic development activities are to foster sustainable regional development, to preserve and to improve the region's economic strengths. Within this context, the development and implementation of innovative measures supporting local companies and especially SMEs are a major emphasis. The main instruments for achieving the strategic aims are a generally focussed sectoral cluster management approach as well as a thematic-based company-driven cluster management initiative, the so-called Regional Competence and Innovation Centre Initiative. Additional specific support services, e.g., a business angel platform, a support measure for entrepreneurs as well as a qualification initiative round up and complete the operative activities of the Stuttgart Region Economic Development Corporation.

In order to meet its tasks and duties, the Stuttgart Region Economic Development Corporation works in close cooperation with public and private sector organisations representing the state government, county governments, local municipalities, the regions' universities and higher education institutions, the chambers of commerce and handicraft as well as individual enterprises.

Major Programmes and Instruments at Regional Level

There is no doubt that the well-being of regional economies in highly developed countries depends to a large extent on their ability to innovate. Innovation in this sense refers to the ability to turn technological progress and research results into marketable products.

Against this background, a wide range of different activities, programmes, and initiatives are implemented and initiated by the Stuttgart Region Economic Development Corporation in order to support innovation, research, and development as well as information and know-how-exchange among the different institutional players located in the Stuttgart Region.

Regarding innovation, research, and development, three initiatives at the regional level have to be highlighted: the Competence Centre Initiative, the PUSH!-network and the Business Angel Forum.

Regional Competence and Innovation Centre Initiative Stuttgart Region

Supporting network creation, tight cooperation as well as information and know-how-exchange among the business, science, and research communities, the Regional Competence and Innovation Centre Initiative was initiated by the Stuttgart Region Economic Development Corporation in 1999.

Main aim of the initiative is the set-up and management support of well organised regional networks by integrating ideally all regional companies, universities, research facilities, and additional institutions working in a particular field of technology.

In this regard, primary tasks of the Competence and Innovation Centres are to promote cooperation between relevant stakeholders, to foster technological development, to strengthen the competitiveness of regional enterprises, especially the small- and medium-sized enterprises—ensure information and know-how exchange among the participating institutions, as well as to initiate innovative cooperation projects. In addition, Competence and Innovation Centres identify and consolidate technological and business expertise—and make it available to local firms—above all, to small-and medium-sized enterprises with limited R&D resources of their own.

Implemented as a regional competition and contribution programme, the Stuttgart Region initially funded the set-up process of these thematic-based, company-driven Competence and Innovation Centres in the Stuttgart Region. After a first three years implementation process, an external evaluation of the achieved progress and status quo identified strengths and weaknesses of the implemented Competence and Innovation Centres and helped to adopt and ensure further improvements.

At present, more than 450 companies (global players as well as SMEs), nearly 60 university institutes and research facilities, 16 municipalities, a number of non-governmental organisations as well as associations contribute actively to the existing Competence and Innovation Centres.

In order to achieve intensive cooperation links among the participating partners, each competence and innovation centre is focussed on a special technology field.

Figure 47: Competence and Innovation Centres in the Stuttgart Region

PUSH!—Partner Network for Start-ups from Universities in the Stuttgart Region

PUSH! is a public-private partnership bringing together more than 60 partners from all over the Stuttgart Region in order to support start-up activities and entrepreneurial spirit at universities and research institutes. Students and scientists get access to courses, trainings and seminars. Entrepreneurship (and intrapreneurship) became a part of the university curriculum, thus influencing the mindset of students, engineers, scientists, professors as well as administration.

Organised in three »profit centres«—PUSH! Education, PUSH! Incubator, and PUSH! Corporate Development—with close internal relations and cross-institutional cooperation, the PUSH! Association as an umbrella organisation develops, decides, and oversees long term strategy, mid-term objectives as well as monitoring and controlling.

While »PUSH! Education« mainly consists of academic partners and institutions of advanced vocational training, offering seminars, courses, and training in entrepreneurship, business development, and management, »PUSH! Incubator« consists of three university-based incubators offering office space, production facilities, and lab space for start-ups from universities, universities of applied science, and research institutes.

As the third »profit centre«, PUSH! Corporate Development is operated by the Stuttgart Region Economic Development Corporation and focusses on public relations, (inter-)national networking and linking PUSH!'s activities to the regional economy (business community) and world of investment (business angels, banks, and VC companies).

Moreover, PUSH! facilitates the exchange of experiences and good practices by participating in European networks and projects and cooperates with related initiatives in the Stuttgart Region, in Germany, and beyond.

Business Angel Forum Region Stuttgart (BAFRS)

High-tech start-ups depend to a large extent on the availability of some crucial resources: In order to provide both financial resources and business contacts, the BAFRS was established in 2003 as a joint initiative of the Stuttgart Region, the City of Stuttgart, and a private company offering a set of specific services for well-off business people.

In general, the BAFRS aims at reducing the early-stage financing gap for knowledge-based and high-tech start-ups within the Stuttgart Region and at improving the number of deals by efficient pre-selection and preparation of pitch events for the involved and contributing business angels.

Objectives of BAFRS are mainly the creation of a business angel culture and building up and supporting a sustainable network of private business angels. Moreover, both the promotion of a culture of entrepreneurship and independence within the Stuttgart Region and the whole of Baden-Württemberg as well as an increased awareness of the importance of investing in young high-tech start-up companies for a wealthy future of the Stuttgart Region and Baden-Württemberg have to be mentioned.

Regional R&D Competencies

The Stuttgart Region has an excellent research infrastructure, including many leading universities and institutes working at the cutting edge of new technologies (e.g., Universities of Stuttgart and Hohenheim), nine universities of applied sciences, and various Fraunhofer and Max-Planck Society research institutes. Numerous institutions of the Steinbeis Foundation for technology transfer are located here. The regional R&D competencies reflect to a great extent the industrial strengths of the Stuttgart Region. In addition, universities and research institutes excel at certain research fields such as aerospace (University of Stuttgart) or agriculture (University of Hohenheim) on national and international level. In addition, large companies like Daimler, Bosch, and Porsche have their own large R&D competencies and departments, being responsible for the high value of R&D spending in the Stuttgart Region.

Universities in the Stuttgart Region

University of Stuttgart

The cooperation between technical, physical, and human sciences has always been a great advantage of the University of Stuttgart. Today, the University is a modern, achievement-orientated institution with a focus on technical and physical disciplines.

A core competency in order to develop major strategic focal points is an inter-disciplinary combination of different research activities. This is proven by special research units, major projects, post graduate programmes as well as integrated and international courses of studies. Major emphasis of the more than 20,000 students registered at University of Stuttgart is put on material technology, ecology and environmental protection technology, power engineering, transportation, traffic system and automotive engineering (including aerospace), combustion research, industrial engineering, micro systems and nano-technology, process engineering and IT. Moreover, social research and management, architecture and town planning, civil engineering and cultural theory are focal points of the University of Stuttgart.

Besides its own research facilities, there are additional research institutes which are operated in cooperation with the University of Stuttgart and in many cases are led by its professors: e.g., institutes of the Fraunhofer, Max-Planck, and Hahn Schickard Societies as well as a number of additional scientific institutions (e.g., an institute of the German Aerospace Center, institutes for microelectronics and production engineering as well as a Centre for Solar Energy and Hydrogen Research Baden-Württemberg).

University of Hohenheim

The origins of the University of Hohenheim date back to the year 1818 when an agricultural teaching and pilot testing station was implemented in order to foster agricultural development. Although the University of Hohenheim is nowadays the smaller one of the two Stuttgart universities, it combines cutting-edge research and modern education.

Its international reputation has been established through a high rate of international partnership links and research cooperation as well as a high percentage of foreign students within the scientific, agricultural, economic, and social sciences.

At present, the University has around 5,500 students and consists of the Faculty of Natural Sciences, the Faculty of Agricultural Sciences, and the Faculty of Economics and Social Sciences. Within these three faculties, 38 different institutes as well as additional research centres and experimental labs ensure and guarantee intensive, practice-oriented research on site.

Esslingen University of Applied Sciences
(Hochschule Esslingen)

Today the Esslingen University of Applied Sciences offers premier programmes for its 5,000 students in manufacturing, engineering, technology, microelectronics, management and information systems management. These programmes rely heavily on the interaction between industry and academia and build upon strong links between the Departments of Management, Information Technology, and the many Engineering Departments.

In order to bridge the gap between education, basic research as well as technology transfer, the Esslingen University of Applied Sciences has established the Institute of Applied Research. Major topics of research and development are innovative engineering, comprising microsystem engineering, modelling and prototyping, and applied social science research with an emphasis on exploratory studies, monitoring of research studies, concept development, evaluation, merit appraisal, and quality control.

Stuttgart University of Applied Sciences (HfT, Hochschule für Technik Stuttgart)

Closely associated with engineering sciences at the HfT are the processes of analytical thinking and taking economically-oriented action. That is why the Stuttgart University of Applied Sciences offers mathematics, computer science, and business management as part of the curriculum. In keeping with the trend towards internationalisation of the educational system, the HfT offers both a variety of bachelor as well as master degree programmes.

Taking research activities into account, the HfT has been concentrating particularly on fields of building physics, building technology, geoinformatics, and techno-mathematics. Aside from a number of research laboratories with a number of specific topics (e.g., building physics, building materials testing, GIS technology etc.), applied research and development topics regarding architectural acoustics, heat insulation, thermic building physics and use of solar energy are all concentrated under one common roof at the Joseph-von-Egle Institute.

Moreover, a new institute, the Centre for Applied Research at Universities of Applied Science—Sustainable Energy Technology (zafh.net), was founded in 2002 in order to pool research skills available at five universities for applied sciences in Baden-Württemberg in the field of »intelligent buildings.«

Stuttgart Media University (HdM, Hochschule der Medien Stuttgart)

Stuttgart Media University regards itself as a full-service university for the media industry and is the only educational institute in Europe to cover every media field.

All in all, 20 courses of study comprise all topics from printing to the Internet, from design to business administration, from library science to advertising, from media contents to packaging technology, and from computer science and publishing to electronic media.

With regard to research topics, main activities are bundled within two institutes: the Institute for Applied Media Research for Children as well as the Institute for Applied Research. The latter conducts research and development on a number of different topics, such as ambient intelligence, audio-visual media, colour and imaging, e-learning, entrepreneurship and start-up, innovative application of printing technologies, streaming media, usability engineering, etc.

Nürtingen-Geislingen University (HfWU, Hochschule für Wirtschaft und Umwelt Nürtingen-Geislingen)

Founded in 1949, the former Higher School for Agriculture (»Höhere Landbauschule») is today a university of applied sciences with several study courses. Beside agriculture and landscape planning, the HfWU possesses one of the biggest faculties for economics in Baden-Württemberg providing 14 different courses of study.

The main research activities at HfWU are concentrated in the so-called Institute of Applied Research: a scientific institute for applied, practical-oriented research, development, and application within the sectors of landscape and environmental planning, agrarian economics as well as business economics and political economics.

Research Institutes and Research Facilities in the Stuttgart Region

Fraunhofer Society

The Fraunhofer Society undertakes applied research and is solicited by the industry, the service sector, and by public administrations. The Fraunhofer Society maintains 56 Fraunhofer Institutes at over 40 different locations throughout Germany. A staff of some 12,500 people works with an annual research budget of over € 1.2 billion, of which more than € 900 million is generated through contract research.

Six different Fraunhofer Institutes are located in Stuttgart: the Institute for Industrial Engineering (IAO) with its focus on investigating current topics in the field of technology management; the Institute for Building Physics (IBP) with an extensive bundle of research, development, testing, demonstration, and consultancy in the field of building physics; the Institute for Interfacial Engineering and Biotechnology (IGB), offering R&D solutions in the fields of health, environment, and technology; the Fraunhofer Information Centre for Planning and Building (IRB), providing specialised knowledge resources for all fields of planning and building; the Institute for Manufacturing Engineering and Automation (IPA), offering solutions for organisational and technological functions in the production sector of industrial companies. Moreover, the Fraunhofer Technology Development Group acts as a specialist of the Fraunhofer Society in the fields of product development, production technology, management, strategy, and organisation.

Max-Planck Society

The Max Planck Society for the Advancement of Science is an independent, non-profit research organisation primarily promoting and supporting research at its own institutes. In particular, the Max Planck Society takes up new and innovative research areas that German universities are not able to accommodate or adequately deal with.

Within its 78 institutes and research centres, approximately 4300 scientists as well as ca. 11,000 student assistants are employed. Together with fellows of the international Max Planck Research School, doctoral and postdoctoral students etc., the Max Planck Society comprises 23,400 people.

Two Institutes of the Max Planck Society are located in Stuttgart: The Institute for Solid State Research and the Institute for Metal Research. Both institutes cover different research topics in a number of different departments. In 2001, together with the University of Stuttgart, these two institutes established an international graduate school with a PhD training programme in advanced materials, called the International Max Planck Research School for Advanced Materials (IMPRS-AM).

German Aerospace Center (DLR, Deutsches Zentrum für Luft- und Raumfahrt)

The German Aerospace Center (DLR) is Germany's national research centre for aeronautics and space. Its research and development in aeronautics, space, transportation, and energy is integrated into national and international cooperative ventures and comprises beside the exploration of the earth and the solar system the development of environmentally-friendly technologies for mobility, communications, and security.

In Stuttgart, the DLR consists of five research institutes conducting research in the fields of space, aeronautics, energy, and transportation. In detail, research topics cover especially development and implementation of composite materials, the development of highly efficient energy conversion technologies including renewables, the reliability of combustion processes, the investigation and development of new laser sources and active optical systems. Moreover, research in the field of transportation, comprising alternative power trains, energy conversion, hybrid design and construction, and innovative technology systems has been implemented at the DLR facilities in Stuttgart.

Leading Sectors in the Stuttgart Region

Geographically located at the heart of Europe and the Federal State of Baden-Württemberg, Stuttgart stands as the epicenter of economic, scientific, and political life in southwest Germany.

The Stuttgart Region possesses a wide range of economic and industrial activity that creates synergy effects, e.g., the electronics, machinery, and automotive sectors. The composition of the economy displays a significant portion of services but also an industrial activity of atypically high percentage among European regions. An idiosyncrasy of the Stuttgart Region is the strength of its manufacturing-related industries and technologies, which still play a bigger role here than in many other EU regions. The strength in these industries is based on high-technology competencies. In fact, ca. 25% of the regional workforce is employed in high-technology industries—one of the highest percentages in the whole EU.

In the year of 2005, the regional economy generated a GDP of about € 93 billion. Besides creating 30% of the added value generated in Baden-Württemberg alone, with € 65,000 per employee, the Stuttgart Region lies far above national averages in added value creation. Both in terms of total and percentage, the Stuttgart Region has one of the lowest unemployment rates among the top metropolitan areas in Germany (4,2% in April 2008).

The fabric of enterprises in the Stuttgart Region includes both major global players and dynamic SMEs. The latter group in fact forms the backbone of the regional economy and includes many successful medium-sized companies that are world leaders in their respective fields.

The main feature of the regional economic structure is a specialisation in the industry sectors of mechanical engineering, electrical engineering/electronics, and vehicle construction. Three-quarters of the people employed in the manufacturing industry work in one of these three sectors which cover almost 40% of industrial firms. In addition, a well-established tradition—and a bright future—in publishing and media can be stated.

The Automotive Sector

The Stuttgart Region has a unique cluster of automobile manufacturers, component suppliers, and research establishments and leads the way in technologies such as telematics, fuel cell technology, and virtual reality. The automotive cluster covers 36% of all industrial employees in the Stuttgart Region and 47% of the total industrial turnover (2002).

The automotive industry in the region has been increasing its turnover steadily over the last several years and shook off the effects of the crisis of the early 1990s, and since then it has been on the rise, thanks to its success in export markets. The growth of export income, which currently lies at 64% (2004) in terms of turnover, proves the global competitiveness of Stuttgart's automotive cluster.

Apart from the two major automobile producers Daimler and Porsche, a number of well-known suppliers belong to the automotive cluster and shape the character of the Stuttgart Region automotive sector. On the heavyweight end of the scales, Bosch and Mahle lead the group of bigger suppliers, which also includes Behr, Dürr, Eberspächer, Bertrandt, Recaro, Mann+Hummel, Beru, and other companies. These globalized firms have their headquarters, R&D facilities and manufacturing operations in the region. Moreover, there is a large group of smaller suppliers from the 2nd and 3rd tiers and an even larger group of firms from other industries that supply components for the auto industry. In addition, research and scientific players like the Institute for Automotive Research (UAS Nürtingen) or the High Performance Computing Centre at the University of Stuttgart also contribute to the automotive sector.

Engineering

The Stuttgart Region is a leading centre for mechanical and electrical engineering—both of which play a key role in the automotive sector as well as in new sectors like environmental technology or laser technology, too.

Taking laser technology into consideration, market leaders and renowned appliers in the field of laser technology can be found within the region. Innovations are enabled by cooperation within the Photonics BW Network and several scientific institutions and R&D service providers. A strong cooperation initiative between the »Institute for Laser Technologies,« (University of Stuttgart), the »Research Society for Laser Technologies« and the »Technological Society for Laser Technologies« pools regional skills and know-how.

Some of the most significant regional companies in the engineering sector are: Bosch, Trumpf, Alcatel SEL, Agilent Technologies.

In the sub-field of electricity, Robert Bosch clearly has a dominating position. Additional important players include Trumpf, Stihl, Festo, Kärcher as well as related research institutes.

Environmental Technology

The Stuttgart Region's clean energy cluster comprises now nearly 300 companies, many of which maintain their own research and development departments. An additional 600 craft and trade businesses as well as numerous architects, engineers and consultants are involved, too.

Companies specialising in mechanical engineering and production technology have also discovered the potential of this young sector and benefit from the current boom as suppliers or have been able to expand into clean energy. Moreover, a number of pioneer projects and facilities are located in the Stuttgart Region, e.g., the Research and Test Centre for Solar

Plants, which is the largest testing centre for thermal solar technology in Germany, the Endowed Chair of Wind Energy as well as a fully automated biogas laboratory at the University of Hohenheim.

Biotechnology

In order to support the development within the biotechnology cluster, the counties of Reutlingen, Tübingen, and Neckar-Alb in cooperation with the Stuttgart Region and the cities of Esslingen and Stuttgart, have founded the BioRegio STERN Management GmbH. The major objective of BioRegio STERN is to back biotechnology businesses, help them to achieve their objectives, and provide funding support. Currently, 86 biotech companies and 94 medical technology businesses are working there intensively to make their ideas a success.

Beyond that, two centres—the Life Science Centre in Esslingen and the Technology Park Tübingen-Reutlingen—do not only offer basic research facilities but also boast specially-developed financing and consultancy models in the greater Stuttgart Region.

Creative Industries, TIME (Telecommunication, Information, Media, Entertainment)

The Stuttgart Region is home to many highly specialised IT service providers and software designers. The publishing and printing industry, which has had a long tradition in Stuttgart, is still a major branch of industry and provides 8% of industrial employment.

Within the TIME-industry, nearly 28,000 companies in total were counted for the Stuttgart Region, providing jobs for more than 230,000 people. The greatest share in the number of companies is held by the IT service providers (28%), followed by the printing industry (22%) and advertisement/marketing (17%).

Important actors in the TIME-industry are: Hewlett-Packard, Klett, Reclam, the Filmakademie in Ludwigsburg as well as additional related university institutes.

Summary and Conclusions

Through this brief overview of the innovation system and policy framework in the Stuttgart Region, one can easily understand why the EU has already twice granted this region its renowned Award of Excellence for Innovative Regions.

The success of the Stuttgart Region with regard to innovation can be explained not only by its well-balanced and high-performing economic structure, which is composed of a good mix of big global companies and high-quality SMEs, but also by its ability to create a favourable environment for researchers, followed by a great aptitude in converting innovative ideas into real businesses.

These skills are enabled through a general framework of R&D-oriented policies and support programmes and by consistent networks of intermediary and thematic institutions encouraging entrepreneurship and helping entrepreneurs to succeed in their undertakings.

This is also probably due to the fact that the Stuttgart Region has systematically developed its strengths and potential, both in the academic and the business worlds, which are constantly in interaction through initiatives and through efficient networks of businesses, research institutes, experts, and public authorities.

Driven by a number of key industries in the prominent sectors of mechanical and automotive engineering as well as creative industries including information and communication technologies, the Region gained a top-of-the-list ranking for high-tech, innovation, and manufacturing. Moreover, the Stuttgart Region is one of Europe's leaders in emerging industries such as fuel cell, nano- and biotechnologies, and possesses a number of companies and research facilities within the aerospace area.

Part D

Appendix

1

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Markus Gruber read Business Studies at the University of Graz. From 1992 to 2004, he was researcher, senior researcher and from 2000 head of the Graz branch of the Institute of Technology and Regional Policy (InTeReg) at the research organisation Joanneum Research. He has been involved in many studies and consulting projects in the areas of regional economics, regional innovation policies, and programme evaluation. In 1998, he carried out research at the »European Policies Research Centre« at the University of Strathclyde in Glasgow. He has been general manager of convelop since 2005, responsible for the areas of policy design and evaluation.

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KLEMEN KOMAN is a researcher at the Institute for Economic Research, Lubljana and holds a MSc degree in economics from the University of Ljubljana. His research interests have been focused on projects concerning innovation and technology transfer policy and regional-specific projects. In recent years, he has worked on international projects such as CORINNA, with the Innovation Relay Centre Slovenia (IRC Slovenia), and on the Slovenian Regional Innovation and Technology Transfer Strategy (SLORITTS).

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Georg Panholzer is a senior expert in the Unit for International Technology and Innovation of the Austrian Federal Ministry of Economics and Labour. He is responsible for technology cooperation issues with Central, Eastern and Southeastern Europe. In this function he has been responsible for the development of the funding programmes STRAPAMO and CIR-CE. Since 2007, he also acts as the Austrian delegate to the programme committee »Research for the Benefit of SMEs« (= SME-specific measures) in FP7. Mr. Panholzer was a member of the steering committee of CORINNA.

Thomas Schneemann was born in Austria in 1979. After his compulsory education, he did an apprenticeship and worked in jobs for ten years. In 2007 he graduated from the University of Applied Sciences Pinkafeld in a second chance education. He is engaged as a project assistant at the Technology Promotion Burgenland and in addition attends postgraduate studies concerning sustainable energy systems in Pinkafeld. Mr. Schneemann was a member of the CORINNA team.

Eduard Sturm was project manager in the Innovation and Technology group of the Carinthian Economic Promotion Fund (KWF), Klagenfurt. Prior to his work for KWF, he was an engineer in software, electronics, and semiconductor companies. Presently, he is starting a career as a business consultant. Mr. Sturm was the coordinator of the CORINNA project.

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Abbreviations

BERD ... Business Expenditure for Research and Development

BMWA ... Austrian Ministry for economics and labour

CIP ... Competitiveness and Innovation Framework Programme

EC ... European Commission

EPO ... European Patent Office

ERA ... European Research Area

ERDF ... European Regional Development Fund

ESF ... European Social Fund

EAFRD ... European Agricultural Fund for Regional Development

EUREKA ... Pan-European Network for Market-Oriented Industrial R&D

FAS ... Italian Fund for Under-used Areas

FDI ... Foreign Direct Investment

FFG ... Austrian Research Promotion Agency

FP 5, FP 6, FP 7 ... 5^{th} (6^{th}, 7^{th}) European Framework Programme for Research and Development and Innovation

FTE ... Full Time Equivalents

FWF ... Austrian Science Fund

GERD ... Gross Expenditure for Reseach and Development

GDP ... Gross Domestic Product

GRP ... Gross Regional Product

IMD ... International Institute for Management, Development, Lausanne

IRC ... Inovation Relay Centre

NIS ... National Innvation System

NUTS 2, NUTS 3 ... Nomenclature of Territorial Units for Statistics, with NUTS 2 standing for units like provinces that consist of counties (NUTS 3)

PPP ... Purschasing Power Parity

RIS ... Regional Innovation System

RITTS ... Regional Innovation and Technology Transfer Strategy

ROP ... Regional Operative Programme

RTD, RTDI ... Research and Technology Development (and Innovation)

RTO ... Research & Technology, Organsation

SME ... Small and / or Medium Enterprise

S&T ... Science and Technology

STI ... Science, Technology and Innovation

VC ... Venture Capital

WEF ... World Economic Forum, Geneva