

# ***Summary of Regional Roundtables and Inputs to New Policies***

## ***Project LocoMotive***

***Regions of Knowledge 2***

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***Deliverable 9 (D 9)***

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***Interlace-Invent***

## **Preamble**

This LocoMotive project report provides summaries from a series of regionally organized roundtables on the location motives for R&D investments. The roundtables were set to screen and comment on the main points of the project and review the facts and findings from some 60 interviews with R&D managers in eight European city-regions. The R&D managers interviewed were representing mainly large multinational enterprises (MNEs), able to influence the size and in some regional cases even the direction of R&D investments and related innovation activity in the region.

The roundtables, which were conducted in seven selected regions, took place in 2006 and 2007 and were managed by the LocoMotive team in each region. Each organizing team provided inputs to this document in the form of a regional summary account.

In addition to the regional summary accounts, further inputs were drawn from the interviews of the R&D managers in selected companies in each region. Furthermore, other facts and findings were processed and added to the inputs by the persons who have written and edited this report.

This report provides a mosaic of key points made at the roundtables (illustrated by selected roundtable accounts). Some of the principal points are edited according to themes and main issue areas. There is no full report from any of the regional roundtables included in this document. Roundtable reports from any of the seven regions may be requested from the responsible regional team.

For more details on the objectives for this document and for information about the special context of this part of the LocoMotive project, see the section below on Deliverable 9 (D 9) in Work Package 3.

This document is Version 6. Comments on the previous versions were received from some of the team members. The comments from the other LocoMotive team

members, especially from those who managed one or several of the regional roundtables, will be included in the final version.

Even after the regional roundtables, the ambition remains to keep the stakeholders involved in an open dialogue, aimed at creating optimal conditions for sustainable R&D investments and innovation strategies at the regional level. The stakeholder dialogue in each of the regions is intended to keep regional and other parties together so that they jointly or via the most committed and resourceful groups of stakeholders address the region's need for information and guidance.

In the project's methodology report (cf. Deliverable 3) the relevant regional actors were to include the following stakeholders:

- Local and regional government/policy makers (aim: include investment officers, local innovation policy makers)
- Subsidiaries of MNEs in the region (aim: include the most important firms whether or not they engage in innovative activities)
- A selection of regional SMEs (or their representatives; aim: include in any case important (high-tech) suppliers and venturing activities)
- Workers' representatives
- Local knowledge institutions (including relevant universities and consultancies)

The composition of the various roundtables across Europe varied considerably, but, taken together, the five groupings of stakeholders were all represented in one or several of the regional stakeholder meetings.

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## ***Introduction: R&D investments and diversity among EU regions***

### **Regional diversity increases**

The regions in Europe are ample evidence of diversity. As noted in many comparative studies of European regions and further emphasized in the reports from the LocoMotive project, there are wide varieties according to regional economic structure, competitiveness and growth, with considerable impact on living standards and social cohesion. Regional diversity is a main feature also for R&D investments and for the location of innovative capabilities among the multinational companies and their supporting institutions, located in various European regions. These diversities seem to increase.

### **R&D - one source of innovation among many**

If regional diversity across Europe is a key feature, it should be underlined that the wider European society has become more multifaceted and that knowledge creation by universities and other R&D institutions and innovation processes by business firms have become increasingly complex. This is further stressed by a recent study by an expert group under the European Commission (DG Research), focused on the creation of new regional capabilities.<sup>1</sup> Regional sources of knowledge for innovation are countless and the variety of inputs to be used by organisations and firms when innovating tend to stimulate more of 'open innovation' processes relative to 'in-house' innovation. For example, using results from our regional roundtables or workshops and from the interviews of R&D managers, this phenomenon seems particularly strong in companies involved in innovation processes based on information and communications technology, while pharmaceutical and other 'life science' companies seem to avoid 'open innovation' at least in the most commercially sensitive stages of an innovation process.

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<sup>1</sup> "Constructing Regional Advantage: Principles, Perspectives, Policies." Report prepared by Phil COOKE (chair) and Bjørn ASHEIM, Jan ANNERSTEDT, Jiří BLAŽEK, Ron BOSCHMA, Daneš BRZICA, Åsa DAHLSTRAND LINDHOLM, Jaime DEL CASTILLO HERMOSA, Philippe LAREDO, Marina MOULA, Andrea PICCALUGA, Brussels: European Commission (DG Research), 2006.

## Open landscapes of innovation

‘Open innovation’ and other externalization of knowledge exploration and innovation to ‘knowledge entrepreneurs’ and innovators outside of the firms, including in universities, is shaping a new landscape for regional governances. Regional policy-makers need to chart this new landscape and explore it together with business firms and other stakeholders in order to take advantage of its opportunities for R&D investments and innovation.

During the interviews, we have taken note of new types of interdependencies among firms, new patterns of specialization, and new divisions of labor among the parties involved, especially in large innovation processes (involving individual entrepreneurs, business firms, R&D and intermediary institutions and other organizations). In the new regional context, firm-level shifts towards more of management of ‘open innovation’ compared to more of ‘closed innovation’ could be promptly summarized as follows:

### “Closed innovation“

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**Largely internal ideas for innovation**  
**Firms perform R&D in-house**  
**Strategic R&D – core business**  
**Low labor mobility**  
**Few, weak startup firms**

### “Open innovation“

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**Many external ideas for innovation**  
**Firms acquire desired technologies**  
**R&D in networks and outsourcing**  
**High labor mobility**  
**Numerous start-up firms**

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Based on Henry W. Chesbrough, *Open innovation: The new imperative for creating and profiting from technology*, (Boston: Harvard Business School Publishing), 2003.

All economic activities are based on knowledge and processes of learning, also those activities which are commonly referred to as low-tech. One lesson learned from the regional roundtables is the fact that R&D is only one of many sources of innovation. And, ‘investments in R&D’ and ‘level of technological complexity’ are only two broad indicators, among many, for trying to measure and manage knowledge development and innovative capability.

## **Different ‘logics’ behind R&D**

Another general lesson from the regional roundtables is more conceptual. For analytical purposes it is often necessary to treat research and experimental development (R&D) separately. The latter (“D”) is typically more cost-sensitive and project-specific, while the former (“R”) is usually less costly and, at least in principle, allows more creative freedom. Innovation, on the other hand, is oftentimes a more general process of change that typically could connect R&D with other socio-economic activities into commercial or other diffusible results in the form of products and processes. Hence, our preliminary findings as well as our early recommendations, which are listed in this document and in the final policy recommendations, may therefore apply differently to these specialized areas of inventive activity in the regions under scrutiny.

## **Global R&D links**

From an economic point of view, successful processes of R&D and other knowledge creation and exploitation are increasingly becoming part of transactions among companies and institutions in networks at the regional, national and global levels. More and more, so it seems from the information in the interviews and at the regional roundtables, R&D and other forms of knowledge generation for the purpose of innovation require effective linkages of communication that go beyond the company borders. There is a strong need to engage regionally in dynamic interplay among companies, institutions and other organizations as well as among entrepreneurial individuals. At the same time, and increasingly so, global competition pushes even the small and medium-sized companies to think globally, when making R&D investments and considering future market opportunities while considering new products and services. R&D investments in the regional context have become part of the global positioning to achieve successful innovation.



### **Strategic public-private partnerships**

European regions, which have come to grip with the networks of collaboration between firms as well as among firms and collaborating universities and other R&D institutions, appear to be more successful than other regions in energizing R&D capabilities and in fostering innovation. They also appear to have become long-lasting partners with multinational enterprises (MNEs) as well as more attractive hosts for inward investments of R&D.

## **Objectives for LocoMotive project Deliverable 9 (D 9)**

More specifically, what is this report to bring forward? -This document summarizes some of (1) the determinants of R&D location in selected European regions, as presented at the regional roundtables and in the interviews with the R&D managers. It also depicts some of (2) the organizational structures that characterize R&D performed in companies in these regions, when they manage strategically their R&D investments and link up with R&D performed by others. The report also discusses (3) the various types of linkages of the R&D investments by the MNEs in relation to other companies and to universities and other institutions in each region. And, finally, as part of the reporting, the document begins to summarize some (4) policy conclusion and other recommendations, which – later in the project work – will become an essential part of the more general outcome of the LocoMotive project. Most of the policy conclusions are built into the text. They will be summarized in a different LocoMotive document in another Work Package.

LocoMotive Deliverable 9 is part of Work Package 3 (WP 3). Here, excerpts from the Description of Work for WP3:

“The basis of work in WP3 is fact-finding on private-sector R&D investments in each region represented in the project. Each investigatory team will follow the methodologies agreed upon in work package 2 and make use also of other primary and secondary sources of facts and figures on R&D investment localization.

Each partner will

- organize at least one, if appropriate, two events in their region, which provide a forum for competent discussion partners from the private and public sector to engage in an exchange of views about the research investment in the regional context and attainment of the Barcelona objectives.

- In addition, in each region interviews with the R&D managers from two private sector companies will be interviewed to find out the regional issues involved in the decision making process concerning R&D investments in the regions.”

The principle objective for this deliverable (D 9) is to provide summaries of the regional roundtable deliberations which, originally, were to be based also on the interviews of R&D managers (and other senior persons) in selected firms in each region.

According to the Description of Work (DoW) for the LocoMotive research projects, all participating research groups should organize at least one, if appropriate even two roundtable in their region, which “provide a forum for competent discussion partners from the private and public sector to engage in an exchange of views about the research investment in the regional context”.

This activity is part of Work Package 3 (cf. DoW) and is aimed at:

- Assessing private sector investments in R&D in the selected region, especially with a view to understand the involvement of MNEs in the regional economy as R&D investors;
- Comparing and contrasting the specific findings of interviews conducted with MNE managers (and in some cases local policy-makers) in order to reach general conclusions and policy recommendations for industry, R&D units and regional/governmental decision-makers;
- Connecting corporate level analysis to the investigation of global trends in MNE-driven R&D.

The results of the LocoMotive Regional Roundtables are summarized according to main points made or themes in the text below. Here, it should be noted that each partner in the project has been responsible for delivering a summary of the roundtable deliberations held in their region according to an agreed structure. Each partner was responsible also for managing these regional stakeholder

workshops and for delivering from these workshops a series of observations on top of or integrated with the summary account.

The responsibility for this step-wise procedure in qualifying the further deliberations remains with each partner. All partners have agreed to contribute in this way and, hence, to ensure that the reports have reached the desired level of quality.

Accordingly, this report contains many of the points reported from the roundtables and it should appear as a thematically organized version of the edited summaries from each of the regional roundtables (or stakeholder workshops) for the LocoMotive project and from the interviews conducted with R&D managers prior to the roundtables.

### **Scope of the regional workshops among the stakeholders**

The regional roundtables were all aimed to assess broadly the situation regarding private sector investments in R&D in each selected region, especially with a view to understand the involvement of globally oriented companies as R&D investors. Focus has been on how to attract R&D investments (and related innovative activities) by multinational enterprises (MNEs).

An ambition behind of this part of the workpackage is to put the interviews with the R&D managers into the most relevant regional contexts for, later, to deduce both general and more specific recommendations to industry, to R&D institutions and to regional and other decision-makers in the public sector. For example, the two roundtables organized in the cross-border Danish-Swedish region of Öresund were made highly selective from the beginning simply by inviting companies mainly with highly-competitive expertise in information and communications technology (ICT) and from institutions (such as technical universities, think tanks or research centers of branch organizations, etc.), which support ICT companies. The idea, when meeting in Copenhagen (Denmark) and Lund (Sweden), was to delve deeper into the various company perspectives

on R&D investments to attain better insights and specialized knowledge into the companies' interests in doing regionally anchored R&D activity and in securing a high-level workforce that will allow them to reach science-based innovations.

It should be underlined that this deliverable (D 9) should be a bridge between the company-level analysis and the global trends in R&D investments by multinational corporations. The report should help situate these two types of analyses in a context relevant to public policy-makers. However, a focus should remain on the identification of locational factors that could attract regional R&D investment by MNEs, and the way in which MNEs typically structure and organize their international R&D in relation to the European regions under scrutiny.

The presentations below have been organized into issue areas, developed also during the roundtable conversations with the companies and institutions involved. For further details of each regional roundtable or regional set of roundtables, please look at the individual reports from these roundtables, as documented by the regional teams.

For in-depth insights into the interviews of R&D managers in each region, please consult the accounts of the interviews summarized by the region's LocoMotive team. For the general readership, a summary of all these interviews (some 60 interviews) is available as Deliverable D 10 ("The Final Report on Interviews with R&D Managers", prepared by CEU and Erasmus University with contributions from the LocoMotive project partners).

Before the results from the roundtables are listed and further elaborated, please find summaries of some overall conclusions, drawn (a) from the roundtables, (b) from the interviews and (c) from other fact-finding during the process of work. These summaries should address the "new regional context" which influences the conditions for R&D investments by multinational enterprises (MNEs) in the regions under scrutiny in this project.

## **Which regions organized roundtables on R&D investments?**

Below, the list of regions covered in this document. Two regions have not reported any roundtables.

1. The Free and Hanseatic City of Hamburg
2. The Øresund Region
3. Budapest region (Central Hungary)
4. The Prague region
5. Toulouse Midi-Pyrénées
6. Helsinki metropolitan region
7. Oxfordshire

These two regions did not arrange regional roundtables or did not report from any roundtable:

8. Catalonia (not reported)
9. Rotterdam region (not reported)

From previous documents of the LocoMotive project, the following seven regional profiles are extracted:

### **1. The Free and Hanseatic City of Hamburg**

FHH is one of the 16 states of the Federal Republic of Germany, and is the second largest city in Germany with a population of 1.7 million. Hamburg is the world's 5th largest port, well known as a trading centre, but over 5% of the workforce is engaged in R&D. It is home to Airbus and leading medical technology companies such as Philips who are supporting this project. Hamburg has many public and private R&D performers covering almost every field of research with particular emphasis on materials technologies, life sciences and related technologies, microelectronics, transport and logistics. Trading relations with China established over centuries also means there are clustering competences in developing relations with China which Hamburg seeks to exploit.

## **2. The Øresund Region (the greater Copenhagen area)**

The opening of the Øresund Bridge between Denmark and Sweden in the summer of 2000 provided infrastructure conditions for a fully inter-connected cross-border region in which policies to foster clustering are aligned across the national boundaries. The region has 3.5 million inhabitants. The major cities are Copenhagen and Malmö-Lund).

The 'Øresund Science Region' program now forms a strategic policy backbone of the regional high-tech development. The Øresund Region lies at the forefront in areas such as medicine, pharmaceuticals and biotechnology, IT, environmental engineering and food technology. The Medicon Valley cluster accounts for approx. 60% of the Scandinavian pharmaceutical and medical industry making it the third most dominant region in Europe for R&D in these fields.

The Øresund Region has 14 universities and institutions of higher education employing nearly 12,000 researchers and providing third level education for 140,000 students in a consortium known as the Øresund University. Students can freely choose between their place of study on either side of the new bridge and attend courses in both countries.

## **3. Budapest and Central Hungary**

Budapest is not only the capital of Hungary with approximately 2 million of inhabitants, but also the political, economic and commercial centre of the country situated in the middle of Central and Eastern Europe. Hungary, and especially the region of Budapest, is a particularly interesting target for foreign investors. A huge number of large multinational companies found the region ideal for relocation. In addition to the private sector companies, significant public organisations, recognised research institutes and universities have their headquarters in the capital.

## 4. The Prague Region

Prague is the Capital of the Czech Republic and constitutes one of the European Union's economically most developed regions, having a high innovative potential based on its diversified economic structure, growing economy, skilled population, and a large concentration of R&D and university institutions. Prague generates approximately 25% of the Czech Republic's GDP. The unemployment rate here is roughly half the national average. The region is also highly attractive for foreign investors. Almost all central institutions are located here.

## 5. Toulouse Midi-Pyrénées

The Midi-Pyrénées region with Toulouse as its metropolitan center covers a region in France about the size of Denmark, with a population of almost 2,5 million. Industry in the Midi-Pyrénées relies mainly on agribusiness, aerospace, electric and electronic equipment, and metallurgy and metal fabrication. These four industrial sectors account for more than 40% of the region's industrial added value. The European aerospace platform mushrooming out from Toulouse where the Airbus family aircraft are built is the cornerstone of the regional economy. This sector alone accounts for 13% of the regional industrial workforce i.e., 19,000 direct jobs and a further 65,000 indirect jobs throughout the region, and is a wellspring of business for the metallurgy and metal fabrication industries employing 13,000 people.

The region ranks fourth in France in R&D with 400 public laboratories including CNES, ONERA, CNRS, INRA, and INSERM and more than 9,000 research scientists, including 5,400 in the public sector, are working out of Midi-Pyrénées. The region allocates 3.7% of its GDP to research. More than 110,000 students study at the four universities of the region where Toulouse is France's second largest university city after Paris. More than 7,600 executives are trained at the region's fifteen engineering schools with curricula geared to industry core skills.



## **6. Helsinki Metropolitan Region**

The Helsinki Metropolitan Region forms an area of 1,2 million inhabitants and includes the capital, Helsinki, and the neighbouring cities Espoo and Vantaa with 22 other surrounding municipalities, within a wider region, Uusimaa. The region accounts for nearly one third of Finland's GDP. Half of Finland's facilities for research and experimental development are based in the Uusimaa region. One fifth of the region's population of working age has an academic degree and the student population in the 9 universities of the region is over 50.000.

The Helsinki region has been widely recognised for creating and cultivating a world-class cluster of businesses and research organisations in the field of information and communication technology, and high-tech manufacturing plays an important role in the Finnish economy.

## **7. Oxfordshire**

Oxfordshire is a leading area in the UK for innovation and business enterprising. It is of significance both regionally and at a national and European level. There are over 1,400 high tech companies in Oxfordshire and major R&D-based employers in the area include AEA technology, Rutherford-Appleton Laboratories and Oxford Instruments.

Oxfordshire and its surrounding area, Southeast England, is one of the top high-tech locations in Europe. Of a total of 209 regions and sub-regions across the EU, only five have a higher proportion of their employment in high-tech areas. These strengths combine with high levels of investment in R&D to make Oxfordshire one the strongest knowledge-based economies in the UK. This recent success is due to a combination of factors. Its contribution to the 'geography of talent' is its mix of high-calibre individuals who have produced the science, supplied the funding developed the incubators and used the networks to bring together the local authorities, business and enterprises developing a

unique innovation support system. The county has an extensive set of business angels and more incubators and science parks than any other country in the UK.

The University of Oxford attracts over £20m a year of research income from industrial sources, from spinouts, regional high-tech companies and international corporations. This is the second highest figure of any UK university. This collaborative research activity is fuelling Oxfordshire's growth rate in high-technology employment, which at 82% is the highest of any county in the UK.

## ***The changing context for R&D investments in EU regions***

### **Increasing regional disparities of R&D investments**

From a European policy point of view, the observations made at the roundtables (and in many of the interviews with R&D managers which were conducted as part of the fact-finding for the project), point at major changes in the location of R&D investments by the business sector. For example, the project finds strong tendencies of an increasing, uneven distribution of R&D investments among Europe's city-regions. Other studies confirm this overall picture of change. It seems that R&D-based innovative capabilities across the European countries as well as the regional disparities of R&D resources are being enforced. In various parts of the continent, there is a swiftly increasing concentration of R&D resources, while, on the other hand, there is a decreasing concentration of local and regional innovation environments in a wide range of European cities. For example, there are regions without major R&D facilities and with no such investment in sight in a foreseeable future.

### **R&D centers supported by MNEs**

In the age of swift globalization of trade and investments, the uneven distribution of invested R&D resources and related capabilities for innovation appears to be reflected in a Europe-wide division of labor or specialization. It was noted during the fact-finding process and reported from other studies of R&D that modern Europe has an archipelago of relatively advanced innovation regions in a sea of less R&D-intensive regions. Some of these 'islands of innovation' are closely connected with each other as nodes in continental and even in global networks. Typically, the intermediation is achieved by multinational enterprises (MNE) and supporting institutions, including universities and science and technology parks.

### **Hubs in trans-European flows of R&D results**

Accordingly, the analytical framework for the LocoMotive study of private-sector R&D investment motives in regions, must include the hub-cities (and their

regions), increasingly being structured around trans-border and trans-continental flows of goods, capital and services. The variety and diversity among localized hub functions seem to stimulate the mobility of specialists and other individuals in between the hubs and their regions. In Europe's metropolitan hubs, there is a multitude of advanced business services offered by private enterprises, both large and small, sometimes in cooperation with universities and other R&D or technology-related institutions.

For example, much of the two roundtables in the Öresund region and of the second regional roundtable in Hamburg circled around the notion of dynamic hub-cities (with vibrant R&D and innovation activities in and around them) and their regions. The stakeholders in Hamburg perceive their city as a 'Wissensmetropole' or a regional and global knowledge hub with many, functionally organized linkages across Europe and into the rest of the world. The roundtable discussion here focused on how to improve the linking of policies, industrial and research/academic activities to serve this type of combined regional and global interests with a focus on R&D and innovation.

### **Hubs and local innovation environments**

The resourceful European hub-cities serve as important transaction points for the diffusion of new designs and know-how and other specialized information and knowledge. Together with multinational and transnational companies, these cities serve as nodes in the global economies of trade, investments and some other types of. Globalization, also of the kind just indicated, opens up the regional economy to competition, but globalization also allows a broader resource base for the MNEs and other large enterprises as well as for the SMEs.

All of the regions under study in this project do illustrate – in various ways and at various stages – the importance of a place that breeds a local innovation environment (or supports a cluster of competencies) as well as being an effective node in large, even continental networks. Increasingly, so it seems

from the fact-finding, the MNEs look for resource-rich innovation environments in Europe's regions, where relevant research results could be made easily accessible as raw material for the experimental development by these companies, while designing and prototyping new products and processes.

### **R&D, regional governance and place marketing**

The complexity of each place in offering a variety of services that meet a mixture of advanced demands from MNEs, and how these complexities are being managed in each location by the city-region and by stakeholder groupings, appears to be determining factors of real significance. Innovation environments, which are transparent to investors, with clearly defined roles and regulations, and which are able to bring together stakeholder involvement across all sectors (research institutions, industry and regional government), seem to be the most attractive to the MNEs.

As understood by some of the participants in the regional roundtables there seems to be no 'one-size-fits-all' solution, or a single principal pathway to success in attracting R&D investments from the private sector to a given location. On the contrary, MNEs and other companies call for combined efforts and undertakings that create a broad, sustainable platform for R&D investments and related innovation activity. Regionally anchored policies need to be coupled with business-oriented or broader mobilization of R&D resources.

## ***What's new? –MNEs and entrepreneurial research universities***

### **Increasing economic importance of universities**

Well-endowed and well-functioning research universities (with an entrepreneurial profile) are one of the prime location factors for companies investing in and/or benefiting from R&D as part of their resource-base. This is a clear message from many of the interviews of R&D managers and from the regional roundtables. In Europe, as in many other countries and regions that have research universities with an entrepreneurial orientation, universities are perceived as powerful engines of technological development and innovation. However, the regional environment within which the universities operate, are currently generating strong pressures (including new financial restraints) that are propelling them further into commercial arenas.<sup>2</sup>

At the same time, judging from some of the statements in the roundtable deliberations, the business-research interactions are not expected to become merged into fully-fledged commercial operations or into a hybrid organization, which is neither fully academic, nor fully commercial. Greater value is seen in business firms participating in open, curiosity-driven and interpretive research in the relatively independent academic institutions, while professors and other academic specialists could engage – outside of their normal duties – in proprietary problem solving off-campus, such as in science and technology parks, business incubators or inside the firms.

While universities, by a regional authority, might be seen as important 'agents of economic development', and while new policies designed to encourage further university-industry collaborations are numerous across Europe, the general trend is not to submerge the university into the regional business arena. However, we have found many new forms of organized (as well as informal)

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<sup>2</sup> Richard Lester & Michael Piore: *Innovation – The missing dimension*, Cambridge: Harvard University Press, 2004, especially chapter 7 ("Universities as public spaces").

forms of cooperation. In all the regions under study, there are many new communications linkages between the regional economy and the local universities. According to the regional roundtable reports, this communication trend will be further encouraged.

### **Co-location of R&D facilities**

[The regional example of Oxfordshire]

The R&D intensive multinationals enterprises (MNEs) which participated in the study of the Oxfordshire region include three American, two European and a Japanese enterprise. With the exception of Sharp, which established a new European R&D laboratory in 1990, the other MNEs have been in the region for less than seven years and were either merged or acquired and subsequently (co)located on a site owned by previous companies. The additional inclusion of Monsanto in the study represents an interesting extra-regional example, and was included because of the close research relationship with the University of Oxford. The case of Oxfordshire is a case also for the proof that resourceful, advanced research facilities at the heart of a major university will always be an attraction factor for companies to co-locate with such research environments.

### **‘Global centers’ of corporate R&D in the region**

[The example of the Öresund region]

With 13 universities and Europe’s fourth or fifth largest production of refereed papers in scientific journals (medical and other science journals in particular), the Öresund region (combining the cities of Copenhagen and Malmö-Lund) has become an attractive site for the location of science-based and high-tech companies such as NovoNordisk, Novozymes, TetraPak, Ericsson, Sony-Ericsson, Microsoft, Nokia and IBM. Some of these companies are included in our sample for specialized study of location motives. All of these have made the Öresund region one of their global ‘centers of excellence’ for R&D and science-based innovation.

At the same time, resourceful universities with huge R&D capabilities and relatively large number of third level students (150 000 in the Öresund region) are not enough to secure the long-term presence of these and other MNEs. Several of the companies complained during the roundtables in both regions that the number of talents and the inward flow of skilled personnel are too limited. Even some of the most resourceful regions in Europe's knowledge society lack specialized human resources, while other parts of Europe seem to have more than enough to meet the demand by the MNEs. In Oxfordshire, for example, there is a skills shortage in physics and chemistry. In Öresund, to take the other example, there is a serious skills shortage related to IT and electronics. These skills shortages seem to be structural rather than dependent on the current economic boom period.

### **Excellence in research = Excellence in innovation?**

[The regional example of the Hamburg region]

Starting with a remark from industry that the typical MNEs find it increasingly difficult to recruit relevant staff for their company R&D and for other innovative activity, the regional roundtable spun around the problems for universities to become a magnet for industrial funding. It was agreed that the most important way to attract MNEs to invest in R&D in this region and to foster innovation environments together with the universities is to create and maintain excellence in research at the relevant university departments, while fostering a profile of entrepreneurship in order to link up better with the broader business community.

Universities need to develop a strategy for excellence which must not be changed every five years or with the ending of a major research contract. In addition, universities should bid farewell to trying to cover all areas of research but should concentrate on developing a distinct profiles of excellence. At the same time, the universities should be careful not to lose their advantage of interdisciplinary research capability by more specialization. Moreover, the key to the achievement of excellence for the universities is to try to compete globally,



being benchmarked with their international peers. In a world of globalization, excellence has to be defined accordingly.

## ***What's new? –City-regions as nodes of knowledge and innovation***

### **European hubs in global competition**

A relatively new feature, related to the hub-city and the regional node perspective, is the fact that three city-regions listed in the previous section (Oxford, Öresund/Copenhagen, and Hamburg), as well as many other European city-regions, have to compete with city-regions on other continents, including Asia, for R&D investments by MNEs. More and more, the local innovation environments in Asian cities like Shanghai, Singapore, Bangalore and other major city-hubs with a metropolitan resource-base nearby effectively compete for R&D investments with Oxford/London and Lund/Copenhagen.

Loudly and clearly, R&D managers interviewed in this project spelled out a trans-regional perspective on R&D investments in competing city-regions, even competing on the other side of the globe. These investments are not only part of outsourcing of some of their R&D, but could also be the re-location of core R&D activities from Europe to city-regions in North America and in East and South Asia. For example, since 2002, NovoNordisk has located new, core R&D activities to Beijing and Novartis has done the same in a new R&D facility in Shanghai. This list of re-distribution of core R&D functions from Europe could easily be made much longer.

### **Creating a 'global hub' vision and a supporting strategy**

[The regional example of the greater Helsinki region]

In Finland, the regional workshop reported a strong need for a commonly shared vision for the future development of the Helsinki metropolitan area. The vision should be developed, shared and fostered among key stakeholder groupings in the region. The greater Helsinki region should situate its development within a global context, regardless of the (artificial) borders that earlier may have set limits to cooperation between the three cities in the region.

The strategy should include goals and ideas for the organization of future development processes, help attract and mobilize relevant R&D investments and other resources for innovation, and create a basis for cross-sectoral coordination of major projects.

The overall strategy for the Helsinki region should also include branding and marketing elements. The participants in the regional workshop found it vital to strengthen the Helsinki brand in international fora and to global investors and potential clients. The stakeholders in the Finnish metropolitan area should share a vision and the overall image, work together in implementing the strategy, and promote a common message related to the innovation capabilities in the region.

### **Shaping a regional high-tech brand**

[The example of the Öresund region]

In the first Öresund roundtable, the Danish and Swedish participants (mainly from the private sector) shared the ambition to establish a more functional network or a joint cross-border program to position the region's already richly endowed, resourceful mobile & wireless technology effort and make it truly competitive for new applications and user-centered mobile solutions. To achieve early success, many of the participants underlined the importance of strategic resource mobilization in industry as well as among public R&D establishments and higher education institutions. Others emphasized place branding, strategic marketing and making the region attractive for talented individuals, like R&D specialists, computer design engineers and other professionals in support of new ventures and start-ups, entrepreneurial companies, risk capital investments and business partnering in high-tech industries.

### **New needs for comprehensive service provision**

As indicated in the text that follows, the location motives identified in the interviews and at the LocoMotive regional roundtables across Europe include a range of factors that previously might not be considered important for regional

policy-makers. Yet, companies of today, while in a process of determining R&D facility locations will not only consider the economic rationale according to standards textbooks in R&D and innovation management. They must consider the broad picture of regional attractiveness, which includes a variety of factors as follows. Examples of such attraction factors are extracted from selected interviews and the roundtables in Oxfordshire (Oxford) and Öresund (Lund and Copenhagen):

- Competitive salaries and possibilities to compose attractive incentive packages (including pension schemes, education, medical services);
- Taxes on wages and labor (also to attract and keep the best international R&D scientists and engineers and other experts).
- University brands, quality of local schools and daycare centers
- Skills on various scales (including technicians and other supporting personnel)
- Entertainments and sports related to life styles
- Transportation and telecom infrastructure
- Environmental qualities in the work and living environments
- Affordable housing
- Direct and indirect subsidies for R&D and related services
- Public services such as procurement, based on advanced requirements for new or even future technology

### **Public policy as a strength – and as a weakness**

In addition, the regional policy environment is considered an important factor for locational decisions for R&D, while being related to the supply of advanced services in a given region. Depending on their quality, public policy and regulation are sometimes considered as weaknesses for locating R&D in a particular region or country. For example, corporate taxation schemes and the great regional and national varieties of regulation force companies to continuously consider the location and re-location of their R&D investments.

To manage a corporate R&D facility in a globalizing world, the companies will have to consider these and other factors as determinants for medium-term and long-term effectiveness of their operations. As indicated, policy makers in the same regions (and nationally and in Europe) will also need to meet the variety of demands in order to be able to attract firms and the talents needed for R&D and innovation. It comes out clearly from many of the roundtables that the combinations of these and similar factors for the future of the regional attractiveness are part of a growing concern among the MNEs. The importance of each factor may also vary over time.

### **Joint regional scouting for talents**

In one region in particular (Öresund), its second roundtable was dedicated simply to human resource development and the search for the appropriate specialists and other potential personnel to occupy the many empty positions in the R&D and engineering labs of the MNEs. For example, it was agreed among companies, which normally compete fiercely in the marketplace, will join forces and engage in joint 'road shows' elsewhere in Europe to secure the recruitment of more specialists to the regional labor market.

For smaller science-based or high-tech companies, the same issues of regional positioning for attracting talents are becoming a major concern. R&D and other specialized activities at the level of the company cannot expand in some regions due to the low, general level of attractiveness. Some of these needs seem to temporary and dependent on a local economic boom; others seem to be more structural and of a long-term nature.

## ***What's new? –MNEs and R&D in Eastern European regions***

While the Oxfordshire and Öresund regions both represent some of the oldest and most well-known universities in Europe, which have managed to respond effectively to some of the needs of a more science-based and high-tech industry, the new, still emerging market economies in former Eastern Europe have very different problems to attract R&D investment related to regional innovation.

### **R&D not 'embedded' in the economy**

[The case of the Budapest region (Central Hungary)]

Although foreign direct investments (FDI) since 1989 have been very significant for the Hungarian economy (and especially in the Budapest region), the mounting presence of MNEs has led to the emergence of a 'dual economy'. The term articulates the fact that while MNEs generate nearly a third of Hungary's GDP and approximately 70% of its exports (and employ roughly 20-25% of the total workforce), the same companies remain weakly linked to or poorly embedded in the domestic economic environment.

There is a significant gap, the Budapest regional roundtable concluded, between MNEs on the one hand and local companies and regional institutions on the other hand in terms of competitiveness, productivity, participation in European or global networks, R&D activities and openness towards innovation whether technological or otherwise. For this reason, cooperation between MNEs and domestic SMEs as well as with other organizations (e.g. universities, local governments, etc.) remains low.

### **Lack of operational R&D linkages**

[The case of the Prague region]

The lack of linkages between R&D investments by MNEs and the universities and other R&D centers in the Prague region is similar as in the Budapest region.

In addition, in both regional cases, the roles for R&D played by the local and regional companies are minimal. The overall problem of 'embeddedness' by the MNEs and their R&D activities remains a central issue for the analysis of the long-term R&D activities by MNEs operating also in the Prague region.

### **How to position local partners to MNEs?**

[The case of the Budapest region]

The roundtable in the Budapest region (Central Hungary) also sought to determine whether domestic stakeholders in R&D (e.g. universities, innovation-oriented SMEs and local policy-makers) really are able to successfully cooperate with MNEs. Will the issue of the dual structure of the Hungarian economy continue to appear as a major feature also for R&D by the MNEs?

So far, perhaps the most important result of the LocoMotive project in the Central Hungarian region is the fact that further growth of investments into R&D will depend primarily on the positioning of potential local partners with regard to the MNEs. Here, incentives by national/local governments and the European Union could play a crucial role. Decision-makers representing these political bodies could facilitate relations and help 'empower' local actors to make them more capable of entering into extensive and even institutionalized R&D cooperation with MNEs.

## **Main Issue 1: Locational determinants**

The regional roundtables do not add new, general information on locational determinants for R&D investments by MNEs. Such general information has already been processed from the interviews with the R&D managers of the 39 firms selected for fact-finding to this project. In Deliverable 10 (D 10) from the LocoMotive project, these interviews plus some other location-relevant information have been summarized. The summary was made from six overall categories of locational decisions. At the same time, some early policy conclusions have been drawn on the basis of what the R&D managers have suggested.

The regional roundtables do not add any specific implications or new proposals for changes in policy, compared with what has already been reported in Deliverable 10 (D 10). However, several cases could be made by anchoring the available proposals in the particular regional setting and historic situation, thereby going beyond what an individual company may have of ideas for regional improvements. This includes technology considerations, market availability, factor costs, advancements of infrastructure, etc. all related R&D investments.

### **How to achieve inward investment strategies?**

[The case of the greater Helsinki region]

Finland – and particularly the greater Helsinki region (the communities of Helsinki, Espoo and Vantaa) – stands out in recent international statistical surveys of R&D capabilities (investments/GDP, researchers/population, patents etc) as one of the most competitive innovation environments in Europe and in the world. However, and this remains intriguing, the global recognition of inventiveness has not been transformed into increased attractiveness of Finland as a major destination for R&D investments by MNEs. The Helsinki region of today has very limited international R&D investments compared to many other European regions which host some MNE headquarters. The roundtable



concluded that much more active promotion is needed to attract R&D investments, to recruit talented researchers from Europe and from the rest of the world, and to support international networking of Finnish R&D projects and other research-related efforts.

In Helsinki a new promotional agency for the Helsinki metropolitan area should serve as platform for brand development and promotional activities. The communications platform should create a stronger message, based on the truly differentiated strengths of Finland, served not only by the Finnish companies but also by R&D and intermediary organizations such as Tekes, Sitra, and VTT, which have proved to be effective in fostering regional innovation activities with a global edge.

The regional workshop in Helsinki also concluded that a changing R&D environment geared towards investments by multinational enterprises (MNEs) with new type of innovation processes, including open innovation and service innovations, will require new R&D infrastructure and new innovative capabilities in the greater Helsinki region. Moreover, recognition of future needs and concrete actions to support such internationally-oriented capability building should be promoted. For example, new support and funding programs should be introduced to activate emergence of 'open innovation' environments.

### **Connecting 'upstream' R&D by joint public/private initiatives**

[The case of the Toulouse Midi-Pyrénées]

At the Toulouse Midi-Pyrénées regional roundtable, it was acknowledged that there is relatively little involvement by academic and other public-sector researchers in EU-funded R&D initiatives such as the Joint Technological Initiatives (JTIs) and the European Technology Platforms (ETPs). The JTIs and the ETPs are led by industrial companies and operated according to agreements with the European Commission (DG Research, DG INFSO, etc.). It was recommended that many more researchers from public institutions could become actively involved in the 'upstream' parts of the R&D of these projects.

The universities and other R&D institutions located in the region already employ specialists recognized for their ability to perform multi-disciplinary and trans-disciplinary research in nano-sciences, new materials and other advanced target areas, which are close to commercial exploitation, yet still being scientifically demanding areas of specialty. These specialists already do research work that could lead to break-through results and to commercially interesting technological advancements. New science-based innovation could be fostered by making combined public-private efforts of the kind just indicated. A first step could be to associate public researchers in the ‘upstream’ activities of the JTIs and ETPs.

The industrial representatives at the regional roundtable in Toulouse also called for substantial organizational improvements at the level of the universities, thereby creating a regional Pôle Recherche Enseignement Supérieur (PRES) “University of Toulouse”, which would allow a higher intensity and speed in the collaboration between public and private R&D centers, a better use of the scientific potential (resting in the public institutions) and improvements in higher education and training.

Another way to make the linkages between the R&D of the MNEs and of the public labs in the region is to co-locate labs or to form joint laboratories, which is an emerging feature in various high-tech industries. The roundtable participants also discussed various modes of advanced consultancy services in the regional context and the experiences gained from the National Thematic Network for Advanced Research (RTRA).

### **Universities need model strategies for excellence in research**

[The case of the Hamburg region]

Changes in the remuneration of professors, introduced recently in the Hamburg region, might help to change the culture for competitive research. The provision of pecuniary incentives to researchers and research groups could help in

fostering excellence in research. Role models for how to achieve excellence in research are very much needed.

Universities should build up interest profiles and be concerned with openness to foster a dialogue with industry on new research topics. This could involve not only individual companies, investing in R&D. In addition, the Chamber of Commerce could become involved in the discussions. However, in the regional workshop in Hamburg, it was emphasized by some speakers that the universities should not expect industry to tell them what to do, but the universities should develop their own strategies for research and concepts for innovation – also in terms of new roles for the university in the regional development.

In the light of the proposed academic changes, the entrepreneurial culture of technology-driven enterprises in the Hamburg region needs to be assessed and further improved. Better innovation environments need to be created and managed throughout the Hamburg region. There should be an active policy from the region in using international funding programs (EU and other such programs) to promote the networking capacity of Hamburg's science and industry for cross-border cooperation.

### **Values and attitudes**

[The case of the Budapest region (Central Hungary)]

The regional roundtable in Central Hungary concluded that the growth of MNE-driven R&D in the Budapest region is hindered not only by clearly tangible factors, but also by some intangibles. For example, there is often a lack of trust and a feeling of insecurity. More is needed of entrepreneurial courage. The participants in the roundtable agreed that there must be more of openness to cooperative ventures in R&D with MNEs, while also consensus building among local players could prove to be crucial for success.

More generally, there seems to be too little of readiness to finance innovation without clear expectations of immediate return. At present, the region lacks risk capital, seed funding, business incubation initiatives, etc. One recommendation from the workshop is to enhance education and furnish the insights and skills needed for business venturing. Another recommendation from the roundtable is to recognize the roles of science parks and innovation center, which could play important roles also in transforming attitudes to entrepreneurship, innovation and business venturing.

### **Mixing key attraction factors**

[The case of the Oxfordshire region]

The two most significant location determinants identified by the multinationals were 'Technology/Supply Side' and 'Policy' factors. The University of Oxford was identified by three MNEs as the most important technology/supply side factor. Other factors identified in the regional roundtable included the presence of other companies in the region for collaboration and service provision, while the availability of highly skilled labor in the region was also highlighted by two of the MNEs. The importance of the UK regulatory environment was indicated by four of the five MNEs, with two citing the favorable taxation system to be a determining factor.

The presence of competitors was considered unimportant for the sample of Oxfordshire MNEs, as none identified this factor as being significant to their location decision. Indeed Sharp identified this as a disincentive, and identified a consideration in their decision of location was that they were the first company on the Oxford Science Park and did not want to go where there were already similar Japanese companies.

## **Human resources and the mobility of talents**

[The case of the Budapest region (Central Hungary)]

Originally an appealing locational factor for R&D-intensive foreign direct investment into the Budapest region, the Hungarian highly-educated and otherwise skilled workforce is becoming harder to find (particularly engineers and natural scientists). Moreover, some researchers and other professionals lack project experiences, management skills and business insights, often necessary prerequisites for becoming engaged in a R&D project by a MNE. Scarcity in Hungary remains of proficient foreign-language speakers. Computer literacy is not as high and comprehensive as in many other European countries.

The regional workshop participants noted that the introduction in Hungary of the Bologna-process for third level education has brought mixed results as it seems to have led to the lowering of overall standards at the undergraduate level.

A general recommendation from the participants in the roundtable is to open up the Hungarian labor market. It is important also to strengthen higher education in the relevant disciplines (returning to traditionally successful areas of the Hungarian school system such as mathematics and natural sciences). There is a need for a general overhaul of the institutional structure, funding and educational priorities of higher education in Hungary. More attention should be given at the university level to research and project management skills and to attain business expertise even among researchers. Training in foreign languages is also much desired priority.

## **Human resource development as an attraction factor**

[The case of the Hamburg region]

Universities should remind themselves that they must not only concentrate on advanced research but also on advanced education. Excellent researchers may also attract very good students. Hopefully, a larger part of the graduates of today will stay in the region after their studies have been completed. This in

itself will become an attraction factor for R&D-based companies, the roundtable participants in Hamburg concluded.

### **Not ‘brain drain’, but ‘brain circulation’**

[The case of the Öresund region]

The two roundtables in the cross-border Öresund region covered six themes, cutting across the public/private sectors. The most important one related to R&D investments (by MNEs and by small and medium-sized companies alike) proved to be access to human resources or, more specifically, recruitment of researchers, R&D engineers and technicians, the enhancement of skills among specialists, ‘brain circulation’ (not ‘brain drain’) across Europe’s border, etc. In short, the principal strategic issue among all the stakeholders in R&D and innovation, including globally operating stakeholder companies in the Öresund region – such as Microsoft and Sony-Ericsson as well as companies and institutions from several other countries (Spain, Italy, Germany, France, etc.) – was the availability of highly-skilled personnel.

Focusing solely on this issue during a second roundtable, the deliberations became very concrete both in the short-term perspective and in a long-term or ‘visionary’ perspective. The second workshop systematically reviewed the human resource situation – as seen from the R&D-intensive companies in the region and was able also to identify practical solutions to some of the problems posed and considered in the roundtable.

- **New ideas at the industry level:** The regional roundtable concluded that there is need for ideas for new programs, methods and activities to be launched at the firm level and, even more importantly, at the industry level to help solve the challenges of shortage of particular skills in the short-term and in the medium-term (especially for electronics and the mobile and wireless ICT industry, which is a major segment of the high-tech industry in the region). The future development of R&D capacities in the Öresund

region was defined as a crucial point, currently hampered by human resource deficiencies.

- **Selected actions:** A platform for inter-firm collaboration for the purpose of addressing constructively employment and recruitment challenges by selected actions (such as a joint road show and recruitment program) of particular relevance to the mobile and wireless ICT industry.
- **Availability of specialized skills:** Appraisals of various short-term and medium-term actions, including assessments of the current demand and supply for specialized ICT-related skills within particular regions in the EU and in some of the EMEA member countries (including Russia).
- **Joint activity plan:** A program or a set of scheduled activities addressing the needs for early recruitment of specialized skills to the mobile and wireless ICT industry to be initiated soonest and, if possible, completed by the summer 2007.

### **Broadening the R&D funding base**

[The case of the Budapest region (Central Hungary)]

At present, one of the most critical bottlenecks to increasing R&D is the severe under-funding of universities/research institutes/R&D places. The government appears to be unsure whether it should continue to finance basic scientific research. This is a problem because universities cannot act as partners of MNEs as long as they do not command the necessary resources in terms of financing and skilled management.

Universities in the Budapest region cannot rely on private money to expand their R&D resources, since a considerable share of corporate funding of R&D remains intramural.

The recommendation to the government from the regional roundtable participants in Budapest is as follows: Do not reduce public expenditure in education and R&D. In particular, provide incentives to MNEs to cooperate with universities on a long-term, institutional basis (e.g. MNEs should finance not

only ‘one-shot’ projects but also R&D centers and labs at universities as well as special teaching streams, department research activities, professorial chairs, special training programs, etc.)

On top of these, the recommendations to government by the regional roundtable are to improve interactions between R&D units of MNEs and R&D organizations by altering regulation, improving education, fostering networks, providing governmental subsidies for actual cooperation. The workshop noted that applied innovation cannot thrive without continued inputs from basic research.



### ***Main Issue 2: Organization of R&D in the MNE: The driving forces behind***

The second main issue in the regional roundtables and in the interviews with the R&D managers in the regions is on the organizational structure of the MNE in terms of its international and regional R&D activity. And, to some degree, how the region organizes its R&D to capture inward R&D investments from the private sector.

One conclusion – also from the roundtables – is that the modes of the MNE's R&D organization regionally (and globally) and the roles to play by this R&D organization in the region do influence the level of R&D investments and the driving forces behind these investments. The main organizational issues, extracted and summarized from the interviews with the R&D managers, are presented in Deliverable 10 (D 10).

However, there is no easy conclusion to be drawn from the roundtables, since the varieties of organization of R&D in a region are vast and depend on a series of considerations, often unique or otherwise special for each company.

None of the regional roundtables was able to draw a general set of conclusions during its deliberations of organization of R&D by the region's MNEs. Yet, there are observations from some of the regional roundtables that might have a general value. These are summarized below.

#### **Regional anchoring of global chains of innovation**

[The case of the Oxfordshire region]

The R&D organizational structures of the MNEs scrutinized by the regional LocoMotive team were mostly of the type with central coordination from a global, or at least regional, headquarters. All of the MNEs identified strong lateral ties in R&D, as well as more generally within the region/locality. The exception in terms of organizational structure was Infineum, which identified its

organizational structure as different from the others due to the specialized nature of the R&D centers and the cross-coordination of national teams in addition to the strong lateral R&D ties. The fifth MNE, Novartis, was unable to identify itself with an organizational structure as although its R&D is in Sienna and it several thousand other research staff in Europe and the US, the company is currently are reconfiguring its operations in order to overcome problems of coordination within the various research groups.

Patterns and processes of mergers and acquisitions have had, and continue to have a profound influence on the location and organizational structure of R&D, especially in the bio-pharma sector. MNEs are very selective about which sites they will keep open post- merger and/or acquisition: for example, Novartis has virtually closed the operations of Powderject which came with the acquisition of Chiron; and Siemens having acquired Mirada, is now likely to merge its diagnostic activities with their magnet technology operations already in Oxfordshire.

### **Science parks and other intermediaries**

[The case of the Budapest region (Central Hungary)]

The regional roundtable took stock of the science and technology parks and found little progress. For example, there is little support forthcoming for the incubation of small and medium-sized enterprises and innovative R&D activities whether in science parks or elsewhere in the Budapest region. Early attempts to create science/industrial parks have typically led to the establishment of office centers rather than of genuine innovation centers.

The roundtable participants reasoned as follows: Through initiating networking events and training programs, science parks could play a crucial role in fostering missing R&D skills and in encouraging the rise of an innovation-friendly entrepreneurial culture. Since science parks and innovation centers can act as indispensable interfaces for the transfer of knowledge and information, they are

to be financed in the long-run funding cycles in order to ensure their sustainable development.

### **Compensating for bureaucratic procedures**

[The case of the Budapest region (Central Hungary)]

The regional roundtable in Budapest addressed also bureaucratic procedures and delayed financing with regard to R&D. The participants noted that the success of existing governmental initiatives to support innovation and R&D cooperation oftentimes is seriously jeopardized by red tape and the requirement that participants are to pre-finance programs before gaining access to governmental funds. They noted that the regulatory environment is at best overly complicated and unstable, and at worst positively obstructing R&D and innovation (e.g. by protecting monopolies), which could be a hotbed for corruption.

To pave the way for more efficiency and transparency, also for inward R&D investments, the roundtable recommended a reduction of bureaucracy, the acceleration of access to R&D subsidies and other funding, and a more stabile regulatory environment.

### ***Main Issue 3: Linking R&D by MNEs to the region: Quest for impact***

The third main issue in the interviews with the R&D managers in the regions and in the regional roundtables focused on the impact of the linkages between R&D by the MNEs and the region's economic and other development. Technology transfer and the diffusion of related know-how and know-what and even know-who could be very important inputs to the region's innovation capabilities. There are in fact a number of examples at the regional level, where spill-over from the MNE R&D labs substantially enhances quality, productivity and growth in companies and institutions able to capture these spill-overs, while operating in the region.

A conclusion from several of the regional roundtables is that linkages between the regional economy and the global economy – intermediated by the MNEs – typically have an impact on a whole range of growth factors. Likewise, an MNE that is able to tap into the local and regional resources for R&D and innovation will also find benefits that could influence decisions on further investments and location of R&D.

More detailed information on company-level considerations is summarized in the interviews with a selection of R&D managers in each region, presented in Deliverable 10 (D 10).

Below, an attempt is made to bring forward what the regional roundtables were able to draw of conclusions of a more general character during the deliberations on effective linkages to the regional economy by the MNEs.

#### **The regional R&D base and infrastructure**

[The case of the Budapest region (Central Hungary)]

As indicated elsewhere in this document, the availability of R&D and manpower resources, a modern regional R&D infrastructure and advanced qualifications on

the part of potential Hungarian R&D partners are principal location factors on which the further growth of MNE-driven R&D depends. Although some factors are beyond their control (e.g. global economic trends and pan-European investment patterns), making domestic stakeholders fit for cooperation with global players is where local and European policy-makers shoulder the greatest responsibility.

Encouraging MNEs to integrate their R&D operations based in the region is in the host country's prime interest if it is to avoid loss of R&D investments by the MNEs and the brain drain of its well-qualified experts. But the MNEs, too, must have an interest in avoiding costly relocation of their R&D units to other regions and other continents.

### **Crafting functional business linkages to a research university**

[The case of the Oxfordshire region]

The MNEs generally exhibit a low level of embeddedness in the region, although there is some evidence of embeddedness in relation to specific areas of research, skill development and networking activities. Three MNEs (Siemens, Novartis and Sharp) have formal research linkages with Oxford University, reflecting their corporate histories with the first two having acquired Oxford University spin-offs and their associated research patterns. Infineum has established embryonic links with Oxford University, as is the case with GE Healthcare who are looking to extend their linkages, although both have found it difficult to establish links with the relevant departments. In addition to connections with the University's scientific base Siemens and Sharp also participate in wider university-based networks, for example Sharp works closely with the Said Business School on the MBA programme, while Infineum has strong links with Oxford Brookes' MBA programme.

Further to the engagement with the university, Sharp also has strong links to the high-tech community through their participation in broader networks (for example on skills developments). However, there are few examples of local

contracting and/or sales linkages. Only Siemens presently engage in a technical collaboration with another local high-tech firm and benefit from the support of local/regional policy organisations, while Sharp explained their most significant local impact is through the salaries paid to its staff and the purchase of local services. At the regional roundtable, there was a general interest in improving local networking, especially by the non-bio firms which found the county's networks to be dominated by the biotech sector. GE Healthcare which is located on the edge of the Oxfordshire region, and Infineum which was new to the county identified the need for networks in order to find specialised contractors etc.

### **Cross-sectoral cooperation to foster clusters of competencies**

[The case of the Budapest region (Central Hungary)]

As already indicated in an earlier section of this report, and according to findings from the interviews of R&D managers in the Budapest region, the local and government policy-makers in Central Hungary confirmed the view that R&D - in many ways - is a key to improving the embeddedness of the MNEs in the region's economy and in the Hungarian economy as a whole. This is especially the case if R&D activities can be concentrated in the more dynamic cross-sectoral clusters, which could rely on cooperation among private investors, research and educational institutions and the involvement also of local and regional decision-makers.

### **Making science and technology linkages to the region more functional**

[The case of the Toulouse Midi-Pyrénées region]

The regional roundtable of Toulouse Midi-Pyrénées recommended the creation of quality procedures to guarantee property rights, privacy and consistency of commitments (also in the scheduling of work) to better link science and technology between business firms and the supporting R&D institutions. Such procedures should help shape the region's innovation environment and make

the science and technology linkages more functional and thereby effective, as seen from all parties concerned.

For example, there is a concern among the regional industrialists, representing also the high-tech MNEs (in the aerospace industry), that quality procedures at the level of the public laboratories and in their research teams are not always at the very high standards required by industry. It was noted that public labs, more and more, take the issue of advanced quality into account. This will ensure a close cooperation, cost-effectiveness in the collaboration and, ideally, more useful results. Nevertheless, the companies involved need to be able to assess better the performance of the public laboratories in the region in order to be able to integrate the research of these labs into their own R&D and innovation activities.

The roundtable in the Toulouse region recommended the option of creating 'scientific councils of higher education and research' to incite public laboratories to create quality assurance methods and means. Furthermore, the roundtable participants discussed a special 'charter' document as a means to stimulate and improve contractual relations between public R&D labs and private industry.

### **Cluster support needed – also from policy-makers**

[The case of the Hamburg region]

The roundtable in Hamburg focused on the universities saying that they must position themselves to the region as a whole, not only towards company-specific needs and other explicit business demands. More and more, to have a good general standing in the region is seen as a prerequisite towards working globally.

The clustering of industrial biotech in Hamburg might be seen as an excellent example of university/industry co-operation in the Hamburg area. Clustering is a long process and may need political support to become successful. This lesson can be drawn from the relatively slow start of the cluster development around

Airbus in Hamburg, which may need further political support at least in the phase of collaboration that cuts across industries.

### **How to improve interaction between R&D places and companies?**

[The case of the Budapest region]

More often than not, R&D units of the MNEs in Hungary operate as enclaves with hardly any interaction between them and to other R&D stakeholders. This was a conclusion reached during the roundtable at Budapest. One strongly supported recommendation was to find better cooperation between R&D places and the R&D performing companies.

Existing links are often based on personal, informal contacts. Frequently, joint ventures are in reality 'one-shot' projects, while a more institutionalized cooperation is atypical, even exceptional. It was recommended that the national and regional governments should undertake a much more pro-active role in alleviating this situation.

Contrary to current practices, governmental support should be market neutral. At present, the key priority should be – not the finding of new partners through direct subsidies given to individual firms, but – improving the positions of Hungarian stakeholders, in particular that of the universities, and support for the development of an innovation-friendly environment and sustaining infrastructure.

### **Diffusion of R&D results and technologies across sectors**

[The case of the Toulouse Midi-Pyrénées region]

At the regional roundtable of Toulouse Midi-Pyrénées a point of special attention was the successful diffusion across sectors of applied research results and new technology. Potentially, a technology device or other process developed for one purpose could be transformed into new sets of usages, if there would be means and methods to make such transformations easy and effective. However, the transfer of science-based technology may need special methods and means. It



was recommended that public labs and business firms should work together to increase the value of given technologies, achieved in specific areas of application, by making the transfer and transformation of the technology to other areas of application more easy.

For aerospace applications, medical devices and a range of other high-tech specialties of the region, there are already examples of successful transfer and transformation, but these examples need to become better known to serve as models. The involvement of R&D managers directors of laboratories, policy-makers, etc. is needed to anticipate and develop new approaches to the transfer of technology and related knowledge. The migration of specialists across sectors and fields of specialty, particularly the careers of young researchers, were considered a means for such transfer of technology and related know-how. Formally, there is an organization (Regional Advisory Committee for Research and Development) in Toulouse, but in reality it does not have the time and the means to develop new methods for the diffusion of R&D results and technologies across sectors.

There is a plan to create a regionally anchored 'Aerospace Institute of Technology', which could promote the whole range and the full potential of aerospace-related fields of knowledge (in scientific, technological and educational terms) for the purpose of knowledge transfer across sectors. There is also a related concept for a regional strategy or technology-focused 'Plan in Aeronautics and Space' that could be made operational for the purpose of cross-sector transfer of knowledge.

### **Linking R&D and business development by public service**

[The case of the greater Helsinki region]

For many years, Finland has been relatively strong in R&D investments, much stronger than most other European countries. However, in order to increase innovation productivity, based on the R&D efforts, there is an urgent need to focus more on building effective processes or commercialization of R&D results.

Moreover, universities and other R&D institutions in the greater Helsinki region, where most of the country's R&D is currently located, will need to strengthen the links between industry and research and extend the know-how of R&D scientists and engineers into the broader business community.

The newly established national TULI Program in Finland, managed by TEKES; is set to promote new business activities on the basis of research results. The services provided under the program support commercialization mainly of public research projects or R&D projects performed by publicly employed researchers, engineers and other specialists. This program and other such linkage programs should set new targets for industry involvement in research. A range of tools should be tested from mentoring of new business development to academy–industry platforms of cooperation.

### **'Role models' to advance industry-university interaction**

[The case of the Hamburg region]

The regional workshop underlined the need to foster an entrepreneurial spirit among researchers, which will lead to closer and more functional university–industry interactions. Unfortunately industrial cooperation today does not imply career benefits and add value to the academic reputation of a researcher, especially as more applied research organisations and intermediary agencies (e.g. the Fraunhofer Gesellschaft) are not well-represented in the Hamburg region. This seems to have led to the absence of good role models and therefore too little interest among academic researchers and engineers in acting entrepreneurial.

Furthermore, it was stated that universities needed industry contracts to keep jobs in industry. A warning was expressed however that companies would not want universities to act as if they were companies and position themselves as competitors to business enterprises.

## **Training of entrepreneurs and trans-disciplinary research**

[The case of the Helsinki region]

The regional roundtable concluded that entrepreneurial studies are needed to complement specialized knowledge and to serve as platform for networking different capabilities (technology, economics, design, and business). Special focus should be in building entrepreneurial spirit and understanding commercialization (how to turn research to solutions serving customer needs).

The Helsinki innovation university-project, combining technology, economics and design studies, should be actively promoted. Pilot projects on cross-disciplinary studies should be initiated as means to collect best practices for innovation university, e.g. the Helsinki School of Creative Entrepreneurship.

## **Upgrading of research management skills**

[The case of the Budapest region]

In today's Budapest region, there is a severe lack of research management skills. Industry-university cooperation, especially the cooperation between the MNEs and the universities, suffer from the fact that universities have inadequate expertise in organizing and professionally managing R&D projects with the objective also to provide relevant knowledge to industry and for other practical purposes. This was identified as one principal reason why MNEs are reluctant to outsource the management and coordination of R&D activities to universities and other research institutes in the region.

Furthermore, the current disciplinary organization of research and the curricular structure of higher education do not meet the expectations of the MNEs in the Budapest region. Reforms will have to be instituted in consultation with experts from the private sector.

The roundtable recommends that more attention is given at the university level to the advancement of research and project management skills as well as business insights even among researchers. It also recommends the introduction

of some form of talent promotion, possibly through the adoption of a two-track system.

### **Dedicating special linkages between companies and public R&D labs**

[The case of the Toulouse Midi-Pyrénées region]

MNEs considering investments in a region or contemplating to leave the region for other city-regions may have a lack of knowledge of all relevant R&D resources available. The regional roundtable of Toulouse Midi-Pyrénées discussed this lack of intelligence on the local and regional scene as a weakness among its attraction factors.

On the other hand, the public R&D labs, whether in a university or elsewhere, may lack insights of the current and future R&D needs of the MNEs, both the ones already in the region and those who may consider coming. Hence, the roundtable recommended organizing regular information days, dedicated to explore the incentives to cooperate. Such information days could also be seen as match-making events. Here, in a favorable, informal environment, research teams from different laboratories could present their on-going and planned activities in relation to the industrial interests expressed by the companies prior to the event. This would be a search for convergence of interests and the groundbreaking for common activity. Such match-making events could be focused on a selected techno-scientific area (nano-materials, safety in embedded systems, etc.) or focus on the activities performed at a particular lab of special interest or on the activity plans by a group of public R&D centers.

The format of such thematic days will help determine their success. The operational objective is to match-make among interests in science and in business and thereby help dedicate special linkages between companies and public R&D labs.

## ***Main Issue 4: Additional notes on R&D location in EU regions***

In addition to the three groupings of main issues listed in the sections above, there are a number of observations and proposals made at the regional roundtables, which deserve to be included in this document.

### **How to compensate for missing stability and predictability?**

[The case of the Budapest region (Central Hungary)]

The roundtable in the Budapest region observed that R&D investments in the region actually suffered heavily from ever-changing regulations and shifting priorities for the region's and the country's development. Decision-makers at all levels altered the goals and re-oriented the development strategies, which influence the local, regional and national contexts for R&D investments.

The roundtable participants recommended that the political leaderships should create more stability for the region's R&D investment environment. For example, it is recommended that the regional and national governments should carefully develop more long-term governmental blueprints for R&D investments to be adopted as part of the national/regional/local R&D and innovation strategies. A more conducive environment for R&D will encourage MNEs and other potential investors in R&D to locate in the Budapest region. Long-term institutional and other commitments from other stakeholders (such as the universities, science parks and other intermediary institutions) in support of such inward investments would also be helpful.

### **R&D, public procurement and user-centered innovation**

[The case of the cross-border Öresund region]

As indicated earlier, the Öresund region is relatively unique in the sample of regions within this project. It is a truly cross-border area between Denmark and Sweden united not only by advanced transportation (a regional and European hub) and other infrastructure, but by a range of institutional and other support

schemes that entail policies for innovation and human resource development. For example, there is a general policy that public procurement of technology-based services in most sectors should help drive the advancement and diffusion of technology. The Öresund region is considered richly endowed with inventive companies in many areas of science-based venturing and high technology business operations. The region has more than a dozen universities, seven science parks plus other intermediary institutions and benefits from a well-functioning public sector, sensitive to public-private partnerships in support of innovation. With relatively small means – it has been claimed by regional stakeholders contributing to this project – it would be possible to advance new mobile services and to actively pioneer radically new solutions based on communications technology for citizens, companies and institutions in the Öresund region.

The focus of the regional roundtable deliberations was on R&D and innovation and how to achieve more of world-class technology for mobility by the optimal use of the resources in the region (the regional cluster dimension) and by linking up better with resources elsewhere (the hub dimension). A key strategy question put to all participants individually and to all as a group was: How to develop more of competitive solutions and create useful applications of ICT for end-users in the Öresund regional context?

As importantly, it will be feasible to open up for much more investments, to stimulate the creation of new market opportunities and to strengthen the innovative capabilities among the region's firms and institutions. Some of these achievements are already being made, but much more could be achieved by a more elaborate, strategic approach, involving end-users and user communities even at the early design stage of a new product or process.

## Europe-wide issues that influence regional R&D

[The case of the Oxfordshire region]

At the regional workshop in Oxfordshire, a review was made of general attraction factors that would influence R&D investments in the region and across Europe. Apart from having an exceptionally resource-rich university like Oxford, there are factors that influence the location of R&D investments, which go beyond the region. Europe-wide issues that influence regional R&D as well are especially important for European policy makers to consider. At the roundtable, four key themes were identified from the interviews with the sampled R&D-intensive MNEs. They are:

- **Functional linkages:** Developing more, better and broader links and means of communication, even for firms with well established linkages.
- **Public regulations:** The regulatory environment in Europe need to be improved – and particularly, in the UK, for science-based technologies such as in biomed, biotech and pharmaceuticals. For example, the drug approval process and standards are important location factors. Specific areas such as improving the system of clinical trials were highlighted.
- **Skills shortages:** Addressing the skills shortages in physics and chemistry. (This was identified as starting with problems at school level because of a lack of good teachers.) This is a regional problem for Oxfordshire as well as being an issue problem for the UK and EU. More generally, the skills shortage relates to a general lack of investments in the science base of the universities and other research institutions. (Cf. also the next section on the Helsinki region.)
- **Global competition:** Competition from R&D centers in countries like Russia, India and China is an issue of concern to the Oxford region and to Europe more generally, not only due to new market opportunities but also because of the growing volume of highly qualified labor being trained in those countries.

## Changing the focus in higher education

[The case of the Helsinki region]

At the Helsinki LocoMotive roundtable, it was agreed that the Finnish education system should consider changing some of its focal points from 'quantity' to 'quality'. The roles and images of the different types of education should be made clearer (for example, differentiating between the polytechnics and the universities). This will help advance each type of specialized education, attract highly-motivated students, and increase productivity (time period needed to complete graduation, issues of quality, share of graduates).

Generally, the numbers in university intake should be reduced followed by an increased focus on post-graduate studies. Polytechnics and universities should differentiate their offering and build platforms for cooperation rather than strive for overlapping activities.

## Creating a more international academic environment

[The case of the Helsinki region]

Another type of re-orientation of the third level education system was discussed at the Helsinki roundtable. It will not be enough to increase university funding (funding per student should be doubled from the current ratio), although this remains important also for the promotion of high-level research and to attract internationally recognized talent at all levels of the university education system. The universities, at least in the Finnish capital region, must also become more international. Interesting research opportunities should be the prime motivation for attracting foreign post-graduate students to Finland (as opposed to free tuition).

Student exchange programs should be activated. The exchange programs should be oriented towards areas where Finland has internationally recognized research projects and special opportunities.

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