

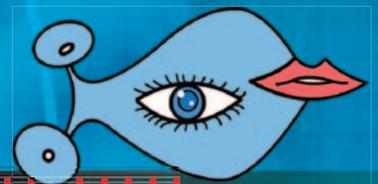


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# The European Foresight Monitoring Network

Collection of EFMN Briefs  
Part 2



November 2009

EU 23095 EN

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EUROPEAN COMMISSION

# **The European Foresight Monitoring Network**

## **Collection of EFMN Briefs – Part 2**

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# Foreword

Globalisation as well as the crisis that Europe and the world have to face appeal for new ideas and ways of thinking. There is more and more pressure to imagine scenarios for the future and envisage solutions to the emerging societal needs. In this sense foresight is an appropriate tool to help rethinking our future. It helps in the early identification of emerging issues that could have far-reaching implications for European Science and Technology in the long run. It contributes to the analysis of changes in the global research system and their possible implications for European research policy.

The Foresight Monitoring Network (EFMN) is a Europe-wide network inspired and financed by the European Commission in the framework of the Foresight Knowledge Sharing Platform implemented under the Research Framework Programme. Through its network of 180 foresight correspondents the EFMN initiative mapped, from 2004 to 2008, the foresight exercises conducted in Europe but also in other regions of the world covering countries as varied as the EU Member States, Japan, China and Korea, the US, Canada and Brazil. It identified the big scientific, technological and societal challenges of tomorrow, such as the growing concern in Europe for environmental technologies, energy, information and communications, as well as the growing interest and need in public health care. It formulated policy recommendations on specific “hot topics” and contributed to the dissemination of this relevant information through the production of 160 short foresight policy briefs.

The present publication is part 2 of the collection of EFMN briefs. The first 120 briefs were published in April 2008 and met a large success (EU 23095 EN). They contributed to a better use of the results of foresight exercises by bringing information on crucial societal topics to the attention of policy-makers. The EFMN project received indeed in March 2009 the Bled Forum Award for its efficient promotion of foresight.

Part 2 of the EFMN briefs presents the last 40 EFMN briefs written in 2008 and summarises the results of recent foresight activities on crucial topics such as the role of the EU in the world, future jobs and skills in the EU, the identification of the most important challenges for Europe in the fields of rural areas and migration, the security of energy supply, robotics for healthcare. We are confident that this publication will also receive a warm welcome among the Foresight Community and policy-makers.

A handwritten signature in black ink, appearing to read 'JMB', with a long horizontal stroke extending to the right.

Jean-Michel Baer  
Director

# Introduction

## The European Foresight Monitoring Network

With the publication of the second volume of Briefs the European Foresight Monitoring Network (EFMN) continues the work that was inspired and financed by the European Commission as a service to foresight practitioners and policy-makers in Europe and beyond. Responsible for the operation of EFMN are the following European organisations: TNO (NL), PREST (now: UNIMAN, UK), CKA (B), VDITZ (D), and ARC (now: AIT, A).

Starting its work in 2004, the European Foresight Monitoring Network is a part of the Foresight Knowledge Sharing Platform – a coordinated series of European Commission initiatives to support the professional development of foresight practitioners in Europe. It forms an important part of a strategy to develop the European Research Area and contains three main lines of action:

1. Monitor and disseminate information about foresight developments in Europe and the rest of the world,
2. Promote mutual learning among professionals interested in foresight related issues,
3. Conduct studies on key issues for EU research and innovation policy that provide input to RTD and Innovation related foresight activities in Europe.

The EFMN approach is based on the continuous process of monitoring and collecting data on foresight exercises conducted not only in Europe, but in other regions of the world as well. This information is collected using experts within the international foresight community. The information gathered provides the basic raw material for the following tasks:

- Production of briefs: These are short 4-page descriptions of interesting, recent, or ongoing foresight exercises and forward-looking studies. The present publication comprises the 40 EFMN briefs that were written between 2007 and 2008. This is the second volume of Briefs publication. The first volume published in 2007 contains 120 EFMN briefs.
- Mapping: In addition to simply monitoring on-going activities, we compile detailed data on these activities and publish an annual report that analyzes trends and developments in Europe and other regions of the world.
- Issues analysis: This analysis allows us to identify emerging issues that may be of importance to the research community

in Europe. The intention is to highlight emerging issues rather than established and easily recognizable trends. All of this is summarized in an annual report.

- Dissemination of information: The EFMN portal and its mailing lists located at [www.efmn.eu](http://www.efmn.eu) provide the main means of dissemination. It is updated continuously as briefs are produced and as new initiatives are identified. It features the individual correspondents and provides links to the main European Commission foresight related initiatives, as well as a calendar and a distribution list that already has about 3,000 members.

### The Network of Correspondents

The EFMN relies on a high level of participation of foresight experts from Europe and the rest of the world. Although the EFMN team provides a critical mass to ensure continuity and momentum, it is important that other foresight experts and policy-makers are involved in the collection of data.

We rely on the active participation of correspondents who can contribute to the identification of foresight exercises, the mapping and the production of briefs. All of these contributions support the network in providing information on foresight events, identifying new important emerging issues related to societal and economic implications to help create an innovative European Research Area.

The network represents about 200 correspondents who themselves are often actively involved in the implementation of specific foresight exercises and have taken the opportunity to contribute to the building of a database. It is open to anyone else interested in making a contribution.

## The Purpose of the Foresight Briefs

Foresight briefs provide our readers with concise, up-to-date overview information on the motivations, the process and the results of recent or ongoing foresight exercises. The EFMN platform serves as a “showroom” for the most remarkable foresight processes whose initiators are willing to share information about their methods applied, participants, addresses, outcomes and policy implications with a wider audience. The unique activity of the European Foresight Monitoring Network offers foresight practitioners an opportunity to make their activities more widely known in the European foresight community and beyond. As foresight is more and more becoming a tool for policy-makers and corporate decision makers the EFMN briefs prove to be a valuable source of information on subjects that are discussed in world wide foresight activities as well as on future policy options to support socially sound and economically feasible solutions.

The success of the foresight briefs thus depends on the willingness of the foresight community to make interesting contributions to the growing list of briefs and thus jointly build up a rich content-driven information base on the most recent foresight activities not only in Europe but in other regions of the world.

## The Content of the Foresight Briefs

Since its inception in late 2004, the number of briefs written by independent correspondents and members of the EFMN core team published on the EFMN web site has risen steadily up to 160 to this date. The majority of briefs are authored by foresight practitioners from the EU27 covering activities in the European Research Area. However, a considerable number of briefs reports on emerging trends worldwide, and touch regions beyond Europe: North America, Latin America, Asia, the Pacific region and Africa. While many briefs give an overview on national foresight activities, specific topics are addressed as well. It is noteworthy that technological developments are more and more regarded within their societal contexts, considering the social, economic and ecological impacts they might foster. In this sense, foresight becomes a policy tools that helps decision makers chart directions of technological developments that meet social needs and take people’s concerns serious.

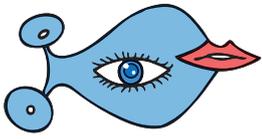
The second volume of Briefs contains a considerable number of regional foresight activities. A new type of brief is the policy brief: This issue presents four of them and they give an overview on pressing societal challenges policy-makers have to react to at European level such as migration. In addition, there are also briefs that reflect on foresight in a more general way, pointing out implications for more precise actions to take in a foresight process, e.g. lessons from best practices in corporate foresight. Other topics in focus are safety and security (of food, of energy supply, of data, civil security); health and health care; agriculture; skills and education.

In addition to these thematic trends, the briefs present also a good overview on a broad variety of methodological approaches applied in the various foresight exercises. Whilst in the past foresight and its predecessor tools (e.g. forecast) were associated with the top-down approach, recent foresight initiative have some bottom-up approaches as well, trusting the benefits of participatory activities. Given the recent nature of most foresight initiatives that are presented in this volume, it is hard to assess the policy implications and outcomes that are associated with these initiatives. Though most authors attempted to give an outlook on these aspects more timely distance is needed to report on the political effects and the realization of the policy recommendations that are formulated in the specific foresight briefs. This is a task that we have to address in the future.

The briefs published here reflect the order of the appearance on the EFMN homepage. No ranking is associated with the numbering. The three indices at the end of this volume are meant to give the readers a better orientation in search of specific subjects, regions or authors.

As the EFMN core team we would like to use this occasion to thank the many correspondents for their precious contributions that made this publication of this volume of briefs possible. Special thanks go to the Directorate L of DG Research, namely Pierre Valette, Marie-Christine Brichard, Elie Faroult, and Belmiro Martin for their valuable support of the Network in many regards and their initiative to publish the two volumes of Briefs. We hope this book will stimulate future foresight activities in Europe and beyond and an enlargement of the European Foresight Monitoring Network.

*Susanne Giesecke  
Vienna, June 2009*



# National Foresight Programme “Poland 2020”

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<b>Sponsor:</b>	Ministry of Science and Higher Education, Poland	
<b>Type:</b>	National foresight exercise	
<b>Organizer:</b>	Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT-PAN)	
<b>Duration:</b>	January 2006-June 2008	Budget: € 1,300,000

## Purpose

*The National Foresight Programme “Poland 2020” is the first national foresight exercise being carried out in Poland. It is being conducted in three research areas: sustainable development of Poland, information and telecommunication technologies, and security. Its main aim is to set up paths of scientific research and development capable of accelerating long-term social and economic growth. Another equally important goal is to trigger public debate on visions of Poland’s future. The realization of the programme has been preceded by a pilot foresight project in the area of “Health and Life” research.*

## Rationale and Design of the National Foresight Programme “Poland 2020”

The idea for the National Foresight Programme for Poland emerged in 2003 and is associated with the person of the Minister of Science and Information Society Technologies at that time, professor Michał Kleiber. It was included as one of the measures to foster innovativeness in a document called “Plan for promoting growth in the years 2003-2004”, adopted by the Council of Ministers on July 1, 2003 and launched in the fourth quarter of 2003. The resulting pilot foresight programme was carried out in the area of “Health and Life” research. The choice of this research area was dictated by a large public concern for this issue, by the ongoing change in the demographic structure of Polish society (the problem of an aging society), the Polish traditions of producing safe, that is uncontaminated food, and by attempts to find niches on the Polish pharmaceutical and medical markets. The pilot project in the health and life research area was the first step in the realization of the National Foresight Programme. The overall programme was initially supposed to cover the following research areas: “Sustainable Development of Poland”, “Information and Telecommunication Technologies” and “Security”. Due to changes in political administration, the programme was not continued until 2006.

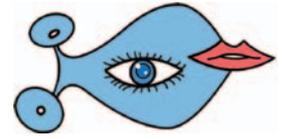
## Why is a National Foresight Programme Needed in Poland? Socio-economic Factors to be considered

In Poland, the following social and economic conditions crucially affect implementation of national and other foresight projects:

- lack of a systematic approach to challenges that arise from progress in science and technology;
- overinterpretation of the notion of “autonomy of scientific research”;
- tendency to copy policy innovation patterns that are not necessarily relevant or appropriate;
- relatively small share of industry in R&D expenditure;
- insufficient public debate;
- lower level of economic development as compared to the EU-15 countries;
- bureaucracy in public administration;
- dislike for long-term thinking.

The above factors can be seen as obstacles to properly carrying out the programme. At the same time, they cast light on the need for Poland to develop a well-thought-out national research and development strategy of its own. A nation-wide foresight exercise is the first step in this direction. Its aim is:

- to lay out a vision for Poland’s development by 2020;
- to set up the main paths of scientific research and development – in consensus with the main beneficiaries – for accelerating social and economic growth in the long run;



- to put the research results into practice and to set priorities accordingly when it comes to allotting public funds;
- to demonstrate the significance of scientific research to economic growth and show how the economy can successfully adopt it;
- to adjust Polish science policy to the requirements of the European Union;
- to align science and innovation policy with the needs of a knowledge-based economy.

Implementation of the national foresight programme in Poland is expected to render the following results:

- to identify lines of strategic research and development that will guarantee fast economic growth in the medium and long term;
- to streamline expenditures from public funds;
- to create a common language suited to cultivate a public debate and a culture of thinking about the future, leading to coordinated efforts towards economic growth and improvement of the quality of life in Poland.

## How is the Programme structured?

A steering committee has been installed to assume consultancy and supervisory functions to ensure the proper implementation of the programme. This body is to act under the Ministry of Science and Higher Education, in cooperation with the Foresight Unit based at the Department of Science Strategy and Development of the Ministry and a support group comprised of young researchers from Polish universities and research centres. The steering committee is responsible for:

- supervising over the proper execution of the national foresight programme;
- selection of experts to be involved in the programme;
- choice of methods in executing the programme;
- determining the scope of each research area;
- approving the programme’s financial plans;
- approving the reports on each stage of the programme.

The other main bodies involved in project realization are:

- a coordination consortium;
- expert panels.

The consortium members are the Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN) – project coordinator, the Institute of Economics of the Polish Academy of Sciences (INE PAN) and Pentor Research International; they are responsible for organizing and managing the project. The Institute of Fundamental Technological Research of the Polish Academy of Sciences is responsible for project management and coordinating the work of the expert panels. The Institute of Economics of the Polish Academy of Sciences is in charge of analysing statistical

data and providing other analyses associated with the foresight procedure, such as: PEST (political, economic, social, and technological) analysis and cross-impact analysis. Pentor Research International is assigned the tasks of conducting a two-round Delphi survey, organising public debates, and providing consultancy and supervisory services for the promotion and dissemination activities in the context of the National Foresight Programme “Poland 2020”.

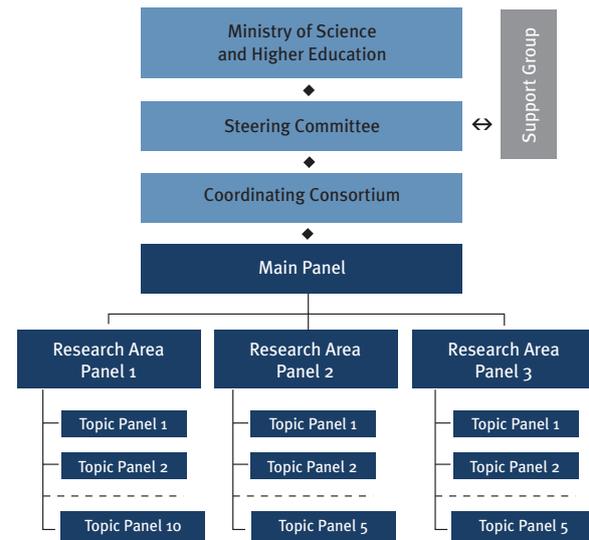


Figure 1: The simplified organizational structure of the National Foresight Programme “Poland 2020”

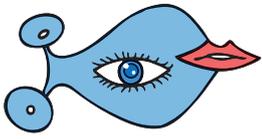
The expert panels (a main panel, three research area panels, and 20 topic panels) are preoccupied with conceptual work, as the basis for further analyses by the coordination consortium. The main panel is comprised of renowned specialists in the areas covered by the foresight programme, experts on social and economic issues, and representatives of the potential beneficiaries and users of foresight from industry, politics, and the media. Its main tasks include:

- developing a first outline of a vision of Poland’s development by 2020, with a special focus on the science and research sector and its ties to the economy;
- supervision over the entire project in terms of content;
- laying out the guidelines for the work of the research area panels in terms of content.

There are three research area panels composed of key experts, who manage and coordinate the work of the topic panels.

The research area panels are:

**Sustainable Development of Poland** (Quality of life, Sources and use of power resources, Key ecological problems, Environmental protection technologies, Natural resources, new materials and technologies, Transport, Integration of ecological



policy with sectoral policies, Product policy, Sustainable development of regions and areas);

**Information and Telecommunication Technologies** (Access to information, ICT and the society, ICT and education, E-business, New media);

**Security** (Economic security (external and internal), Intellectual security, Social security, Technical and technological security, Development of civic society).

The main tasks of the topic panels include: assessment of current knowledge in the areas in question, analysis of major issues and macro topics of each research area using selected foresight methods, and the formulation of Delphi statements. Topic panels are composed of renowned experts in the respective fields, representatives of academic and research institutions, industry, innovative enterprises, institutions promoting technology transfer, media, etc.

The work of the research area and topic panels is supported by experts from partner institutions, which include universities, such as Warsaw School of Economics, Warsaw University of Technology, and agencies and associations, such as Polish Agency of Enterprise Development, Polish Federation of Engineering Associations, and the Polish Technological Platforms.

## What Methods are Applied?

Among the methods employed in the National Foresight Programme “Poland 2020”, the most important ones are: expert panels, SWOT analysis, Delphi survey, PEST analysis, cross-impact analysis, and scenario-building.

Out of the methods listed above, the Delphi method, which has not yet been used on such a large scale in Poland, will be of crucial importance. The general procedure for the implementation of National Foresight Programme “Poland 2020” is presented in figure 2.

## The National Foresight Programme “Poland 2020” as a Social Project

As the essence of foresight projects is to involve representatives from business, academia, media, government, political groups and, finally, the general public in debate about the future, two models of consultation will be used in the project:

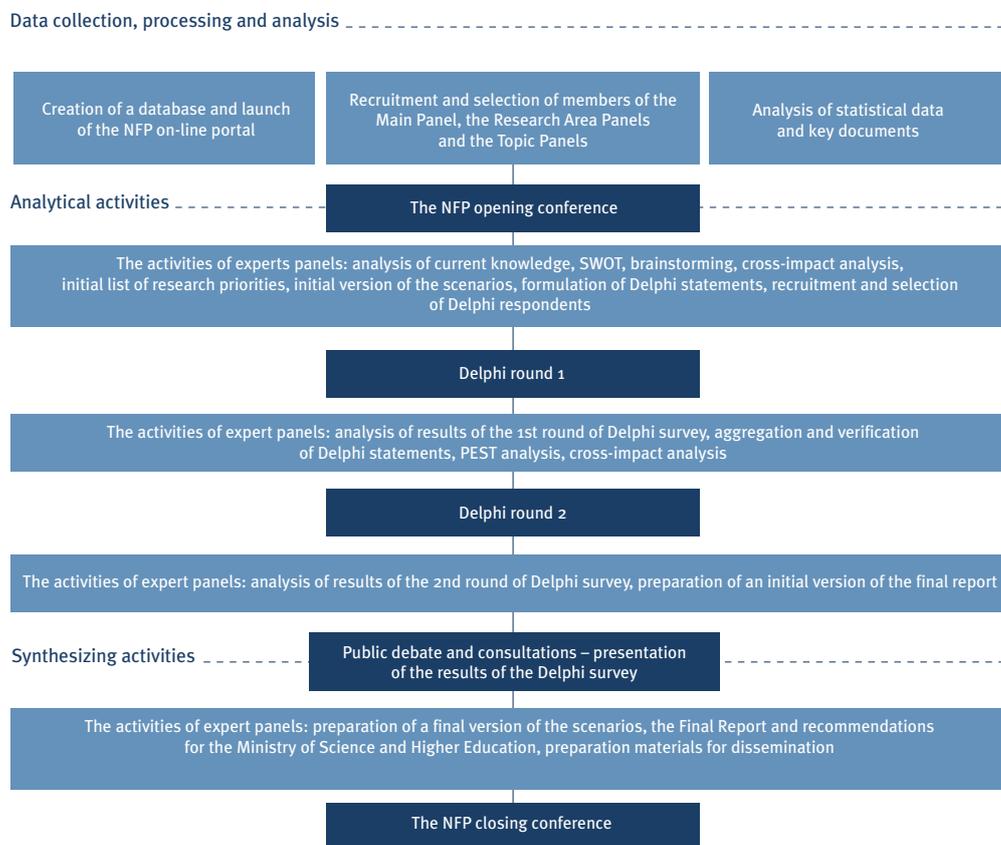
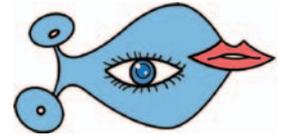


Figure 2: General procedure for the implementation of National Foresight Programme “Poland 2020”



- a closed consultation model, reserved for persons having outstanding professional and academic background – expert consultations,
- an open consultation model, open to anyone interested in the project – public debate and public opinion polls.

As part of the expert consultations, a Delphi survey will be conducted. Representatives from science, business, public administration, media, and non-governmental organizations will be invited to participate in the survey. Building scenarios on social and economic developments also requires knowledge on social reactions to the situations described in the scenarios. For this reason, the results of the Delphi survey and the preliminary development scenarios will be subject to a debate involving participants from many different walks of life. The website of the National Foresight Programme “Poland 2020” ([www.foresight.polska2020.pl](http://www.foresight.polska2020.pl)) provides another method for broad social consultations. Users are able to express their opinions on the materials published on the website by filling out an anonymous survey and participating in an online forum. Thanks to this, the National Foresight Programme “Poland 2020” portal will serve as a platform for broad public discussion and for an exchange of views concerning the economy, its growth forecasts, and evaluations of the project’s progress and results.

Additionally, the National Foresight Programme “Poland 2020” portal serves as the basic tool of the programme’s in-formation and promotion campaign. It supports:

- communication within scientific circles,
- communication between scientists and users of science and technology,
- and broader education of society, the government, and politicians.

## What is planned? What has been done?

On March 1, 2007, the official opening ceremony of the National Foresight Programme “Poland 2020” was held. In May, the expert panels began their work. The topic and research area panels engaged in:

- preparing a list of the main research topics,
- preparing an initial list (20-30 for each topic panel) of research priorities (technology, method, technique, and procedure),
- assessing and reducing the number of proposed priorities drawing on agreed upon criteria of selection (scientific research, implementation, economic, social, and environmental criteria), and
- selecting macro-priorities for the Delphi statements.

In the following weeks (October-November), Delphi statements will be formulated on the basis of these macro-priorities. By the end of 2007, the first round of the Delphi survey will

be conducted. The second round of the Delphi survey and analysis of its results will take place from January to February 2008. Since the National Foresight Programme “Poland 2020” is officially to be completed by June 2008, the programme’s final report will be presented and the closing conference held around this date.

The results of National Foresight Programme “Poland 2020” will serve the Ministry of Science and Higher Education as a guideline to verify and complement the strategy for the development of science in Poland by 2015.

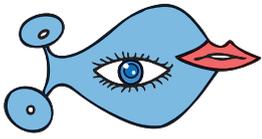
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# Strategic Policy Intelligence for Regional Decision-Making

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Sponsors:	European Commission (FP6) and participating regional organisations		
Type:	Regional exercise		
Organizer:	Steinbeis-Europa-Zentrum, Stuttgart, Germany, Dr Guenter Clar, clar@steinbeis-europa.de		
Duration:	01/2006-03/2008	Budget: € 500,000	Date of Brief: Nov. 2007

## Purpose

*The RegStrat-project explored new ways of combining foresight with other strategic policy intelligence (SPI) tools, such as technology assessment, evaluation, benchmarking and innovation auditing, to advise regional decision-makers along the whole policy-cycle on the best ways to apply these tools to design and implement regional research, technological development and innovation (RTDI) policies and programmes, and related RTDI investment strategies. This approach is tested in pilot applications in the six participating regions. Based on this, a guide is developed to support regional decision-makers in applying and combining SPI tools.*

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## The Environment for Regional Decision-making

During the last decade, policy-makers have become more and more aware of the growing social and economic problems caused by stagnating and/or falling competitiveness of many regions in the EU compared to other parts of the world especially in America and Asia. The need to jointly address the resulting challenges has been stressed up to the highest levels, for instance, when the Lisbon European Council in 2000 called for the EU to become “the most competitive and dynamic knowledge-based economy in the world” by 2010. As research and innovation were considered key to increase long-term competitiveness, the concept of the European Research Area (ERA) was developed, and, subsequently, the European Council in Barcelona set the target to raise investments in research and technological development (RTD) to 3% of GDP by 2010.

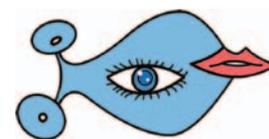
It is evident that decision-makers in the EU need to explore novel strategies and approaches to contribute to a more competitive Europe and to successfully address the challenges in question against the background of a rapidly changing and complex socio-economic-political environment.

Thus, policy-making at all governance levels needs to focus on the acquisition of adequate knowledge for improved decision-making and the involvement of all relevant

stakeholders, and, more generally speaking, on developing the building blocks for a 21<sup>st</sup> century governance of innovation: appropriate institutional set-ups, procedures and practices for agenda setting, prioritisation, implementation and policy learning.

In this context, the regional dimension is of key importance in innovation policy, because learning and innovation processes are often spatially bound, and strengthened and improved by spatial proximity. Thus, regional research and innovation activities can have a significant influence on strengthening the overall European RTDI capacity. By adapting the European RTDI policy approach to specific territorial conditions (top-down) and at the same time communicating the needs of the regions to the national and EU-level (bottom-up), regions perform an effective intermediary role in developing, tailoring and implementing RTDI policies, enhancing RTDI investments and thus strengthening the ERA.

In this context, SPI tools can be used as strategic instruments for boosting regional development and can provide the basis for successful regional policy-making. The application of SPI tools can contribute to successful regional policy-making under diverse regional circumstances and for different purposes, if the instruments are adapted to the specific regional framework conditions, challenges and needs. Prominent examples for regional innovation policy instruments which can be enhanced considerably by the application of SPI tools



are the development of regional innovation strategies and regional clusters.

Thus, regional policy-makers can increase both the effectiveness and the efficiency of research and innovation policies and measures by using SPI-based approaches more systematically.

## Strategic Policy Intelligence: the RegStrat-Approach

RegStrat is based on a comprehensive approach, bringing together the dispersed knowledge available on SPI tools such as foresight, technology assessment, benchmarking, evaluation and innovation auditing. Thus, synergies are harnessed which result from integrating this previously distributed know-how and applying it in a combined way.

The availability of such a comprehensive knowledge stock makes it easier for regional decision-makers to design sustainable, forward-looking and tailored policies and programmes as this information usually is both expensive to generate and difficult to translate into day-to-day decision-making. Ultimately, it will generate positive impacts on regional RTDI investments. Furthermore, this also supports networking and knowledge-exchange among regions and with EU level organisations to encourage and facilitate inter-regional learning.

To build the knowledge base, literature on the topic was reviewed and compiled, and expert and stakeholder meetings were organised. These workshops aimed to assess the specific demand regarding strategic policy advice for RTDI decision-making and how using SPI tools could satisfy this demand. Subsequently, pilot exercises were developed and implemented to test the application and integration of SPI tools in specific regional contexts.

Finally, a guide and compendium were developed to synthesise the experiences made and the knowledge gathered. They are available to anybody interested in applying and combining foresight and related tools to enhance regional progress by tailored RTDI policies.

The project was funded by the “Regions of Knowledge 2” programme of the European Commission’s DG Research and the participating organisations. The participating regions were:

- Baden-Württemberg, Germany;
- Lombardy, Italy;
- Ireland;
- Extremadura, Spain;
- Lower Silesia, Poland; and
- Estonia.

## SPI – Methodology and Application

Strategic policy intelligence can be defined as “the set of actions to search, process, diffuse and protect information in order to make it available to the right person at the right time in order to make the right decision.”<sup>1</sup> SPI tools comprise the methodologies used in order to provide decision-makers with comprehensive, objective, politically unbiased and, most importantly, forward-looking information. The effective use of SPI tools yields more realistic, efficient, relevant and democratic strategies for a range of policy fields.

The strength of the application of SPI tools derives from:

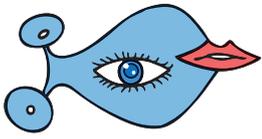
- **participation:** SPI incorporates multiple perspectives of all stakeholders involved in decision-making;
- **objectivisation:** SPI makes policy-making more objective through the integration of unbiased information and rigorous analyses;
- **mediation and alignment:** the application of SPI generates mutual learning and understanding among stakeholders and facilitates consensus-building;
- **decision support:** SPI tools not only facilitate decision-making but, very importantly, also facilitate the implementation of decisions taken.

In addition, SPI exercises can gain in efficacy and efficiency if carried out continuously and are synchronised with major policy developments.

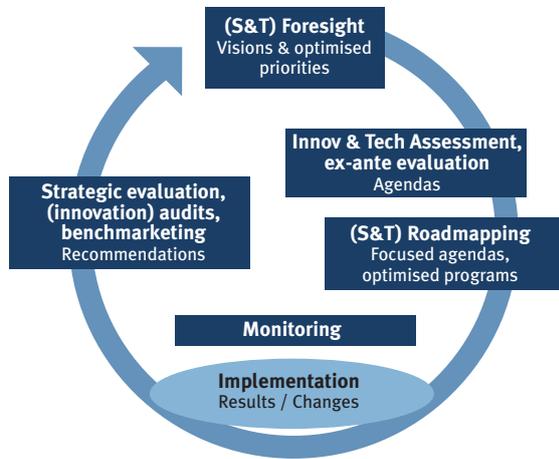
To ensure that SPI applications are tailored to the needs of the respective policy environment, they should be applied at all stages of the decision-making process. The following simplified policy cycle framework is used for demonstration (see figure):

- A decision-making process aims to shape the future state of and address challenges faced by society. It starts by developing ideas and **defining visions** of how the future should – and could – look like (e.g. using foresight).
- Once the preferred vision is defined, discussed and agreed upon, an **agenda** detailing the steps to be taken to move towards the vision needs to be worked out, and the **implications** of adopting particular options have to be assessed. (e.g. by TA and evaluation).
- When **detailing an, e.g. regional, agenda** the issues that got onto the policy agenda are formulated into concrete regional initiatives, programmes or policies to be implemented (e.g. using roadmapping).
- The **implementation and monitoring** part of the policy cycle refers to the application of the policy measures developed in the previous phase.
- Both the evaluation of the whole process and the benchmarking with other relevant exercises/fields etc. lead to **recommendations** for improvements in the process or for further actions (including **policy learning**).

<sup>1</sup> Strategic Policy Intelligence: Current Trends, the State of Play and Perspectives. IPTS Technical Report Series, Seville, December 2001.



- To close the circle, outcomes of this phase should be used to provide new input for future formulation of visions and priorities.



Integrating SPI tools can further reinforce policy development and learning. As there is no generally applicable model, optimally combined use will depend on the objectives and the scope of the decisions in question, on the quantity and quality of information on the topic, on the scope of the decision to be taken, and on the composition and relevance of the group of stakeholders involved.

### Regional Pilot Projects

To test the application and combination of SPI tools at the regional level, pilot applications were designed and implemented, tailored to the concrete situations of the partner regions. Each regional partner developed its pilot project in close cooperation with and supported by the other project partners, taking into account both the specific regional situation and previous SPI activities which had already been conducted in the region. Also, upcoming funding possibilities (regional, national and European, especially Structural Funds) for the regions were taken into account.

These pilot applications were designed around one or more workshops or seminars with regional stakeholders and decision-makers. They included regional SPI awareness raising, gap analyses, recommendations on how to implement the findings in the specific regional policy and investment environments, and regional implementation and outreach activities.

In **Extremadura**, it was considered especially relevant to set up a foresight exercise and to investigate in which direction the region might and/or should develop during the next 10 to 20 years. This exercise could be based on comprehensive knowledge available from long-standing Structural Funds evaluations and was soundly backed by regional decision-

makers. It was designed and thoroughly supported by the regional project partner and facilitated by foresight professionals to maximise outcomes.

In **Lower Silesia**, conducting a RTDI benchmarking exercise was regarded as most appropriate to develop a sound information base for the region and for further SPI activities, such as a foresight exercise or evaluations of regional funding activities, and to establish a regional think tank for ongoing policy support. The exercise involved all relevant stakeholders in the region and led to a broad-based communication and cooperation between them. In addition, contacts were established to the regions which were benchmarked, such as Saxony, the neighbouring German region, and to national organisations such as ministries and statistical agencies.

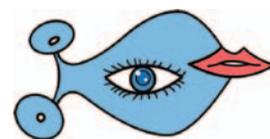
In **Estonia**, a foresight exercise on biotechnology had been conducted in 2002/2003. At the time, there was no way of implementing the outcomes. Thus the regional partner decided to base the pilot project on these experiences and explore possibilities of developing a technology assessment exercise involving all relevant stakeholders and generating sustainable and implementable outcomes to improve forward-looking biotechnology policy-making in Estonia.

**Baden-Württemberg, Lombardy and Ireland** first of all supported the other three regions in designing and conducting their exercises. In addition, one workshop was conducted in each region to discuss with regional stakeholders and policy-makers current and future applications of SPI tools in the respective regional context and to validate the RegStrat Guide and Compendium.

## Outcomes and Policy Impact

A broad variety of techniques to generate SPI have been developed over the decades such as scenario building, Delphi, trend analysis, STEEPV (Society, Technology, Economy, Ecology, Policy, Values), roadmapping and others. As a general observation one can say that participative, creative and communication-oriented techniques have become fashionable and are used more frequently. One should aim to combine the tools and techniques available in a way that they appropriately address the objectives, are best suited to generate the desired impact, and the outcomes are best tailored to the needs and requirements of the decision-makers.

Foresight exercises, for example, usually aim at providing more general advice on elements, issues and/or technologies that might be relevant for strategic decision-making, while benchmarking exercises are expected to produce very concrete, detailed and technical outcomes in terms of analyses, RTD priorities or other policy actions to be taken.



The **RegStrat Guide**, which is available from the project website and is broadly distributed in Europe's regions, gives a concise overview over the need and the context for applying SPI; it outlines the tools and techniques at hand, and it demonstrates by way of a fictional case study how SPI tools can be applied in an integrated way at the regional level.

The **RegStrat Compendium** is based on the Guide but is far more comprehensive. It also lists good practice examples, gives additional resources to be used when designing and conducting an SPI exercise and shows in which contexts SPI can be successfully applied at the regional level.

When these two documents were applied and validated during the RegStrat pilot exercises, several aspects were regarded as most relevant:

- **Expertise:** choose adequate professional expertise and support to select techniques and to guide the process. This will lend credibility to the process and its outcomes.
- **Resources:** allow for enough personal and financial resources to adequately implement the techniques chosen; only then will the techniques produce the desired outcomes and meet the expectations.
- **Fitness:** as different techniques generate different types of knowledge, combine them to fit the issues, objectives, aims and context; this facilitates translating the recommendations into adequate decisions.
- **Transparency:** make the process of choosing techniques as transparent as possible and easy to understand, thereby keeping expectations on outcomes realistic and making the subsequent decision-making process more objective.
- **Information:** keep the decision-makers and the stakeholders informed during the whole exercise to raise their understanding of and commitment to the process.
- **Participation:** choose techniques which incorporate all relevant perspectives into the process.
- **Mediation:** apply techniques to optimally support mutual learning and understanding on part of the involved stakeholders to facilitate consensus-building.
- **Know-how:** when implementing the techniques chosen, take into consideration the type of stakeholders involved and their level of expertise, and facilitate the exercise accordingly.

## Funding of SPI Activities

The project also elaborated on the possibilities for funding SPI activities in Europe's regions. Apart from national and regional funding for SPI exercises, European programmes, especially the Seventh Framework Programme (FP7), the Competitiveness and Innovation Programme (CIP) and the Structural Funds should be taken into account. In the wake of the EU 2007-2013 funding deliberations, experts broadly acknowledged that the opportunities offered by these

funding sources could be improved if synergies between these sources are enhanced and utilised.

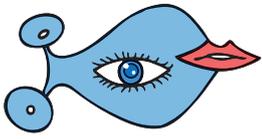
On the one hand, this reinforces the application of SPI tools for better programme design, management and assessment at all levels; and, on the other hand, this calls for developing and applying projects which test the integrated use of these funding sources, e.g. at the regional level.

During the RegStrat project this notion was reinforced and is reflected in its outcomes, both the physical ones, the guide and compendium, and the intangible ones, as the regional decision-makers who participated in RegStrat were highly encouraged to take stock of the funding and knowledge sources available and apply them for the benefit of their regions.

## Sources and References

The RegStrat Guide and Compendium are available for download from the project website [www.regstrat.net](http://www.regstrat.net)

For further information, please contact the project coordinator Dr. Guenter Clar, [clar@steinbeis-europa.de](mailto:clar@steinbeis-europa.de), <http://www.steinbeis-europa.de/340.html>



# Scenarios 2026 for the South West of England

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Sponsors:	South West of England Regional Development Agency and the South West Regional Assembly		
Type:	Regional sector-specific foresight exercise		
Organizer:	Centre for Future Studies and South West Regional Development Agency		
Duration:	4 months	Time Horizon: 2026	Date of Brief: Nov. 2007

## Purpose

*This study (which took place in 2004) presents four “socio-economic-political scenarios” designed to stimulate, guide and inform strategic thinking about the future of one of nine English regions, namely the South West. The scenarios portray distinct pictures of the social, political and economic background against which the strategies for the South West can be reviewed and developed. They provide a consistent approach and serve as practical thinking tools. The scenarios are also intended to help organisations in the South West to assess their vulnerability to forces of change and to plan appropriate adaptation strategies.*

## Reflecting on Alternative Futures

The starting point for the development of the scenarios was a comprehensive futures research programme across five major themes – society, technology, economy, environment and politics. The results of the research programme were followed by the development of a number of future scenarios. The development of the scenarios has involved a combined process of consultation and research, through workshops with stakeholders and specialists at the regional level. The aim has been to develop a scenario framework through which various stakeholders are able to reflect about possible alternative futures, and to make sense of what this means for them in the context of the South West. Therefore, there was no intention to produce prescriptive results. On the contrary, stakeholders were encouraged to provide the texture of possible futures themselves, based on their own expert and local knowledge.

This inclusive approach was meant to allow stakeholders to build a set of internally consistent and plausible pictures of the future. These pictures were constructed around a series of simple propositions about how society and the economy could develop. It was pointed out from the outset that the future would most likely be a combination of elements from all scenarios.

Four socio-economic-political scenarios have been developed and set in the timeframe to 2026. The aim was to describe situations in a range of possible futures that can be used to assess regional strategy and policy responses for

the South West region. Five main dimensions of change have been identified:

- demography and settlement patterns,
- the nature of economic growth,
- the rate and direction of technological change,
- the nature of governance,
- social and political values.

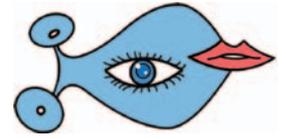
In addition, there were four criteria for the development of scenarios:

- relevance (applicable to public, voluntary and private sector decision-making),
- consistency (based on coherent assumptions),
- plausibility (not over-estimating the rate of change),
- transparency (clear demonstration of assumptions).

## Values, Governance & Economic Activities Defining Four Future Scenarios

The scenario framework has segmented the future into differing possible views of the future in 2026 that were defined by “values”, “governance” and the “locus of economic activity”. The four scenarios were the following:

The “**Media World**”, in which values are dominated by the drive to increased private consumption and personal expression. The rights of the individual and the immediate present take precedence over those of the collective and the future. Resources are distributed through free and competitive markets, with the function of governance limited



to guaranteeing trade and capitalist accumulation. It is a global, consumerist world that is manipulated by big business, the media and government.

In this world, the desire to be fashionable has driven society to a highly consumerist position, in which it has become increasingly superficial in terms of its values and beliefs. In turn, this leads to a short-term view on the use of environmental resources resulting in the degrading of the environment itself. In this scenario, a number of powerful forces combined over the period to 2026:

- pursuit of high economic growth,
- the development of powerful globalised markets,
- global markets take over personal values,
- consumption, culture and most public services are heavily market based,
- the increasing power of marketing and the media to manipulate attitudes,
- the supremacy of the individual over the community,
- big business interests dominate,
- social inequalities increase,
- private provision is favoured over public,
- the development of powerful international governance,
- growth of information communications technology (ICT) and biotechnology.

This scenario conceives the South West as particularly hard hit by these developments as the “new” shopping centre experiences are only located in the ten largest cities, leaving the smaller urban areas and rural areas without proximal access to the “old” shopping experience at all. A new wave of local “boutique” start-ups to counter this trend, selling physical wares made by local residents and businesses, trading on the unique element of their fashion, rather than the mass-produced made-to-measure. There is a certain exclusivity to this local development, and traders exchange stock with other traders in areas over 20 miles away. While this does not become a massive sector of the economy, it is indicative of how the South West tries to beat some of the modernisation trends that are generated by the Millennium Generation and Generation X before them. The age profile of the region supports such industrial endeavours and it supports the growth of small creative industries in the region, although how long this will survive beyond 2026 is questionable.

The main issue on the local agenda is the masts required for the increased levels of satellite communication activity. Despite numerous reports jointly sponsored by the media and government claiming that they are safe, the general public are wary about the health effects that the masts may generate. This is particularly the case in the South West, as the wide distribution of the population requires more masts per capita than the more densely populated areas require. While everyone wants access to the technology, nobody wants the mast in their “back yard”.

In “**Community Life**”, values are shaped by concern for the common good. In this scenario, the individual is seen as part of a collective, with rights and responsibilities determined by social goals. There is greater concern about the future, equity and participation. Civil society is strong and highly valued, and resources are allocated through more deeply managed markets. Economic and political power is devolved to the regional levels.

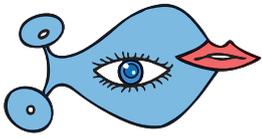
Basically a society develops where there is a strong sense of community stemming from family and social bonds. This attracts older people to the region, who in turn are active in promoting the family and social bonds which underpin the community. In this scenario, a number of powerful forces combined over the period to 2026:

- disenchantment with consumerist values,
- the relative failure of globalised markets,
- the demand for sustainable lifestyles,
- the pressure for environmental sustainability,
- devolution of political and economic power to the regions,
- the influence of “third agers” in the mature society,
- spiritual values take precedence over materialism,
- a rejection of economic growth in favour of quality of life,
- the adoption of the beliefs of social capitalism.

The key influence of the politicians is to devolve more power to the regions, and real power at that in terms of better budgetary control and legislative power within the range of issues that impact on the regions most, such as environmental control, planning regulations, housing policy and policing. The regions can set their own local income tax (which replaced the council tax in 2008) to meet the needs and desires of their region. This devolution of power has led to a greater sense of empowerment and involvement, as people really feel they can personally gain from the taxes they are paying.

As in the Media World scenario, a new wave of local “boutique” start-ups takes off. They too sell physical wares made by local residents and businesses, focusing on uniqueness rather than mass-production. While this does not develop into a massive sector of the economy in this case either, it is indicative of how the South West is developing regionally rather than trying to play the “globalisation game”. Another example is the growth of small holdings, purchased by whole villages rather than individuals, and farmed organically to provide good local produce which is home grown rather than mass produced to fit industrial instead of nutritional and ecological quality standards (such as apples that never go brown when cut).

The success of the local income tax leads government to devolve further power to the regions, eventually giving them control of health, education and welfare around 2020. This



allows the South West to regenerate its economy as the “healthy” place to retire to and the “centre of education for green, grey and global studies”. Healthcare and education continue to be the foundations of the South West knowledge economy, but the expertise in coastal management is a fast growing area, accounting for a reasonable percentage of the region’s economic growth.

In the “**Risk Society**” scenario, the power to govern is centralised with the permission of the electorate. International, economic, political and cultural relationships strengthen, and regional and national boundaries become more enforced. There may be a role for regional decision-making and for regional particularities, but this will be in the context of globalised and national economic and political systems. In this scenario, a number of powerful forces combined over the period to 2026:

- a significant increase in terrorist activities threatening personal and commercial security,
- the increasing occurrence of environmental crises and disasters,
- the consequent demand for safety and security,
- the rapid application of technologies to provide solutions,
- the adoption of policies and practices aimed at reducing environmental risk,
- public acceptance of the compromising of some individual rights for security,
- a shift in public attitudes towards sustainability from lip service to commitment,
- a technology driven economy.

By 2010, virtually every street in every city centre has CCTV, so the average person is filmed 43 times in an average day. Cameras also watch and control the motorways, stations and airports. This constant surveillance gives a peculiar sense of security, as you know that if anything happens to you, someone is watching. Street crime has reduced, as has house crime in cities. Neighbourhood patrols have started to emerge in an almost vigilante fashion, although there is a general feeling that the government approves.

The borders are very closely monitored and immigrants have to go through such strenuous procedures to enter the country it is astounding that anyone makes it through at all. However, a certain number are needed each year to do the menial jobs that remain unfilled. Those who were previously employed in these roles are now largely employed in the security industry. Despite the high levels of security everywhere, children do not feel safe to play on the streets or in the parks, and childhood has become networked. Children play life simulation games, such as Sim, where they can create a new life for themselves in a free and safe world.

The last scenario is the “**Populist State**”: economic and political power resides in Westminster, but continues to

be influenced by European and global developments. Government is populist and in seeking to please all of the people all of the time fails on many fronts and achieves “half measure” compromises. In this scenario, a number of powerful forces combined over the period to 2026:

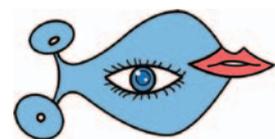
- public disaffection with the political process,
- a political concern to be “popular”,
- conflicting social, political and economic agendas at all levels,
- pursuit of economic growth in the name of prosperity,
- the need for strong political and economic leadership,
- competing interests impede integrated planning,
- a reticence in society to change,
- a society of mixed fortunes and blessings.

In this scenario, taxes rise significantly and there is a general rise in interest rates in response to the US having to “get tough” to secure its own economy. This pushes many second-homeowners over the edge, and a glut of “holiday homes” appear on the South West property market. As homes repossession rates nationally increase, the housing market crashes, leaving many of these homes unsold for a number of years. The tourist industry is struggling as the UK population favours overseas sun, and overseas visitors prefer the attractions of the big cities to what the rural areas have to offer. Taking a regional decision to accept Euros as well as Sterling in all shops and restaurants has not really improved things. Finally, continuous natural disasters make the South West an expensive region in which to get insurance cover, if you can get flood cover at all. This buildings cover difficulty drives the property market down further.

## Creating a Buzz around the Future

Because the aim has been to develop a scenario framework through which various stakeholders are able to reflect about possible alternative futures, and to make sense of what this means for them in the context of the South West, there was no intention to produce prescriptive results or follow through with any implementation strategies. Differing scenarios on how the South West might function in the year 2026 were presented to more than 400 of the region’s top strategic decision-makers on 14 September 2004 at a conference called *Looking Forward to the Future*. The conference included some short role-plays that animated the different scenarios.

The foresight exercise and the conference formed the two main components of this project, which largely sought to educate stakeholders in the region about the rationales behind some of policymakers’ decisions aimed at long term issues rather than more pending concerns. The project was also meant to generate a wider interest in the activities of the Regional Development Agency (RDA) and to create



a community around it. English RDAs remain relatively new players in English policymaking (since 1999) and have had some mixed reviews from the public regarding their effectiveness. Thus, this foresight exercise was also meant to help the RDA integrate its planning better with the perceived needs of the local community and to help it shape a consensus around a future vision of where the region should be heading in the years and decades to come. Finally, and perhaps most importantly, the project aimed at forcing public sector workers to think long term and beyond their typical short-to-middle term concerns that often characterize the nature of their work. Judging by the number of people attending the conference (around 400), the project was successful in creating a buzz in the region around the idea of a collective thinking about the future.

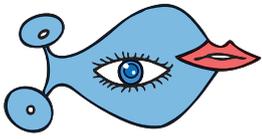
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This brief is a summary of the document *South West Scenarios 2026*.

<http://www.southwestrda.org.uk/downloads/document.asp?lang=&documentid=579&>

Conference website:

<http://www.southwestrda.org.uk/region/futures-conference/speakers.shtm>



# Foresight to Strengthen a Regional Innovation Strategy – the Case of Lower Silesia

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<b>Sponsor:</b>	European Commission, DG Enterprise			
<b>Type:</b>	Regional foresight exercise			
<b>Organizers:</b>	Wroclaw Centre for Technology Transfer, Poland; Marshal Office of the Lower Silesia Voivodship, Poland; Steinbeis-Europa-Zentrum Stuttgart, Germany; Innovations-Management GmbH Rheinland-Pfalz, Germany			
<b>Duration:</b>	10/2005-01/2008	Budget: ca. € 200,000	Time Horizon: 2020	Date of Brief: Nov. 2007

## Purpose

*The UPRIS foresight exercise built upon the Regional Innovation Strategy (RIS) of the Lower Silesia region in Poland. The foresight complemented RIS with a broader based and longer-term know-how for sustainable regional development. It was a participative process involving panels of experts and regional stakeholders, which were to discuss future challenges facing Lower Silesia and possible options for meeting them. The panels elaborated normative scenarios, which served as a basis for developing an action plan for RIS and a plan for trans-regional cooperation. In this way, a cornerstone was laid down for sound, well informed and future-oriented policy-making in Lower Silesia.*

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## Innovative Conditions in Lower Silesia

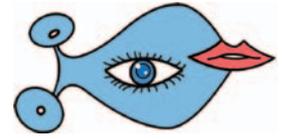
The Lower Silesia region in the South-West of Poland is the seventh largest and one of Poland's fastest developing regions. Nevertheless, supporting the emergence of an efficient innovation system in Lower Silesia poses a significant challenge for regional decision-makers.

The region is home to a significant number of universities and research institutes, yet the services they offer need to be better adapted to respond to the needs of SMEs. Although there has been success in attracting foreign investments in recent years, involving prominent global players like Toyota, General Electric, Volvo, Volkswagen and Bosch, they in many cases rely on their own R&D resources instead of approaching local ones. New forms of cooperation between SMEs and large national or multinational corporations need to be sought and supported, and cooperation and knowledge transfer between R&D and the business sector further enhanced. Incentives should be created for enterprises to compete with the quality and innovativeness of their products rather than with relatively low labour costs. Finally, investment in research, technological development and innovation (RTDI) needs to be increased to approach the 3% Barcelona target. To successfully meet the challenges mentioned above, decision-makers in Lower Silesia decided to place pro-innovation

activities at the core of their strategic considerations, and to explore novel approaches and instruments to contribute to a more competitive region. In January 2005, a Regional Innovation Strategy was created to improve regional framework conditions for innovation and to define measures to establish and optimise the regional innovation infrastructure. The strategy document was approved by the Regional Parliament in April 2005.

## Need to reinforce RIS

Creating the RIS in Lower Silesia was an important milestone in supporting the development of innovation policy in the region. To elaborate the RIS, key sectors of economy and science characteristic of the Voivodship were identified and the regional innovative potential assessed by taking into account the innovative capability of research institutions, the availability of non-commercial business support institutions, innovation needs of SMEs and the scientific potential of Lower Silesia. Subsequently, pilot actions and new institutional arrangements were proposed, e.g. the establishment of a special unit for procuring funds for investments, an Innovation Council, a Centre for Regional Studies, a Bureau for Analyses of Innovative Processes as well as 30 "bridge activities" implementing the RIS. Particularly, the document stressed the need in Lower Silesia for:



- establishing a dialogue between industry and science,
- raising awareness among regional policy-makers of the conditions under which enterprises can be encouraged to innovate,
- supporting cooperation and linkages between business support institutions in the region.

After finalisation of the RIS, it was recognised that this strategic document needed to be supplemented with additional insights and dimensions to provide a sound basis for sustainable regional decision-making and development. In addition, monitoring and implementation of the RIS required further specification and development.

## About the UPRIS Project

In October 2005, the UPRIS project “Upgrading Lower Silesia – From Regional Innovation Strategy towards Operating System” started as one of 33 projects being supported in the second round of RIS funding by the EU (FP6). The general objective of these projects was to develop Regional Innovation Strategies in the NAC (Newly Associated Countries) regions by following the RIS-methodology in partnership with at least one further advanced EU-region.

In the case of Lower Silesia, the underlying question, which led to the establishment of UPRIS, was how to make the existing Regional Innovation Strategy more sustainable, applicable and suitable for guiding decision-makers. To approach this goal, regional foresight was regarded as the most appropriate means. By applying foresight, UPRIS aimed to

- promote long-term, visionary thinking in Lower Silesia,
- raise awareness of problems and challenges in the region,
- supplement RIS with a broader societal scope and long-term focus provided by foresight,
- build consensus around the common vision for Lower Silesia,
- consider options for facing future challenges,
- and secure institutional and stakeholder support for the implementation of RIS and foresight results.

## The FOR-RIS Approach

The UPRIS approach of applying foresight in the context of RIS was based on the experience and outcomes of the so-called “Blueprints Expert Group”. This EU expert group was established to produce practical guides on how to set up and execute foresight activities in regions facing different types of challenges.

In 2004, the FOR-RIS exercise, highlighting how foresight could be applied to conduct or enhance a regional innovation strategy, was finalised. The FOR-RIS approach underlines that methodologically foresight and RIS can be easily integrated, as differences between them complement each other, especially in relation to the time horizon taken into account,

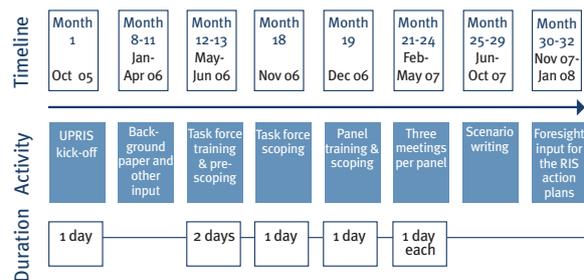
stakeholder groups involved, perspectives considered, methodology used, and the spectrum of recommendations given. Compared to RIS, a foresight process is more oriented towards medium- to long-term issues, involves a broader variety of regional actors and generates a broader and more reliable information base, as it is open to all topics of interest, not only economic ones. Thus, foresight can help identify issues and drivers that have potentially large impact on the region and that might not have been detected or approached by the conventional RIS methodology.

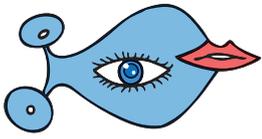
## The UPRIS Foresight Process

The UPRIS foresight process is based on a participatory and expert-based approach. It was designed by Steinbeis-Europa-Zentrum (SEZ), which also supported and guided the partners from Lower Silesia in executing it. Whereas SEZ accompanied the project as an expert on the implementation of foresight processes in regions, the partners from Lower Silesia, the Wroclaw Centre for Technology Transfer (WCCT) and the Marshal Office of the Lower Silesia Voivodship (LSV) were responsible for implementing the concept in Lower Silesia, and for guaranteeing a timely and effective execution of the whole process. Furthermore, they also provided local know-how on the specific needs and situation in Lower Silesia regarding, e.g., relevant actors, available funds, innovation infrastructure and existing support measures.

To officially inaugurate the UPRIS project in Lower Silesia, a kick-off conference brought together all project partners as well as potential stakeholders and addressees of foresight results. In the months following the meeting, project structures and bodies, such as the secretariat, were established to ensure methodological and administrative support for the process.

The next step was to provide background information and materials to prepare project partners and participants for their tasks and to raise their awareness of the context, aims and possible outcomes of the UPRIS foresight process and foresight exercises in general.





Then, a steering committee was established, which comprised 15 high-level stakeholders from the region as potential beneficiaries and addressees of foresight results. In addition, the project secretariat, supported by SEZ and the steering committee, identified seven medium-level stakeholders from Lower Silesia with various backgrounds to form a task force. The task force was expected to support the foresight process and the implementation of its results.

During a first meeting of the task force in May 06, the members discussed the existing RIS and identified issues that had to be further dealt with during the foresight process. The subsequent meeting in June aimed to train the task force members in foresight methodology and techniques and to directly apply what was learned. By this interactive approach, the meeting produced first outcomes in terms of identifying potentially relevant thematic areas of the foresight exercise. A STEEPV analysis was conducted, which enabled identifying factors (social, technological, economic, environmental, political and normative [values]) having direct or indirect impact on the current and future development of Lower Silesia. In addition, major problems and challenges in Lower Silesia were identified and ranked according to their potential impact on policy design and implementation as well as the level of regional mobilisation required to meet them.

On this basis, in November 06, the task force members, supported by the secretariat, took a major decision on three broad topics to be further elaborated by the foresight panels:

- 1. Wrocław as a Metropolitan Area:** future role of the regional capital in driving the development of the whole region,
- 2. Knowledge-based Economy:** development of human and social capital as well as linkages between science and business,
- 3. Infrastructure:** business support institutions, transport of people and transfer of data.

### ***A Panel-based Approach***

Subsequently, the members of the three foresight panels were carefully selected depending on their expertise and interests, as they were the main source of information the UPRIS foresight exercise drew upon.

In December 06, a joint meeting for all panel members was held to prepare the panels for participation in the subsequent meetings and to communicate objectives and expected outcomes. During the event, the participants were assigned to the panels: “Wrocław” 8 members, “Knowledge-based Economy” 11 members and “Infrastructure” 18 members.

In the following, three consecutive 1-day meetings for each panel took place, guided by a professional moderator. During the first meeting, the panels dealt with problem definition and worked out a detailed overview of the subjects, including problems and challenges, driving forces as well as current

measures and activities. The second panel meeting aimed to explore the future and focused on selecting factors of change considered to be decisive in the future, discussed the interdependencies between them as well as possible developments and trends. After having defined and discussed different possible future states of affairs, the third panel meeting provided a forum to work out and agree upon a common vision as well as to identify steps, decisions and prerequisites that would enable reaching this vision.

After each panel meeting, the moderator compiled the statements, assumptions and opinions in a panel report. The time in-between meetings was used for consultations as well as for feedback on results. At the end of the panel work, the results of each panel were compiled into three separate reports, together with additional input from the panel members. On this basis, a final foresight report including three topical scenarios of possible futures in Lower Silesia were written.

### ***The UPRIS Scenarios***

The UPRIS scenarios are examples of normative scenarios, as they present descriptions of futures that are either desirable or feared by regional stakeholders. The scenarios will be disseminated to regional decision-makers and other stakeholders in Lower Silesia to raise awareness of the long-term challenges, to activate dialogue between regional actors and to promote creative, visionary thinking.

Each scenario starts with outlining the role of the respective topic (Wrocław, knowledge-based economy, infrastructure) for the future development of an efficient innovation system in Lower Silesia. Then, the following sections highlight:

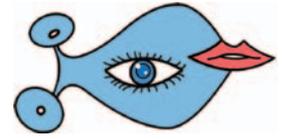
- the current situation and challenges identified,
- different visions of the year 2020 comprising both negative and positive aspects as well as the desirable vision from each panel’s point of view and
- recommendations for action, milestones and concrete measures to realise the desirable future.

## **Implementation and Policy Impact**

In addition to fostering “thinking about the future”, the UPRIS foresight exercise aimed to “concretise” the RIS and to pave the way for the subsequent implementation of foresight results. For that reason, policy-makers were engaged and strongly encouraged to participate in the foresight process.

Furthermore, based on the scenarios, the project secretariat developed two action plans:

- a RIS action plan proposing a set of pilot actions and concrete projects to be funded in the region, and



- a plan for trans-regional cooperation of Lower Silesia with other European regions.

Both action plans proposed concrete measures in the field of RTD, innovation infrastructure, support for start-ups and for the development of clusters. Thus, to enhance capacity building in those fields, additional activities such as workshops for SMEs, women entrepreneurs and cluster actors were organised, and studies performed of available financial instruments, programmes, and innovation services in the region.

### Funding of Foresight Results

The action plans also pointed out different funding schemes that could be utilised to finance projects. During the 2007-13 period, Lower Silesia will receive significant resources from the EU-budget for supporting research and innovation. Thus, in addition to considering national and regional budgets, the action plans explored the EU-level funding schemes such as the Structural Funds, the Seventh Framework Programme for Research (FP7) and the Competitiveness and Innovation Programme (CIP).

The Structural Funds, in particular, received special attention in the action plans due to a remarkable increase in available resources (approx. seven times more compared to the previous funding period) as well as an intensified focus on innovation. Approximately 40% of the whole Structural Funds budget in Lower Silesia is to go to projects supporting innovation and SMEs. Yet, at the moment, the share of project proposals realising this goal does not exceed 3% of all applications. Thus, the UPRIS action plans will significantly contribute to closing this gap. In addition, they will facilitate effective coordination of the funding programmes employed for the development of Lower Silesia.

## Lessons learned

Based on the experience gained during the realisation of UPRIS, the following aspects seem to be crucial for foresight practitioners to guarantee smooth and effective execution of regional foresight exercises:

- 1. Leadership and facilitation:** committed actors are needed to keep the process going forward, such as thematic leaders and a project secretariat.
- 2. Balanced participation:** stakeholders need to represent key organisations and institutions driving development in the region. Direct participation of decision-makers ensures that they own foresight results and thus will be more willing to implement them.
- 3. Communication:** constant communication at all process levels: between the project partners, the moderator and the foresight participants. This will keep the process alive, especially in-between meetings. Disseminating information via a website and at regional events and establishing links

to other projects in the region is necessary to attract attention and avoid “reinventing the wheel”.

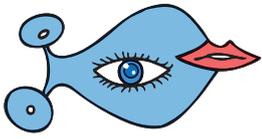
- 4. Flexibility:** a foresight exercise must retain flexibility to be able to adapt to modifications in clients’ needs and to accommodate helpful suggestions from participants that were not initially foreseen in the work plan.
- 5. Follow-on:** as important as exploring and discussing trends and driving forces is drawing out their implications in terms of recommendations for action addressed to regional decision-makers.

## Sources and References

The scenarios are available (in Polish) on the project website: <http://www.upris-dolnyslask.pl/>

Further information:  
Steinbeis Europa-Zentrum:  
<http://www.steinbeis-europa.de/index.php5?file=360>

FOR-RIS Blueprint:  
<ftp://ftp.cordis.europa.eu/pub/foresight/docs/blueprint-for-ris.pdf>



# Technology Foresight on Cognition and Robotics

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<b>Sponsor:</b>	Ministry of Science, Technology and Innovation (Denmark)			
<b>Type:</b>	A national technology foresight project with the purpose of identifying and motivating development agendas that seem particularly promising for Denmark within a time frame of ten years			
<b>Organizers:</b>	Risø DTU, Systems Analysis, Roskilde, Denmark (www.risoe.dk) Birgitte Rasmussen, Per Dannemand Andersen			
<b>Duration:</b>	Jan. 05-Feb. 06	Budget: € 147,000	Time Horizon: 2005-2015	Date of Brief: Dec. 2007

## Purpose

*This technology foresight project was motivated by the significant resources recently invested, both nationally and internationally, in the development of increasingly advanced and complex robots. There is a need to examine the perspectives, possibilities and consequences of development and utilisation of advances in robotics. The goal of the foresight project is to formulate a robust and broadly accepted foundation that can be used to identify opportunities for innovation associated with the development of robot technology that seem particularly promising for Denmark within a time frame of ten years.*

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## Why Cognition and Robotics?

In recent years, significant amounts, in dollars, euro and yen, have been invested, both nationally and internationally, in the development of increasingly advanced robots that can, independently or in interaction with humans, perform increasingly complex tasks and functions.

The use of robots with cognitive capabilities will enable machines to operate and behave in different ways depending on their surroundings. Robots can interpret the meaning of information gathered from their surroundings; they can act under the guidance of rules or in response to sensory perceptions. Robot technology has an extremely wide range of applications, and users are formulating promising perspectives for innovation. Advanced robots are not only a question of technology and intelligence. Increased utilisation of robot technology may also necessitate debates on the ethical and societal aspects of relying on robots in our daily lives – both at home and at work.

### **Steering Committee and Target Groups**

The project was undertaken by a steering committee appointed by the Danish Ministry of Science, Technology and Innovation, with eight members, including representatives

from robotics, computer vision, psychology, learning, social science and industry. A project team from Risø National Laboratory,<sup>1</sup> the University of Southern Denmark and the University of Aarhus acted as methodological advisers. The target groups for the study are the Danish Ministry of Science, Technology and Innovation, scientific advisory and grantawarding bodies, research institutions and universities, as well as companies on both the development and user sides of the technologies.

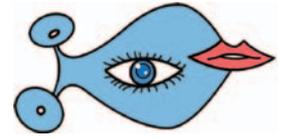
## Methodology

### **Transdisciplinary Approach**

The foresight project can be viewed in a transdisciplinary perspective. The goal is bridging, coupling and integrating concepts and theories from the fields of robotics and cognition in a problem-oriented context, including viewpoints and ideas from various groups of stakeholders, both scientific and non-scientific.

The overlap and intersection between robotics and cognition is a relatively unexplored research area. Therefore, the foresight project was of a more preliminary nature than other Danish technology foresight studies. The study did not attempt to set agendas for research and innovation in

<sup>1</sup> Since 1 January 2007, Risø National Laboratory has merged with the Technical University of Denmark (DTU) with DTU as the continuing unit.



robotics, but focused only on the possibilities at the crossroads where robotics and cognition meet.

### Mandate

The mandate for the technology foresight was:

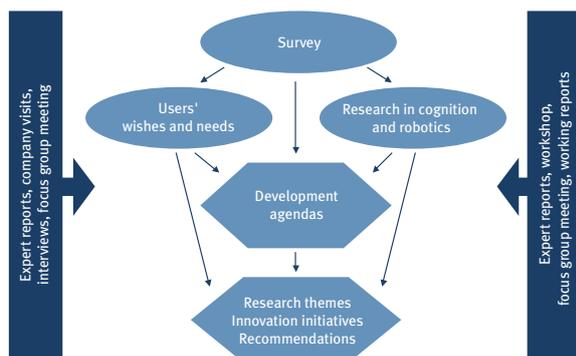
- Formulation of three to five promising development agendas for Denmark. Development agendas are understood as long-term visions within selected application areas in which cognitive robots will promote innovation.
- Formulation of research, education and innovation policy recommendations.

### Documentation and Knowledge Provisions

The process was conducted as a broad dialogue between users and producers of robot technology solutions, as well as researchers and experts in cognitive and robotics research. The goal was to lay down a robust and broadly accepted foundation that could be used to identify promising prospects for innovation associated with the development of robotics. Approximately 100 stakeholders and scientists participated in the process in one way or another.

The overall design of the foresight project is presented in the figure below. The key elements are:

- Through dialogue with users and experts, a broad survey was conducted of the prospects for innovation that robots with cognitive capabilities can help create.
- Five application areas were selected where the use of robots with cognitive capabilities appears particularly promising from a business and societal point of view. For each area, a development agenda was formulated.
- In extension of this, players with insight into the selected application areas were asked to formulate which user wishes and needs for robots and their cognitive capabilities would be crucial to realising the prospects of innovation within the different areas.
- Finally, based on these wishes and needs, a selection of proposals was formulated for transdisciplinary research themes and innovation initiatives, which would need to be initiated in order to promote the development and utilisation of robots with cognitive capabilities.



Project design

## Findings and Lessons learned

### Development Agendas

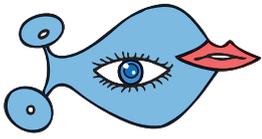
Ten areas were identified at the outset where cognitive robots could promote innovations relevant in a Danish context: industrial automation; agriculture, horticulture and forestry; entertainment, play and learning; personal service and care; health and hospitals; handling of hazardous substances; offshore and underwater systems; building, installation and construction; military, defence and contingency; transport.

According to the mandate, a significant deliverable was the formulation of three to five promising development agendas. The steering committee adopted the following four criteria for priority-setting:

- **Megatrends** – understood as general international trends for social development that will influence promising application- and business-related potentials.
- **General importance of area to society** – that is, areas where the use of robots with cognitive capabilities can alleviate critical, societal problems or challenges.
- **User needs in the area** – refers to application areas where robots with advanced cognitive capabilities can lead to improved problem-solving and quality of life for users.
- **Research and business opportunities** – in terms of the competitiveness of Danish companies, there are three underlying criteria: new products, new markets, and new production systems. Special consideration is given to areas where Danish companies utilise existing technology and already lucrative niche markets.

The steering committee identified five particularly promising development agendas for Denmark.

- **Industrial automation** – including flexible robots and production systems for various types of automation in the manufacturing and food industries; for instance materials finishing, pallet picking, welding, painting, cutting and item handling.
- **Agriculture, horticulture and forestry** – including robots for plant and animal production in conventional and organic agriculture, horticulture, nurseries, tree plantations, and cultivation of crops for energy production or for medicinal purposes.
- **Entertainment, play and learning** – covering leisure and entertainment activities for both children and adults, including cognitive robots for services in relation to quality of life, leisure activities, home entertainment, play and education.
- **Personal service and care** – including care for the elderly, assistance for people with physical disabilities, personal care and services, home security and domestic cleaning.



- **Health and hospitals** – including diagnostics, surgery, rehabilitation, laboratory analyses, patient care and internal transport at hospitals.

### **Research Themes and Innovation Initiatives**

A transdisciplinary perspective balancing the interaction between needs-driven and research-driven innovation was recommended by the steering committee. Instead of the highly ambitious “man-on-the-moon” focus seen in many international robot technology initiatives, the Danish initiative instead focused on user needs and practical experiences and on the need of research to be able to regularly define its research agendas and redefine its critical problems.

The steering committee found it useful to distinguish between short-, medium- and long-term initiatives as well as between initiatives that focus on innovation, application orientation and basic research:

- **Short-term:** Innovation initiatives in which robots with simple cognitive capabilities can be used to help solve concrete known and well-described problems in specific applications. These are robots that function as parts of systems with well-structured surroundings and high predictability, as well as robots with pre-programmed reaction patterns and limited interaction with users/operators. In the short term, these initiatives are expected to be geared primarily towards industrial applications. Innovation initiatives: new vision and sensor technology; production cells; standard solutions and systems; toys and games; improved user interfaces; user studies in robot development; working environment and safety.
- **Medium-term:** Research and development in which robots with cognitive capabilities are incorporated into specific applications with semi-structured surroundings and a certain degree of unpredictability in the robot’s tasks. Application-oriented research: mobile robots that can navigate outdoors and indoors; robot technology for varied one-off production tasks; cognitive robots; multimodal user interfaces; role division between user and robot; robots in organisational interaction.
- **Long-term:** Research into complex cognitive capabilities and their potential for robot technology. A number of basic research topics are essential in the long-term for developing robots that can evolve, are flexible and which interact naturally with their surroundings. Basic research: new materials; shape-changing and self-repairing robots; adaptability, stability and dynamics; the robot as a system component; system integration; intelligent user interfaces; organic cognition; embodied cognition; contributions to cognition through robotics research; cognitive taxonomy.

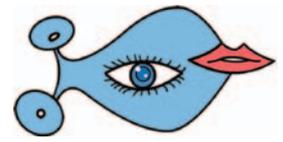
### **Transdisciplinary Approach**

The study focused on the overlap and intersection between robotics and cognition, which is a relatively uncharted transdisciplinary area. Consequently, a key question concerns the attractiveness and incentives for becoming involved in this new transdisciplinary area. The concept of “boundary objects” (Bowker and Star, 1999) was considered. Boundary objects are objects that inhabit several communities of practice and satisfy the informal requirements of each of them. They represent topics of sufficient common interest to form a meeting point. The formulation and selection of promising development agendas for Denmark can be considered as the first step in the boundary object identification process.

Successful transdisciplinary work is highly dependent on the existence of strong, but permeable, disciplines. Further, trans-disciplinary initiatives ought to be problem- or topic-driven. During the foresight project, substantial disagreements arose and conflicting scientific paradigms from different scientists within the cognitive science community were encountered. Although these differences were discussed and reflected upon in the various activities of the foresight process, they also caused difficulties in identifying a strong permeable core discipline in cognitive science, which would make it attractive for a robotics/cognition transdisciplinary initiative. This would also have been uncomfortable for researchers outside the field of cognitive science, who would have been forced to take sides in controversies about which they had little knowledge or understanding. These experiences are not only a Danish phenomenon. A EU review (Andler, 2005) also identified barriers to the involvement of cognitive science in transdisciplinary initiatives.

Another challenge is the coupling of disciplines with significantly different research traditions and progression structures. Robotics tends to be interdisciplinary and problem-oriented, whereas cognitive science is monodisciplinary and more focused on epistemic research. Participants from different scientific traditions may have different ideas about how transdisciplinary research should be framed and how the different scientific objects should be investigated and interfaced. Framing is action-oriented and plays a crucial role in forming a perspective from which a situation can be understood and acted upon. In this study, the overall objective was to develop robots with new cognitive properties, thus placing robotics in a core position and establishing an advantage for the field of robotics in the transdisciplinary framing process.

Robotics is a very active field worldwide. Recent developments in human factors, sensory perception and computing are opening up many new potential application areas for robotics. Thus, the robotics-cognition domain can be characterised as an emerging field with potential for the establishment of new networks and scientific communities including technological,



medical, humanities, and sociological research and disciplines. Consequently, there has been no long-term cooperation and common understanding of the field between the robotics and the cognition science communities to serve as a basis for the technology foresight project. To cope with the absence of a common basis of understanding, the foresight project proceeded in an explorative manner, attempting to identify promising future applications involving both robotics as well as cognitive science, in a Danish context.

## Policy Impact

The results have been disseminated among relevant advisory and grant-awarding bodies within research and innovation, relevant institutions and universities, and companies on both the development and user sides of the technologies.

The following actions are specifically recommended.

- **Improving opportunities for transdisciplinary research:** The Board of the Danish Councils for Independent Research and its scientific research councils are recommended to improve the prospects of transdisciplinary-research-initiated (bottom-up) projects to obtain funding.
- **Strengthening transdisciplinary strategic research:** The setting up of future ICT-related strategic research programmes for transdisciplinary projects on cognition and robotics is recommended. The Danish Council for Strategic Research should also incorporate cognitive robotics into its innovation-accelerating research platforms.
- **Incorporating cognitive robotics as an element in ICT strategy:** The Danish High Technology Foundation is recommended to include cognitive robotics as an element in its ICT strategy.
- **Improving opportunities for networking and innovation:** The Danish Council for Technology and Innovation is encouraged to consider how to support networking and innovation within the development and utilisation of cognitive robotics.
- **Exploiting funding options, forming networks and formulating specific transdisciplinary research projects:** Organisations within the five application areas need to consider how to support networks among users, researchers and manufacturers of robot technology solutions.
- **Debating possibilities within cognitive robotics and considering educational initiatives:** The Danish Board of Technology is recommended to initiate a project on the ethical and societal aspects of cognitive robotics, and the managing bodies and staff of universities and research institutions should discuss the needs and possibilities in terms of research and educational initiatives within and across cognitive and robotics research.
- **Establishing a separate research and development programme in the longer term:** Earmarked funding is recommended, as an extension of the Danish Government's

globalisation strategy, for a separate research and development programme in robot technology and cognition.

The study contributes to European experiences on national-level foresight exercises. The conceptual findings of the case study are of value to science and innovation policy-makers, foresight practitioners and scholars within the field.

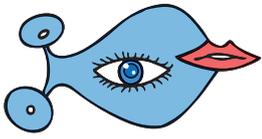
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# “In the Long Run” Best Practices for New Foresight Conditions

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Type:	Worldwide foresight exercise	
Organizer:	Z_punkt GmbH The Foresight Company, Germany info@z-punkt.de	
Duration:	2004-2005	Date of Brief: Jan. 2008

## Purpose

*The objective of this foresight brief is to summarise foresight experiences made by foresight practitioners of international companies attending the conference “in the long run” in Berlin in October 2004. The paper summarises new environmental conditions for corporate foresight and the resulting challenges for foresight work as perceived by the speakers. The paper also gives an overview of best practice solutions for the challenges presented.*

## The Context of Corporate Foresight

Corporate foresight is a systematic future intelligence gathering process aimed at present-day decisions. It looks at companies' changing environments and draws implications for new strategies, products, or processes. However, foresight itself is also part of a changing environment. For corporate foresight, success hinges upon the ability to flexibly and continuously adapt processes to the challenges resulting from changing environmental conditions. There is a motivated exchange of experiences in the foresight community about notable changes and best practices solutions that help to adapt and improve corporate foresight processes.

The following findings are based on lectures given by several foresight practitioners at the conference “in the long run” in Berlin in October, 2004, and their complementary essays published by the host-company Z\_punkt GmbH. The ideas and predictions express the opinion of the speakers, and only statements made at the conference are taken into account.

## New Conditions for Foresight Work

Based on their experiences made in diverse projects and branches, conference participants have identified a number of new and relevant changes in the foresight context.

### *Increased Complexity and Dynamics in the Corporate World*

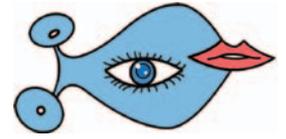
Almost all speakers agree that the environment is changing, and consider the increased complexity and dynamics of the globalised and networked economy to be key drivers, with major shifts in the business environment leading to an increase of discontinuities. Furthermore, some speakers emphasise the rapid speed of primarily technological developments, as well as the customers' swiftly shifting needs and desires, where often obviously inconsistent values are valid simultaneously. The director of the Millennium Project even predicts an acceleration of the change rate in the next 20 to 25 years. Especially in innovative branches with long-term investment decisions, foresight gains in importance to avoid sunk costs.

### *A New Technology Era*

As the rapid pace of technological progress continues, an end of the information-age and an evolution towards a “conscious-technology civilization” (humans integrated with technology, and technology with consciousness) are foreseen. Businesses and societies will operate in new contexts. Artificial intelligence can be expected to spread into more and more areas of human life; nano- and biotechnology will come to be the new lead-technologies; distinctions between humans and machines will blur.

### *Social and Cultural Aspects Gain in Importance*

Philips Design's explorations of future trends show that populations are increasingly concerned over the excesses



of a mainly technology-led future. According to Philips, a new growth model, based on sustainable development, balancing the economic, the environmental and the social, with stronger social values as new guiding principles, is struggling to emerge. People feel more empowered and believe to be in control of their own life and destiny. Here, new technologies should be used to a greater extent to facilitate whole system changes, instead of being primary drivers of change.

### ***The End of the Capitalist Era***

Arie de Geus, the former Coordinator for Group Planning at the Royal Dutch/Shell Group, states that the capital market has shifted from a seller's market to a buyer's market and that, therefore, capital is no longer the critical success factor in business. He argues that what we are witnessing is in fact the end of the capitalist era in an economic sense. While sufficient capital for investments is available, there is an obvious lack of ideas, visions, and progressive thoughts. Thus it appears that the new key to success is the human factor.

### ***New Forms of Cooperation: Transinstitutions***

The world faces challenges traditional institutions are unable to cope with. What is required are new forms of cooperation: transinstitutions based on the principle of shared power, funded and managed by different institutional categories: governments, corporations, NGOs, international organisations, foundations, and individuals.

## **Key Challenges for Foresight**

These new conditions impact the work of foresight practitioners. Foresight must find answers to the following challenges and adapt its processes accordingly.

### ***Creating a New Culture***

In the eyes of the speakers, successful foresight requires more than the efficient use of tools and methods. They see a need to create a new foresight culture as one answer to the increased significance of social values. Among the challenges mentioned are a lasting integration of foresight into corporate culture and reinforcing the idea that long-term thinking/acting contributes more to a prosperous future than short-term profit orientation. Executive time-horizons have to be extended, much more so than in the past. There remains, regrettably, a discrepancy between companies' internal and external reality, a result of the fact that capital suppliers have legal authority to determine a company's goals, which are mostly short-term financial objectives and not suitable to getting the maximum out of human capital and gaining a sustainable advantage over competitors.

### ***Being More Human Centred***

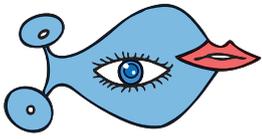
The authors advance the opinion that, if social values are to be the new determinants for growth, corporate foresight processes have to focus more on people. Foresight has to realise that it is not solely technological developments but also today's social values that impact on tomorrow's world and become the interface of different disciplines such as market research, foresight, and social research. Therefore, it is imperative to study people's everyday needs and lives with a holistic perspective, and develop emotional, social, cultural, and human competence. Foresight has to change from a rationalistic, technocratic, efficiency-driven mindset towards a more intuitive, imaginative, non-rationalistic, and non-military mindset to deal with people and social values and finally move forward to tell a human future story.

### ***Thinking Holistically and Networking***

The increased complexity of today's business entails a general need for corporate foresight to extend its spectrum of surveyed contexts. Almost all speakers see the necessity to create macro-scenarios and look at the future on a meta-level to get at underlying reasons of change. Various fields (e.g. demography, environment, law, globalisation, and resources) are already integrated into today's scenarios. In the future, however, society and culture as new influencing factors have to be given more weight. Interactions between society, industry, and technology are complex. Foresight almost certainly has to focus more on integrated reflections, to create a new, holistic framework to map the overall context and master the new complex conditions. Integrating both stakeholders and competitors ("coopetition"), and setting up of interdisciplinary teams, if possible with a great range of views and opinions, would make more drivers of change perceivable and increase overall foresight process quality.

### ***Allowing Alternative and Unthinkable Futures***

Experienced futurologists state that whereas in the past, foresight activities predominantly focused on predicting a single, most plausible future, increasing complexity and dynamics make such an approach obsolete and risky. Immersion in many alternative future scenarios (collective future memory) gives decision-makers the option of filtering all incoming signals from the environment and identifying those relevant for the company's future, thus creating scope for advance actions. Belief in a single outcome means disregarding other developments (or previous signals), limiting companies' options. During planning processes, "unthinkable" futures have to be considered, since discontinuities will be much more frequent.



## Going Beyond Trends

Foresight projects often end with trend-reports or scenarios that are not directly employed in strategic planning. The new challenge is to go beyond that step and create actions based on the mapped-out future visions, distribute insights among all employees, and anchor corporate foresight in the daily routines of corporate management. In a complex environment with rapid technological development, talking about futures is insufficient; foresight has to produce quick and sustainable solutions that ultimately lead to innovative ideas and real products or process transformations.

## Best Practice Solutions

In the following section, best practice solutions from the companies attending the conference are summarised and their key elements described. The focus lies on solutions by Philips, one of the worlds biggest electronics companies, Royal Dutch/Shell, a global group of energy and petrochemical companies, and Ove Arup & Partners, a professional services firm providing engineering, design, planning, project management and consulting services; it will be supplemented with foresight activities from the other participating companies and institutions.

### Foresight – Concept: Ove Arup & Partners

Ove Arup's foresight and innovation team has implemented a remarkable framework of **holistic thinking**. To grasp customers' needs and desires Ove Arup has, next to several other approaches, developed its "**A\_ or ADOPT, ADAPT, ADVANCE**" approach and has used it in several workshops. This end-user-centred process aims at developing a "roadmap of a future world from the perspective of those experiencing it". Firstly, to avoid the pitfall of self-referentiality, all workshop participants **adopt** the profile of a third party (usually that of an end-user of Ove Arup's products) and try to identify motivations, values, attitudes toward technology, hopes and fears of that party, and keep doing so for the remainder of the event. Secondly, external experts are invited to outline possible future changes and drivers of change, which the participants then **adapt** into their views. Finally, the process leads to a new, **advanced** "holistic body of knowledge that helps to advance the state of the industry".

In addition, the "**W\_ or What? So What? Now What?**" formula helps to raise the quality of foresight and innovation outcomes by systematically asking strategic questions. The first question "**What?**" aims at the experiences made so far; what proved to be successful, what did not. Therefore, all prospected employees are invited to share their knowledge at a workshop. With the second question "**So what?**" the group summarises its findings into successful actions that support sustainable solutions. Asking "**Now What?**" means a switching to the customer's perspective and validating the findings and activities that must be pursued.

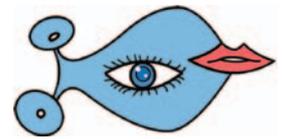
### Foresight – Culture and Organisation: Philips

Philips Design distinguishes itself especially through the way its foresight work is organised. Philips has developed a new approach of thinking about futures and exploring new innovations christened: **socio-cultural research**. As the name implies, Philips believes, "The future is about technology and social innovation". Philips has thus put people at the heart of the foresight process. Its primary aim is to look at the deeper currents in social values shaping tomorrow's world, the expression of these values as they manifest themselves in the culture, and the needs and behaviours of people in their everyday lives and activities. The base of the creative, socio-culturally oriented process is built through the **exchange and collaboration of interdisciplinary teams** consisting of futurists, psychologists, historians, anthropologists as well as of social researchers, technology researchers, designers, marketers and business people from almost all product divisions of Philips, drawing on future, social, cultural, and design studies as well as on ethnography and other human sciences. Insights, in order to become accessible and useful for all people engaged, are visualised as far as possible.

To meet the increased requirements of producing "more systems-oriented future solutions", Philips works with a concept of **open innovation**. Philips is "innovating through a network of partnerships and alliances". On the high-tech campus MiPlaza in Eindhoven/Holland, Philips researchers work together with colleagues from other companies, are linked with universities and research institutes, and also integrate users and customers. In the eyes of Philips, **integration of stakeholders** increases the chance of implementation, with solutions built on consensus. Future thinking plays an important role at Philips, it is actively promoted and claimed by the CEO and **deeply rooted in its corporate culture**.

### Foresight – Method: Shell International

Shell's foresight work has become famous for using the scenario method during the oil crisis in the 1970s. In the meantime, it has honed its approach. To reduce the risk of sunk costs and the number of misdirected investments in a highly volatile and discontinuous industry, Shell International has **combined scenario planning and the real-options approach**. The use of scenarios contributes at three levels to the investment decision: it identifies future options, helps timing the decision to exercise an option, and provides important input in the process of evaluating real options. While scenarios commit business planners to increasing their future horizon and acting proactively in the light of uncertainty, they would be unsuitable for the selection of investment projects and the efficient allocation of capital. Here, the real-options approach seems to be more useful. Given complete information about the future (if necessary in the form of scenarios), the method analyses the



value of alternative options. Yet, completely relying on the real-options approach could also result in wrong decisions, because a project's value may change over time and the approach does not take that into account, while scenarios do.

For even longer time horizons, the scenario method may be too insufficient an input for strategic planning. Therefore, **BASF** uses wild cards and scenarios as a permanent part of its strategic dialogue with their global and regional business units. At the **Munich Reinsurance Group** future scenarios and wild cards influence business planning. Siemens pursues a different approach. The company has not adapted its foresight methods to a long time horizon, but its time horizon to its foresight capabilities by cutting development times. **Siemens** has implemented a so-called **RAPID-Program**. Key elements are the switch in R&D from matrix to project organisation, minimizing interfaces between R&D groups and allocating resources more efficiently. Secondly, production of early prototypes and customer validation of progress has received higher priority. Finally, "Business Target Agreements" have been introduced into the R&D departments.

## Applying the "Future Check"

The conference results emphasise that Foresight operates in a changing context. Foresight work constantly has to adapt its processes to new challenges. For instance, the scenario method alone is insufficient to successfully cope with the rising complexity of today's and tomorrow's markets. In order to consider unthinkable futures, wild cards may be integrated systematically into the foresight work.

Today, foresight practitioners are tasked not only with monitoring environmental changes for their companies. Furthermore, they always have to factor in the changing contexts of their work as such. The aspects summarised, however, are only first indicators. The context of foresight work more specifically depends on the individual company for which it is used. Next to social, technological, economic, and political conditions, the foresight framework is predominantly determined by the company's stage of development and the market it operates in: company size, strategic focus, regional positioning, internal organisation, and corporate culture all impact on foresight.

Z\_punkt has used this knowledge and, subsequent to the conference, developed the "Future Check" which checks a company's foresight activities against its individual requirements. This analysis will be helpful to foresight practitioners in advancing their work.

Furthermore, every exchange of experience offers new momentum for progress. The foresight community has to continue to embrace these interchanges. We have to make

visible and further expand the scope offered by foresight, a scope best imagined as a construction kit containing foresight uses, tools, methods, and forms of organisation. Best practices show how to combine these elements successfully, depending on individual requirements. What is best practices today may not necessarily be so tomorrow.

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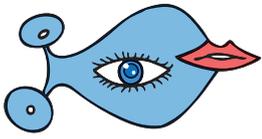
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# Malta's Futures for Higher and Further Education

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<b>Sponsor:</b>	Malta Council for Science and Technology		
<b>Type:</b>	Strategic Futures – a futures exercise undertaken to improve strategic and organisational development capacities in higher and further education in Malta. A pilot application of the INTERREG IIIC West FUTUR-REG – Futures for Regional Development Project (2005-2007), www.mcst.gov.mt		
<b>Organizer:</b>	Jennifer Cassingena Harper		
<b>Duration:</b>	Jan-Nov 2007	Time Horizon: 2028	Date of Brief: Jan. 2008

## Purpose

*The main aim of this initiative was to promote more long-term futures and evidence-based approaches to governance, strategies, and policy development in the higher and further education in Malta under the aegis of the INTERREG IIIC FUTURREG Project. The FUTURREG Project (2005-2007) was designed to ensure that regional policies and regional development organisations were informed by high-quality futures tools and participatory processes with significant long-term impacts. This particular FUTURREG sub-project/exercise focused on an urgent need to build up the strategic and organizational capacities of institutions in the higher and further education sector and to support them in using futures approaches and foresight tools in developing their strategies in Malta. The results of this work are being used by the Maltese National Commission for Higher Education to define a framework for future-oriented higher and further education strategies using futures approaches.*

## Reform of the Higher and Further Education Sector

The Higher and Further Education sector in Malta has in recent years been the focus of attention on the part of Government in Malta as part of a concerted effort to gear up the country for the knowledge-based society and the innovation-driven economy. This approach reflects Government's awareness of the importance of sound investments in higher education, research and lifelong human resources development as the drivers for sustaining wealth generation, competitiveness and quality of life.

There was also recognition that progress in this sector could only be achieved through institution-building and capacity-building efforts aimed at bringing about much-needed sector-wide reforms. These reforms are not unique to higher education since they go hand in hand with similar change processes underway in research and innovation.

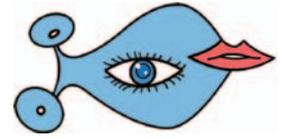
In 2006, the Government set up the permanent National Commission for Higher Education (NCHE) in an effort to spearhead the reform process, especially to make recommendations regarding the required changes in the Education Act. The NCHE after consultations with all stakeholders has identified the following issues:

1. Vision and strategic oversight,
2. Expansion of higher education to meet future requirements,
3. Funding and accountability,
4. Quality assurance and accreditation, and
5. Student choice and fair access.

In this context, the NCHE identified a clear need to strengthen the strategic capacities of key organisations within the higher and further education sector to ensure an effective input on their part both to the national strategic plan for the sector and in developing their own long-term strategies. The NCHE was quick to recognise the importance and value of futures approaches in addressing this concern and in ensuring the development of a more coherent and robust national strategy. This led to the development of a strong collaboration in 2007 between NCHE and the Malta Council for Science and Technology (MCST) through the Interreg 3C Futurereg project to introduce the use of futures approaches in the sector.

## Encouraging Students and Creating a Shared Vision

In July 2007, the NCHE through support provided through the MCST Futurereg project embarked on an exercise aimed at pro-



moting more long-term futures and evidence-based approaches to policy and governance in the higher education sector in Malta.

The main objectives of the exercise were:

- to promote more long-term futures and evidence based approaches to governance, strategies, and policy development in the higher and further education in Malta;
- to support institutions in the higher and further education sector in using futures approaches and foresight tools in developing their strategies;
- to encourage students to play a more proactive role in the higher and further education strategy process through enhanced awareness and use of futures approaches;
- to create a shared understanding of emerging trends and drivers of science-society and science popularisation futures;
- to share inter-regional experiences on futures methods and approaches for tackling future and emerging science-society challenges, namely gender, privatisation, and lifelong learning;
- to define a framework for future-oriented higher and further education and science popularisation strategies using futures approaches.

To kick-start this initiative, a training event for the development of futures skills in policy was organized at the end of July for key stakeholders in the higher education sector. Those responsible for strategic policy development within higher and further education organisations were particularly targeted as it was expected that this training would benefit the development of the organisations’ long-term strategic plans. As a result of the feedback from this event, three key groups of stakeholders were identified for follow-up action, namely educational institutions in Gozo (the sister island), the vocational college (Malta College for Arts, Science and Technology) and student bodies.

## Adapting Futures Approaches to the Higher Education Sector

The futures approaches used in this exercise were adapted to the needs and understandings of the different stakeholder groups. Three one-day futures workshops were organised for each stakeholder group: Gozo, MCAST and students. All three workshops adopted a broadly similar approach of creating a shared awareness and understanding of emerging trends and drivers of change and their implications for the sector. The Gozo and MCAST workshops followed scenario-building approaches and produced superlative sentences describing the organisation’s achievements by 2028. The student workshop focused on the development of a mini-vision for the higher education sector. The following stepped approach was used in the three workshops organised:

<b>Warm-up: time-line for Gozo &amp; GPSS 1977-2007</b>	Goal: to heighten awareness of past change and past watersheds/transformations.
<b>Reversing the negative</b>	Goal: to move from worries to transformative goals.
<b>Emerging issues of change</b>	Goal: to heighten awareness of on-coming change.
<b>Briefing on emerging issues</b>	Goal: to increase awareness of emerging changes and implications.
<b>Stakeholder/potential partner identification</b>	Goal: to identify network of support for positive change.
<b>Sentence completion</b>	Goal: to define concrete goals for transformative change.
<b>Strategy working groups</b>	Goal: to draft initial strategies for positive change.
<b>Reviewing strategies</b>	Goal: to share brainstormed strategies, add more concrete details, understand how the strategies might work in concert.
<b>Creating change</b>	Goals: to add more concrete details, resources, and allies to each strategy; to create a list of possible next steps; to commit to creating change.
<b>Debrief, next steps, close</b>	Goals: to identify biggest opportunities within grasp, hazards to avoid and desired next steps.

## Visions of Superlatives in Higher Education

The main findings of each workshop are presented below and these take the form of success scenarios or visions for the organisation and sector.

### *Giovanni Curmi Higher Secondary School Gozo – Strategic Foresight Workshop*

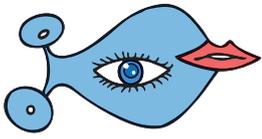
#### Exercise: “Superlatives” Sentence Completion

In 2028, GOZO POST-SECONDARY is a futuristic school because all the staff are intrinsically motivated and work together to provide a service of excellence and a climate of collegiality. Because of this, students are happy to be part of this Centre. In 2028, GOZO POST-SECONDARY is historic among all other schools, because

- we will be considered the major educational institution as regards proactive change in Malta, and
- it will be a state-of-the-art institution.

In 2028, the school was the first school to introduce entrepreneurship and collaborate with private entities offering employment and training using EU funds. The school is truly great among all other schools, because

- it is a school that caters for various disciplines, and
- it has a great past from which it has learned to project itself into the future.



In 2028, GOZO POST-SECONDARY is a leader among all other schools, because

- all its teachers are themselves convinced learners,
- all its teachers are themselves catalysts of change, and
- it will be the key institution leading to further education and life-long education.

### ***MCAST – Strategic Foresight Workshop***

#### **Exercise: “Superlatives” Sentence Completion**

In 2028, MCAST produced a breakthrough when it inaugurated its state-of-the-art campus catering for new frontier areas of vocational expertise. In 2028, MCAST is a futuristic school, because

- it has several institutes abroad and an international student profile.

MCAST is historic among all other schools, because

- it will self-fund all its educational programs and related resources, and
- it was the first school to offer a chance to students who were drop outs at secondary education and to offer courses that were totally new to Malta.

MCAST is famous among all other schools because it will be leading in creating career opportunities rather than satisfying existing and emerging industry requirements. In 2028, MCAST was the first school to

- utilise nuclear energy to generate its own technological systems – and in a next step, send a student to Mars!
- And it was the first school to perform the retraining of all of the workforce.

MCAST is special among all other schools because it is the foremost, leading VET College in all Europe due to its responsiveness to many educational, social, and cultural changes, all of which make it a place which students – youngsters and adults – cannot do without. People who in 2028 visit MCAST say, “WOW!” because

- MCAST graduates are reaching excellence while keeping the social intelligence aspect as the core of the curriculum, and
- it is providing to thousands of students the best standards of education and courses relevant to economic needs in a state-of-the-art campus
- In 2028, MCAST is truly great among all other schools because it endeavours to cater for the needs of industry and the economy.

### ***Student Councils and Organizations – Strategic Foresight Workshop***

The mini-vision developed by students identified the following significant changes required in the higher education sector in Malta.

#### **Introduce more hands-on learning**

- In 6<sup>th</sup> forms and universities, students should be given more time to experience new things, such as hands-on experience, rather than studying and lectures only, because it is the practice and experience that count. More hands-on experience both for self-development, quality, and employability.
- Change the syllabus by decreasing syllabus content and an increasing voluntary and practical work of what one is studying.
- Bridge the gap between the school bench and future work through a revision of curriculum and on-site/specific training.
- Teach entrepreneurship in University courses, e.g.: Pharmacy, Law, BA, etc.
- Conduct integrated work placements during university courses.

#### **Introduce alternative education**

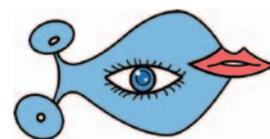
- Change the curriculum to include necessary skills that are conducive to character formation and development – so that students will not [merely] accept jobs but CREATE them.
- Conceive new courses for holistic education to learn skills such as reporting, analysing, and other soft skills.
- Promote development and sustainability of VALUES in society for the grassroots of tomorrow’s society.
- Enhance social conscience for developing the student as a fulfilled being/ person.
- Not only academic subjects are important. Post-secondary schools for arts such as dancing, singing, acting, etc. should be opened. Courses to prepare for change and advancements, for example cybernetics, and to spread awareness for a better future – including performing arts.
- Offer additional extracurricular courses (not compulsory) to provide general knowledge, better preparation for future jobs, and to make important lifetime decisions. (If already available, improving awareness of such courses should be considered.)

#### **Communication platforms**

- Improve use and availability of Internet and e-learning in the curriculum.
- Students should have a platform for commenting without the fear of being penalised.

#### **Revision and updating of curricula**

- Revise curriculum in recognition of informal education. Change the syllabus to an up-to-date one, removing invalid information from the syllabus to be studied, giving students more time to focus on important topics, e.g., physics or geography.
- The systems of knowledge course needs to be revised. It should be modular, with students choosing areas they want to study. Systems of knowledge should NOT be a compulsory subject; this is NOT a requirement for entry in university.



- Consider career and work possibilities that can be offered after post-secondary/university courses. Course options are often too stylised.
- Develop a flexible and competence-based curriculum design.

#### Improving quality assurance

- Quality assurance and recognition structures that involve teachers, employers, students, and social partners should be improved. Strengthen national quality assurance agencies through increased funding and legal authority.
- Allow stakeholders an opportunity to form or revise and voice openly their opinions.

## Improving Higher Education by Involving the Stakeholders

The main conclusions to be drawn from the exercise is that in a fast-evolving sector of higher and further education, representing a range of diverse interests and needs, it is the stakeholders who are best placed to advise on and support the development of long-term strategies. The insights and lessons learnt from these workshops highlight the fact that foresight exercises are vital tools to support the strategy development process by:

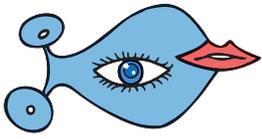
- allowing stakeholders an opportunity to form or revise and voice openly their opinions;
- jointly reviewing current pathways emerging from past decisions and actions and ways of escaping future lockins;
- prioritising key challenges and next steps for joint action.

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# Third Czech National Research Programme (2009-2014)

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<b>Sponsor:</b>	Ministry of Education of the Czech Republic			
<b>Type:</b>	National foresight exercise			
<b>Organizer:</b>	Technology Centre AS CR, Karel Klusacek (Director)			
<b>Duration:</b>	2006-2007	Budget: € 50,000	Time Horizon: 2020	Date of Brief: Dec. 2007

## Purpose

*A national foresight exercise aimed at identifying research priorities for the Czech National Research Programme III, through which about 20 % of public R&D funds are to be allocated from 2009 to 2014.*

## The Objective: Focusing National Public Research Funding

A foresight exercise as a means of identifying research priorities for the purpose of setting up a National Research Programme (NRP) for public funding of research was conducted for the third time in the Czech Republic. The first project was carried out in 2001 in preparation of the first NRP (2004-2009) and was based on the National Policy for Research and Development adopted by the Czech Government in 2000. This policy clearly stated the need to identify research priorities for national public funding in order to focus limited public resources for research and to provide funding in a coordinated way. A foresight approach was chosen as a means for arriving at such priorities in a transparent, systematic process involving a broad range of stakeholders and thus by a participatory approach.

The first exercise was a multi-sectoral, technology-focused one; its methodology was based on the key technologies approach, and expert panels were set up involving almost four hundred experts. The main objective was to identify research priorities with a potential for promoting economic development and social welfare. The second round of the national foresight exercise was conducted in 2003 to 2004. A multidisciplinary expert panel was established to identify important problem-oriented issues and possible solutions through research. Prioritization was based on the most urgent needs, the interests of application sectors and feasibility. In order to explore the private sector's interest in co-financing specific research areas, interviews were conducted with business representatives.

The National Research Programme III (NRP III) is based on the Czech National Research and Development Policy (2004-2008) and its broadly formulated Long-term Principal Research Directions.<sup>1</sup> The programme will be running from 2009 to 2014 and can be expected to allocate about 20 % of public R&D funds.<sup>2</sup> Research funded by NRP III is assumed to translate into practical applications by 2015 to 2020.

## The Process: Applying Foresight in Research Policy-Making

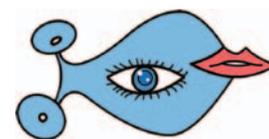
The Czech Government, through the Ministry of Education, which is responsible for R&D policy, initiated the project leading up to the proposal of the NRP III. The Technology Centre AS CR coordinated it. The project took place from June 2006 to June 2007.

The following methodological principles were defined:

- problem-oriented approach,
- multidisciplinary character,
- panel of experts (about 70 people) – meetings combined with electronic communication (a web site was established),

<sup>1</sup> On 1 June 2005, a set of “Long-term Research Directions” was adopted by the Czech Government as an amendment to the National Research Policy (2004-2008). Sustainable development, molecular biology, energy sources, materials, competitive mechanical engineering, information society, security, and social sciences were defined as such areas of research.

<sup>2</sup> The remaining 75-80% of public R&D funds will be allocated especially to funding research institutes, to specific research at universities, as well as to grants for bottom-up research projects.



- combination of analyses of the current situation prepared by the coordinating team and scenarios generated by invited experts,
- combination of exploratory scenarios (“possible future”) and normative scenarios (“what to do and when to do it for the desirable future to happen”).

The project consisted of two main stages: analytical work and desk research (July-September 2006), and work involving a group of experts (November 2006-May 2007).

### 1) The Analytical Phase – work preceding the work of the expert group:

The coordinator’s team at the Technology Centre AS CR prepared the analyses listed below – to provide a basis for the work of the expert group:

- R&D Analysis:
  - R&D output – scientific publications, patents,
  - allocation of R&D funding,
  - innovation potential of Czech regions,
  - analysis of preliminary project proposals elaborated in the context of preparing applications for financing through the EU Structural Funds in 2007-2013,
  - international cooperation of the Czech Republic especially in the EU Framework Programme,
  - analysis of the existing National Research Programme.
- Structural Analysis of Czech Economy.
- Analysis of Human Resources for R&D.
- Review of R&D-related Strategic Documents.

Based on the above analyses, it was concluded that the NRP III priorities should reflect:

- above-average and excellent fields of basic and applied research,
- dominant fields in international research cooperation,
- fields demanding development of research infrastructure (EU Structural Funds),
- allocation and distribution of R&D funding and its dynamics,
- development of the economic structure of the Czech Republic since 1990 in relation to the long-term principal research directions.

### 2) The Expert Group

A multidisciplinary panel of experts (~ 70 experts, representing a wide range of academic disciplines ranging from socio-economic fields to technical areas) was set up. Its main objective consisted in identifying key opportunities and challenges for the Czech Republic in the period from 2015 to 2020, to which research supported by the NRP III could make a contribution, and in specifying thematic research directions.

The applied methodology consisted of a **combination of exploratory and normative scenarios**. First, the experts were asked to suggest topics and outline a business- as-usual

scenario for each topic, resulting in a probable future state of the area concerned. As the experts were not experts in developing scenarios, the method they were to follow was quite simple in terms of filling in text in a template structure on the following issues:

- topic/issue proposed,
- probable future development – locally and abroad, a likely situation in the Czech Republic in 2015-2020, and consequences of such a development,
- objectives achieved and benefits for the Czech Republic should the opportunity be exploited or the threat avoided,
- research to be supported related to the topic/issue.

Once the topics were collected, they were sorted, grouped or aggregated into thematic areas, which would represent the main level for opening calls for project proposals for the NRP III. At this stage, the experts were asked to outline normative scenarios related to each thematic area (group of topics/issues) in terms of suggesting what would need to be done to either achieve the desired state (i.e. opportunity) or to avoid an undesirable situation (i.e. a threat) in the future. The template was designed to build normative scenarios concerning the:

- situation in the Czech Republic and abroad,
- description of the desired state concerning the area in question in 2015-2020,
- objectives to be achieved and their justification,
- expected benefits,
- research to be supported so that the objectives are met, and
- measures needed for achieving the objectives and the desired state in the future.

Simplified templates for topics/issues within the thematic areas were also developed. Thirty-four thematic areas were defined and grouped into four thematic priorities for the purpose of administering the NRP III.

The experts met twice; between meetings they were supposed to provide input to the website application developed for the purpose of facilitating (electronic) communication within the group. Upon completion of the experts’ work in May 2007, the coordination team at the Technology Centre AS CR compiled the final report (i.e. proposal of the NRP III) and submitted it to the sponsor (Ministry of Education) in June 2007.

## Results: Priorities for NRP III

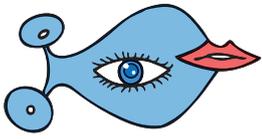
**The thirty-four thematic areas (TA) were grouped into four thematic priorities (TP):**

**TP-1: R&D FOR A COMPETITIVE INDUSTRY** (10 TAs)

**TP-2: MOLECULAR BIOLOGY FOR HEALTH AND PROSPERITY** (4 TAs)

**TP-3: INFORMATION SOCIETY** (9 TAs)

**TP-4: SOCIETY AND ENVIRONMENT** (11 TAs)



**Thematic Areas of TP-1 (R&D for a Competitive Industry):**

- 1-A Renewable Energy Sources
- 1-B Nuclear Energy
- 1-C Effective Use of Fossil Energy Sources
- 1-D Power Systems and Networks
- 1-E Integrated Mechanical Engineering
- 1-F New Production Technologies, Machinery and Devices
- 1-G Competitive Transport Mechanical Engineering
- 1-H Nanomaterials, Nanostructures and Nanotechnologies
- 1-I Microstructures and Components
- 1-J New Materials for Increasing Competitiveness

**Thematic Areas of TP-2 (Molecular Biology for Health and Prosperity):**

- 2-A New Analytic and Diagnostic Methods
- 2-B New Treatment Methods and Drugs
- 2-C Advanced Biotechnologies
- 2-D Genome and Proteome in Health and Illness

**Thematic Areas of TP-3 (Information Society):**

- 3-A Intelligent Environment
- 3-B Advanced Robotics
- 3-C Computer Modelling and Simulation
- 3-D Monitoring and Diagnostic Systems
- 3-E Processing and Presentation of Knowledge
- 3-F Biomedical Informatics and e-Health
- 3-G Intelligent Transport Systems
- 3-H Network and Communication Infrastructure
- 3-I New Computing and Software Architectures

**Thematic Areas of TP-4 (Society and Environment):**

- 4-A Development of Life Quality and Sustainability
- 4-B Impacts of Global Environmental and Climatic Changes on the Territory of the Czech Republic
- 4-C Optimal Land Use
- 4-D Food for Healthy Nutrition
- 4-E Safe Society
- 4-F Protection of Population, Environment and Critical Infrastructure
- 4-G Population Trends in the Czech Republic and Their Political, Economic and Social Implications
- 4-H Governance, Public Administration in the Czech Republic and EU
- 4-I Competitiveness of the Czech Republic, Labour Market, Education
- 4-J Social Cohesion and Marginalization
- 4-K Czech Identity

The four TPs are based on the broad priorities as defined by the Long-term Principal Research Directions (cf. fn. 1).

The proposed priorities of the National Research Programme (2009-2014) are subject to the Government's approval. In addition to the thematic priorities, accompanying and supporting measures (policy measures, legislation, national R&D system, human resources) were also specified in the NRP III proposal.

Once approved, the NRP will also serve as a guideline for selecting priority areas for infrastructural investments into research capacities using EU Structural Funds (> € 5 billion in 2008-2013).

## Policy Implications

The principal ambition of the project consisted in identifying national research priorities based on the existing National Research Policy with its broadly defined research priorities (Long-term Principal Research Directions) formulated by expert committees on behalf of the R&D Council, an advisory body to the Czech Government.

Upon Government approval, the National Research Programme will be administered by a designated body or bodies and will help allocate public funds for research in a more focused and coordinated way.

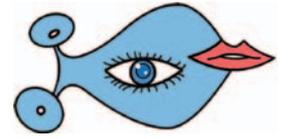
### **Key Issue: Reconciling EU and National Research Funding**

The research priorities as such are a key issue as well as how to further prioritise them with respect to research to be conducted and specific research infrastructures to be developed with support from the EU Structural Funds in 2008 to 2013. There are two main aspects to this that need to be tackled when closely interlinking EU Structural Funds for R&D infrastructure and the NRP III for financing R&D at such facilities: 1) EU funding for research infrastructure cannot be used in Prague, because the Czech capital is not eligible for support due to a GDP per capita above the EU average. Hence, linking the NRP III as a source for funding research at research infrastructures developed with EU funds would, in consequence, exclude the Prague region from the programme. 2) A decision needs to be made on which research infrastructures are to be preferentially supported from the EU Structural Funds and what research is specifically to be sponsored there by the NRP III (on condition of shared priorities).

The discussion on research priorities is thus closely related to priorities in building research infrastructure. The question is to what extent research will be funded that falls into the priorities as defined by the NRP III and is not related to newly developed research infrastructures.

### **Opportunity: Centres of Excellence**

A limited number of European centres of excellence with a quality research infrastructure fully capable of contributing to the European Research Area are to be built in the Czech Republic using the EU Structural Funds in 2008-2013. Such centres are expected to combine research, education and innovation and to generate research resulting in commercial



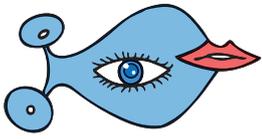
applications. Biotechnologies and biomedicine, molecular biology and material science, as well as information technologies and cybernetics are prime candidates for large infrastructure investments in accordance with the priorities formulated in the proposal of the National Research Programme III.

Besides NRP III, national public R&D funds will further be allocated to specified research programmes, to bottom-up research projects by means of grants, and to financing of existing research institutes, which will be based on stricter evaluation criteria.

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# Rural Areas: One of the Most Important Challenges for Europe

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Sponsor:	NA
Type:	Policy Brief
Organizer:	NA
Duration:	Date of Brief: Feb. 2008

## Purpose

*This brief presents an overview of major trends and policy options for rural areas. A number of social, technological, economic, environmental and political trends as well as strengths, weaknesses, opportunities and threats will be highlighted, followed by ten major policy options in view of two traditional and conflicting objectives: rural socio-economic development and countryside protection.*

## Why Focus on Rural Areas?

In many European countries, a large number of the population may be described as rural in that they live outside the major urban centres or predominantly coastal zones. This number, according to recent studies, is likely to increase despite the fact that many urban areas across the world, in both developed and developing countries, will continue growing in size and population density. While many forecasts predict that by 2015 more than half of the world's population will be urban, emerging trends suggest that the excessive crowding and growing pollution of cities will accelerate the already **increasing migration from urban to rural areas**. In addition to the migration effect, there are other factors augmenting the **functional interdependence between rural and urban areas**, such as (a) peri-urban areas with a high level of commuting to urban-based jobs, (b) economically diversified areas relying on construction, manufacturing and other non-agricultural employment, (c) commercially strong farming areas, and (d) economically weak areas highly dependent upon heavily subsidised farming.

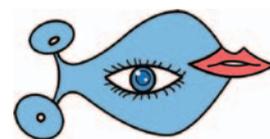
## Farmers under Pressure

**Rural communities are also considered custodians of national values** through the close association between farming and local culture. In many towns farming sustains local traditions and supports activities such as hunting, fishing, village fetes and local sports. However, since the introduction of the Common Agricultural Policy (CAP) or the

Rural Environment Protection Scheme (REPS), farmers are coming progressively more under pressure to invest outside the farm. These policies are part of a EU effort to promote multi-functionality, involving for instance tourism and leisure facilities, which help support the rural economy, or relate to the goal of providing habitats for threatened species. However, the stability of rural systems depends upon income guarantees to sustain an acceptable lifestyle. Otherwise, the search for income may draw more people away from the countryside.

## Analysing Foresight Studies: TextAnalyst

A selection of 160 foresight and futures studies was taken from the EFMN database. These were studies with different backgrounds, scopes, themes, horizons and on different scales. The semantic data-mining tool "TextAnalyst" was employed to analyse the texts. First, out of the 160 studies, a small number of relevant studies was selected that had titles strongly related to the researched topic. TextAnalyst analysed these texts and found the most relevant keywords and semantic relations between the most important words. These words were compiled into a keyword list for the researched topic. This list of keywords was used to analyse all 160 selected studies. The TextAnalyst yielded all sentences in which any of the keywords was present, with an additional hyperlink in the text file allowing to view the context in which the sentence occurred. The TextAnalyst also gave a semantic relation between the searched keywords and other words. The related



terms thus identified were added to the list of keywords. The summary of sentences that contained one or more words from the list of keywords was manually read in the original context and if the sentence or the section where the sentence occurred was regarded as providing new or additional information, this section was copied into a text file. In order to avoid any extreme out-of-context copying of sentences, statements that were part of a scenario description were not added to the file. After this analysis of the 160 studies, a text file was created containing sections of the original studies with information related to the selected topic and the reference to the original document.

## Major Trends

### *Social Segregation*

In terms of social trends, **migration** is one of the most important ones. For example, in northern Europe (e.g. Nordic countries, Ireland, United Kingdom), it is thought that advanced age groups will move from the cities to the countryside, especially after retirement. Besides, in many municipalities more than a third of the population will be over the age of 65, thus making **ageing population** the second most important social trend. Ageing concerns are fuelled by declining fertility levels and the overall decrease in average household size, particularly among the middle aged. While property crimes and vandalism tend to increase in large cities, in rural areas “social control” still functions. This perceived security in the country-side is thought to attract more people from urban areas, thus reinforcing the migration trend. However, migration can have its dark side too. For example, in the UK, the population of rural districts is growing twice as fast as the national average. But many of the newcomers are older and wealthier and can outbid rural residents in the competition to buy homes. This leads to polarisation and social exclusion as well as new types of xenophobic incidents and crime.

### *Linked by Virtual Spaces*

Technological trends will also improve the quality of life of rural areas. It is expected that by 2030 schoolchildren who live in sparsely populated areas will be able to study at home using virtual reality technology. These virtual spaces should also link individuals, communities and organisations from different regions and countries.

Some socio-economic and technological developments in rural areas are driven by major national and global trends. Among them are: growth in the share of non-traditional products; lower costs in agriculture and forestry; more people having a second home in rural areas, resulting in an increased traffic between cities and countryside; regions becoming more competitive through industrial specialisation; and new

SMEs playing a critical role in rural development and job creation. In some countries, the employment expansion in rural areas has more than offset job losses in farming. However, rural areas continue to highly rely on agriculture or other production-based employment.

### *Impact of Environmental Policies*

European and national environmental policies are also affecting rural communities. For example, rural areas are becoming more and more oriented towards zero emissions and preserving the quality of rural environments. Other global forces, such as climate change, also have big impacts on rural economies: for instance, shallow aquifers may not resist harsh dry seasons and, as a consequence, ground-water resources as well as surface flows tend to dry up.

Finally, it is important to consider political trends such as growing efforts to reduce the use of rural areas for agricultural purposes and to promote networks of protected areas, recreation and urban purposes. These policies are aimed at improving social cohesion within and between regions.

## Major SWOTs

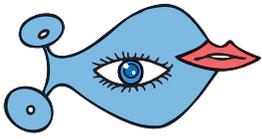
The identification of major SWOTs (strengths, weaknesses, opportunities and threats) of rural areas brought some interesting results. First, most of the foresight studies analysed make little reference to the strengths of rural areas. They mainly focus their attention on weaknesses, opportunities and threats.

### *Strengths: Environment and Quality of Life*

Only a few strengths are highlighted in the selected foresight cases. A major strength of rural areas is the attractiveness of landscapes with thriving populations of wildlife and areas for recreation. These landscapes and wildlife contribute to the sense of well-being and quality of life of many people, including residents and visitors. The second major strength relates to the low levels of pollution in rural areas. Another already mentioned strength is that, in some countries, rural areas are considered custodians of national values, traditions and rituals.

### *Weaknesses: Poor Infrastructure*

Unfortunately, these strengths are significantly outnumbered by the perceived weaknesses of rural areas. The most relevant ones are associated to the poorly developed and inefficient physical infrastructures, especially information and communication (ICT) infrastructure, which in most cases is targeted at national and international routes. However, some basic services, such as water and electricity are not very reliable either.



Both travel distance and time required for accessing and collecting water can be long and existing groundwater insufficient or unsuitable. In some rural areas, the lack of services and communication infrastructure hinder migration and development, thus generating a path dependency and lock-in situation in which technological trajectories of specific regions and localities are historically determined by the limited research and innovation capabilities developed by individuals and organizations over time.

In addition, transport (bus and rail) services are often infrequent and do not necessarily facilitate travel to work or education. This infrastructure deficit, together with the inability of rural economies to develop the underlying conditions of trust and social capital that contribute to the presence of a knowledge-based learning economy may exacerbate the conditions of lock-in to a specific – but not necessarily desired – innovation trajectory.

A large number of rural economies have failed to develop the regional innovation support services required to address the weak technological absorptive capacity of many indigenous SMEs, particularly those which are not close to main cities. The lack of institutional and technological capacities reflects the need for effective operating networks between local businesses and universities, as well as other education, research and training facilities, including colleges. But meanwhile, these weaknesses translate into a lack of business initiative and enthusiasm, a lack of spin-off from foreign direct investments (FDI) and the failure to develop regionally indigenous innovation or technological absorptive capacity. Other serious and more day-to-day problems are the lack of specialised health care and emergency care arrangements in rural regions.

### ***Threats: Depopulation and Economic Decline***

Several threats have also been underlined in recent foresight reports; among them are: imbalances in population structure; rural depopulation; redundant or under-used investments; further spread of one-off scattered housing in the countryside, especially holiday homes; higher servicing costs inherent in a low rural population density; degradation of rural and coastal landscapes; flood and coastal erosion risks; and increasing unemployment resulting from the decline in farming and other agriculture-related activities.

### ***Opportunities: Environmental and Tourism Industries***

In spite of the weakness and threats, rural areas are not always seen through dark or grey glasses. There are also opportunities for the future of rural areas, especially for national and regional governments, local and global businesses, and other stakeholders, including citizens. For

example, wireless solutions and cable TV are cost effective solutions capable of improving the ICT infrastructure and connectivity for rural areas. The increasing use of rural space for multi-functional activities (e.g. forestry, environmental conservation and housing) may boost employment rates and economic growth. In addition, the sustainable use of natural resources, such as scenic landscapes for tourism and recreation, may contribute to the emergence of “new farmers” (with environmental management skills), who, with appropriate assistance from European and national funding schemes, could remain involved in non-competitive businesses, take on a new profile and image, and act as a point of attraction and enhancement of human resources. Other opportunities lie in complementary sectors, such as fisheries, marine-based aquaculture, inland aquaculture (in rivers and lakes), renewable energy production and forestry. The development of skills in these sectors would add value to rural businesses related to wood products, craft industries, country sports, and rural tourism, for example. Finally, it is important to emphasise that the political process of enlargement in the European Union has brought social divides back to the top of the European agenda, thus creating new funding schemes and opportunities for regional development in rural areas.

## **Major Policy Options**

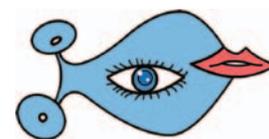
The previous discussions on major social, economic, environmental and political trends and the description of major SWOTs are complemented here with a wide range of policy options considered in recent foresight studies.

First, **government leadership** is vital for rural development. This leadership may be a response to economic or social pressures but aims at solving specific problems (e.g. upgrading infrastructures, allowing business clusters to expand into adjacent farmland, or supporting residential construction) and promoting a sustainable rural economy where enterprises will be commercially competitive without damaging the environment.

Second, the rural economy should promote a **more competitive agriculture and food industry**, with increased emphasis on multi-functionality of agri-rural areas. In so doing, regional and national authorities would need to develop more adequate spatial planning instruments.

Third, in terms of employment policy, regional governments should launch plans to **secure and stabilise employment** for at least one member of every rural household. In addition, employment for rural youth should ideally be available in their own regions.

Fourth, both the public and private sectors need to invest in the development of the so-called “**social infrastructure**”, that is, the promotion of new skills and talents leading to the



formation of thriving multicultural communities and more developed regional institutional capacity. In other words, new capabilities and competences for managers and employees in the private and public sectors would help rural citizens to become (a) more entrepreneurs, (b) more adaptive to changes, and (c) more capable of anticipating and overcoming risks.

Fifth, in order to provide reliable water services in time and space, more **water supply** and reticulation systems need to be developed (for example, dams and other water transport systems via canals and pipes). This includes the creation of wetlands and managed realignment of coasts and rivers (see UK's *Making Space for Water* project).

Sixth, there is a need for **monitoring and maintaining the size** of rural populations, not just in aggregate numbers but also in a balanced spatial distribution. This relates to the previous policy on water services, for example, given that the required investments in labour and/or capital imply the grouping of water users around bigger towns. The objective here is to promote equity and balanced development between regions.

Seventh, in some regions the **health and welfare policy** as a whole would need to be completely reconsidered. This would mainly depend on major trends such as migration and ageing.

Eighth, national and regional governments should support the development of **rural economies** with commercially competitive enterprises, without damaging the natural environment.

Ninth, the development of new concepts in the interrelations between cities and the countryside would benefit from the creation of regional industrial or research **clusters** with more co-ordinated rural data collection and sharing of information at different levels (regional, national and international).

Tenth, regional policy-makers should ensure that national regulatory frameworks can **respond to regional needs** and that policies directed at rural areas are effectively implemented.

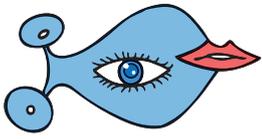
## Conclusions

This short brief has discussed major trends related to rural areas. For practical reasons, these trends have been grouped into social, technological, economic, environmental and political categories. Many trends could have been further elaborated to complement the SWOTs. However, for reasons of space, only the most relevant ones have been considered. In any case, these trends and SWOTs are only some of the many elements contributing to the complexity of “rural systems”, which are continuously affected by regional, national, European and global trends.

The reader should also bear in mind that the proposed policy options result from a review of over 30 foresight exercises (out of the 160 scanned) that either focus on or are to some extent interested in rural areas and regional development.

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# Migration: One of the Most Important Challenges for Europe

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Type:	Policy Brief
Organizer:	NA
Duration:	Date of Brief: Feb. 2008

## Purpose

*This brief presents major social, technological, economic, environmental and political trends and rationales for migration, followed by a number of strengths, weaknesses, opportunities and threats of migratory processes. In the last section, the brief concludes with a set of general policy options and some final remarks about the sources and data analysed.*

## Why Focus on Migration?

According to the 2003 Eurostat population reports, the European population growth at a level of less than 3% per year was only possible through net migration, which is restricted in most countries. A more recent European Commission report (2008) indicates that the natural population growth in the EU is becoming critical.

The average number of children per woman (the current fertility rate) is low, at 1.5 children for the EU-25, well below the replacement rate of 2.1 required to stabilise the population size in the absence of immigration. A limited increase of 1.6 is projected for the EU-25 by 2030 (p. 5).

Other European forecasts show that the EU population will continue to grow until approximately mid-2020s, after which population will decline steadily and fall to the current level before 2050. But this is not only a European problem, current United Nations forecasts show that the world population is expected to fall to 5.5 billion by 2100, that is, 1 billion fewer people than are alive today. These demographic trends will have several socio-economic implications in the future, for example, by 2050 it is expected that the EU will change from having four to only two persons of working age for each citizen aged 65 and above. In this context, the EU has become the recipient of some major inflows of net migration from third countries.

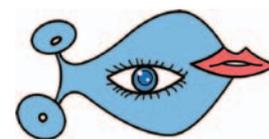
Some commentators present migration as a “quick fix” to the ageing population problem, while others explore a wider range of benefits of living in progressively more multicultural

societies. This brief will discuss these issues but it will also include major trends related to the migration from rural to urban areas, and *vice versa*.

In so doing, the first section presents major social, technological, economic, environmental and political trends and rationales for migration, followed by a number of strengths, weaknesses, opportunities and threats of migratory processes. The brief concludes with a set of policy options and some final remarks about the future of migration in the EU.

## Analysing EFMN Documents

A selection of available foresight and futures studies in English has been made. A total of 160 studies has been collected and selected out of the EFMN database. These were studies with different backgrounds, scopes, themes, horizons and scales. These PDF files were then converted into txt files. With the semantic data mining tool “TextAnalyst” these text files were analysed. First, out of the 160 studies a small number of relevant studies was selected that had titles strongly related to the researched topic. The TextAnalyst analysed these texts and found the most relevant keywords and semantic relations between the most important words. These words were collected into a key word list for the researched topic. This list of keywords was used to analyse all 160 selected studies. The TextAnalyst yielded all sentences in which each of the keywords was present, with an additional hyperlink in the Text file to see the context in which the sentence occurred. The TextAnalyst also gave a semantic relation between the searched keywords and other words.



With this relationship the list of keywords could be further enriched. The summary of sentences that contained one or more words from the list of keywords was manually read in the original context and if the sentence or the section in which the sentence occurred was regarded as providing new or additional information, this section has been copied into a word file. In order to avoid the extreme out of the context copying of sentences, statements that were part of a scenario description were not copied into the word file. After the analysis of 160 studies a word file was created containing sections out of the original studies with information related to the selected topic and the reference to the original document.

## Major Trends and Rationales

In terms of social trends and rationales, ageing population is often presented as “the main justification” for welcoming immigrants into the EU. But in some countries (especially in northern Europe), ageing has also generated a new type of migration from urban to rural areas.

### *Elderly on Top*

Figures of a gradually more ageing and stagnating EU, mainly because of an increase in life expectancy and lower fertility rates, have indeed put socio-economic activities for the elderly on top of policy-makers agendas and have made migration into the EU a major focus of attention.

### *From Rural to Urban Areas and vice versa*

However, with forecasts showing that more than half of the world’s population will be urban by 2015, it makes sense to consider both the rural and urban aspects of migration. For example, it is possible to observe different types of migration between social classes. The rich are often moving to rural (or peri-urban) areas which are environmentally pleasant, less violent and healthier, while the poor tend to migrate to bigger cities or urban areas where they can find more job and education opportunities.

### *Translational Networks*

Traditionally, research on migration has focused on two distinct trajectories: assimilation and ethnic pluralism. Now there is a third trajectory called translational networks. This focuses on the commercial and institutional relations and continuous exchanges immigrants have had between the countries of origin and the countries of settlement. These translational networks can be seen as the basis for translational social spaces in which collective identities overlap the boundaries of nations and states. Other social rationales for migration relate to key values such as tolerance (including political and religion). These together with techno-economic rationales

(described below) have made various EU countries key target destinations for millions of immigrants in the last decades. For instance, in 2007 the net migration in the EU27 surpassed 1.6 million people and four countries alone (Spain, Italy, UK and France) received 80% of these migrations (see <http://epp.eurostat.ec.europa.eu>). In any case, the net migration is heavily influenced by the levels of economic development and migration policy of each individual country.

### *Impact of Technologies*

Technological developments have also played an important role in accelerating and shaping migration patterns. For example, the innovative use of ICT to support new business models in the air transport industry (e.g. the emergence of budget airlines) has increased the mobility possibilities of low-skilled workers looking for higher salaries in Western Europe.

### *Migration to New Jobs*

Several economic reasons have underpinned migration into and within the EU. Non-EU members are attracted by the higher quality of life (including job opportunities), open-mindedness and multiculturalism characteristic of Europe. However, migration within the EU is mainly due to the so-called industrial deficit, whereby management-level workers from Western Europe find better opportunities in Eastern European countries and ICT professional from Eastern Europe find better salaries in Western Europe.

### *Environmental Drivers*

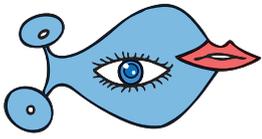
Infections diseases, water scarcity and food shortages have been the classic environmental drivers of migration from developing countries. Unfortunately this list has been expanded to include the broader effects of climate change and pollution.

### *Political Drivers*

Among the political trends affecting migration within Europe, the EU enlargement process is probably the most influential one. The increasing integration of the EU is bringing more cultures into closer contact with each other. This adds to a long tradition of cultural interchange, sometimes harmonious, sometimes with more friction.

### *Search for Ethical Values*

Finally, we should consider changes in values as potential contributors to a new type of “ethical” migration. This migration assumes that life in the world (as conceived in the 19<sup>th</sup> and 20<sup>th</sup> centuries) should no longer be aimed at the accumulation of wealth, wild consumption, experimenting of anarchical freedom or listening to distorted mass media.



Instead, the ethical migrants of the 21st century are constantly looking for the meaning of the life rather than wealth, promoting sustainable consumption, sharing global concerns for human development (peace, welfare and education) and promoting an alternative world opinion based on the critical mind of educated citizens.

## Major SWOTs

This section lists some of the major strengths, weaknesses, opportunities and threats of migratory processes in the EU.

### Strengths

- Both low- and high-skilled migrants help the EU to improve economic growth, technological innovation and living conditions.
- New forms of “translational exchange” (see above), reciprocity and solidarity based on immigrants’ kindness are typical strengths, especially among the first-generation labour immigrants and refugees (e.g. in the form of business contacts, homeland-oriented voluntary associations and political organisations).

### Weaknesses

- There are unrestricted and large-scale migrations across national borders within the European Union, induced by severe environmental conditions.
- A major challenge facing the future of European democracy is intertwined with its demographic development and how its economic prosperity develops in the regions around Europe.
- Migration to the cities will increase population density and put more pressure on the access to resources like water.
- There is a negative effect of the departure of skilled people from their countries of origin.
- Immigrants often establish very close and isolated minority groups around culture and/or religion.

### Threats

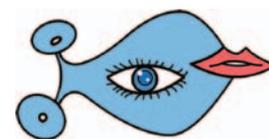
- Until around 2020 the share of persons aged more than 60 is expected to continue to increase at the present or a higher rate.
- If demographic forecasts prove accurate and the EU does not open its borders to migration, Europe will lose its power of renewal. However, the possibility of having too many migrants with a low birth rate could postpone the ageing process but not fundamentally change the demographic structure in Europe and may lead to serious instabilities.
- Restrictive migration policies with non-EU countries may increase controls at the external borders of the EU thus

creating bottlenecks for freight transport and a decrease of transport efficiency.

- It might be difficult to achieve the sufficient number of young educated people, even with the support of positive migration flows.
- The prospects for the poorest people may not improve fast enough to prevent the acceleration of their migrations.
- The lack of water due to the pollution of aquifers, the increase in urbanisation and an increase of water consumption may be the origin of a new wave of migrations. In addition, a few countries controlling the water sheds might create conflicts (40% of humanity lives on international watersheds). The UN estimates that by 2050 more than 2 billion people will live in water scarce areas. However, water scarcity is not a problem in Western Europe except in the south (see <http://www.acunu.org/millennium/ch-02.html>).
- The migration of people from damaged areas to more environmentally stable areas seem inevitable and might lead to a series of conflicts and calls for less democratic means to keep order.
- It is not unreasonable to expect more economic migration in the future than in the past and this might increase the hostility towards the immigrants.
- Migration flows could widespread diseases.

### Opportunities

- Migration can be, at least in part, a solution for the ageing population.
- Migration from Western to Eastern Europe (especially management-level workers and young ICT professionals) will help filling the skills deficit in the information-based economy.
- A reversal in the ageing population in Europe is not expected after 2020 but a slow down is possible.
- Europe can renew its population by increasing birth rate to its former level, by opening borders to immigrants or by doing both.
- Better understand the link between democracy and citizenship.
- Need to find strategies to manage diversity; especially in contexts where there are second generations of immigrants (the offspring’s of former immigrants) and improve the understanding of integration in the long run.
- Globalisation will increase the community labour.
- Immigration and recruitment of experts from other countries will transform workplaces into multicultural communities.
- Service providers will have to gain a greater insight into various cultural factors, which poses a major competence challenge.
- Countries that encourage the immigration of working age people increase their labour supply and tax revenue and reduce the fiscal pressures associated to the ageing population of the country.



- Service providers can explore opportunities for new business models.

## Major Policy Options

The previous discussions on major social, economic, environmental and political trends and the description of major SWOTs is complemented here with a wide range of policy options considered in recent foresight studies.

- The EU needs to build further decision processes at a National or European level to face problems related to “undesired” immigration.
- The EU needs to establish linkages among different policies such as migration, ethnic minorities and health.
- The EU needs to create and implement a strategic plan for a global partnership between rich and poor that combines the strengths of free markets with rules based on global ethics.
- The EU needs to establish communication channels to bring rural areas and rural population to the mainstream societal activities, in order to create a participating society and avoid exclusion.
- The EU needs a more proactive and assertive **immigration and asylum policy** given that, to date, it has been almost solely dependent on very-short term decisions taken in response to political pressures.

## Final Remarks

- This short brief has discussed major trends related to migration. For practical reasons, these trends have been grouped into social, technological, economic, environmental and political categories. Many trends could have been further elaborated to complement the SWOTs, however, for space reasons, only the most relevant ones have been considered. In any case, these trends and SWOTs are only some of the many elements contributing to the complexity “migratory processes” which are also affected by other regional, national, European and global trends.

The reader should also bear in mind that the proposed policy options result from the analysis of a literature review based on over 18 foresight exercises focused (or partially interested) on migration issues.

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FISTERA – Future Prospects in Romania – Scenarios for the Development of the Knowledge Society in Romania

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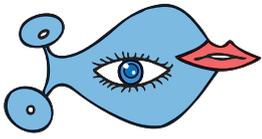
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UK National Technology Foresight Programme – Ageing\_Population

UK National Technology Foresight Programme – Foresight\_Financing\_the\_Entreprise\_Society\_2000[1]

Z – Finnish Parliament – Finland 2015 – Balanced Development

Z – European Science Foundation – Migration and Transcultural Identities



# Banks & Future Preparing for the Scenario 2015

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<b>Sponsors:</b>	IBM Deutschland GmbH and more than 25 other partners, including banks, technology suppliers and service providers from the financial services sector		
<b>Type:</b>	National (Germany) and European foresight exercise for the banking markets		
<b>Organizer:</b>	Martin Engstler, Fraunhofer IAO, martin.engstler@iao.fraunhofer.de		
<b>Duration:</b>	2004-2008	Time Horizon: 2015	Date of Brief: Feb. 2008

## Purpose

*In the Innovation Forum “Banks & Future” (Innovationsforum “Bank & Zukunft”) under the academic direction of Fraunhofer IAO (Germany), numerous banks and IT service companies have pooled their competences with regard to future trends in the banking sector. Their aim is to identify market-oriented opportunities for development and structural and technical optimisation potential, to bring together users and producers of technologies in the banking sector, and to initiate the necessary innovation processes. Ever since this research initiative was started in July 2004, a yearly trend survey has been part of the research work.*

## Innovation in Sales and Industrialised Processes

In the Innovation Forum “Banks & Future” numerous banks and IT service companies have pooled their competences under the academic direction of Fraunhofer IAO with regard to future trends in the banking sector in Germany and in Europe. Their aim is to identify market-oriented opportunities for development and structural and technical optimisation potential, to bring together users and producers of technologies in the banking sector, and to initiate the necessary innovation processes. The main aspect is to enforce competitiveness through innovation in sales and industrialised processes by adopting an integrated view. Use of modern information technology is seen as an enabler of future business models. In the meantime, the Innovation Forum “Banks & Future” has become an internationally accepted trademark for research and development in the financial services sector. It addresses innovative companies having a vital interest in advancing existing business processes as well as utilising the potential of innovative technologies.

- conceiving scenarios for future banking to cope with changing markets in the financial services sector,
- innovation in sales (new sales models, reorganisation of sales structures and processes),
- identifying success factors for the optimisation of processes within extended value chains in the context of the industrialisation of the financial services sector,
- designing innovation processes for enhancing institutional abilities to react to changes in an innovative way,
- developing personnel, organisational and technical infrastructures for the implementation of future business models in banking.

## Research Approach

The following figure shows the project’s main areas of research.

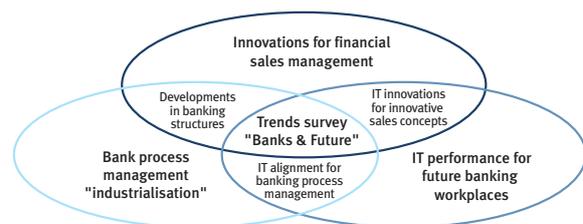
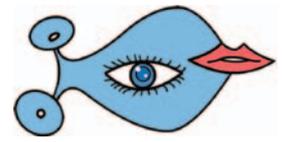


Figure 1: Framework for joint research

## Coping with Change in the Banking Industry

The main challenges which banks have to face in defining future business strategies include the following aspects:



The Innovation Forum’s research approach seeks to develop practical solutions and applications by:

- trend analysis of the German and the European retail banking market,
- surveys in the industrial and technological sector and, on this basis, drawing inferences for the banking industry,
- test and demonstration of innovative IT solutions at the show case “Banks & Future” at Fraunhofer IAO in Stuttgart.

### Partners

The Innovation Forum “Banks & Future” was initiated in 2004 by Fraunhofer IAO and IBM Deutschland GmbH. Since the beginning of this joint research project, the following partners were involved in the research process: 3X-Banktechnik, Akademie Deutscher Genossenschaften ADG, Allen International Ltd., arvato logistics services – arvato distribution GmbH, Berliner Volksbank eG, Bosch Sicherheitssysteme GmbH, Cisco Systems GmbH, Citibank Privatkunden AG & Co. KGaA, Commerzbank AG, DaimlerChrysler Bank AG, Deutsche Apotheker- und Ärztebank, DWP-Bank, Elaxy GmbH, Equens AG, Fiducia IT AG, GAD eG, inasys Gesellschaft für Informations- und Analyse-Systeme GmbH, Nord/LB Informationstechnologie GmbH, MVR Marketing-gemeinschaft der Volks- und Raiffeisenbanken e.V., S&N AG, Siemens AG, Sparkasse Pforzheim Calw, Sparkasse Pfullendorf-Meßkirch, Strähle Raum-Systeme GmbH, Tineon AG, Vitra GmbH, Volkswagen Bank GmbH, Vereinigte Volksbank AG Böblingen/Sindelfingen – Schönbuch – Calw/Weil der Stadt, VR-Bank Rhön-Grabfeld, VR Bauregie GmbH, and Wincor Nixdorf International GmbH.

## Trend Survey “Banks & Future”

Since 2004, Fraunhofer IAO has established a yearly trend survey of the German banking market called “Banks & Future”. The survey addresses bank managers of different banking sectors and of different bank sizes. Since 2007, the trend survey has been extended to the European level and will be continued in 2008. In 2007, about 460 bank managers in Germany and about 80 bank managers from other European countries participated in this survey. Survey design is based on research results of the Innovation Forum “Banks & Future”. In turn, the empirical results provide the basis for further research by the Forum. Figure 2 gives an overview on the main aspects.

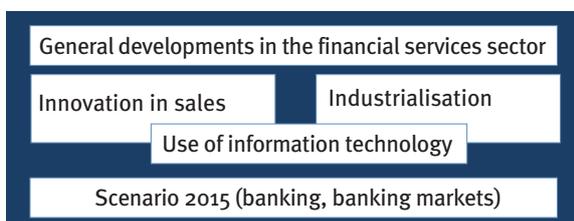


Figure 2: Structure of the trend survey “Banks & Future”

## Major Challenges in the Banking Markets

In the financial service sector, and especially in the area of retail banks, there is an intense competition between banks and a high pressure to improve customer orientation (see Figure 3). This pertains to increasing price competition in the field of standardised products as well as increasing demands from “better” informed customers for high quality consultancy. Even the German banking market is affected by a heightened price competition (90 per cent in Germany, 71 per cent in other European countries). Banks also have to cope with more European regulations to prepare for harmonised European financial markets.



Figure 3: Challenges in the banking markets (only top three)

## Strategic Projects

Looking at actual strategic projects, the intensification of sales activities has highest priority for increasing cross- and up-selling rates (see Figure 4). Another point is to improve organisational effectiveness and efficiency by establishing end-to-end IT support of business processes. Finally, bank managers have ranked the modernisation of sales channels among the top three strategic projects for innovation.

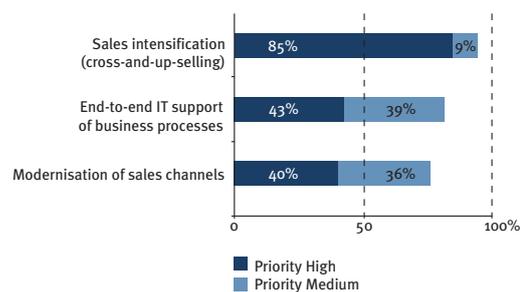
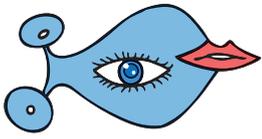


Figure 4: Strategic projects (only top three)

In summary, the bank managers plan to renew the business models by innovation in sales and by optimising value chain processes.



## Innovation in Sales – Branches & More

Innovation in sales involves a new design for the interaction of bank and customers. Despite the trend toward face-to-face contact, the virtual branch has also gained relevance for customer interaction; while it has further development potential also a variety of requirements need to be met for tapping its full potential.

Innovation in sales demands a well-integrated comprehensive approach, which considers all sales channels and their interrelations. At the Innovation Forum “Banks & Future”, four scenarios for future banking were developed, which characterize future-oriented concepts of interaction and focus on the communication between customer and consultant.

### 1. “Life-assistance-banking”

In this scenario, customer interaction is based on individual consulting. At the show case, a biometric and a Radio Frequency Identification (RFID) based customer recognition supports the new role of a “navigator”, who addresses incoming customers based on Customer Relationship Management (CRM) information. The branch design and integrated technologies encourage a consultancy approach that reflects a long-term customer relationship providing support over a lifetime, even beyond banking.



Figure 5: “Life-assistance-banking” at the show case

### 2. “Community-banking”

The branch is a communication and experience space that provides customers with additional occasions for interaction (e.g. “after-work-banking” at a bank café and supplementary services by partners). Self-service areas are connected to the workplace of a “service assistant”. Areas of “communication” and areas of “privacy” are combined in an open space concept. Customers and non-customers are invited to visit the branch.



Figure 6: “Community-banking” at the show case

### 3. “Convenience-banking”

The idea of “financial shopping” requires easy access to standardized financial services. The informed customer can do business at self-service terminals or by approaching a “service assistant”.

### 4. “High-tech-banking”

The branch is part of a multimedia-based communication and interaction concept. New media and enhanced information services support personal communication in and outside the branch.

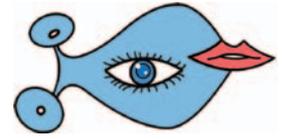


Figure 7: Scenario “High-tech-banking”

The scenarios “Life-assistance-banking” and “Community-banking” have been presented at a show case at Fraunhofer IAO since May 2007 to demonstrate innovative sales processes supported by innovative IT solutions.

## Scenario Future Sales

Additional scenarios reflecting new opportunities of direct sales channels by using new technologies like Web 2.0 or virtual sales rooms are part of the ongoing and future research work.



## Industrialisation – the Process View

The term “bank industrialisation” describes the transfer of technological concepts and management processes from the industrial to the financial service sector. Industrialisation focuses on the capability of a bank to optimise the complete value chain by managing the vertical and horizontal integration of business partners as well as implementing a mature business process management within the organisation.

### Status of “Bank Industrialisation”

In the trend survey “European Retail Banking Survey 2007” by Fraunhofer IAO, about 46 percent of the banks achieved significant success as a result of implementing industrial methods, 49 percent achieved minor success and only 5 percent of the participants stated that they had no success with industrialisation. With regard to the expected industrialisation potential, 13 percent of the participants estimated a very high potential and 57 percent estimated a high industrialisation potential in their banks. To achieve the potential of industrialisation, the implementation of a professional business process management is a key success factor.

### Quick-check Tools for “Bank Industrialisation”

At the Innovation Forum “Banks & Future” an industrialisation assessment tool was developed, which enables bank managers to analyse the actual situation of banks with respect to industrialisation. The tool integrates the structured analysis of the bank’s strategies, its process alignment and its process management maturity (see Figure 8).

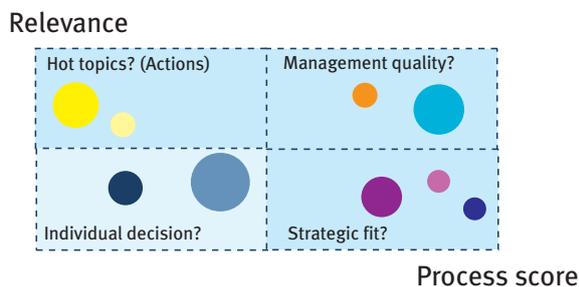


Figure 8: Decision portfolio of bank industrialisation

The industrialisation assessment tool provides information at the strategy and operational level of bank management. The industrialisation assessment must be extended to other organisational issues. In a next step, a structural model of an industrialised bank will be developed that reflects increasing requirements in flexibility and agility. On this basis, the tool set will be expanded to include additional aspects of industrialisation.

## Outlook to 2015

The trend survey “Banks & Future” provides an outlook on the future banking markets as perceived by the bank managers:

### 1. Changing Banking Markets

Establishment of a European financial market, growth of niche players and cooperation across borders (agile and flexible).

### 2. Competition by Service Quality and Speed

Besides price competition, other critical success factors such as service quality, added value and speed will gain increasing significance.

### 3. Industrialised Processes and Structures

Redefinition of value chains in extended models of cooperation, assessment of structural changes in banks including new roles.

### 4. New Services within Industrialised Value Chains

An industrialised value chain enables agile and flexible service composition to address changing and new markets.

### 5. Customer Management 2.0

Banks invest in customer contact and emotional selling, without losing the benefits of bank automation and of new communication technologies like Web 2.0 and virtual sales.

### 6. Security and Service Quality

Biometric solutions are a standard part of security concepts and are used to support customer convenience.

### 7. Management Skills and Personnel Development

New bank profiles require different management skills. Better informed customers ask for well educated banking people.

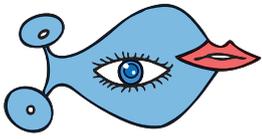
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# Target 2020: A Quantitative Scenario on Greenhouse Gas Emission Reductions for the EU-25

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Type:	Single issue		
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Duration:	12/2004-7/2005	Time Horizon: 2020	Date of Brief: Feb. 2008

## Purpose

*An integrated quantitative scenario analysis was conducted to elaborate, describe and evaluate strategies and paths for the European Union to achieve significant reductions in domestic greenhouse gas emissions by 2020. The objective of the foresight exercise was to support EU wide consensus formation, to assist in priority-setting, and to help raise awareness with regard to policy, industry or society as a whole.*

## How to Reach EU Targets on Green House Gas Emissions?

The EU has committed itself to limiting global warming to a maximum of 2°C average temperature increase above pre-industrial temperatures (Council 2005). According to most recent research, keeping within this threshold requires that global green house gas (GHG) emissions be cut approximately in half by 2050 (Hare & Meinshausen 2004). In fact, global emissions will have to peak and decline in the next one to two decades for temperatures to stay below the 2°C threshold. This consequently indicates that industrialized countries will have to reduce their GHG emissions by approximately 60-80% by 2050 in order to leave room for legitimate economic growth and ensuing higher emissions in developing countries (European Commission 2004). In addition, some developing countries will also need to commit to taking steps toward a less carbon intensive development strategy. To achieve this challenging goal, rapid action is needed.

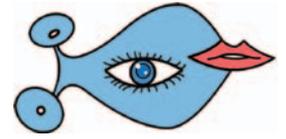
Future commitment periods under the Kyoto Protocol with a likely time horizon of 2013 to 2017 and 2018 to 2022 will thus need to see substantial reduction targets by developed countries. This will be a precursor of further action and commitments on part of developing countries.

In January 2005, the European Parliament emphasized “the necessity of significantly enhanced reduction efforts by all

developed countries in the medium term to be able to meet the long-term emission reduction challenge”, which it quantified for industrial countries “of the order of 30% by 2020” and “of 60-80% by 2050”. It also called on the EU “to adopt reduction targets at the 2005 Spring European Council which are in line” with these objectives (European Parliament 2005). The European Commission in its communication “Winning the Battle Against Global Climate Change” supported the necessity to limit temperature increases to a maximum of 2°C worldwide compared with pre-industrial levels and confirmed its will to take international leadership towards combating climate change (European Commission 2005). It also documented the relatively low economic costs to do so without even calculating the expected benefits from emissions reductions.

Against this background, WWF commissioned the Wuppertal Institute to conduct an integrated scenario analysis of GHG emission reduction potentials of the EU-25 for the year 2020.

For this purpose, the Wuppertal Institute developed a strategy scenario called the “policies and measures (P&M) scenario”. This scenario relies on a baseline derived from the energy and transport projections for Europe (Mantzou et al. 2003). Its strategies and assumptions are based on evaluation and extrapolation of detailed analyses in all sectors, for many countries, and for important energy-using goods and appliances. The most relevant studies were selected for this purpose.



## Integrated Scenario Analysis: Business as Usual vs. Active Energy Policy

An integrated scenario analysis of the EU-25 was carried out in order to determine whether and how a reduction of GHG emissions in the order of about 30 % below 1990 levels by 2020 could be achieved. The analysis consisted of two scenarios:

The **Business-as-usual (BAU) scenario** assumed policies with no special emphasis on climate protection and energy issues, neither with regard to additional policies since 2003 specifically designed to meet the Kyoto Protocol targets nor to rising energy prices and increasing concern about limited resources. The BAU scenario is mainly based on the data and assumptions made in the most recent energy projections for Europe (Mantzos et al. 2003).

In the **P&M scenario**, existing cost-effective potential for increasing energy efficiency is exploited and ambitious targets for market penetration of renewable energies are actively pursued. In addition, a switch to less carbon-intensive fossil fuels, such as natural gas, and effective policies and measures to mitigate the exploding demand in the transport sector are assumed under the P&M scenario. The P&M scenario includes a moratorium on new nuclear power plants and compliance with the nuclear phase-out schemes in the respective countries concerned.

Quantification and combination of potential, strategies, policies and measures, and the calculation of scenarios were conducted using the Wuppertal scenario modelling approach.

- The modelling technique uses a technology-oriented, sectoral bottom-up approach. Reflecting its relevance for GHG emissions, the energy sector is modelled in greatest detail, using appliance or end-use specific sub-models for each demand sector (households, tertiary, industry, transport) and a purpose-oriented model of the transformation sector (cp. Fishedick, Hanke and Lechtenböhmer 2002). GHG emissions in the energy sector are calculated based on the final and primary energy balance. CH<sub>4</sub> and N<sub>2</sub>O emissions in the energy sector are calculated by sub-sector, using a simplified approach based on current sector-specific emission factors.
- Other sectors and greenhouse gases are covered by specific sub-models, which are adapted to the currently limited information available for these sectors.
- The modelling technique applies a heuristic (i.e. expert-based) approach in order to identify potential, to formulate strategies, and to estimate market penetration rates of new technologies, market shares of fuels, etc.

## The Business as Usual Scenario

Although the BAU includes considerable energy-efficiency improvements in all energy-consuming sectors, increasing renewable energy shares and a decoupling of gross energy consumption growth (+0.7 % p.a.) from GDP growth (+2.4 % p.a.), no reduction of GHG emissions from energy use can be achieved by 2020 under BAU conditions. On the contrary, CO<sub>2</sub> emissions from fuel combustion are expected to increase by 10 % compared to 2000 levels.

These results highlight the fact that with the existing EU climate policies the Kyoto targets for the first commitment period (ranging from 2008 to 2012), which aim at a reducing emissions of six gases by 8 % compared to 1990 for the EU-15 and slightly lower reductions for the new member states, will not be met even if further greenhouse gas emission reductions in other sectors and gases are taken into account. Tougher long-term targets for the following periods up to 2020, which are crucial for mitigating climate change, seem to be even more out of reach with BAU policies.

## The Policies & Measures Scenario

To explore how the BAU development could be redirected toward a more sustainable course, a sectorally disaggregated high efficiency scenario was developed for the EU-25. The P&M scenario includes policies and measures specifically geared toward enhancing emissions reductions. Supplementary to the high efficiency strategy, a renewable strategy is outlined which is based on the medium-term potential for renewable energy within the EC (European Commission 2004) and can be expected to produce substantial additional emissions reductions.

The P&M scenario describes an ambitious energy efficiency strategy, which covers all demand sectors and is projected to lead to final energy savings of about 22 % versus BAU by 2020. This would mean stabilising final energy demand at about current levels.

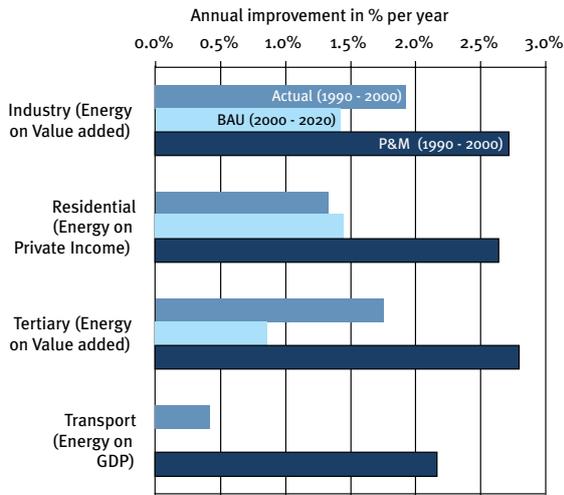
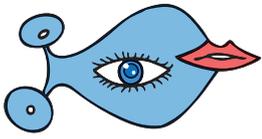


Figure 1: Annual improvement of energy efficiency by sector (Source: Lechtenböhmer et al. [2005b])

Combined with a similar strategy to boost the use of renewable energies, their share could be increased to 21% of total primary energy supply and about 37% of electricity production in the EU-25 until 2020 (BAU: 7.15% / 7.32%).

These two effects – stabilising energy consumption through energy efficiency at all levels and maintaining domestic production by increased production of renewable energies – will not only allow to reduce domestic GHG emissions by more than 30% but at the same time will enable to bring the trend toward increasing import dependency to a halt. Domestic energy production would be able to deliver about half of European energy consumption.

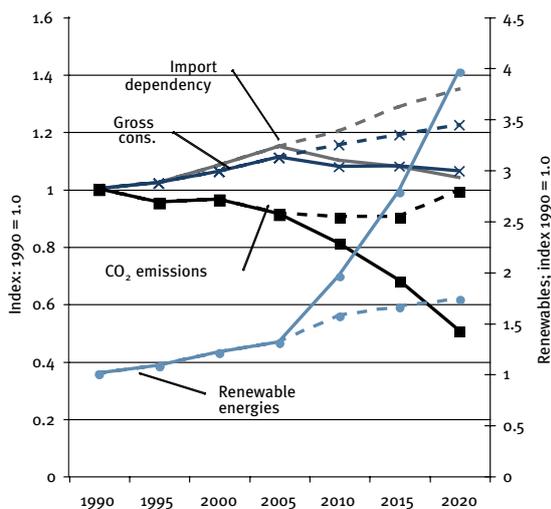


Figure 2: Comparison of key indicators of the BAU (dotted lines) and P&M (solid lines) scenarios for the EU-25 (Source: Lechtenböhmer et al. [2005b])

This means that economic and ecological risk minimization can be achieved. As compared to BAU, the P&M scenario will reduce risks and potential costs of climate change as far as possible as well as other environmental damages incurred as external costs of energy supply.

## Towards a Comprehensive Policy Package

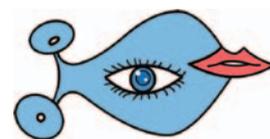
In order to change the course from BAU trends, which lead to increased energy demand, greater dependency on foreign resources, and accumulating risks, towards a sustainable energy strategy, a **comprehensive policy package** is needed.

Combining the EU emission trading system with a comprehensive set of sector- and technology-specific policies and measures for energy end-use and supply efficiency, such as combined heat and power (CHP), and electricity generation from renewable energies has to play a leading role, as the emission trading scheme covers sectors that are expected to account for about 60% of total emission reductions in our P&M scenario. Consequently, national caps have to be set to ensure an overall 2.8% per year decrease in emissions. Strong policies and measures for transport, for energy efficiency, in support of thermal uses of renewable energies, CHP heating and housing renovation.

## Making Active Climate Protection Feasible

The study concludes that an integrated and active climate protection strategy for the EU is not only necessary in order to mitigate impending global climate change but is also feasible, as such a strategy would spur the EU economy to accelerate improvement of energy efficiency and to adapt power systems to renewable energy supply. Furthermore, it represents an approach suited for minimizing risks, not only of global warming but also of disruptions in energy supply and of increasing energy prices.

- Our analyses show that there is huge and cost-effective potential for improved energy efficiency in all sectors to stabilise EU energy consumption at or below current levels (about 22% below BAU) and that a share of more than 20% of renewable energy supply can be achieved under an active strategy. Overall these results show that a 30% target for 2020, as envisaged by the European Parliament on the 13th of January 2005 (European Parliament 2005), is achievable when actively employing the available strategies.
- This makes clear that the necessary reductions of greenhouse gas emissions can be achieved by exploiting the potential for cost-efficient energy savings and expanded use of renewable energy sources.



- Another important result is that an active climate protection strategy yields further benefits in form of massively reduced risks of energy shortages and energy price peaks. It relieves the European economy from the burden of high energy costs and also reduces other environmental strains.

The results show that the strategy described by the P&M scenario is superior to a “muddling through”, business as usual development with regard to quite a number of important economic and ecological variables. EU policy-makers are well advised to further intensify and accelerate their efforts to speed up energy efficiency improvements in all sectors, to support further expansion of CHP, and to prioritise renewable energy sources in the necessary replacement of a large proportion of the European power plant stock.

## Translating Results into Policy

The study, published in summer 2005, was probably the first to draw a complete, though rough, scenario for the EU-25 in line with the target indicated by the European Parliament: a domestic reduction of GHG emissions by more than 30% by 2020. In the P&M scenario, the study briefly sketched the general feasibility, the sectoral distribution, as well as the technology and the policy requirements for achieving more than 20% final energy savings versus BAU and expanding renewable energies to deliver more than 20% of EU primary energy supply.

In so doing, the study already anticipated the key targets of the “triple 20” climate policy package adopted by the EU Spring Council in 2007. Moreover, it also gives evidence for the fact that energy savings of 20% compared to BAU and a share of 20% renewable energies have the potential to reduce EU-25 GHG emissions by about 30%, which is substantially more than the 20% the EU has so far decided upon.

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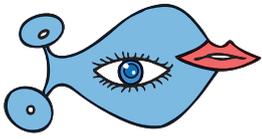
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# The Role of the EU in the World

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Organizer:	NA
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## Purpose

*The purpose of the present brief is to explore how the role of the EU in the world is perceived, interpreted and handled in foresight studies. The examination of the role of the EU in the world can be interpreted in different ways, include a wide range of perspectives, and apply to various levels of reference (political – social – economic – technological / scientific, etc.). To guide our thinking and orientation we focused on the related concerns and challenges the European Commission noted as of major importance in the coming years. These are expressed in the documents “Socio-economic Sciences and Humanities Work-programme 2007-2008” (pp. 4, 23-26) and “Reforming The Budget, Changing Europe, A Public Consultation Paper In View Of The 2008/2009 Budget Review” (sec. 2.1).*

## The Multi-faceted “Role of the EU in the World”

The role of the EU in the world is considered manifold as illustrated in the Commission documents mentioned above. The underlying argument in all these is that the EU has to increase its role and presence worldwide. This is considered a necessity both to be able to project its interests and values successfully as well as to contribute to world stability and development drawing upon its wide experience, strengths and unique characteristics.

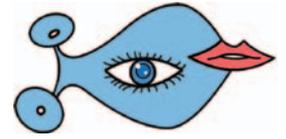
Increasing the role of the EU is seen imperative in response to the implications and challenges brought by globalisation, the changing interactions between world regions and the rise of new global players. A second line of argumentation lies upon the need to develop cross-cutting policies to face global challenges that go beyond national borders like climate change and biodiversity, demographic change and migration, competitiveness, terrorism and organised crime, or sustainable energy. A third line of argumentation refers to the increasing role of the European dimension in boosting knowledge, mobility, competitiveness and innovation within a globalised environment of scientific and technological progress.

## Text Analysis & Intelligent Reading

The methodology that was applied to identify and retrieve the information relevant to the subject matter involved “text analysis” as well as “intelligent reading” of relevant studies and reports.

The text analysis was applied to 160 studies included in the EFMN database. These studies represented a variety of backgrounds, scopes, themes, horizons and scales. First a small number of relevant studies was selected that had a title strongly related to the researched topic. Using the semantic data mining tool “Text analyst”, the texts were then analysed to identify the most relevant keywords and semantic relations between them. This list of keywords was then used to analyse the 160 selected studies.

Thus sentences were identified in which each of the keywords was present. These were then read in the original context. If the section in which the sentence occurred was regarded as providing new or additional information, then it was also marked as relevant. The final result was a word file containing the relevant sentences and sections out of the original studies with information related to the selected topic and the reference to the original document.



Being this wide, generic and international in nature, the specific topic was not expected to be treated in relevant foresight studies as a core subject. Foresight studies usually focus on more specific challenges and issues. They examine more generic challenges at the level of defining the background and setting the framework of analysis. Furthermore, most of the foresight studies have a national or regional, rather than European or international scope to allow the specific topic a central position in the study.<sup>1</sup> These factors limited the degree to which the text analysis resulted in a wealth of related information even though a second round of text analysis was carried out of only the trans/international in scope foresight studies. Thus, additional documents were reviewed that were considered relevant. These included EFMN publications and background documents as well as reviews of books dealing with the future of Europe.

## EU as a Global Player

The role of the EU in relation to the changing interactions between world regions and the rise of new global players is examined in foresight studies from the total range of perspectives (political, socio-economic, technological / scientific, cultural).

### *Towards European Democracy and Citizenship*

The political aspect given to the EU's role examines the internal challenges the EU has to face to further develop, the definition of the European citizenship, as well as the degree to which the EU's institutional architecture can be a model for new forms of governance.

In the study *Democracy and Futures* (Finish Committee for the Future) R. Cinquegrani analyses different aspects of the concept of democracy within the context of the European Union. Several issues are addressed ranging from understanding and managing the connection between all the new and different social, economic and political positions inside the EU to defining a European democracy and citizenship or handling exclusivists' conceptions of the state and the consequent implications for minority issues.

### *Governance Models for the Developing World*

The role that the EU can play as a model for the democratisation of the developing world gathers diverse views. T. Murata in the same study examines the future of democracy in India and China and the degree to which these countries can be models for democracy in the developing world. He

argues that many developing states needing better governance structures are likely to find a better match in the well established Indian model rather than the existing US model or the currently developing EU one. India has a long tradition of a liberal representative government and had been dealing relatively effectively with large language, ethnic, religious and communal divides.

Still consisting of a large poor and agrarian population and a large and poorly integrated territory, India is still in the developing world despite its recent economic growth. Thus, it is more likely that its solutions are more applicable to the many developing states which are the same countries often referred to as "emerging democracies" in Africa, Central Asia, South Asia, the Middle East, and Indonesia and the Philippines.

Regarding China the author asserts that the conspicuous lack of a liberal, representative democracy and the Communist regime are counterbalanced to a certain point by a passionate desire for political participation in China. In addition, its historical support for anti-colonial, pro-independence struggles allows China to enjoy respect and legitimacy in many parts of the developing world. Many also see a major possibility for Chinese people to successfully "leapfrog" into a new political future having a fair chance to incorporate current technologies to better approximate true democracy than the currently dominant representative government.

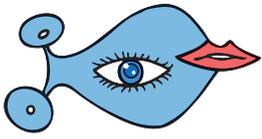
These considerations along with the fact that many non-OECD nations consider standards of living and political systems of the First World to be unachievable, may lead the developing world to identify with and derive images of their future from Third World major powers.

### *The Soft (but Dominating) Power of the EU*

However, the opposite view about the role of the EU as a governance model is also found in relevant literature. M. Leonard, for example, in his book "Why Europe Will Run The 21<sup>st</sup> Century" (2005) argues that the basis for American power (the ability to wage war transcontinentally and the ubiquity of American popular culture) has reached its natural limits. Against this he compares the European method of influence, which relies heavily on the so-called "soft power". In contrast with the previous study, he considers the European method as the more influential with the developing "BRIC" nations (Brazil, Russia, India, and China).

The BRIC nations are more interested in the European model of capitalism delivering prosperity, security and greater levels of equality to its citizens. This contrasts to the US model where the winner takes all. The rising nations are encouraged by the way in which the EU has allowed tiny nations to leverage their influence. They can either join the EU or start their own regional association to overcome a "unipolar" world.

<sup>1</sup> From the total of 846 cases mapped in detail in the EFMN database the trans-Europe ones (cases with two or more EU countries) amounted to 62.



Eventually, the EU may be encouraged to develop a “Union of Unions”. It is in this way that Europe will run the 21<sup>st</sup> century.

Another example is J. Rifkin’s book about “The European Dream” (2004). In examining how the world will develop in the real future, Rifkin, an enthusiastic advocate of the European model, notes that the market economy and the nation state are not designed for instant global communication, and the networked world that is already rapidly being developed. Thus, he anticipates that the EU develops decentralised and polycentric models of governance giving the EU the role of rule-maker and gatekeeper rather than governor and enforcer. The European model is being exported to other parts of the world replacing the crucible of US soft power as the ideal to which the world aspires. The European Dream expresses global connectivity without losing the sense of cultural identity and locality, freedom in relationships with others and the pursuit of the quality of life, leading to the championing of human rights and the rights of nature.

### ***The Role of the EU in Facing Global Challenges***

The importance of the EU in the world is not seen only in political terms. Significant weight and responsibility is placed especially in facing global challenges and threats that go beyond national borders. Many Foresight exercises point out the fact that future challenges (which are mostly not limited to a specific country) cannot – or at least not only – be addressed at national level and moreover the supranational dimension and in particularly the European dimension should be taken into account.

The FinnSight 2015 study states clearly that to implement Finland’s national vision as well as the positive impacts of scientific and technological development, Finland need actively to search for European and global partners. According to the French study “Technologies-Clés 2010”, it is not only necessary to take the European dimension into consideration, moreover the importance of national industry policies decreases in the globalised context.

Foresight exercises point out the following domains for which a European common answer to future challenges is necessary: ageing population; country differences in infrastructures; spatial and rural development / environment and agriculture; competitiveness (for instance in the domain ICT it is only possible at European level); energy (the successful promotion of wind energy for instance is only possible at European level); security (nongovernmental and governmental action forces at national as well as international level have to be coordinated); social issues (challenges like social cohesion).

### ***Safeguarding Socio-economic Growth***

Interestingly, people see the success of the EU model of socio-economic development as being both aspired and threatened by the so-called global powers.

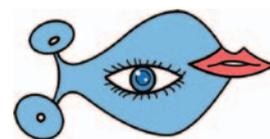
As the French FutuRIS study notes, the development of eastern and southern Asia will lead to major changes to the global geopolitical and economic map, which will modify the balance of power in the area of research and innovation. If Europe does not devote enough resources to this area, growth, which is already at risk of slowing down, will be compromised. This will leave Europe in a difficult position between Asia with its dynamic growth and the US, which is expected to continue to devote considerable resources to research and innovation. To provide a rough overview, world GERD is expected to rise from €629 to €1,320 billion over the next 20 years (on a constant euro basis), with the percentage claimed by the US down slightly from 36.6% to 33.0%, while Europe-15 will see its share fall from 22.3% to 17.5%. China will rise to 14.9% and industrial Asia to 24.1% (Japan, Korea, Taiwan, Indonesia, Thailand, Singapore, and Malaysia).

Other studies (Globalisation Trends, 2006) note the rapidly rising China’s R&D intensity as well as the rapid development in sectors like motor vehicles. They warn that the complementarities (and thus less direct competition) that EU enjoys now with China are fading away and that future trading conditions for European companies will be more demanding. On the other hand, they argue that Europe has no need to fear globalisation. Unlike the US and Japan, the EU has managed to maintain its dominant world market share position despite the emergence of countries such as China as major trading powers.

Referring to growth in the non-OECD economies the study Globalisation and Macroeconomic Policy (2007) argues that GDP growth will remain well above that in the OECD economies, reflecting higher productivity growth and more favourable demographic developments. Per capita output in the non-OECD economies is projected to rise by close to 5% per annum over the next two decades if globalisation continues at its current pace, compared with growth of 2% per annum in the OECD. Amongst the non-OECD, China and non-OECD Europe would enjoy the largest increases in per capita output.

### ***EU to Lead International Cooperation***

The scientific and technological aspect of the role of the EU is seen as of major importance for the future. Even more so international cooperation is highlighted. SCOPE 2015 Project covering four regions of the world (countries of the Commonwealth of Independent States (CIS) states excluding Russia, Latin America excluding Brazil, Maghreb and Mashreq, and Sub-Saharan Africa excluding South Africa) seeks to



demonstrate the utility of foresight to EC policy-makers and others concerned with cooperation for research, technology and innovation with developing countries.

The specific purpose of the project was to produce ten-year scenarios focused upon contextualised scientific and technological developments in selected regions of developing countries with a view to drawing implications for European RTDI cooperation policy.

The study “Emerging S+T Priorities in the Triadic Regions” helped identifying scientific and technological developments and research priorities in which Europe could take the lead in the years to come. Several strategies have been proposed to prevent a decline of the European science and technology positioning in the eventuality of a failure of the Lisbon strategy combined with the consolidation of current trends that emphasise economic factors for the support of research and innovation.

In addition, a number of foresight studies (like FISTERA or Transport and Mobility in an Enlarged Europe 2020) focus on examining the future of specific research fields and associated sectors on a European if not international scale.

### **Building the European Research Area**

Another aspect of the role of the EU appearing in foresight studies links to the Lisbon and Barcelona objectives and the development of the European Research Area.

For example, in the “Ukrainian STI 2025” foresight exercise a clear orientation on integration into the EU is deemed as the best way for an effective modernization of the national science and technology system. The competitiveness imperative enshrined in the Lisbon Strategy is tackled in the exercise “Imagineering Ireland – Future Scenarios for 2030”, the future of Ireland seen here strongly linked with the future of the EU.

A common integrated European policy in the maritime sector is the starting point of the exercise “Malta Marine 2020”. The Foresight exercise “East German Cross Border Regions”, also considering cross-border regions in Poland and the Czech Republic, aims to initiate cross-border innovations strategies to further the development of the regional economy.

The analysis of the ERA dimension in the foresight exercises concluded that the Lisbon goals and the objective to raise the R&D intensity is a major concern in many foresight exercises. Due to the increasing R&D competition at global scale, cooperation between research institutions – also beyond national borders – becomes increasingly important.

Furthermore, there are several European scenarios developed and placed as the basis for developing national or regional scenarios within foresight exercises. Yet, there are quite a few cases where there is no connection of the fore-

sight exercise with the European dimension and recommendations mainly focus at their local level of implementation. This “myopia” where the European dimension is concerned is hardly unexpected, given that national and sub-national exercises are typically framed to address localised settings.

The social / cultural aspect of the role of the EU is not that evidently examined as a core feature in foresight studies. The social fabric of the EU states with their beliefs and needs is of explicit concern to only a few exercises (Imagineering Ireland – Future Scenarios for 2030; Futur Radar 2030; Aufbruch Musik – German Music 2020). Though coming from different thematic topics they broach the demise of traditional values, customs and beliefs and the need for developing new ones.

## **Conclusions**

The interpretation of the challenge for the EU to strengthen its importance worldwide includes a wide range of perspectives as expressed in relevant Commission documents. From a first scan and analysis of relevant foresight studies it can be argued that this challenge is definitely not seen as a core subject of discussion in foresight exercises. This is not surprising given their national, regional or local focus.

When looked at the right level though (as one of the major elements of the framework for foresight studies) it can be argued that the foresight studies cover indeed all the different aspects and perspectives that this challenge includes.

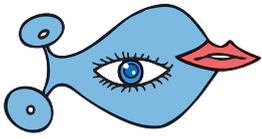
The need for increasing the role of the EU worldwide comes as a necessity in tackling the consequences associated with the trend of globalisation, the changing interactions between world regions and the rise of new global players. It is also seen as an imperative for the EU to play a leading role in international cooperation to deal with global challenges.

The European model is also considered worth by some to form a model of governance for the developing world even though the success of the EU model of socio-economic development is being both aspired and threatened by the so-called new rising global powers.

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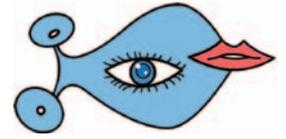
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#### **Examples of relevant Foresight studies analysed**

Global Trade Integration and Outsourcing (2006); Globalisation Trends (2006); Globalisation and Macroeconomic Policy (2007); Finish Committee for the Future – Democracy and Futures.

#### **Examples of relevant Foresight exercises analysed**

Danish Teknologisk Fremsyn 2020; FinnSight 2015; Technologies Clés 2010; Foresight for Rural Ireland 2025; Austrian BMVIT Safety and Security Research 2011; FutuRIS; SCOPE 2015 Project; Emerging S+T Priorities in the Triadic Regions; FISTERA; Transport and Mobility in an Enlarged Europe 2020; Ukrainian STI 2025; Imagineering Ireland – Future Scenarios for 2030; Malta Marine 2020; East German Cross Border Regions; Futur Radar 2030; German Music 2020.



# Future Challenge for Europe: Providing Security and Safety to Citizens

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## Purpose

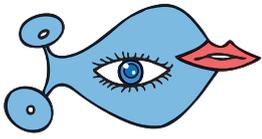
*As stated in the recent EC Communication on “Reforming the budget, changing Europe” (SEC (2007) 1188), the European Union has a key role to play in “providing security and safety to citizens”. Especially in the aftermath of 11<sup>th</sup> Sept. 2001 security related issues are becoming an increasingly important facet of global society and have an increasing impact on economy and science. The issues are manifold and include protecting citizens and state from organized crime, preventing terrorist acts, and responding to natural and manmade disasters. Civil security issues are becoming more and more important to governments and national economies across the globe, and the EU is no exception. The EC sees security research as an important policy objective, which started in 2001 with a Preparatory Action on Security Research (PASR) and is now the tenth theme of the FP7 Cooperation programme. Security and safety technologies are seen to have applications in many sectors including transport, civil protection, energy, environment, health and financial systems.*

## Analysing EFMN Documents: TextAnalyst

A selection of 160 foresight and futures studies was taken from the EFMN database. These were studies with different backgrounds, scopes, themes, horizons and on different scales. The semantic data-mining tool “TextAnalyst” was employed to analyse the texts. First, out of the 160 studies, a small number of relevant studies was selected that had titles strongly related to the researched topic. TextAnalyst analysed these texts and found the most relevant keywords and semantic relations between the most important words. These terms were compiled into a keyword list for the researched topic. This list of keywords was used to analyse all 160 selected studies. The TextAnalyst yielded all sentences containing any of the keywords, with an additional hyperlink in the text file allowing to view the context in which the sentence occurred. The TextAnalyst also gave a semantic relation between the searched keywords and other words. The related terms thus identified were added to the list of keywords. The summary of sentences that contained one or more words from the list of keywords was manually read in

the original context and if the sentence or the section where the sentence occurred was regarded as providing new or additional information, this section was copied into a text file. In order to avoid any extreme out-of-context copying of sentences, statements that were part of a scenario description were not added to the file. After this analysis of the 160 studies, a text file was created containing sections of the original studies with information related to the selected topic and the reference to the original document.

The dictionary for the analysis presented here consisted of the following terms: anticipation, crisis, defence, defence, emergency, enemy, intelligence, military, NBC, NRBC, prevention, protection, risk, safety, secure, security, surveillance, terrorism, terrorist, threat and weapon. This analysis is exclusively based on the review of 36 foresights and future-oriented studies completed between 2000 and 2007 – most of them in 2004-2005. While most studies were carried out at a national level in Europe, the pool of sources also included seven studies conducted at the EU-level, eight Japanese national studies, the global study AC-UNU Millennium project, the supranational study on information and communication technology (ICT) in the Nordic countries, and one Finnish study of regional scope.



### **Limitations of the Analysis**

Attention should be paid to the fact that, while all 36 studies address certain safety and security issues, they are not all equally detailed. In particular, whereas some foresights (e.g. the UK Foresight) provide an in-depth analysis of the state-of-the-art of technology, as well as a detailed forward look, the significance of some one-sentence statements, as they are typically made in Delphi studies such as the 8<sup>th</sup> Japanese National Foresight, may be more limited. Such statements have been considered very carefully so as not to bias the analysis. From the above, it follows that the following analysis – based on a restricted number of foresights – neither intends to be exhaustive nor to provide an overview of security and safety-related issues weighted according to their importance for future EU policies. However, it might provide some interesting insights about future safety and security threats – as predicted in foresights – as well as how future technological, societal or economic developments and policies might help to combat them. Since some of the analysed foresights are quite old, this means that some of the proposed actions could already have been implemented.

## **Safety & Security: A Crosscutting Issue**

Safety and security issues are generally related to all kinds of natural and human-induced (intentional and non-intentional) disasters or risks, which can affect individuals, societies or nations. Important technological and political tasks in the context of the protection of citizens and vital infrastructures have addressed a broad spectrum of issues such as future threats and vulnerabilities of critical infrastructures in key sectors (e.g. information systems, financial systems, industrial plants, public buildings, transport systems and infrastructures, communication networks, energy infrastructures, food distribution systems, etc.) or the impact of terrorism and organized crime on the development of civil societies.

From the selected studies two major areas were identified bearing future risks for society: civil security and IT security. The area of civil security can be divided into subsections as follows:

- terrorism and crime prevention,
- ensuring the safety and security of critical infrastructures,
- food and chemicals safety, and
- threats from climate change and natural disasters.

## **Civil Security**

### **Terrorism and Crime Prevention**

Terrorism is expected to become a growing threat to all parts of society in the future mainly for two reasons. Firstly, due to the increasing dependence on computer networks, modern societies

have become more vulnerable. Secondly, the proliferation of NRBC (nuclear, radiological, biological and chemical) weapons, the proliferation of ballistic, tactical and cruise missiles, and, on another level, the proliferation of small arms, the use of technological objects (e.g. civilian aircraft) as weapons and the transfer of technical know-how have multiplied risk factors for our societies. Also terrorist activities are becoming networked and are increasingly seeking points of entry into international business and, through corruption, into public administration.

The threat from terrorism must be counteracted by increased international cooperation on all levels and increased spending for security.

Another aspect raised by the study by the Finnish Committee for the Future is that because of continued synergy among, and miniaturization of, everything from chemistry sets and pharmaceutical manufacturing to genetic and nanotech engineering terrorist attacks will be much simpler to conduct in the future. Eventually an individual (single individual being massively destructive, SIMAD), acting alone, will be able to create and deploy a weapon of mass destruction.

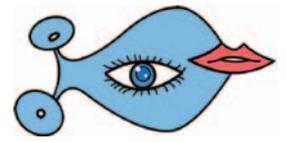
In the broader context of terrorism, general crime prevention is an important aspect. The Japanese studies suggest that the security provided by governments will deteriorate in the future; thus people must provide for their own protection. Means like physical access control and burglary alarm systems for private homes are seen to be possible substitutes. The British study “Strategic Futures Thinking” concludes that new technologies, such as DNA profiling, will prove increasingly vital in criminal trials as will more sophisticated detection, surveillance and monitoring devices in the wider field of crime prevention.

### **Safety and Security of Critical Infrastructures**

Energy and transport infrastructures (so-called “critical infrastructures”) are crucial to economy and society. Therefore, it is hardly surprising that their safety and security is addressed in different foresights – at a national and supranational level. The Finnish foresight “Finsight 2015”, for instance, stresses the fact that modern societies have increasingly become vulnerable in the sense that any malfunctioning or failure of critical infrastructures may paralyse the whole society.

The foresights identify several threats to critical infrastructures:

- Critical infrastructures increasingly rely on ICT applications and they more and more depend on the reliability of broad and complex ICT networks. Protecting critical infrastructures is therefore closely related to protecting the **ICT networks** they are based on. In this regard, ICT liability has to be ensured; it will also be particularly important to prevent criminal intrusion and the misuse of networked-based infrastructures.



- Of course, on a global scale, terrorism is expected to remain one of the main threats in the future. Several foresights such as the Fistera study and the UK Foresight therefore focus on threats to aviation and possible means to combat them based on better identification systems (e.g. embedded codes in airline tickets and in luggage, allowing matching them with the personal identification provided at the point of embarkation). Indeed, the terrorism threat is expected to give further momentum to the development of specific markets such as imaging technologies (allowing for instance the detection of suicide bombers in case remote identification and containment become reality).
- Transport safety for citizens also implies reducing the risk of accidents. Thanks to the diffusion and increasing affordability of ICT, use of intelligent transport systems based on telematics as well as video-surveillance systems are expected to become more widespread to improve transport safety, for instance, by reacting in case fatigue, recreational drug use or medication impair the performance of the driver of a car or the pilot of a plane. Intelligent transport systems may also help maximise transport and logistics efficiency leading to benefits in terms of increased productivity and economic growth.

### **Food and Chemical Safety**

Quite surprisingly, and despite their relevance for everyday life and everyone's health, issues related to food safety is rarely addressed by the foresights screened. Some, however, do highlight that ensuring food safety requires assessing the long-term impact of harmful chemicals (e.g. heavy metals) on human beings, crops, as well as livestock. Food safety is therefore closely related to preventing damage to the environment due to chemicals in general. Standardized and socially approved tools for the risk assessment of chemicals should hence be developed. In this regard, chemical analysis is expected to be facilitated in the future through the use of miniature chemical analysis systems. Regarding functional foods, the monitoring of the long-term consequences of their use is underscored as essential. The EU may have a role to play in assessing health claims and the safety of new functional food products entering the market. Providing transparent information on health issues, safe threshold limits for specific functional food products, as well as on storage requirements will also contribute to promoting food safety for the consumer.

### **Threats from Climate Change and Natural Disasters**

Some studies emphasize the risk from climate change and natural disasters. Particularly in Japan the risk from natural disasters such as volcano eruptions, avalanches and earthquakes is addressed. The development of new predictive systems is proposed. Systems to observe disasters such

as communications satellites, GPS, unmanned aircraft, and so on should be implemented in order to better understand situations after disasters have occurred and to be able to respond more swiftly.

Nearly all studies addressing climate change raise the issue of flooding – often in connection with the expected rise of the sea level. For instance the UK Foresight study claims that climate change will have a high impact under every scenario due to two threats. Firstly, the coasts are expected to be especially at risk: relative sea-level rise could increase the risk of coastal flooding by four to ten times. Secondly, precipitation is expected to increase flood risks across the country by two to four times. Flooding in towns and cities will be one of the greatest challenges in the future. Building in areas at risk from flooding should be avoided or, if inevitable, space should be provided to accommodate flooding in river and coastal areas. In this context, the development of effective modelling capabilities to predict flooding and manage flood routes in intra-urban areas should be pursued.

The study by the Finnish Committee for the Future also expects that change in precipitation will result in water tables falling on all continents. Droughts in areas where 40% of the population depends on watersheds controlled by two or more countries call for new water management strategies that can mitigate the effects of migration, conflicts, etc.

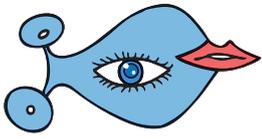
The threat of storm surges in coastal areas will increase due to rising sea levels combined with changes in the number, location, and strength of storms.

Although flooding is seen as one of the main challenges of the future, at the same time, it is also acknowledged that predictions in this area are steeped in uncertainty, as in the case of climate change or demographic and socio-economic trends. Thus, one has to develop robust water management strategies that will yield satisfactory living conditions for a wide range of possible scenarios.

### **IT Security**

IT security in general is seen as a major topic of the future. Society depends on vulnerable, complex information technology systems, which need to be protected.

One major issue is the protection of privacy in the sense of protection against loss of control over one's personal data. Already nowadays, Wikis and mostly blogs may contain data and information about an individual that could easily be disclosed to unauthorised others, given the low levels of security and privacy protection implemented so far. This risk will be enhanced in the future because of the widespread use of ambient intelligence (AmI) with its heterogeneity (in contrast to closed, codesigned systems), its complexity of



hardware and software (introducing the dependability challenge), its distribution of knowledge and resources (cooperation and inter-connection), as well as the foreseen mobility needs (which introduces more vulnerability than in a static world). Radio frequency identification (RFID) implants in people can also cause a threat to privacy, since they permit easy and instantaneous identification and authentication of individuals. On the other hand, they can increase security, for example, by enabling parents to easily track down their children in case of abduction.

The major challenge is to balance privacy and security needs. There are various ways to protect privacy in the future. Legislation to protect data of a personal nature is one of them. Another is by implementing new security measures. The level of privacy and security will be defined more by the location from where data are accessed than by the place where they are actually physically stored.

Another fast-growing area will be the provision of trust and guarantee services in the payments markets. A suggested new measure is establishing a clearinghouse where banks can anonymously share information about security breaches. Also, telecommunication companies are increasingly offering payment services. The introduction of m-payment systems will require new risk management systems and co-operation between different providers. It also calls for improved protection of confidential data provided by customers. Although wireless networks already provide a more secure network than the ones offered in fixed-line markets, there is need for further measures. Among those suggested are enhanced use of digital signatures (a kind of unique electronic stamp), authentication and encryption. One study suggests replacing binary network security (access or not) by more complex security mechanisms thereby granting differential access to different actors.

## Three Prevailing Issues

Taking the limits of the applied methodology into account, the analysis of 36 foresights and future-oriented studies, which were completed between 2000 and 2007, yielded three major security and safety issues: terrorism, IT security and natural disaster protection in the context of the global climate change. Concerning terrorism, studies seem to perceive growing future threats to all parts of society mainly because of modern societies' increasing dependence on computer networks and critical infrastructures and also because of the growing proliferation of NRBC agents, ballistic missiles and small arms. In the broader context of terrorism general crime prevention is also an important aspect.

IT security in general is seen as a major concern of the future. Important issues in this field are related to the protection of privacy in terms of protecting against the loss of control over

personal data and to the containment of future risks connected with the widespread use of ambient intelligence (Aml), RFID chips or wireless networks. The studies addressing natural disaster protection predict rising global threats of climate change causing flooding, storms and other weather anomalies in the future. Such studies also expect that the change in precipitation will result in water tables falling on all continents, which calls for new water management strategies capable of mitigating the effects of migration, conflicts, etc.

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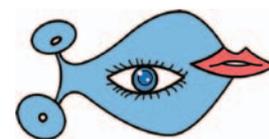
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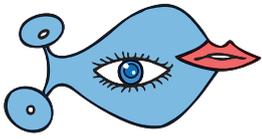
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# Globalisation in the 21st Century: Where Optimism and Fear Collide

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Type:	National foresight exercise, single issue			
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Duration:	2007-2008	Budget: € 100,000	Time Horizon: 2007	Date of Brief: Jan. 2008

## Purpose

*Globalisation has become a keyword of the 21st century. Who are the winners and who are the losers in a globalised world? The term globalisation triggers extremely contradictory emotions among the people of Europe. One third of Europeans (33 %) regard themselves as winners of this development and see globalisation as a kind of liberation from overly constrictive and outdated boundaries. In contrast, one in five citizens feels to have lost out in this process (21 %). Europeans only agree on one issue: the process of globalisation can neither be halted nor reversed. These are the results of the first European representative study that asked 11,000 citizens aged 14 and above in Belgium, Finland, France, Germany, Great Britain, Hungary, Italy, Russia and Switzerland about their hopes and fears for the future. The study was part of a research project by the Stiftung für Zukunftsfragen (Foundation for Research on the Future) of British American Tobacco.*

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## Germans and Hungarians Regard Themselves as the Losers of Globalisation – Finns as the Winners

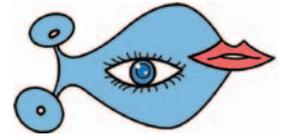
The effects of globalisation were subject to extremely different interpretations in the individual European countries: over half of the Finns questioned (51%) see themselves as winners. The Belgians (43%), Swiss (43%) and British (39%) take a similarly positive view of the future. Equally for the French (37%), Italians (25%) and Russians (24%), the hope of being able to profit from globalisation is greater than any fears they have. The Hungarians and Germans, however, are of a less positive mindset. In both countries, less than one in five (19%) believes that globalisation would have positive effects on their future. In these two countries, globalisation is evidently not the problem, but rather the degree of inequality and the subjectively perceived unjust distribution of the benefits of globalisation between the winners and losers. Citizens doubt whether this distribution is socially just and fair.

## Survey of Nine Countries

A representative face-to-face approach was used for this study. The interviewees were given a list of possible answers, which were presented in a random order. A total of 11,000 people aged 14 and above were questioned in nine countries. A sample of either 1,000 or 2,000 people was surveyed in each country.

The study was conducted in Belgium, Finland, France, Germany, Great Britain, Hungary, Italy, Russia and Switzerland between 14 September and 26 October 2007. The underlying definition of Europe was not based on membership in the European Community but on geographical criteria. The countries were selected to ensure that nations from all European regions were included in the sample.

The European study was a research project of the German *BAT Stiftung für Zukunftsfragen*. An external market research institute GfK (Gesellschaft für Konsumforschung) and its partners in the various countries conducted the study.



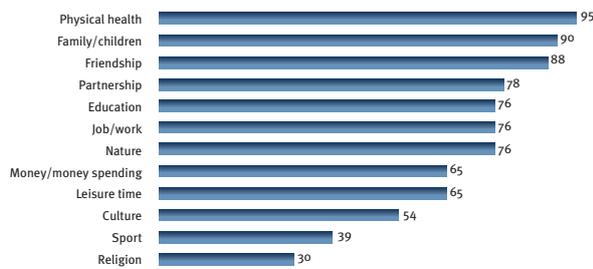
### What is the Stiftung für Zukunftsfragen?

The *BAT Stiftung für Zukunftsfragen*, a German foundation for examining societal expectations, promoting the scientific debate on issues determining our future and furthering approaches to a sustainable resolution of social issues of the future. Futurologists at this foundation have been examining societal expectations since 1979. The foundation acts as an independent interface between science, economics, media and politics. For many important opinion leaders, the foundation’s future research has provided support for political and social decision-making processes for decades.

## Health, Family, Friendship – Quality of Life in Europe

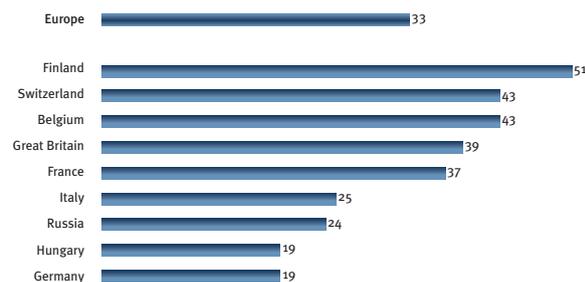
According to the study, the most enduring and sustainable future safeguard for all Europeans is, without a doubt, quality of life. First and foremost, quality of life means one’s health (95%), family (90%) and friends (88%) – partnership (78%), nature, education and work (76% each) are rated slightly lower. Spending money and having leisure time (65% each) are regarded as important by two thirds of those questioned. Religion is mentioned by only one third of the people asked (30%) as a factor significant to personal well-being with even sports ranking higher (39%).

### Share of 100 people interviewed who mention the following aspects as important for achieving quality of life and personal well-being:



(Average nomination across all nine nations where interviews were conducted).

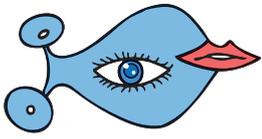
### Share of 100 people interviewed who see themselves as winners of future societal challenges having an impact on their personal living and working conditions and individual welfare:



In this new Europe-wide study, major differences within the countries surveyed can be identified:

- For **Russians**, the family, consumption and money are particularly important. Russia is the only country where the family (90%) ranks first; the importance of spending money (74%) is also significantly above the average value. On the other hand, friendships (68%), education (62%) and nature (48%) are rated as least relevant compared to other countries.
- **Italians** love culture and are proud of their faith. In Italy, culture (76%) and religion (48%) are of above-average importance compared to the other countries; in contrast leisure time (51%) and spending money (53%) play a subordinate role.
- The **British** attach importance to lifelong learning. Amongst all of those questioned, the citizens of the United Kingdom state education most frequently (86%) as a guarantee for the future.
- The **Finn**s are nature lovers. In addition to nature (91%), leisure time (85%) and sports (71%), friendships (94%) and partnerships (84%) are mentioned as important for quality of life.
- For the **Germans**, health (98%) is integral to quality of life. This nation, however, attaches the least importance to family, culture and religion of all the countries surveyed.
- The **Hungarians** are seeking for consumption. In Hungary, spending money (84%) plays the biggest role compared to the other countries.
- The **Swiss** count on partnerships. On average, the Swiss mentioned the lowest number of factors as important for future quality of life – this may be because many of the conditions are already in place today. The significance of partnerships is above average (83%), whilst the relevance of spending money was the lowest of all the countries.
- The **French** want a bit of everything. The French mention the greatest number of factors of all those questioned. Family (95%) and culture (75%) in particular are important for quality of life.
- **Belgians** set particular store by spending money (76%). Furthermore, in no other country do more respondents mention the family as significant (95%).

Europeans do not necessarily wish to improve their standard of living but rather their quality of life. Answers to the question “What are we living for?” are called for. There was agreement amongst those questioned that one’s own health is “the” prerequisite for quality of life. This is followed by family and friends in almost all countries. Alongside health, social areas are coming to the fore. On the other hand, the importance of aspects which were formerly central to quality of life, such as work, consumption and leisure time, is declining.



## Crime, Aggressiveness, Lack of Honesty: Europeans' Fears for the Future

Crime is Europe's unsolved problem. Two thirds (66 %) of those questioned from Helsinki to Rome, Moscow to Zurich and Berlin to London state that fear for their own safety was – by far – their greatest worry for the future. The majority of concerns are focused on interpersonal dealings associated with a feared loss of prosperity. Aside from fear of crime, increasing levels of aggressiveness (51%), decreasing honesty (41%), selfishness (38%) and intolerance (37%) are all causes for concern. The consequences could be loneliness (29%) or social exclusion (27%), which almost inevitably result in social conflict. The entire network that unites, keeps together and protects society is in question.

The citizens of the various countries express different fears:

- Crime is mentioned most frequently in **Switzerland** (80 %) and least frequently in **France** (49 %).
- Intolerance, on the other hand, is rated highest in **France** (58 %) and lowest in **Russia** (15 %).
- Xenophobia is also not a major issue in **Russia** (8 %), whilst for the **Swiss** this is particularly relevant (44 %).
- Social conflict is mentioned in **Germany** (42 %) twice as often as in **Italy** (21 %).
- Envy is a far more significant issue in **Belgium** (39 %) than in the **United Kingdom** (15 %).
- Lack of respect for children is hardly of relevance in **Hungary** (15 %), whilst in **Germany** this is a major issue (40 %).
- Indifference as a concern for the future is mentioned by a majority of **Finns** (53 %) compared to only a minority of the **British** (18 %).

Social cohesion as a society's central resource is threatened. It is being replaced by an aggregation of individuals whose behaviour is determined by short-term cost-benefit calculations and guided by the question: "How can I benefit?" Every single society requires a minimum of solidarity and feeling of community. This, however, requires that people are united and feel responsible for one another. Just as the desire for a sense of community, solidarity and security grows, it becomes increasingly difficult to satisfy these wishes. This presents a challenge to every single one of us. Politics is only in a position to provide the framework, whereas people are responsible for implementation.

## Friendship, Social Justice, Reliability: Europe's Future Values

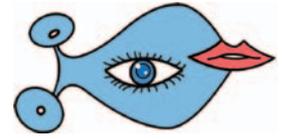
Europeans are just as aware of their fears as they are of potential solutions. There are signs of a positive change in values: the focus is shifting towards pro-society values, aimed at ensuring harmonious cohabitation. These values include friendship (65%), social justice (60%) and reliability (59%). There is also agreement amongst the majority of people asked about the following values: love (58%), helpfulness (55%), freedom (53%) and friendliness (50%). In response to the question which values are particularly important to the person questioned, the following rate slightly lower: loyalty (48%), conscientiousness and social responsibility (46% each).

Comparing the answers given in the various countries, it becomes clear that there are different needs and requirements. For example, helpfulness, conscientiousness and reliability are at their loudest in Germany. In comparison, in Great Britain friendliness, loyalty and social responsibility are demanded first and foremost. The Swiss wish for love and responsibility, whilst the Finns demand freedom and social justice. Europeans want to see a quick end to looming social erosion. They are willing to undergo moral renewal. Research in the nine European countries has shown that there are signs of a renaissance of faith in the future. The citizens of Europe are becoming increasingly confident. The age of egoism is slowly coming to an end. And reliability can once again begin to take hold where arbitrariness once flourished.

## First Approach for the Future of Europe

The results of the study will be interpreted in detail and published in March as a hardcopy (about 80 pages, German and English). This publication will be sent to members of the German and the European parliament who deal with issues affecting the future of Europe. Press releases will be sent out in all nine participating countries. The study is a first approach at addressing one of the main projects of the foundation in 2008 called *The Future of Europe*.

Members of the EFMN Network who are interested in the publication can contact the foundation by email and we will send a copy of the study (a PDF file) in the 2<sup>nd</sup> half of March 2008.



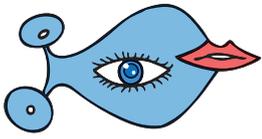
## Europeans' values

Question: "Thinking of the future – which of the following values do you think will be very important for yourself and society in general?"

Future values	Europe	Belgium	Finland	France	Germany	Hungary	Italy	Russia	Switzerland	UK
Friendship	65	71	64	64	75	61	52	42	87	72
Social justice	60	62	73	52	72	63	52	38	68	56
Reliability	59	70	77	33	78	71	28	49	64	60
Love/tenderness	58	69	60	65	66	45	45	46	78	51
Helpfulness	55	48	62	56	70	58	38	40	63	57
Independence/freedom	53	59	71	56	57	46	32	27	71	57
Friendliness/kindness	50	60	63	44	59	47	24	20	66	64
Loyalty	48	54	56	57	47	47	33	9	60	66
Conscientiousness	46	52	50	40	62	57	23	38	54	42
Social responsibility/ social commitment	46	52	55	40	54	41	36	21	57	59

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[www.batstiftung.com](http://www.batstiftung.com)



# Policy Options for the Improvement of the European Patent System

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<b>Sponsor:</b>	The European Parliament's panel for Scientific Technology Options Assessment (STOA)			
<b>Type:</b>	A European technology assessment/foresight project with the purpose of proposing policy options for the improvement of the European patent system			
<b>Organizer:</b>	The Danish Board of Technology/ETAG – www.tekno.dk and www.itas.fzk.de/etag Contacts: Bjørn Bedsted, Signe Skibstrup Blach (e-mail see above)			
<b>Duration:</b>	2006-2007	Budget: € 135,000	Time Horizon: 2007	Date of Brief: Feb. 2008

## Purpose

*The purpose of the project “Policy options for the improvement of the European patent system” has been to assess whether the European patent system adequately fulfils its purpose of stimulating social and economic welfare through the enhancement of technological innovation, and to investigate if improvements can be made. It was commissioned by The European Parliament’s STOA panel (Scientific Technology Options Assessment) from the European Technology Assessment Group (ETAG) and carried out on its behalf by the Danish Board of Technology. The main target group, therefore, was the Members of the European Parliament.*

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## The European Patent System under Pressure

Since October 2005, a group of five European scientific institutes (ETAG) has been providing scientific services for the European Parliament’s STOA panel on social, environmental and economic aspects of new technological and scientific developments. Inspired by a report from the Danish Board of Technology about the future of the European patent system, the STOA panel commissioned an assessment of the current strengthening and expansion of the patent system in order to identify key challenges and ways of dealing with them.

### Combined Expertises

A working group was first established, comprising three legal and three economic experts, hands-on experience from the European Patent Office (EPO) as well as a rapporteur. This combination of expertise has been applied in order to bring together insights from these two disciplines, both of which are central to current debates about the workings of the patent system but whose knowledge is rarely combined in this way.

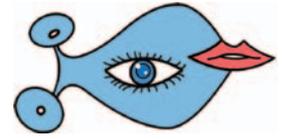
The task of the group was to write a report with the following objectives:

- to analyse the historical and present impact of the European patent system on innovation and diffusion of knowledge,
- to identify current key trends in the patent system,

- to identify the challenges these trends present,
- to point to policy options that may meet these challenges and, in the process, improve the functioning of the European patent system.

The analysis provided by the report and the policy options presented as a result draw on existing knowledge from legal and economic experts as well as on input from various stakeholders and peer reviewers. The group met five times to discuss the report contents and drafts prepared by the rapporteur assigned to the project. In between these meetings, various drafts of the report were exchanged and commented on through e-mail communication.

A preliminary draft of the background analysis was presented and debated with MEP’s at a workshop at the European Parliament in November 2006. In attendance were 12 independent experts and stakeholders, all invited to present policy options and debate them with MEP’s and the working group. These contributions played an important role in compiling the report and writing the final draft. Furthermore, an interim version of the full report was commented on by several workshop speakers and peer reviewed by economic and legal experts. A final draft of the report was presented and debated at the European Parliament in June 2007 with MEP’s and various stakeholders.



## Balancing Inventor's Rights with Societal Concerns

The fundamental premise of the report is that the primary purpose of a patent system is to enhance social and economic welfare by stimulating innovation and diffusion of knowledge. Balancing the exclusive rights of a patent granted to inventors with the overall societal concern of wider economic growth and social welfare is fundamental, because the reward offered to inventors in the form of exclusive rights provides the incentive to innovate, but if the reward is too excessive, it might hamper innovation and the distribution of knowledge. The trends and challenges identified by the working group all relate more or less to this balance.

### *Important Trends Influencing the Balance of the European Patent System*

#### **1. Increasing number of inventions**

New windows of opportunity have been opened by R&D in a number of technical fields, which individuals, firms and other organizations seize upon in order to produce an increasing number of inventions, which then require patent protection. Technological fields such as electrical engineering/electronics and biotechnology/pharmaceuticals have contributed greatly to this trend. Also nanotechnologies are set to repeat the explosion formerly seen by biotechnologies, which have made patent protection available in fields not previously appearing on the patenting scene.

#### **2. New inventors**

New inventors not formerly involved in patenting, such as universities, are appearing. This is the result of science, especially academic science, emerging as a fertile ground for inventions. Also countries that did not use the patent system before now tend to use the patent system more. For example the number of patent applications from China and India are growing fast and seem on the verge of catching up with the Korean patent office, where the patent portfolio of applicants is already as large as that of well-established European countries.

#### **3. Newly patentable subject matters**

Science-based inventions contribute to the growth of patent applications to the extent that many of the new subject matters have been added in order to make room for science-based inventions. Most notably, this has occurred with generated patents.

#### **4. Increasing demand for patent protection**

Firms and other organizations that engage in inventive activity nowadays have a higher propensity than before to look for patent protection for "assertive" and "defensive" reasons. The explanation for this is that companies and not-for-profit research institutions are often worried about the possibility

of other organizations ending up monopolizing a new technological field through patenting and, as a result, pushing them to pursue strategic patenting activities to guard against that potential monopoly.

## Challenges Facing the European Patent System

From the assessment of key trends, the report identifies a range of challenges:

#### **1. Coping with a rapidly increasing demand for patent rights without compromising the quality**

Overall, the total number of patent applications is putting strain on the system and causing problems for patent examiners. Potentially, this pressure will mount further as, for instance, the increase in the number of countries engaged in inventive activities means the filing of more and more patent applications at the EPO. As a result, although it is difficult to document, the quality of patents is reported to be declining. The main challenge is to prevent this from happening within the European patent system.

#### **2. Ensuring that too broad patents are not issued in Europe**

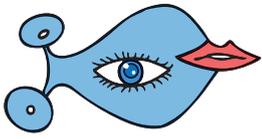
The speed at which new subject matter and science-based inventions are introduced in the patent system makes it harder to assess the patentability requirements, especially the state of the art, and thus to determine whether the claimed invention is novel and involves an inventive step. An overall result is that too broad patents are occasionally granted and one of the effects is that innovation is hampered as other inventors are unable to work around the patents. The main challenge is to ensure that too broad patents are not issued within the European patent system.

#### **3. Alleviating the effects of patent thickets**

The growth of patents in complex technologies, which require the assemblage of a multitude of inventions to move forward, has in certain areas, such as electronics, resulted in a particular form of patent behaviour. Defensive and strategic patenting has, for instance, resulted in patent thickets in some sectors, the consequences of which are generally undesirable in terms of creating too many, possibly overlapping patents, which can crowd a technological field and make it difficult and costly to navigate through. The main challenge is to alleviate the effects of patent thickets within the European patent system.

#### **4. Freeing company resources from trading patent rights and licensing**

More companies are patenting and the effect is that a greater number of companies have to spend more time and effort on trading rights and licensing. Such resources may have been



better used to innovate thus the main challenge is to ensure that companies are not forced to deal excessively with patenting and licensing and are “freed up” to concentrate more on innovation.

### 5. Ensuring an increased level of transparency and political engagement

Increased interest in the system has resulted partly from the trends about emergent technologies and new inventors appearing and partly from a more general shift in emphasis toward issues of “governance”. The main challenge is to ensure that the European patent system is as transparent as possible and that the involvement of more experts, politicians and stakeholders in the future development of the system is secured.

## Working Group Recommendations

The working group concludes that, left unchecked, the trends identified will have a damaging effect on the European patent system and may result in a negative impact on economic and social welfare. The working group developed the following policy options to meet the challenges:

### 1. Insertion of the economic mission of the patent system in the European Patent Convention

The recommendation on insertion of the economic mission of the patent system in the European Patent Convention involves the introduction of a preamble into the legislation. This insertion would state in clear terms what the purpose of the legislation is, namely to promote social and economic welfare. A suggestion for the wording of the preamble is as follows:

“The granting of patents serves the purpose of enhancing social and economic welfare by means of encouraging inventions and their diffusion. The protection provided by patents should be sufficient to ensure proper incentives to inventors. This should imply that patents should be granted in a proportionate and transparent manner, so as to ensure legal certainty”.

The preamble should be placed in the European Patent Convention and if the European Union is able to come forward with a community patent that same preamble is proposed to be included in the community patent legislation. The effect of a preamble with regard to, for instance, emerging technologies would be to guide legislators and to ensure the legislator considers whether the application of the patent system to an emergent technology makes sense from the point of view of the economic mission of the patent system.

### 2. Enhancing governance within the European patent system

The policy options under the governance heading are concerned with issues such as transparency and participation in activities related to the European patent system. One of the

main challenges to be met regarding the debate about the future of the European patent system is ensuring an increased level of transparency and political accountability. First and foremost, this involves strengthening the role and expertise of the European Parliament in this field, given that it is a critical participant in these sorts of discussions. The other main challenge is trying to accommodate the rise in public interest and wish for involvement of civil society at large in matters concerning the European patent system.

The first recommendation of the working group is to establish a standing committee within the European Parliament that is dedicated to patent matters in order to formalize an internal structure within the European Parliament that will enhance its awareness of European patent issues.

The second recommendation is to establish an external advisory body to examine the impact of the European patent system on the innovative sector and other sets of interests in society. The findings it gathers and views it expresses will be part of a formalized dialogue with the European Parliament and, specifically, its standing committee on patents. This sort of body would be composed of experts in law, economics and patent-related matters. An involvement of various practitioners and stakeholders, such as consumer groups, is highly recommended.

Finally, the working group recommends the establishment of a more participatory environment within the EPO and the Commission by including more stakeholders, scientists, NGOs and consumers in the ongoing debate about the design of the European patent system.

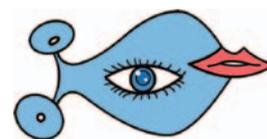
### 3. Improving quality aspects in regard to patentability standards and patent granting procedures

In order to strengthen the patent system and create stronger patents, the report recommends to look at two aspects: (i) the way in which patent offices apply the given standards for patentability and (ii) raising the standards themselves. Looking at the standards concerns the question of what is an invention and when is it valuable enough to be granted a patent. The report suggests taking a closer look at the concept of “inventive step” to see if it is still fulfilling the function it is meant to have and concentrate on the concept of “who is a person skilled in the art”.

Specific suggestions are listed in the report and include e.g. the introduction of quality management mechanisms in order to promote and monitor that consistent and predictable decisions are taken and to increase the awareness about the fact that patent offices are there to serve the general public interest and not the specific interests of applicants.

### 4. Dealing with emerging technologies

The patenting of emerging technologies gives rise to special concerns about patent quality in regard to both the patent system and the individual patent. The quality problem at the



system level is about setting the standards for patents and deciding on what is going to be considered patentable subject matter and what is not. At the executive level (i.e. the EPO), the quality problem relating to emerging technologies deals with applications of patent standards in individual cases. The special problems in emerging technologies in this regard are that prior art can be limited and hard to find for an examiner. In order to avoid these sorts of problems, the report suggests bolstering the executive level by allocating additional resources to EPO examiners to better assess prior art and avoid too broad patents being granted, and finally, to ensure ongoing deliberations between politicians, experts and stakeholders on what is patentable and what is not.

### 5. Increasing access to patented inventions

Patents that crowd the market create a patent thicket that makes it difficult for an inventor to enter the market. In order to overcome a patent thicket, negotiations will have to be started with each and every patent owner in order to obtain a legitimate access to the patents and to obtain the necessary licences. The report suggests two different measures, which would facilitate access to patented technology. One is the license of right, which is a legal mechanism by which a patent holder voluntarily chooses to give general access to anyone willing to pay a certain license. The other possibility suggested is to facilitate access to a web of patents by the establishment of collective rights management models such as patent pools and clearinghouses. The report recommends further investigation of these models, especially in view of current EU competition law.

### 6. Facilitating defensive publications

The report recommends that the European patent system be geared more towards an increased use of publication of inventions rather than patenting *per se*. Both companies and not-for-profit research institutions are often worried about the possibility that other organizations will end up monopolizing a new technological field through patenting, which may push them to pursue strategic patenting activities to guard against that potential monopoly. But strategic patenting is a costly way to prevent monopolization. The publication of scientific results may achieve the same effect for free. Such a process is referred to as “defensive publishing”. And, in fact, firms for a long time have used defensive publishing in industry areas such as software. In cases when an inventor decides to defensively publish rather than patent, he gives up the potential of exclusive rights. In return though, a freedom to use the invention is secured for that inventor, and for others. For this kind of defensive publishing to be effective, publications must be made readily accessible to examiners so as to provide a helpful additional source of information, including the prior art. It is recommended therefore, that measures be introduced to facilitate the practice of defensive publications within the European patent system.

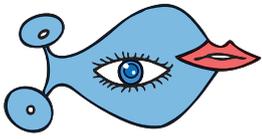
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ETAG: [www.itas.fzk.de/etag/](http://www.itas.fzk.de/etag/)

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The project and the report were coordinated by Bjørn Bedsted, project manager with the Danish Board of Technology. The project was supervised by Mr. Philippe Busquin, MEP and Chairman of the STOA panel.



# The Future of Manufacturing in Europe. A Survey of the Literature and a Modelling Approach

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Sponsor:	European Commission – DG Enterprise & Industry			
Type:	European futures study on manufacturing			
Organizer:	CPB, the Netherlands (Arjan Lejour) & TNO-IPG (Frans van der Zee)			
Duration:	01/2007-05/2007	Budget: € 130,000	Time Horizon: 25-30 years	Date of Brief: March 2008

## Purpose

*Manufacturing in Europe is facing challenges that may impact on its performance in the near future: the emergence of international competitors, new technologies allowing the emergence of new business models, increased off-shore and relocated activities. The aim of this study was to provide policy-makers with a long-term vision of European manufacturing, its characteristics, its place in the EU economy, in the world and the main challenges it will be facing. Its purpose was to identify, on the basis of current demographic, environmental, technological, economic and social trends, and possible scenarios, the likely bottlenecks, unsustainable trends and major challenges that European manufacturing will have to face over the coming 30 years. From this, implications for various microeconomic policies, notably for industrial policy, were explored, contributing to the mid-term review of industrial policy in 2007 by the European Commission's Directorate-General for Enterprise and Industry.*

## Future of European Manufacturing

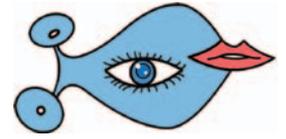
Manufacturing in Europe is affected by a changing world. In 2004, ten countries joined the EU followed by Bulgaria and Rumania in 2007. Most of the new member states have a different economic structure and other comparative advantages than the “old” EU-15, in particular in labour-intensive industries. This is also the case for the candidate countries from the Balkans and Turkey. Enlargement hence not only offers opportunities in terms of a larger domestic EU market, but also in terms of specialisation and – associated – economies of scale and scope.

Secondly, a new wave of globalisation unprecedented in terms of scale and speed is unfolding. This process of economic integration – with resources becoming more mobile, economies becoming increasingly interdependent and financial markets becoming increasingly international – has important implications for the future of manufacturing. This also holds for the integration of China and India in the world economy; each is home to about 20 percent of world population. Both countries are leading and highly competitive exporters, India in software and IT-enabled services, and China in skill-intensive

manufactures. Especially China has emerged as the powerhouse of the Asian region and has in less than 20 years become the world's manufacturing and trading platform. Globalisation has also impacted European manufacturing in another way: lower production costs and the potential of new consumer markets have caused European manufacturers to increase the quality and design of their products and have led to international sourcing of (parts of their) production.

Thirdly, consumer demand in Europe itself is changing. As its citizens are becoming wealthier, they demand more services and place higher requirements on manufactured goods. Demographics (ageing) might strengthen this change. Finally, the pace of technological change appears to have sped up in view of globalisation and increasing international competition. Globalisation, EU integration, shifting demand and progress in science and technology, and innovation – whether disruptive or not – will all have a major impact on how the manufacturing landscape in Europe in terms of location, production, distribution of labour and physical appearance will manifest itself in the near and longer-term future.

The purpose of this long-term scenario study was twofold: (1) to provide policy-makers, decision-makers and others with



two long-term scenario-based views on the future of European manufacturing and (2) to explore the scope for EU policies to positively address and influence the future.

## Combining Qualitative and Quantitative Foresight Approaches

The scenarios in this study have been developed in three consecutive stages, consisting of (1) a survey of existing futures studies, (2) the drafting of qualitative scenarios, and (3) a quantification of the scenarios using WorldScan, a dynamically applied general equilibrium model for the world economy. This approach was designed as a hybrid combining the traditional foresight studies with more quantitative oriented economic-scenario studies.

One important difference between the two groups of studies is the detail with which technological factors are explored in the foresight studies compared to the economic-scenario and modelling studies, which generally treat them as exogenous factors. Furthermore, while the foresight studies, in contrast to the modelling studies, largely employ qualitative scenarios, this study aims at combining the benefits of both approaches: first synthesising the results from many foresight studies to develop qualitative scenarios, followed by a quantification of the expected implications to check for the consistency of the scenarios as well as assess the expected impacts of policy packages. Furthermore, the communities conducting foresight studies and economic-scenario modelling studies have largely co-evolved with little interaction between them. This has led to foresight studies, focusing on participative processes and qualitative (policy) analyses and recommendations, producing results that are challenged by approaches focusing on quantitative analyses. This study therefore aimed to bridge the two communities by employing methods used in each of them. As such, the results of the study can also be seen as an experiment on how to conduct such studies in the future, combining methods from different communities.

## A Three Part Structure

As outlined above the study consisted of three distinct parts: a literature survey, the development of qualitative scenarios and the quantification of the scenarios using a modelling approach.

### Survey of Future Studies

The survey of futures studies<sup>1</sup> served two goals: (1) to help identify the relevant main drivers and trends that form our

<sup>1</sup> Published as an independent background report to this study, see Zee & Brandes (2007).

current perspective and knowledge that can be seen as key to the future of manufacturing in Europe and (2) to explore what other expert groups and think tanks regard as possible manufacturing futures.

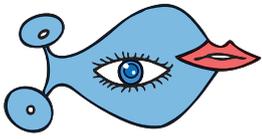
The timeframe considered in the literature surveyed ranged from 2015 to 2050. During the course of stage one, 101 foresight reports, scenario studies, academic publications and policy documents were surveyed along five clusters: international, technological, social and environmental trends and drivers as well as new business models. The studies surveyed covered European studies, global studies, North-American studies and South-East Asian studies in order of importance.

**FutMan, ManVis and Manfuture** – three major EU-wide foresight projects conducted over the past five years – formed the backbone of the survey. The results of these foresight studies were supplemented by other materials ranging from theme or aspect futures studies (e.g. expected income developments; impacts of climate change) to similar foresight studies carried out in other countries, such as the U.S. (e.g. IMTI, 1998; SRI), Japan (Nistep, 2005) and China (NRCSTD, 2005 – for further references see full background report [Zee & Brandes, 2007]).

### Qualitative Scenarios

The survey identified at least five sets of major drivers affecting the future of European manufacturing. These drivers are: (1) globalisation and international competition, (2) technological progress, (3) socio-demographic change (in income and wealth, social values, shifting preferences, ageing), (4) energy and resource scarcity, and (5) climate change and the environment. Based on these, two scenarios were developed: **Cosy at Home** and **Adventuring the World**. The two scenarios exemplify two explicit but “moderate extremes” based on further integrating markets, on the one hand, and a stalling or reversal of market integration, on the other. In **Cosy at Home**, inward-looking, risk-averse, indecisive behaviour dominates the public as well as the private realm. In **Adventuring the World** outward-looking (resulting in a further opening-up), risk-loving and pro-active behaviour is prime.

**Cosy at Home:** This scenario depicts a European manufacturing sector that faces an overall business and political climate that gradually becomes more inward-looking and passive. Uncertainty and indecisiveness at world level are answered with a European response of retreat. Politically unstable regions, threats of international terrorism, absence of binding action at global scale to tackle the negative consequences of climate change and the inevitable depletion of fossil fuels, and – related – a lack of real breakthroughs in alternative energy production and promising new technologies (nanotechnology and to a lesser extent biotechnology), give people the feeling



of standstill and uneasiness. This in turn translates into a downturn in consumer and producer confidence and more inward-looking and risk-averse behaviour. Trust is something that may be found close by, but certainly not far from home. Rising energy prices and strong increases in monitoring and control of international movements of persons, goods and services result in a cost explosion in international transport and trade, which significantly alters the turn-of-the-century trend towards a further integrated world economy.

**Adventuring the World:** This scenario depicts a European manufacturing sector that is faced with an overall business and political climate of international cooperation, openness, but also strong competition. European self-confidence strengthens as the political and ideological emptiness that characterised the turn-of-the-century era has been replaced with new inspiring notions of Europe's role in the world. This includes Europe assuming the position of a front-runner in solving problems of global warming, energy use and ageing as well as major breakthroughs in European social and cultural integration. Renewed decisiveness has triggered momentum at the global level and geo-political instability and threats of international terrorism are gradually disappearing. Considerable progress is made in alternative energy production and promising new technologies (nanotechnologies and biotechnology) have taken hold. A general upswing in consumer and producer confidence combines with new openness, and outward-looking and adventurous entrepreneurial behaviour. Trust relationships thrive. Rising energy prices stimulate new and more cost efficient energy-saving ways of transport of persons and products. Adequate road pricing and energy taxation increasingly supplant traditional labour taxes, making mobility and energy consumption better manageable and curbing harmful consequences.

### Quantification of Scenarios

In the third step, the scenarios were quantified using an applied general equilibrium model for three main purposes: (1) the model ensured that the scenarios were consistent, since economic variables allow to describe and relate constraints and the current knowledge about interactions in the economy in a consistent form; (2) the quantification gave a feeling for the relative importance of various developments for the future well-being of society; (3) the model also offered the possibility of assessing the impact of framework policies and their relative importance.

However, large parts of the scenarios could not be quantified, as the general trends observed are expected to impact variables over too long time horizons for workable quantitative assumptions. The complex feedback loops furthermore make it only realistic to illustrate the scenario trends related to economic growth and economic integration, which are at the heart of the WorldScan model. (For details on the

quantification of the scenarios and their expected impact on manufacturing please see the "final report").

### Impact of Framework Policies on Scenarios

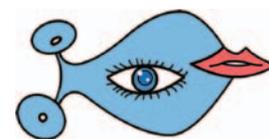
The quantification of scenarios sketched the macroeconomic developments, showing the possible impact of globalisation, technological change, ageing and structural change towards a service economy on economic growth and trade. Europe is expected to become less important as a place for manufacturing production in both scenarios as manufacturing shifts to Asia. The question whether these trends could be affected by policies was assessed in the third step. Rather than thinking about targeting and subsidizing specific industries, framework policies that could affect the environment where industrial production takes place in Europe were modelled for potential impact on the scenarios. The framework policies analysed were: (1) upgrading skills, (2) more effective regulation and less administrative burdens for firms, (3) R&D and innovation policies, (4) a strong competitive single market, (5) environmental policies, (6) supporting energy policies and (7) global trade policy.

The macro-economic outcomes for the EU as a whole in 2025 for both scenarios were analysed under the different framework policies. The differences between the two scenarios are minor. In **Adventuring the World**, GDP increases slightly more than in **Cosy at Home**, mainly because of the large impact of R&D and internal market policies. Exports increase faster in **Cosy at Home**, largely due to a composition effect of a higher share of total exports destined for other European countries. An increase in intra-EU exports due to new single market policies thus has a larger effect on total exports. R&D and innovation policies have the largest impact representing about 40% of the total GDP effect based on the lower bound returns in the literature. The reduction in administrative burden adds about 1.5% to GDP, internal market policies about 2% and skills even less. However, over time, when the whole labour force has been educated, the effects of upgrading skills will be larger. From Gelauff and Lejour (2006) we know that GDP effects will be three times as high in 2040 compared to 2025. However, compared to other framework policies, the economic effects even in 2040 will be unsubstantial.

## A Future for Manufacturing

The analysis has shown that the share of manufacturing in employment and value added has decreased in Europe for decades reflecting structural changes in the global economy. However, manufacturing will remain important for trade and productivity increases, outpacing by far the service sector.

Global manufacturing is expected to grow, fuelled by Asian economic development. Nevertheless, there is a future for manufacturing in Europe. In 2025, Europe's share in global



manufacturing production and trade is estimated to be about 20 %, much higher than its share in global population. Manufacturing is also estimated to contribute more than 15 % to European value added in 2025 and to remain the most important driver for exports. A further strengthening of the internal market and adequate R&D and innovation policies can have a substantial impact on these shares. Both can be influenced by EU policy-making, but the framework policies cannot reverse the trends in shares of value added and employment.

Within the manufacturing sector various developments will take place. The study discriminated between ten aggregate manufacturing sectors: “food products”, “textiles and wearing apparel”, “wood and other manufacturing”, “pulp, paper and publishing”, “chemicals, rubber and plastics”, “basic metals”, “non-metallic minerals”, “electronic equipment”, “transport equipment” and “other machinery and equipment”. Based on historical productivity growth paths of these sectors, their trade openness, R&D intensity, energy efficiency and skill intensity, it is highly likely that these (sub)sectors will develop differently over time. This also applies to subsectors **within** the ten sectors identified. Most sectors can distinguish between basic and specialized manufacturing activities, with basic manufacturing on average being more affected by international competitiveness than specialized manufacturing.

### **Openness a Key Determinant**

A number of interesting conclusions about the future of manufacturing in Europe were drawn. The increase in trade and, more generally, globalisation appears to be one of the most important drivers, making the sectors that are already most open to international trade also the ones mostly affected in the future. They include textiles and wearing apparel, wood and other manufacturing, chemicals, rubber and plastics, electronic equipment, transport equipment and other machinery and equipment. Overall, the sectors food products and pulp, paper and publishing will be less influenced. These are more domestically oriented sectors, less R&D intensive and face less technological progress. Europe has no comparative advantages in textiles and wearing apparel, electronic equipment and basic metals. This disadvantage will become further manifest in the oncoming twenty years. In particular, this applies to electronic equipment, which – while in the past representing a relatively large sector – will decline even further. Textiles and wearing apparel is an already small sector in terms of value added and employment, which means that an even less prosperous future for this sector will also have less overall impact. Chemicals, rubber and plastics, transport equipment and other transport and equipment will be the most important manufacturing sectors in Europe, despite a deteriorating comparative advantage in the other machinery and equipment sector. These sectors are important for European exports and will account for

about a quarter of global production and trade in these sectors over the coming decades.

Of the framework policies analysed in this study, improving skills, reducing the administrative burden and increasing energy efficiency, have the least impact on manufacturing. R&D and innovation policies and strengthening the internal market, on the other hand, have the strongest and most positive impact on manufacturing. They are also the most ambitious in terms of policy formulation and implementation, and potentially very effective in supporting manufacturing because of their R&D intensity and open-to-trade nature. In the coming decades, Europe’s decreasing share in global manufacturing production and trade will flatten. The EU framework policies support this slowing of the relative decline of manufacturing activities in Europe, which may even come to a near standstill in sectors such as chemicals, rubber and plastics, and combined machinery and equipment.

## **Sources and References**

The key results of the study were published as part of Chapter 5 of the European Competitiveness Report 2007. More details and the full scenarios are published in the background reports and final report and can be accessed via the website of the European Commission and the CPB the Netherlands.

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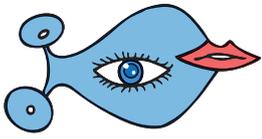
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# Results of Lab on “Old and New Energy”

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Sponsor:	Club of Amsterdam		
Type:	Field/sector specific		
Organizers:	Humberto Schwab / humberto@clubofamsterdam.com – Felix Bopp / felix@clubofamsterdam.com		
Duration:	April 2007	Time Horizon: 10 years	Date of Brief: April 2008

## Purpose

*The Club of Amsterdam set up an “Old and New Energy Lab” designed to generate novel and potentially viable plans of action for dealing with energy issues by leveraging brainstorming methods to produce innovative thinking and bypass preconceived ideas and assumptions. The process tapped into the expertise of “thought leaders” chosen for their diversity so as to maximise the fertility of discussions.*

## Lab Challenges to Think Outside the Box

Diminishing reserves of fossil fuels, climate change, geopolitical factors and a wave of technological advances are bringing complex pressures to bear on the landscape of energy generation and consumption. Change seems inevitable, but reacting appropriately is a challenge. This is especially so when limited modes of supply and consumption have been entrenched for extensive periods, as is the case with the energy landscape. This can make it very hard for people to think “outside the box” – arguably much needed at the moment.

Thus the challenge addressed at “The Lab” was to bypass preconceptions and traditional ways of thinking. Participants were called upon to brainstorm possibilities and then validate the resulting ideas with some tangible, realistic scenarios.

## Conceiving Future Scenarios – the Methodology

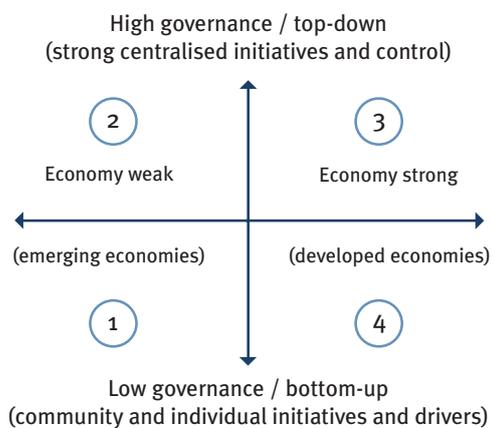
Principal approaches employed were Socratic discourse and a future scenario method. Participants were asked to identify a set of driving “values” deemed desirable (e.g. equal access to resources, freedom, quality of life, stability, etc.). Socratic discourse and other techniques were applied to open up discussion to the broadest possible level. The outcome was the observation of numerous facts, trends, constraints, etc.

The resulting “facts” were then fed into an analysis based on the future scenario method. The values identified earlier were used to drive the scenarios, which were to envision a positive

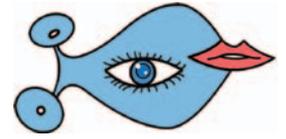
future ten years hence (the goal being to identify possible solutions).

Four scenarios were created by choosing two drivers of change: **governance** and **economy**. Note that there is nothing absolute about the choice of drivers or even the number of drivers considered, but these were the ones considered most important.

These drivers define the axes of a graph depicting four different environments (symbolized by the numbered circles in the diagram) derived from the possible combinations of extreme cases of both drivers. These environments provided the basis for the scenarios.



Keep in mind that these scenarios are not predictions but simply tools to guide discussion from exploration to identification of potential solutions and analysis of important trends and factors (political, cultural, technological, etc.) and their interactions.



## Participants

Four “thought leaders” brought expertise to help keep discussion realistic, whether on technological, economic, political or social levels. Their backgrounds included:

- analysis of new technologies and their commercial and social impact;
- understanding corruption and conflict resulting from exploitation of natural resources and international trade systems;
- energy resource analysis and prediction in the context of the International Energy Agency;
- nuclear policy and law.

## Energy Futures – the Four Scenarios

Observations on trends and forces will be split into socio-economic and cultural, and technological and sectoral. The four scenarios based on these trends and forces will then be outlined before looking at identified opportunities and challenges, which are in turn fed by the scenarios.

### ***Scarcity of Supply, Potential for Conflict, and Environmental Concern – Socio-economic and Cultural Trends/Trend Breaks***

- Rising energy production costs.
- Concern about climate change (global warming).
- Increasing sensitivity to energy supply disruption.
- Concerns over energy dependence and vulnerability.
- Impending scarcity of fossil fuels with increasing demand from rapidly advancing nations such as China and India.
- Increasing global tension relating to energy supplies and the possibility of resulting conflict.
- Environmental concerns about nuclear energy.
- Increasing interest in alternative energy sources.
- Increasing interest and efforts in energy conservation.
- Development of carbon trading schemes.

### ***More Choices and Technological Advances – Technological and Sectoral Trends/Trend Breaks***

- Capability (in some markets) for energy purchasers to also sell to the grid.
- Choice (in some markets) over source of energy bought.
- The nanotechnology “revolution” impacting multiple, interacting energy-related technologies.
- Multiple parallel and rapid advances in solar technologies promising greater efficiency and/or lower cost.
- Advances in fuel cells (in many sectors).
- Advances in batteries and ultracapacitors.

- Developments in thermoelectrics offering promise for waste heat reclamation and geothermal energy.
- Availability of smart energy-saving materials (electrochromic or anti-IR window coatings, etc.).
- Lighter/ stronger metals, ceramics and composites.
- Efficient lighting (especially nanostructured LEDs).
- Improvements in coal/gas/biomass-to-liquid processes, often driven by improved technology (e.g. nanocatalysis).
- Advances in hydrogen production and storage.
- Potential developments in artificial photosynthesis.
- Potential for low-loss electrical transmission.
- New CO<sub>2</sub> separation technologies.
- Improved nuclear fission technologies.

## The Four Scenarios

Four scenarios were framed assuming environments as described in the methodology section. Remember that they are designed to be optimistic views of a situation ten years hence. Their creation allowed disparate ideas to be brought together in a framework where interactions and socio-economic and political realities could be considered.

Not all the scenarios were recorded in the same degree of detail. Different groups of participants chose different styles of presentation.

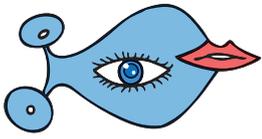
### **Scenario 1 – “Harvesting Energy” (emerging economy, minimal governance)**

The environment envisaged was a poor, sub-Saharan country with village communities as the dominant settlement pattern, poor access to resources and minimal infrastructure. The village in this scenario was assumed to be remote but not overly far from a principal city.

The one plentiful resource is sunshine. New cheap photovoltaics and microloans allow the village to produce electricity. This gives rise to increased productivity and enables more flexibility in trading of staples such as vegetable and meat produce through refrigeration.

The small economic boost and decreasing costs of photovoltaics allow expansion of generating capacity. Direct energy sales become attractive in a future where fossil fuel is expensive and supplies unreliable and the village becomes a supplier of power from solar energy. Improved battery technologies and high fuel prices lead to more electric or hybrid vehicles. Households in and outside the village increasingly use batteries and pay for recharging.

The village has effectively shifted from subsistence agriculture to “farming” sunlight, with batteries as the means of distribution. The availability of power for transport attracts more vehicles and infrastructure improves. Then cables are laid to directly supply electricity to the nearby city. After all,



the village now has the generating capacity, the expertise, and plentiful low-value land for expansion. Infrastructure experiences another boost, including communications. The village buys computers and the community now has Internet access. Educational opportunities increase dramatically. Over time the community becomes generally well-educated and thus capable of engaging in even more diverse and complex commercial activities.

Some time in the future (although maybe not in the ten-year frame), solar energy could be captured in a fuel created by artificial photosynthesis, allowing wider export of energy and opening up the solar farming model to more remote communities. This would require importing water (limiting displacement of battery use), but importing water is certainly preferable to importing oil in this (future) day and age.

### **Scenario 2 – “Central Energy Planning” (emerging economy, strong central governance)**

This scenario assumed a top-down, centrally-organised society with an emerging economy. China was offered as an example, on the assumption that much of the traditional communist philosophy still permeates the government, which regulates the allocation of resources. Short-term (business) thinking is constrained for the benefit of the collective when it comes to something as fundamental as national energy supply.

The immediate need for more energy to support growth is urgent. Coal is abundant and coal-fired power stations proliferate, with little thought given to environmental concerns. But this is only the first, quick fix, part of the plan, which is also influenced by oil imports for vehicles, the need to transport energy over great distances and the fact that even coal resources have limits.

Coal-to-liquid processes are used to produce clean diesel to help ease the dependence on oil imports, while a massive research effort creates low-loss electrical transmission based on high-temperature superconductors (doubly important because of the chosen alternative to coal – photovoltaics).

Huge solar “plains” grow in the country’s remote, arid and impoverished West, bringing employment and commerce. Ultimately, the technology becomes simple plastic sheets that can be rolled out and clipped together. They contain nano-engineered structures that exploit the highly-efficient initial step of photosynthesis but feed the liberated electrons into the superconducting transmission lines and on to the energy-hungry coast. China soon becomes a major exporter of these technologies.

In the cities of the East, electric and hybrid cars are encouraged and manufactured. Coal is increasingly used only to produce diesel and dependence on foreign oil now rapidly disappears.

### **Scenario 3 – “Energy Caps and Taxes” (strong economy, strong central governance)**

Sweden, which aims to become oil-free by 2021, might be an example.

A progressively increasing carbon tax is introduced for individuals and corporations. A flexible power supply network allows individuals to avoid a carbon tax by purchasing energy from sustainable sources. This encourages development of such sources – from the logging and papermaking industries using waste to produce electricity, heat and biofuels, down to individual households generating energy and selling any surplus to the grid.

Central support and legislation for energy-saving technologies in housing and transport increases their uptake through various means. The carbon tax imposes a cost on manufacturers for the lifetime emissions of their products. The tax alone triggers substantial change, but more comes through government-driven, large-scale geothermal, hydroelectric and combined heat and power schemes.

### **Scenario 4 – “Communicating Energy” (strong economy, minimal governance, individual action)**

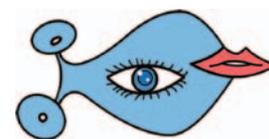
This scenario is one of change through popular movements. Analogies might be seen in the growth in the popularity of “organic” produce or that of “fair trade” products, both of which evolved out of grass roots concern. For instance, we can help the environment by buying local produce rather than that shipped great distances, or eating less meat (such unlikely action probably highlights limits to this approach). Other individual contributions are switching lights off, carpooling, capturing rainwater to water one’s garden or carbon offsetting schemes.

The key is understanding what can be done and creating a culture of willingness and responsibility. Communication is key and the Internet makes this possible as never before.

To some extent this scenario is happening now, but there are clearly limits to how much it can achieve without some top-down initiatives (or economic imperatives) added to the mix.

### **Top-down Action and Technological Advances are Critical for Seizing Opportunities**

The fact that all but one of the scenarios could conceivably address all the main energy issues points to much opportunity. Exploiting this rapidly enough is a major challenge. Another obvious challenge is highlighted by Scenario 4, which suggests that, at least in the developed world, “people power” is not enough and top-down governmental action may well be necessary. Economic and practical pressures would achieve the necessary changes eventually, but it is probably not advisable to wait for the hurricane to prove that you should not have made your house of straw. As for opportunities, the scenarios explored highlight those best. Scenario 1, “Harvesting Energy”, perhaps best illustrates the dramatic achievement that might be had given



only certain technological advances. Many other scenarios are possible, of course, and those developed were deliberately positive. But the consensus at The Lab was that all the scenarios were credible, so they probably do represent real opportunities.

## Diverse Solutions, Proactive Government and Advances in Technology are Key

In view of policy implications, the full two days of discussion and debate might be briefly summarized in the following manner.<sup>1</sup>

### Oil dependence is a danger that needs addressing

Despite much disagreement about how close “peak oil” is, all seemed to agree that action is needed now to reduce the developed world’s dependence on oil.

### Solutions to the problems being faced will be diverse

Different environments are likely to beg different solutions and the diversity of technological developments that bear on the issues prevent simple answers and argue for multiple alternatives to be investigated.

The variation across the scenarios developed suggests that multiple approaches will be needed in parallel, covering conservation, alternative forms of generation, and storage and transmission technologies. The best solution or combination of solutions for a given region will vary with external factors (climate, population density, access to water, etc.) and with developments in numerous interacting technologies. The appropriate focus can vary dramatically depending on the existing situation. For example, a focus on coal in the short-term is sensible for China, if the aim is energy independence, while France might see nuclear in a similar light. In lower latitudes, solar energy will be more quickly economically viable than in higher latitudes, where geothermal may be a better choice. In all cases, conservation makes sense as a priority and gives the most rapid return on investment.

Given this diversity and uncertainty, it seems sensible to recommend broad investment in energy-related R&D and a systematic, inclusive, and iterative analysis of the energy situation at regional scales.

It is worth noting that only two currently achievable sources of energy are sufficient for global needs in the long-term and truly sustainable. They are solar and geothermal energy.

Areas of technological focus to be considered are just as diverse – see section 2 on technological and sectoral trends.

<sup>1</sup> Any misrepresentations of the opinions of the group are of course the fault of the author.

### In the developed world government action is probably essential

The ramifications of energy supply disruption and the time needed to change our infrastructure suggest that appropriate change cannot be expected to arise from market and social forces. Accordingly, governments need to be a key player in developed countries. Proactive action from government is almost certainly necessary to avoid the risk of severe economic disruption.

Much of the rest is down to technological developments and their impacts on the economic competitiveness of certain technologies. Though solar emerged from the Lab as the winner in terms of chief long-term global energy sources, the means of capturing it, transporting it and using it produced no clear favourites. The range of possibilities from domestic to industrial to automotive applications in a diverse range of environments suggests that all avenues of research should be actively explored. Since solutions will likely be more complex than the current rather monolithic systems, flexibility, interoperability and rapid adaptability are critical success factors.

### In the underdeveloped world, small changes or actions may have a large and lasting positive effect

When tackling the issue of poverty on a global scale, there may be a possibility of achieving much with little (Scenario 1), given certain technological shifts.

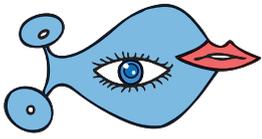
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The participating thought leaders were:

- Nathalie Horbach – Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee;
- Simon Taylor – director and co-founder, Global Witness;
- Christof van Agt – independent participant, formerly at the International Energy Agency;
- Paul Holister – technology impact consultant;
- Humberto Schwab, director of the Club of Amsterdam and innovation philosopher, led the process.



# Future Prospects of Care Facilities and Services for the Dependent Elderly in France

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<b>Sponsor:</b>	French minister of social security, elderly, disability and family affairs		
<b>Type:</b>	National – but includes case studies on other countries		
<b>Organizer:</b>	The Strategic Analysis Centre (former <i>Commissariat au plan</i> )		
<b>Duration:</b>	2005-2006	Time Horizon: 2025	Date of Brief: April 2008

## Purpose

*Following the submission of an initial report in July 2005 on the evolution of illness related to old age and estimations of the number of accommodations available for the dependent elderly, the French minister in charge of elderly affairs asked the Strategic Analysis Centre to further consider how to provide and finance the care of dependent persons until 2025. Relying on a single quantitative scenario, the report proposes a global strategy turning on several key principles: a preference for in-home care and supplying treatment in a welcoming environment, reliance on technological and social innovation, the qualitative improvement of establishments housing the most dependent persons and the use of new regulatory tools in order to promote performance and a better territorial distribution.*

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## Creating a Free Choice Scenario

For economic and social reasons, the French government is willing to give the elderly a freedom of choice regarding healthcare and accommodations. Such a policy requires the simultaneous and complementary development of services designed to care for the elderly in their own homes as well as access to retirement homes.

A policy to that end has been launched in the framework of the first “Ageing and Solidarity” plan, which includes a significant attempt to increase availability of all the types of care for the dependent elderly. Efficient investment implies an extensive study of a balanced scenario including the development of a global offer covering all types of home and institutional care.

In this respect, the minister in charge of elderly affairs asked the Strategic Analysis Centre to:

- establish the number of additional rooms in homes for dependant elderly (EHPAD<sup>1</sup>) needed from 2010-2015 and an estimation for the year 2025,
- anticipate the number of home care assistants required in these two time horizons,

<sup>1</sup> Abbreviation for the French term “Établissement d’hébergement pour personnes âgées dépendantes”.

- analyse the geographical distribution and propose guidelines for better EHPAD accommodations,
- examine issues related to financing and ensuring an even geographical distribution.

A first report was elaborated in 2005 with quantitative forecasts including various scenarios of home and institutional care capacities. The second report, published in June 2006, proposes a single scenario, including an estimation of the requested workforce, taking societal and financial aspects into account.

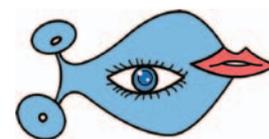
### ***Developing the Scenarios and Political Options***

Studying the ageing society implies taking different variables into account such as demography, healthcare improvement, the development of people’s behaviour and also various political options.

In addition to the Strategic Analysis Centre’s staff, the National Institute of Economic Statistics (INSEE), the National Solidarity Fund for Autonomy (CNSA), the health ministry’s department of statistics (DREES) and other central administration resources were solicited for this exercise.

### **First Report: an Extensive Quantitative Analysis**

The first report aimed at exploring possible scenarios for the development of the number of accommodations available



for the dependent elderly (EHPAD) for the years 2010, 2015 and 2025. This exercise required the following sequence of calculations:

- elderly population growth,
- the development of the prevalence of dependency within this population,
- the consequences in terms of demand for home and institutional care,
- achievable supply of accommodations and workforce in this sector.

As a result, five scenarios were adopted to reflect different balances between home and institutional care. In addition, each of these scenarios was developed based on two different dependency rates and for three time-horizons.

In order to calculate the respective workforces that would be required for home and institutional care in each case, the team also had to envisage different levels of assistance.

### Second Report: Further Exploration of a Single Scenario and Elaboration of Recommendations

The second report was elaborated by a group of 60 experts from various local and national institutions, universities, hospitals and associations. Their work also relied on the results of an ethnological study carried out in three different homes for dependent elderly.

First, the group conducted an in-depth analysis of a single scenario by distinguishing different levels of dependency and types of skills required for health care and assistance. The results were used to predict the development of the labour market in this sector until 2025.

Workshops were then organised in order to arrive at recommendations on how to conceive future homes for dependent elderly and optimise the financing of national and local schemes addressing the ageing population.

## More Intensive Institutional Care for the most Dependent

Demographic development is reasonably predictable. The following chart gives a projection of the number of dependent elderly aged 75 and older:

	x 1000				
	2005	2010	2015	2025	2030
High projection	682	741	808	920	1 017
Low projection	657	691	732	805	855

Source: Insee Destinie, projections Drees-Insee

The first report established five possible scenarios in order to capture the broadest possible range of impacts of population ageing on the caring system:

- Scenario 1 assumed that the current distribution between home care and institutional care would remain constant, thus predicting an increased need for places in rest homes and other care institutions.
- Scenario 2 and 3 planned for an increased recourse to home care: for all elderly, irrespective of the level of dependency prevalence (sc. 2), and for all elderly with the exception of the most dependent (sc. 3). These two scenarios led to a reduced need for specialised accommodations.
- Scenarios 4 and 5 envisaged an increasing recourse to institutional care: for all elderly in scenario 4; for the most dependent only in scenario 5.

Scenarios 2 and 4 were abandoned as too extreme, whereas scenario 3 was chosen as the most efficient and socially satisfactory framework for the future development of the French elderly care scheme.

### Forecasts on Needs for Accommodations and Human Resources

In this scenario, the rate of the most dependent elderly benefiting from institutional care is expected to reach 67% by 2010 and then be stabilised. Simultaneously, the rate of less dependent elderly who benefit from home care is expected to rise progressively.

This scenario thus assumes two consequences in terms of accommodations and human resources:

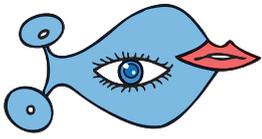
- intensified care in specialised institutions and
- more dense and diversified types of home care.

### Needs for Specialised Facilities

Consequently, with the projected institutional care rates, the report recommends increasing the number of places in specialised facilities up to 680 000 in 2010 – among them 610 000 for the elderly aged 75 and older – and to stabilise this number after 2010.

The following targets for the distribution of places for the 75+ population show that, even within the institutional care solution, priority is given to temporary, flexible care solutions.

	2010	2015	2025
Little medicalised accommodations	90 000	90 000	90 000
EHPAD	420 000	402 000	392 000
Long-stay hospital accommodations	60 000	60 000	60 000
Temporary accommodations	40 000	58 000	68 000
<b>Total</b>	<b>610 000</b>	<b>610 000</b>	<b>610 000</b>



Reaching these targets implies various actions: a sustained effort to create new places by 2010, but also withdrawing licences from obsolete structures and converting some non-specialised accommodations into EHPAD.

**Increased Need for Institutional and Home Care Personnel**

The population in specialised institutions can thus be expected to increase by 2010 and be comparatively more dependent than it currently is. These two trends justify the need for a drastic increase in personnel in these institutions. The report team has chosen to rely on two projections in terms of supervision rates (number of staff per 100 residents):

- a low projection: from 57.4 in 2003 to 75.7 in 2025,
- a high projection: from 57.4 in 2003 to 81.4 in 2025.

As regards home care, the growing share of elderly people who would benefit from this solution implies that the need for staff in the medical, paramedical and social home care sector will also clearly increase.

In the current situation, each dependent person benefits from an average assistance volume of 150 hours per month (the calculation is based on the French dependence allocation distribution). The report team suggests increasing this average volume by 55 % by 2025. It must be noted that these projections are based on the assumption that the help currently received by the elderly from their relatives will remain constant, which is all but certain.

Need for institutional and home care staff 2005-2025:

	2005	2010	2015	2025
<b>Low institutional care projection</b>				
Institut.-care staff	233 400	279 900	296 700	315 500
Home-care staff	375 600	415 500	501 400	739 500
<b>Total</b>	<b>608 900</b>	<b>695 400</b>	<b>798 100</b>	<b>1 055 000</b>
<b>High institutional care projection</b>				
Institut.-care staff	233 400	290 000	313 800	333 000
Home-care staff	375 600	415 500	501 400	739 500
<b>Total</b>	<b>608 900</b>	<b>705 500</b>	<b>815 200</b>	<b>1 072 500</b>

In terms of job creation, in total, 342 000 to 360 000 positions will be available in this sector over the next ten years, which represents 4,6 % of all available positions in the French economy (this includes net creations and replacements after retirement). Net job creation in the elderly care sector alone can be expected to account for 11 % of new jobs in France over the same period.

**Guidelines for Better EHPAD Accommodations: Diversification and Territorial Distribution**

**The Social Background to the Free Choice Scenario**

The target population (aged 85+, 2015-2020) forms a very different social group from today’s elderly. The current baby-boomers are more individualistic; they have developed an identity of active (and exigent) consumers, are geographically and professionally mobile and are used to actively deciding upon matters affecting the course of their lives. These features will have to be taken into account in drawing up tomorrow’s care system and the care accommodations it is to provide. This system and the related accommodations will have to:

- answer a broad diversity of needs and thus provide an equally broad diversity of adapted services and
- take into account a diversity of life territories, values and cultures, and thus be equitably distributed geographically to allow the elderly to maintain their life habits.

An EHPAD should ultimately provide its residents with all needed services and assistance, while being a true living place in the full sense of the word. This includes several objectives, which have some technical impacts.

**Supporting a Project for Life and Maintaining Social Life**

- Project for life: EHPAD should be conceived so as to allow the residents to further develop and not to simply “end their lives”. This includes preserving their freedom in terms of time and space organisation, favouring creativity and encouraging autonomy.
- Social life: Residents should be encouraged and supported in the perpetuation of their social life through the preservation of family links. This means that exchanges between the residents and the exterior should be encouraged (vicinity, city, village, etc.).

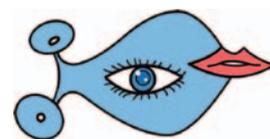
**EHPAD’s Projected Features to Answer these Needs**

Localisation elements

- The geographical distribution of EHPADs should allow residents to remain in the vicinity of their former place of residence in order to facilitate preserving their family and social links.
- EHPAD’s localisation should ensure a social openness: opportunities for the residents to leave the facility and have access to a city or village.

Technical features

- Space organization in EHPAD should provide the residents with private, intimate spaces as well as with community spaces.
- Specific features of the accommodations should allow a customisation of individual living quarters (mobile walls, Internet connections, etc.).



#### Organisational features

- Security and health norms should be intelligently adapted in order to provide the residents with all necessary services and care while infringing as little as possible upon their liberty.
- A provision of diversified services should allow the residents to be provided with any needed service (medical and non-medical).

## Dual Policy Challenge: Services Synergy & Balanced Geographical Distribution

The overall financing need over the 2006-2025 period is estimated at a total between €14-29 billion. This would represent around 1.1 % of GDP in 2010, 1.2 % in 2015 and 1.5 % in 2025.

This financial effort is considered not to be insurmountable, on two conditions: that savings are made in other domains in order to alleviate the burden on the social security resources and that an efficient redistribution is conducted between the hospital sector and the dedicated elderly care system.

### Ensuring Sufficient Care Personnel

#### Professional Staff

A specific effort will have to be made to make medical, paramedical and social professions in the elderly care sector more attractive than they are today and to ensure an efficient balance between childcare, hospital care and elderly care staff.

#### Support to Involved Relatives

Several European states provide financial and fiscal incentives to relatives who reduce their working hours or even suspend their own careers to take care of a parent. In particular, France could follow the example of the German system where the social security system comes up for the social security contributions of people who have stopped working to take care of an elderly person.

### Rethinking Programming and Efficiency

Proposing diversified care services while maintaining a fair geographical and cost distribution implies two levels of action:

- **Evaluating and programming at the national level** in order to take inventory of the global needs and appreciate the relative financial burdens that have to be assumed locally. The team suggests that all involved actors adopt a unified evaluation methodology, which means rethinking the whole current social aid system. The state would have to shoulder a share of necessary start-up investments to

ensure that the restructuring is initiated not only in the wealthier regions but rather equitably throughout the whole territory.

- **Transferring a larger share of responsibilities** (if not all of them) for elderly care to the French *départements* (sub-regional administrative level). As local administrations, they would be in a better position to adapt the services offered to local needs and specificities. In this respect, the report team suggests that a better synergy between all types of services be organized, for instance, by allowing EHPADs to manage, through new regulatory rules, the coordination between private and public, medical, paramedical and social services.

### The Follow-up

The report was made public in late June 2006 at the same time as the government's "Solidarité Grand Age" plan, which it heavily draws upon. The plan concerns the 2007-2012 period and is projected to cost the French social security system €2.7 billion. While most of sector's representatives have overall welcomed this plan, the related financial allocation was viewed as underestimated.

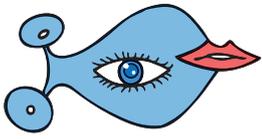
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# Security of Energy Supply: A Quantitative Scenario Study on Future Energy Systems for the EU-25 for 2030

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<b>Sponsor:</b>	European Parliament, Committee on Industry, Research and Energy (ITRE), IP/A/ITRE/ST/2005-70		
<b>Type:</b>	Single issue		
<b>Organizers:</b>	Wuppertal Institute for Climate, Energy, Environment, Doepfersberg 19, 42103 Wuppertal, Germany, info@wupperinst.org; Government Institute for Economic Research VATT, Arkadiankatu 7, 00101 Helsinki, Finland, webmaster@vatt.fi		
<b>Duration:</b>	01/2006-08/2006	Time Horizon: 2030	Date of Brief: April 2008

## Purpose

*The quantitative scenario study on the EU energy system focuses on the security of energy supply and different alternatives for the EU energy system. Five different scenarios for the EU-25 energy system by 2030 were developed. The scenarios were then grouped into two main families called “advanced conventional” and “domestic action” and their respective pros and cons analysed with regard to all relevant EU-policy fields for providing policy recommendations.*

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## The Dual Challenge of Climate Protection and Security of Energy Supply

The EU currently faces two different challenges with regard to the future development of the EU energy system and the question of the “security of energy supply”. Firstly, the era of cheap and abundant conventional energy resources appears to be coming to an end. This means that maintaining reliable supply levels implies significant and timely investment in new and more expensive oil and gas production, which will put upward pressure on world market prices for oil, gas and, to a lesser extent, coal – with potential impacts for economic development and growth. Furthermore, the geographical concentration of oil and gas export potential, combined with newly emerging large energy importing economies (i.e. China, India) can be expected to intensify international competition for market access to the declining resources and, ultimately, may also generate international conflicts.

Distinct from these issues, a second challenge has emerged. Climate change requires substantial reductions in global greenhouse gas emissions, which essentially means using less energy and switching to carbon neutral energy carriers.

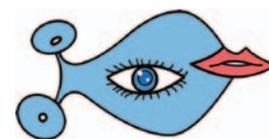
Both challenges require determined and timely action from the EU and its member states, as well as from the international community at large. A conventional, albeit advanced, “business

as usual” (BAU) strategy is likely to face increasing problems when trying to adequately cope with these simultaneous challenges.

In order to analyse important strategies and/or technology decisions (higher/lower nuclear share in electricity generation, increased energy efficiency and use of combined heating and power [CHP], increased use of renewable energies) and highlight a range of possible future energy solutions for the EU-25, five different scenarios have been developed according to the strategies and targets requested by the European Parliament’s Committee on Industry, Research and Energy (ITRE).

## Five Options to go Ahead

In order to draw different possible futures of the EU energy system, five scenarios based on two main sources were designed. The basic data, economic assumptions and the main results for the BAU scenario were derived from the latest available EU energy and transport projections (Decker 2006, Mantzos 2006, Mantzos & Capros 2006). Demand-side projections and analyses of higher penetrations of energy efficiency and renewable energies were derived from a recent scenario analysis by the Wuppertal Institute (Lechtenböhrer et al. 2005a/b). The quantification and combination of potentials, costs, strategies, policies and measures, and the calculation of scenarios were carried out using the Wuppertal Scenario Technique.



In the business as usual (BAU) scenario, the continuation of energy policy trends would already lead to a strong primary energy efficiency increase within the EU-25. However, this increase would not be sufficient to compensate for growing GDP. As a consequence, primary energy demand would increase by almost 15 % and import dependency by more than a third. Due to an increased share of renewable energy sources (RES) and a switch to natural gas, CO<sub>2</sub> emissions would increase by only 3 % to 6.6 %, depending on the nuclear energy policy. With regard to climate policy, it is assumed in the BAU scenario that the EU-25 will accept international emission reduction targets for the commitment periods after 2012 of 15 % by 2020 and 30 % by 2030.

The N+ scenario – as defined in accordance with the request by the ITRE committee – is a variant of the BAU scenario based on the expansion of nuclear energy (thus N+). While in the BAU scenario nuclear capacity declines by 28 % from 141 GW (2000) to 101 GW in 2030, in the N+ scenario the construction of about ten more new nuclear power plants of 1300 MW each is assumed, which would result in a nuclear capacity of about 126 GW in 2030 – or 25 % more than in the BAU scenario. CO<sub>2</sub> emissions in power and steam generation decrease by about 6.6 % vs. BAU by 2030, whereas total emissions from the EU-25 decrease by 1.9 %. Furthermore, this scenario also includes the use of carbon capture and storage (CCS), which can further reduce CO<sub>2</sub> emissions, albeit fairly modestly in the case of the EU (another 6 %~7 % of the power sector emissions compared to BAU).

The N– scenario marks the other end of a range of possible nuclear energy BAU scenarios. Power plants are assumed to perform less well in this scenario and this, together with waste issues and a stronger perception of the risks of nuclear energy, combines to increase the pressure on plant operators. Consequently, no new nuclear power plants are commissioned and a number of nuclear power plants will not reach a lifetime of 40 years. This results in a decline of nuclear capacities to 76 GW in 2030. In total, CO<sub>2</sub> emissions in this scenario would be at a level of 72 million tonnes, or 1.9 %, more than in the BAU scenario by 2030.

The energy efficiency (EE) scenario assumes strong policy at EU level, as well as within the member states, targeted at accelerating the rate of increase of energy efficiency in order to reach a level of energy efficiency 50 % higher than in the BAU scenario by 2030. This means that energy efficiency (GDP per ktoe primary energy use) would increase by 2.2 % per year and reach 10.5 MEur/ktoe in 2030 (BAU: 8.5).

The renewable energy expansion (RE) scenario describes a restructuring towards a renewable energy system with a target of approaching a renewable energy supply as high as possible by 2030. To achieve such a high share of renewable energy, the scenario combines an even stronger drive towards energy efficiency (11.9 MEur/ktoe by 2030) with an accelerated expansion strategy of renewable energies, which reach a share of 31 % of total primary energy supply in 2030. This strategy depends on the feasibility of the projected 34 % share of fluctuating energies (wind, hydro, solar, tidal and wave) in the electricity system and on the feasibility of accelerating energy efficiency improvement to 2.7 % per year.

## Policy Choices

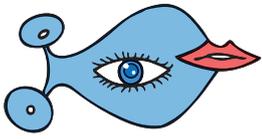
The five scenarios developed for the study have been analysed with regard to the core energy policy fields. Brief discussions on recent trends, followed by implications for policy needs with regard to the different scenarios, have been discussed for each scenario.

The energy issues considered in this report interact directly and indirectly with many European policies, in particular the climate policy, the Lisbon strategy and the external (energy markets) policy, which do not focus exclusively on energy but function as framework policies. These policy areas with wider scope can significantly influence the feasibility of potential pathways for the development of the energy system. In addition to these crosscutting policies, the following key energy policies are touched upon in the study: single European energy market, energy efficiency, renewable energies and energy technology policy.

Table 1: Comparison of the scenarios – results for 2030

Scenario	CO <sub>2</sub> emissions (% Δ 1990)	Primary energy demand (% Δ 1990)	Import dependency	Nuclear share in electricity generation	RES share in PE demand	Energy efficiency growth rate (2000-2030)
BAU	+4.7 %	+14.6 %	64.8 %	18.7 %	12.2 %	1.5 %/ year
N+ (+CCS)	+3.0 % (+1.3 %)	+16.4 %	62.7 %	23.6 %	12.0 %	
N–	+6.6 %	+12.2 %	66.5 %	13.8 %	12.4 %	
EE	-18.8 %	-8.2 %	59.8 %	15.7 %	15.0 %	2.2 %/year
RE	-45.1 %	-20.1 %	49.1 %	16.4 %	31.4 %	2.7 %/year

Source: own calculations, Wuppertal Institute, 2006



## ***Policies on EU External Energy Markets***

The comparison of scenarios with regard to policies on EU external energy markets shows that quite different challenges lie ahead in each scenario. In the BAU scenario – and in both nuclear scenarios – particular emphasis would be needed on external energy supply through the establishment of stable political relations with oil and gas producing countries and (for gas) transit countries and the mobilisation of huge investments – most of all for natural gas. In BAU/N+ the extended efforts to promote clean energy technology transfer in conjunction with a widening use of emission trading (notably the EU's emission trading system and clean development mechanism) are, to some extent, favourable to global stability but, on the other hand, also need global political stability.

The energy efficiency scenario and a fortiori the renewable energy expansion scenario would significantly relieve the pressure on external supplies to the EU due to decreased imports, while offering additional options to mitigate the worldwide depletion of fossil resources.

## ***Single European Energy Market***

In spite of the general current policy lines for the creation of the legal and technical provisions for a single European energy market, which are important in all scenarios and have still to be developed, quite different challenges would lie ahead in each scenario.

In the BAU scenario – and in both nuclear scenarios – current policy trends would have to be pursued and even accelerated. Large investment would be needed for improvements of gas and electricity networks – about €45 bn to €50 bn for electricity grid investment including cross-border transmission, about €11 bn to €14 bn for long distance gas transmission, gas storage and liquefied natural gas terminals (CESI et al. 2005) and about €800 bn over the 25-year scenario period for huge replacements in the existing stock of condensing power plants.

The energy efficiency scenario and, to an even greater extent, the renewable energy expansion scenario would present significant new challenges regarding accelerating progress in energy efficiency and the restructuring of the energy system towards higher shares of renewable energy sources and of CHP in district heating and industry. Grid investments for electricity would be expected to be near the upper limit of the above-mentioned numbers, while those for natural gas would approach the lower end. Investments for new power generation would be 20% lower in the EE scenario than in the BAU scenario and 10% lower in the RE scenario. In the RE scenario the effect of much lower capacity is partly offset by higher cost per kilowatt installed. Furthermore, investment would be completely different. While even in the BAU scenario investments in new CHP and renewable capacities are projected to overtake investments in fossil and nuclear generation, the

latter will stand in the EE scenario for only 20% of total investment and in the RE scenario for less than 10%.

## ***Policy for Energy Efficiency***

The comparison of the current EU policy towards energy efficiency with the three scenarios – BAU, EE and RE – shows some crucial results.

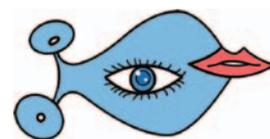
The current EU demand side energy efficiency policy would (by definition) be sufficient in many fields to realise the BAU scenario as well as the two nuclear scenarios N+/N-. However, particularly in the transport sector, in electrical appliances and in industry, further action would be needed. Further action would be necessary as well to protract these policies until 2030. On the other hand, the current political targets with respect to energy efficiency, as set out by the Green Paper “Doing more with less” and the Energy End-Use Efficiency Directive, would not be achieved in the BAU scenario.

A much stronger policy for energy efficiency in the EU would be needed in order to meet the energy efficiency and the renewable energy expansion scenarios. This policy would have to instigate strong and rapid action in order to implement ambitious efficiency targets close to the technical optimum, introduce further stepwise improvements in the energy efficiency of cars, appliances, buildings and businesses, strengthen technology development and provide substantial financial support and appropriate institutions. The evolution in energy market design would also affect the progress in energy efficiency and renewable energy use by affecting end use prices, investment in new and efficient (CHP) generation capacity and the prospects for the introduction of demand side management policies.

## ***Policy for Renewable Energies***

It is assumed that the EU will pursue a very active policy to promote renewable energies in all scenarios. As the analysis of the existing policy shows, broad additional activities are indispensable even in the BAU scenario. However, in this scenario – as in all the others apart from the RE scenario – set targets will be missed and the EU would have to solve the problem of further fostering a supportive framework for renewable energies against a background of possible disappointment.

In the renewable energy expansion scenario on the other hand, both current targets and ambitious targets for the future (20% in 2020, 35% in 2030) are achievable. However, the scenario also illustrates that these targets require a substantial restructuring of the whole energy system and economy by using the opening window of opportunity presented by the ageing energy system and its subsequent high reinvestment need. It appears that current policy for renewable energy – in spite of its impressive success – is not yet in a position to implement the changes needed for the realisation of this scenario.



## Conclusion and Policy Implications

### Two Ways to Go

The scenarios discussed in this report can be grouped into two main strategies.

The first type of strategy could be called “advanced conventional”. This route is described by the BAU scenario combined with the N+ scenario and specific greenhouse gas mitigation options of carbon capture and storage and, particularly, the use of clean technology transfer and other flexible mechanisms to achieve emission reductions outside the EU.

The other type of strategy, “domestic action”, relies much more on the domestic potential of renewable energy sources and energy efficiency and seems to have the capability to adequately cope with both major challenges so that the risks emanating from these are significantly lower.

Both strategies have crucial preconditions that may pose severe challenges to their feasibility. The advanced conventional strategy crucially relies on the successful implementation of an active foreign energy and technology transfer policy. Strong international competition for energy resources may become an increasing threat for this crucial foreign policy link. However, this scenario would carry less risk with respect to the management of change inside the domestic European society, since changes tend to be less radical than in alternative scenarios. The domestic action strategy, on the other hand, would swap, to some extent, the external threats from climate change and geopolitical turmoil for bigger challenges with respect to the management of the more radical changes inside the domestic European society (i.e. within the EU and its member states). More specifically, this strategy would stand or fall on the successful restructuring of the EU energy system and the bulk of all investment decisions.

### Robust Strategies

In spite of the diverging, and at least partly mutually exclusive, directions in which energy policy could steer (energy) policy choices, there are a number of policy actions that would be required in any strategy and which differ only in terms of intensity. Consequently, these policy areas should be given high priority for securing energy supply regardless of the strategy prioritised.

- The first strategy is enhancing demand side energy efficiency including cogeneration.
- The next robust option concerns renewable energies. All the scenarios assume high increases in this area as well, particularly in wind power generation and biomass use. What is more, some policies are already partly in place and the current targets on the EU level already correspond

to a very ambitious RE scenario, but need to be supported by stronger policies and expanded by 2020 and 2030.

- In the energy market overall, and taking into account the efforts being made to enhance energy efficiency, it is also important that retail pricing of electricity appropriately reflect its scarcity and emission impacts on the wholesale market.
- Robust steps towards a future EU external energy and climate policy include the fostering of clean development and clean technology transfer, as this will strengthen international relations, partly relieve demand pressure on energy markets, create additional or strategically needed emission credits and expand markets for renewable and efficiency technologies, which would, in turn, support the domestic development of these technologies.

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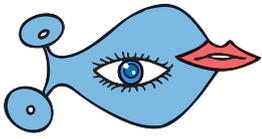
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# Research, Technology and Innovation Policy in Vienna

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<b>Organizer:</b>	Municipal Department MA 27, Christian Wurm – christian.wurm@wien.gv.at; www.magwien.gv.at/forschung		
<b>Duration:</b>	2006-2007	Time Horizon: 2006-2015	Date of Brief: March 2008

## Purpose

*In 2006, the City of Vienna initiated a far-reaching, open strategy process on the orientation of its future research, technology and innovation (RTI) policy. The aim was to develop, in a participatory process, a comprehensive strategic framework and concrete proposals for municipal RTI policy actions until the year 2015. By then, Vienna is aiming to be among Europe’s leading metropolitan areas in research, technology and innovation, as the hub of a network of research locations in the Central European Region (CENTROPE). The objectives, challenges and fields for action to be tackled in order to reach this position were translated into a set of concrete measures, some of which are to be started in 2008.*

## Vienna as a Centre of Science and Research in Central Europe

Vienna is the key centre for science and research in Austria as well as in the wider central European area to which it belongs. With its “twin capital” Bratislava being only 60 km away, it occupies a unique position in Central Europe. As mirrored in international benchmarks, the Austrian innovation system has gone through a phase of fast growth of R&D expenditures and internationalisation. Austria is increasingly recognised as one of the leading European countries in research. Austria has accomplished major structural reforms, affecting universities as well as research funding bodies, many of which are located in Vienna. Simultaneously, several Austrian regions have initiated or reinforced their RTI policies. Vienna already launched an active RTI policy in the early nineties and was now confronted with the necessity to revisit the institutional and RTI policy landscape.

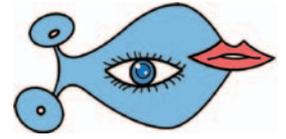
At the same time, new challenges were identified that would have to be tackled in order to keep pace with the international developments in science, technology and innovation, with new employment patterns and with the need to further upgrade research and innovation performance. In 2006, it was therefore decided to initiate a process of strategic debate, bringing the growing number of diverse actors together in an open and self-critical debate.

## Systems Research in the Urban Area: Groundwork for RTI Policy

The strategy process was built on solid ground. In addition to a number of specific studies, it drew on the results of the large-scale research programme “Systems Research in the Urban Area” that provided the analytical groundwork and took first exploratory steps towards identifying future challenges to the RTI policy of the City of Vienna. The results of the programme later on served to fuel the debates in the different expert panels in the strategy process phase.

The goal of this comprehensive research programme was to identify scientifically founded observations and analyses to underpin the development of an integrated, future-oriented urban research and innovation policy.

Initiatives in this urban policy area were expected to contribute to enhancing the competitiveness of firms in the city, thus fostering the socio-economic development of the Vienna metropolitan area by giving those impulses a regional government can specifically provide. Central to the research programme was the combination of different perspectives on the current situation of the urban innovation system.



### Strategic Development in Four Scenarios

The preliminary results from the various analyses from different perspectives were brought together during a forward-looking integration phase in spring 2006, i.e. before the start of the actual strategy process. In this phase, four scenarios were developed, which served as a backdrop for later elaborating elements of an RTI policy strategy for the city of Vienna. The essence of these four scenarios is captured in their titles:

- Innovative niches: application potential of science and technology;
- Fast second mover: exploitation in the focus;
- Multi-centric excellence: leveraging complementarities;
- Excellence4me: Vienna as a centre of science.

## From Fragmentation to Strategic Action: “Wien denkt Zukunft”

Following this preparatory phase, which was initially not even intended to lead to a participatory strategy process, the main phase of the project “Wien denkt Zukunft” started in November 2006 with a major kick-off event attended by over 500 participants.

The title “Wien denkt Zukunft” is actually a wordplay, which is not fully captured by the English translation “Vienna Looks to the Future – knowledge means change”. Over the following twelve months, a broad participative debate on RTI policy strategies for the city was conducted. Many players coming from various units of the municipality, from universities and other research institutions, from the education sector, and from (high-tech) business contributed to the process. The discussion was intended to develop a comprehensive strategy and vision for municipal RTI policies by both identifying areas for action and implementing adequate policy measures until the year 2015. The figure below shows the course of the described process:

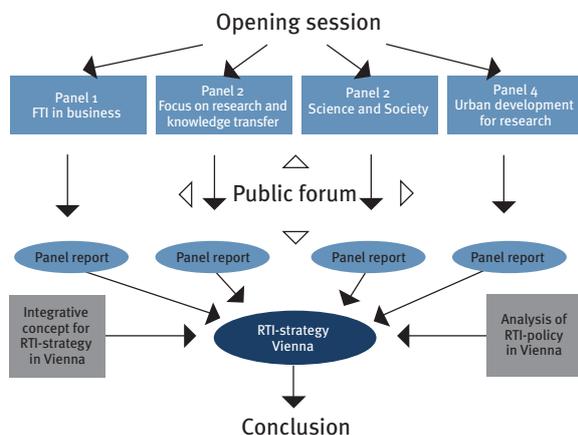


Figure 1: Proceeding “Wien denkt Zukunft”

Inspired by the preparatory research, four core themes were identified on which experts panels focused their work (see Figure 1):

- RTI in business;
- Research priorities and knowledge transfer;
- Science and society;
- Urban development for research.

Each of the panels was chaired by a leading actor in urban RTI policy, coming either from a municipal department in charge of research agendas or from a public research funding agency in charge of research agendas, in order to ensure the ownership and link with current policy initiatives.

In addition, four crosscutting topics were included in the work of all panels:

- Gender aspects;
- Human resources;
- EU-policy;
- Networking.

## Viennese RTI Strategy goes Public

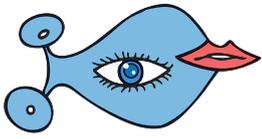
The process started with a kick-off event (opening session) at City Hall with prominent proponents from politics, academia and business and several hundred participants. After the opening session, the panels established themselves and each panel met between three and five times over the following months. In addition, regular inter-panel meetings and meetings with the supporters were held throughout the whole period. A website served to document the discussion and also offered the public an opportunity to contribute to the process with own ideas and proposals throughout the whole period.

The participatory nature of the strategic process is demonstrated by involving more than 100 players from various areas in the panelwork. Additionally, major public events were organized at the beginning, half-way through and at the end of the process in order to gather further input from a broad range of stakeholders, complemented by interactive tools made available on the accompanying website ([www.wienddenktzukunft.at](http://www.wienddenktzukunft.at)).

### Identifying Ambitious Objectives

One of the goals of the strategy process was to identify targets and objectives for optimising the process of research and innovation with the help of the multi-level RTI policy measures used in Vienna. The identified targets and objectives for developing the RTI strategy for the city can be summarized as follows:

- increase Vienna’s research expenditures to 4% of the gross city product;
- 22,000 individuals employed in the R&D sector;
- 800 companies engaged in R&D;



- 20% of the population having a university degree;
- 200 SMEs taking part in projects of the EU's Seventh Research Framework Programme (FP7);
- rate of female researchers in the business sector is to increase by 100 per cent.

## Five Main Challenges

A cross-panel analysis revealed five main challenges that would need to be tackled over the coming six to ten years:

- Making effective use of the potential for research, technology and innovation by creating adequate conditions for young people, irrespective of their origins, to pursue a successful career as scientists and researchers.
- Enhancing RTI quality and visibility with respect to international competition for investors.
- Embedding RTI into society: providing space and occasions for public discussion about RTI, its opportunities and challenges.
- Accelerating the dynamics in RTI by creating adequate infrastructure.
- Integrating Vienna RTI within European networks and strengthening co-operation within the CENTROPE region in order to create a common RTI area that will successfully compete in Europe and in the world.

Bearing in mind this broad spectrum of options, the RTI process "Wien denkt Zukunft" identified five key fields for action on which the City of Vienna will concentrate its RTI policy in the next years:

- Human resources – Bright Minds for Vienna: The goal of activities in this field is to make better use of the city's enormous human resource potential. Various activities will serve to improve the prospects and conditions for highly qualified young scientists, with a special focus on gender issues and populations that have been neglected in the past (e.g. university graduates with a migration background).
- Key areas – profile and relevance: Specific thematic areas that are both relevant and visible are to be supported, building in particular on the existing key areas of life sciences, information and communication technology and creative industries. In addition, the development of a number of new avenues of research and innovation is being promoted.
- Research and the city – communication, learning and public awareness: The three terms form a catchphrase to express the serious interest in strengthening the critical public dialogue about RTI, both within Vienna and on the international stage. By means of a new set of measures called "Vienna research in dialogue", a critical and continuous exchange of knowledge about RTI with the citizenry is to be fostered.
- Vienna as a hothouse for research and innovation – facilitating new developments. Further improvement of working conditions for scientists and creative individuals are called for by providing local networks as breeding grounds for invention and creativity.
- A European location for research and innovation – Vienna as a hub for international networks: Vienna is to be established as the centre of international research networks, and of networks in the CENTROPE region in particular. In this context, Vienna's network-based location of research and innovation will be further strengthened.

## Addressing the Challenges

Within its jurisdiction, the City of Vienna can provide stimuli for achieving the identified goals. Options for translating these goals into specific measures can be conceived along the lines of the main determinants of innovation ranging from push factors in the area of science (e.g. R&D subsidies, selective subsidies complementary to national subsidies), through acceleration of the transfer process (selective measures such as licensing initiatives, venture capital), to pull factors in the area of socio-economic demand or application potential on the demand side.

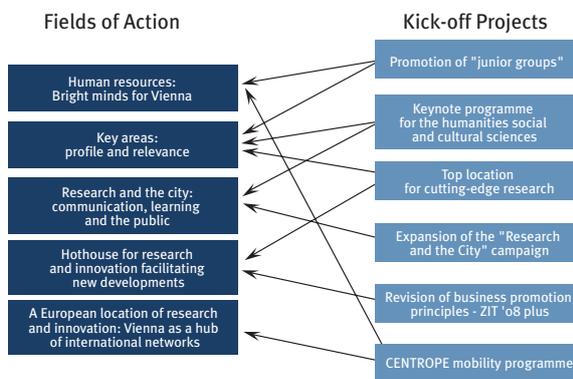
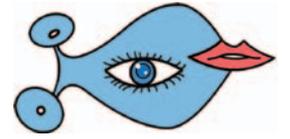


Figure 2: Objectives and challenges

## The Schedule for 2008

Based on the objectives, challenges and measures identified during the strategic process "Wien denkt Zukunft", several concrete proposals for new projects or initiatives were developed in the five fields of action. Six of these projects have been prioritised ("kick-off projects") and are likely to be implemented in the coming two to three years (see Figure 2). For the year 2008, the initial three projects have been endowed with approximately €14 million.

- Under the title of a "Keynote Programme" for the specific fields of research in the humanities, the social and cultural sciences (on the side of the already well established programmes for life sciences, information technologies and the creative industries) will be actively promoted. One of the first calls in this area was scheduled to start March 31.



- Expansion of the “Research and the City” campaign. Under the slogan “Vienna research in dialogue”, the City will address essential contemporary and future issues in the field of science, research and technology. Communication between the various special interest groups and organisations will be encouraged and strengthened.
- In revising the City of Vienna business promotion principles – “ZIT o8plus” – more attention will be given to crosscutting issues of RTI policies, such as promoting innovation in the service sector, encouraging research cooperation and gender mainstreaming.

## Sources and References

More Information is available at:

<http://www.wiendenktzukunft.at>

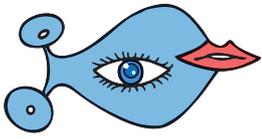
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An English summary is available at:

[http://www.wiendenktzukunft.at/downloads/strategie\\_english.pdf](http://www.wiendenktzukunft.at/downloads/strategie_english.pdf)

For information concerning “Systems Research in the Urban Area” visit: [www.innovationspolitik-wien.at](http://www.innovationspolitik-wien.at)



# Foresighting Food, Rural and Agrifutures in Europe

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Sponsor:	EU Directorate-General Research		
Type:	EU Foresight Exercise		
Organizer:	EU Directoral-General Research Mr Elie Faroult / elie.faroult@ec.europa.eu		
Duration:	July 2006	Time Horizon: 2020	Date of Brief: April 2008

## Purpose

*Through a renewed mandate in 2005 aimed at strengthening the coordination of research efforts in Europe, the Standing Committee on Agricultural Research (SCAR) launched a foresight process to consider the prospects for agriculture in 2015-2020 and to help identify political answers to the challenges raised. In July 2006, the European Commission's Directorate-General Research set up a Foresight Expert Group to support SCAR in identifying long-term research priorities to support a European knowledge-based biosociety. The group was given the remit to formulate possible scenarios for European agriculture in a 20-year perspective allowing for the identification of evidence required (for more robust policy approaches) and innovation needs in the medium to long-term.*

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## Europe's Agrifuture Challenges

Europe's agri-food industries and broader rural economies are being rapidly reshaped, predominantly by global trends and policy developments, combined with a diverse range of non-monetary issues, including food safety/security, environmental sustainability, biodiversity, biosafety and biosecurity, animal welfare, ethical foods, fair trade and the future viability of rural regions. European agrifutures are evolving within the context of the EU's overarching policy drives (Lisbon and Gothenburg), which project Europe as

- the most **competitive** and dynamic **knowledge-driven (sustainable)** economy, and
- a **responsible** global player, particularly vis-à-vis developing countries.

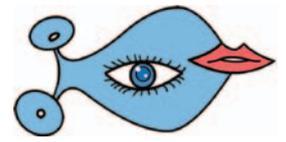
The point of departure for addressing these policy drives is not to consider them as mutually irreconcilable, but to define the most appropriate and effective approaches for creating **synchronous efforts** thereby generating added value. The "agri-environmental" measures in Europe's Common Agricultural Policy (CAP) have been promoting development that incorporates environmental issues and CAP in general is being reoriented towards a wider rural policy perspective integrating environmental issues and rural development perspectives.

## Terms of Reference

The Foresight Expert Group, composed of a chair, rapporteur and eight domain experts,<sup>1</sup> was tasked to work in close collaboration with the EC services involved and the SCAR working group, under the coordination of the Commission's foresight unit (DG RTD E-3), to review and **analyse foresight information** relating to European agriculture in relation to eight major driving forces (economy and trade, science and technology, rural economy and regional development, societal and demographic changes, climate change, non-food and energy, environment, health).

This analysis was to lead to a **working paper** for each driving force. Based on this analysis, the group of experts would agree on a minimum of **three futures scenarios** (20-year horizon) for European agriculture and an analysis of the implications for evidence required (for more robust policies) and innovation needs in the medium to long-term. The work was to take into account foresight activities on a global, European and national level, including other ongoing EU projects in this area.

<sup>1</sup> Thierry Gaudin (Chair), Jennifer Cassingena Harper (Rapporteur), Giovanni Anania, Kerstin Cuhls, Liam Downey, Jos Leyten, Jorgen E. Olesen, Yves Schenkel, Mari Walls, Peter Raspor, Elie Faroult (DG Research).



The main objective of the exercise was to set research **priorities** for the medium to long-term. The terms of reference included:

- The gathering and analysis of foresight information on the eight major drivers.
- Preparation of a foresight paper on each of the major driving forces for agriculture in Europe and perspectives for agricultural research.
- Using the information produced during the first part of the study to conduct a foresight exercise to predict possible futures scenarios (20 year perspective) for European agriculture.
- On the basis of identified scenarios, to assess the implications for research and innovation requirements of European agriculture over the medium to long term.
- To present a draft report based on papers presented on the “major drivers” at a foresight conference in early 2007 and production of a final report.

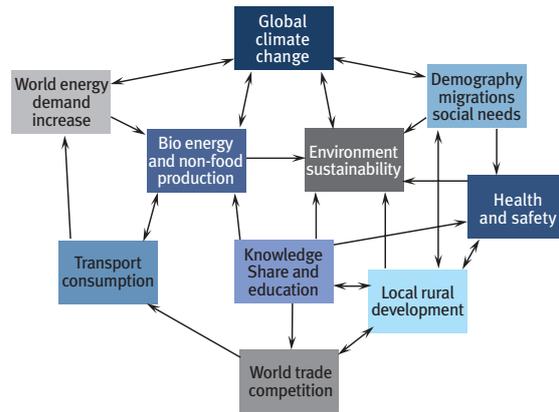


Figure 2: Cross-impacts of major driving forces

## A Creative Disruption Approach

The expert group opted for a disruption scenario approach with four scenarios developed through a simple method, whereby each expert identified four “disruption factors” emerging over the next 20 years. These factors were grouped into three blocks: “**climate disruption**” (the most significant); “**energy disruption**” and “**social**” questions: health, safety, employment. The following “wild cards” emerged: “intellectual property” disruption and “**monetary disruption**”. Four scenarios emerged and a baseline scenario was subsequently developed.

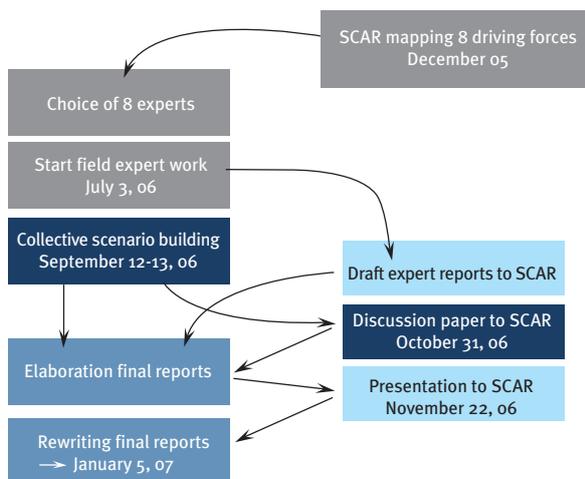
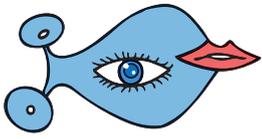


Figure 1: Working process

## Disruption Scenarios

- 1- **Climate Shock** starts with climate change and the acceleration of related environmental impacts as the driving disruption factor. This scenario combines a primary business as usual scenario – with differing geographical climate impacts, no European-level action is taken, and a crisis situation ensues – with a success scenario built into it at the end, where positive action is taken on a national level. It underlines a fundamental challenge that Europe will increasingly face with the onset of climate change impacts on agriculture, namely how to coordinate European policy responses to the diverse regional and local impacts of climate change bearing in mind different regional contexts and framework conditions.
- 2- **Energy Crisis** focuses on energy supply vulnerability of Europe as the key disruption factor and the acceleration of related economic and societal impacts as the key drivers. This scenario also combines a business as usual scenario, a crisis engineered by the energy global players, with a success scenario developing at the end as a result of Internet-based community empowerment and action. It implies a strategic research emphasis at the European level to support in the short-term the improved networking of farmers and researchers with a view to addressing urgent knowledge needs, instituting faster mutual learning processes and supporting communities of practice.
- 3- **We Are What We Eat** focuses on food health and society as sources of disruption jointly determining a more community and consumer-oriented research agenda. This scenario combines an initial crisis situation with a success scenario approach with clear guidelines for an effective European research agenda. It highlights the advantages of a citizen-oriented research where science and technology are effectively harnessed to address the real needs and concerns of citizens. The main priorities relate to quality, safe and functional foods for a range of emerging lifestyles and technologies to produce primarily citizen-oriented enabling environments for knowledge production and



exchange together with socially-driven, environmentally effective products, processes and services.

**4- Cooperation with Nature** focuses on society, science and technology as key joint drivers evolving in a beneficially symbiotic relationship. This primarily utopian scenario projects an ideal situation where science and technology have been effectively deployed to ensure sustainable development at all levels. The key to addressing these needs is the transition to local small-scale production and a shortening and transparency in the food supply chain, and Internet, open learning, and ambient systems creating more globally aware, sustainability conscious consumers.

## Agro-Food Sector Bound to Change

In spite of the excellent performance of Europe's agro-food system in recent decades, the European Union is now facing a major **disruption** period in terms of international competitiveness, climate change, energy supply food security and societal problems of health and unemployment. Disruption means fast change, resulting in both positive and negative impacts and thus the main challenge facing agro-food actors is the **speed of adaptation and proactive responses to secure a European lead in this area**. Systemic approaches show that decentralised systems adapt themselves faster to change than centralized ones. A careful assessment of agricultural research and innovation systems is needed to identify and modify the places where centralised decision-making generates rigidity, in research as in policy.

### *Decentralised Adaptation*

Decentralised adaptation relies on a high performance information system allowing the decision makers, each operating at his level, to use in real time the **best upgraded data** necessary to implement their rationality. Technology now offers the operational tools to put upgraded data at the disposal of the farmers and decision makers of the food chain and to allow an exchange of experience between actors.

### *Early Warning System*

Through **satellite** imaging and Internet diffusion technologies it is now possible to build an **early warning, free access** information system on climate change and its long-term consequences for ecosystems. This system has still to be developed and marketed and training provided to the end users. The Internet is emerging as a powerful tool for facilitating the development of worldwide networks linking growing communities of practice in a number of agriculture-related areas and themes. The Internet not only changes the research framework and conditions, but also the link

between researchers and end-users of research results and has the potential to facilitate a more proactive engagement of rural communities, farmers and citizens in the design and implementation of ongoing research and knowledge exchange activity. In order to facilitate these interactions, eEurope strategies at the European and national levels need to cater for the extension of **broadband access at affordable prices to rural communities, farmers, citizens and other stakeholders**.

### *Overcoming the Barriers towards a Knowledge-based Biosociety*

One of the major hurdles facing Europe in making the transition to knowledge-based agrifutures is the need to address the growing challenge of knowledge failures. European agricultural research is currently **not delivering** the type of knowledge that is needed by end-users in rural communities as they embark on the transition to the rural knowledge-based biosociety. The problems are not exclusive to agricultural research but are felt more acutely in this sector where the role of traditional, indigenous knowledge is already being undermined as a result of the growing disconnection with ongoing research activity.

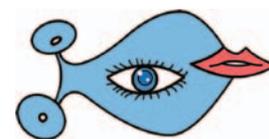
### *New System of Education and Knowledge Diffusion*

The social dimensions of the shift to the knowledge-based bio-society are rendered more complex by the demographic and mobility/migration factors. They call for new systems of **education and knowledge diffusion** and careful consideration of the implications for education as we enter a new system characterised by a shift from engineering, physical and mechanical sciences to converging technologies.

Knowledge exchange strategies and policies, already in place in the more advanced EU member states, need to be formalised and given a higher profile at the EU level, as stand-alone strategies and not merely as add-ons to research and innovation policies and good practices shared with other member states. Knowledge exchange policies differ from innovation policies per se, although they also interconnect with them. The main emphasis of knowledge exchange policies is to ensure the relevance and accessibility of knowledge to communities, farmers, consumers, young people and educational institutions.

## A Case for Action

1. More coordinated EU, national and regional policy responses to a range of challenges that affect the world rural agrifutures and facilitate the **shift to a knowledge-based biosociety are needed**.



2. An overview of emerging global trends, policy developments, challenges and prospects for European agrifutures point to the need for a **new strategic framework** for the planning and delivery of research is called for, addressing the following challenges:

- **sustainability challenge:** facing climate change in the knowledge-based biosociety;
- **security challenge:** safeguarding European food, rural, energy, biodiversity and agrifutures;
- **knowledge challenge:** user-oriented knowledge development and exchange strategies;
- **competitiveness challenge:** positioning Europe in agri-food and other agricultural lead markets;
- **policy and institutional challenge:** facing policy-makers in synchronising multi-level policies.

3. The complex, dynamic interconnection of challenges, facing European agriculture research from a forward-looking, 20-year perspective requires strategic European policy responses right now. This will entail redesigning the institutional framework for research and putting in place a two-track approach for agrifutures research:

- a **transition research agenda** to address the more immediate sustainability and safety/security concerns and the radical transformation arising from the reform of the CAP, combined with
- a more long-term **high-tech research agenda** to ensure that appropriate high-tech research investments are put in place so that Europe's agrifood industries and rural economies retain their competitive position in global markets.

4. To raise the capacity of rural regions to generate, participate in and translate research developments into economic growth, a regionally-focused, **demand-driven approach** to research and innovation needs to be developed. A basic requirement is a dedicated funding system designed (i) to capitalise on regions' comparative advantage, by mobilising all resources available towards attainment of context dependent and demonstrably attainable goals, and (ii) to exploit good practices and models in the governance and delivery of research, technology implementation and innovation.

5. The competitiveness challenge and demographic decline facing rural communities, combined with reduced global financial support to agriculture, may lead the EU to adopt, under emergency pressure, a **temporary protectionist** strategy. Long-term, strategic and institutional capacities in **knowledge transfer, public early warning on ecosystems evolution** and decentralised systems of agricultural research and approaches are of even more central importance in the transition from a subsidies-driven to a knowledge-driven biosociety.

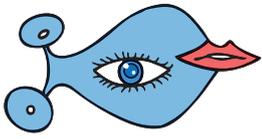
6. Continued, active engagement in foresight is critical for enhancing the strategic and institutional capacities of Europe's agricultural policy-making and research and knowledge-transfer organisations.

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Gaudin, Thierry et al. (2007), Foresighting food, rural and agrifutures.

[http://ec.europa.eu/research/agriculture/scar/index\\_en.cfm?p=3\\_foresight](http://ec.europa.eu/research/agriculture/scar/index_en.cfm?p=3_foresight)

[http://ec.europa.eu/research/agriculture/scar/pdf/foresighting\\_food\\_rural\\_and\\_agri\\_futures.pdf](http://ec.europa.eu/research/agriculture/scar/pdf/foresighting_food_rural_and_agri_futures.pdf)



# Teagasc 2030: Reinventing the Irish Agri-Food Knowledge System

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<b>Sponsor:</b>	Teagasc the Irish food and agricultural research, advisory and training body			
<b>Type:</b>	Structural foresight			
<b>Organizer:</b>	Teagasc, CKA and SEZ			
<b>Duration:</b>	1.5 years	Budget: € 300,000	Time Horizon: 2030	Date of Brief: July 2008

## Purpose

*Teagasc means “teaching” or “instruction” in Gaelic. It is the name of the food and agricultural research, education and advisory body in Ireland. By 2006, fundamental changes happening to the Common Agricultural Policy in Europe were already being felt throughout the Irish agri-food sector. New and emerging issues were gaining importance and looked likely to have an impact on the sector. It was necessary to ask how Teagasc could maintain its relevance to clients and stakeholders as it moved ahead. The study builds upon previous foresight exercises and long-term strategic studies undertaken in Ireland and the EU.*

## Employing Knowledge for Developing a Positive Vision and Creating Opportunities

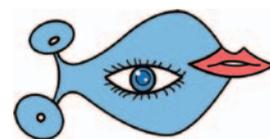
Teagasc 2030 was designed to establish a broadly-shared vision of what the Irish agri-food and rural economy would look like in 2030 and a vision of what Teagasc could become as the leading science-based knowledge organisation in the sector. It set out to develop the strategic capabilities of Teagasc, improve its ability to provide proactive leadership on complex issues, identify strategies and mechanisms to maximize the impact of its knowledge generation and procurement, technology transfer and education activities through innovation support and to develop an internal culture of continuous renewal.

**The Steering Committee (SC)** included key Teagasc managers, high-level representatives from relevant organisations, such as the university system and the Environmental Protection Agency, influential business leaders from both the farming and food sectors, as well as international experts. The members of the SC played a decisive role in the process in that they were fully engaged and provided constructive input each time the group convened. **The Working Group (WG)**, consisting of Teagasc employees aided by two international consultants, was responsible for the detailed planning and execution of the exercise. **The Foresight Panel (FP)** consisted of experts from Teagasc, representatives of

the farming and food sectors, as well as experts from the research community, including a commercial research service provider. FP members participated in and contributed to workshops and other activities organized by the WG.

Early consultations with the SC reinforced the need for a structural approach that went beyond the traditional sectoral view. The SC emphasized the need for new strategic capabilities that would enable the organisation to operate in a rapidly changing context. One of the first tasks of the WG was to review foresight exercises on food, agriculture and the rural economy that had been conducted previously, whether in Ireland or around the world, start a discussion on the scope of the exercise and get agreement on the nature of the results it should provide. The first observation of the WG was that previous foresight exercises on food, agriculture and the rural economy tended to focus on problems related to commodity markets and the Common Agricultural Policy (CAP) system of payments. It was resolved at an early stage that Teagasc 2030 would have to do more than this by identifying how knowledge could help create opportunities for young people in the sector and by developing a positive and realistic vision of an innovation-led rural economy.

The work itself was organized in two phases. A **Divergent Phase**, where the main purpose was to study issues relating to the organisation, the sector and the broader economy in a creative and exploratory fashion, brought in outside knowledge and expertise, as well as relevant case-studies



from abroad. The second **Convergent Phase** focused on choices to be made about desired outcomes, long-term visions for the future of Teagasc and the context in which it would operate, as well as the practical immediate steps to be taken on the basis of an action plan. Just before the end of the Divergent Phase a **Radical Thinkers Workshop** was organized to challenge peoples' thinking and try to overcome any remaining inertia or scepticism as regards new ideas and the necessity for change.

## The Divergent Phase

This consisted of paper writing on a number of key topics that provided important background to the members of the Foresight Panel. The papers were especially important as they allowed people who are not experts in a domain to get an overview of what is happening. The real action, however, was in a series of four workshops (WS).

### *Turning Towards a Knowledge Based Bio-Economy*

**WS1** consisted of a **scoping and profiling** activity to determine the boundaries of the Teagasc 2030 exercise and to verify that the FP included a sufficiently broad range of actors. Important discussions arose concerning how agriculture and food related to the use of land in Ireland, the relationship between this and both the rural and national economy, how both the theatre and the actors might be changing, and how there was a need to revisit ideas of who the typical Teagasc client was, is now or would be in the future. The immediate output of this workshop was strongly criticized by the SC as not being radical enough. It was thought too traditional or sentimental in its attachment to "land". The modern reality consists of urban agriculture, gardens on the sides of buildings, forests, marine and lake habitats, greenhouses and bio-reactors, as well as a food industry that has long outgrown a dependence on local production and that in some sectors relies almost entirely on imports for raw material inputs. This workshop started a process of reflection that lasted until the end of the exercise.

The feedback of the SC on the results of this first workshop was very important. Its intervention ensured that some of the issues addressed in the workshop did not conclude prematurely, but stayed open and continued to be debated for the best part of a year. New ideas need time to mature. The workshop started a process whereby traditional and ultimately limited thinking about farming and the rural economy were replaced with entirely new thinking about the knowledge-based bio-economy or **KBBE**.

**WS2** focused on trying to understand relevant **drivers** of change, the factors shaping the future of Teagasc and the environment in which it operates. The focus was on identifying the drivers and the **impacts** that they could have

on the economy in 2030. The discussion included references to **trends** and **trend breaks**. The exercise was intended to help people develop their "intuition" about 2030.

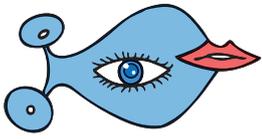
**WS3** focused on strategic **issues** and started the process of formulating the opportunities and challenges that the various sectors and stakeholders would face in 2030. By this stage the concept of the "**Sustainable KBBE**" had started to come into focus.

**WS4** was about developing **scenarios** to further develop thinking **about** the "Sustainable KBBE" in 2030, to further explore and define the issues and challenges, and to identify the **big questions**, whose answers would impact on the structures and programmes of Teagasc going forward.

A **Radical Thinkers Workshop** was timed to take place between WS3 and WS4 to provide new ideas to the ongoing foresight process. This consisted of a series of talks followed by discussions, involving speakers from a variety of areas who were capable of presenting challenging views on relevant topics. It involved scientists, geographers, venture capitalists and policy-makers. For some participants it was an opportunity to hear for the first time about a renewable chemicals industry based on crops grown for their chemistry rather than for food, feed or fibre. For others, it was an opportunity to hear what foreign experts think. A venture capitalist provided his vision of where important opportunities for investment would arise in future. A Danish speaker raised important questions about the organisation of research and innovation when he explained that, while Denmark performs about 1% of all global research, Danish industry requires access to the other 99% of global research if it is to achieve or maintain global competitiveness.

## The Convergent Phase

This consisted of a series of three workshops involving the FP and had to provide an actionable plan for the transformation of Teagasc. Such a plan would require the commitment of Teagasc senior managers. It had to be something they would own and act upon. To make sure that they were adequately prepared, a series of internal meetings was arranged involving senior managers and representatives of the WG to help them understand the implications of the exercise, identify the main axes of change for the organisation and anticipate the detailed requirements of the last workshop. Although the foresight workshops were usually animated by members of the WG with help from the external consultants, the goal was for key sessions of the final workshop to be led by members of senior management with support from the WG. At the same time, an internal dissemination or consultation process took place involving all parts of the organisation. The goal was to explain what was happening and gather feedback on the changes required for moving forward. An external consultation process separately involved farming and food industry representatives.



It too explained the ideas that were emerging. It gathered feedback and inputs from Teagasc clients as inputs to the final stages of the foresight exercise.

**WS5** was dedicated to the development of **scenarios** about the **Sustainable KBBE**. In particular, the goal was to develop more specific thinking about the role of knowledge, learning, research, innovation, training and advice in the sector in 2030.

**WS6** was used to finalize the **scenarios** and flesh out a **vision** for the sector in 2030 along with an identification of its knowledge requirements and the role that Teagasc would occupy in the system.

**WS7** was devoted to the issue of organizational transformation and the **directions of change** for Teagasc. The senior **management** meetings played a significant role in determining the structure of this last meeting. Based on their discussions it was decided to focus on transformation under the major headings of **leadership, partnership and governance**.

The issue of leadership originally emerged in meetings of the SC and was echoed in discussions with industrial stakeholders. Leadership gaps emerged on long-term scientific and technological issues not only for small and medium-sized enterprises, but for larger companies as well.

## The Vision of a Sustainable Bio-Economy

One of the most important results was the development of a vision for the Agri-Food and Rural Economy in 2030 as a “**knowledge intensive, innovative, internationally competitive and marketled bio-economy**”. This helped to place the sector at the centre of something big and positive, with significant opportunities that would play a role not only in the rural economy, but also in the general knowledge economy, via its contribution to climate change, energy security, sustainability and the transition to a post-petroleum era.

Recognizing that countries with excellence in agriculture have opportunities for moving up the value-chain by selling not only their products but their know-how, the final report speculated about a time when the most important export of the dairy sector in Ireland might no longer be its milk, cheese, yoghurt and functional foods, but its management expertise and its technical knowledge about the organisation of competitive dairy production systems.

### **The Four Pillars of the KBBE**

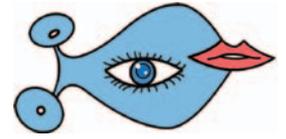
From an Irish perspective it made sense to complete this vision by distinguishing “**four pillars of the KBBE**”:

- **Food Production and Processing**, which mainly represents mature industries where competition is relentless and global, where competitiveness often relies on efficiencies of scale, automation and process technologies, as well as scientific management and competitive sourcing.
- **Value-Added Food Processing**, which includes advanced food processing and food service, functional foods, as well as food-additives and ingredients, bio-actives, nutraceuticals and cosmaceuticals. This sector is fast moving and innovative. There is continuous adoption and improvement of technologies for production, processing, distribution and preparation. Supply chains are constantly changing and considerable attention is given to intangibles such as patents, brands, provenance and traceability.
- **Agri-Environmental Goods and Services** includes food-safety and traceability, animal welfare, energy security, climate, clean air and water, fertile soils, bio-diversity, areas of public amenity, natural beauty and those of importance for cultural heritage. Although these are normally treated as spin-offs from other activities based on multi-functionality, they are given a separate identity in recognition of the overall role they will play in the quality of life of citizens, in energy and climate security as well as in the overall sustainability of society and the economy.
- **Energy and Bio-Processing** includes the production of feedstock for bio-fuels and bio-polymers. This sector makes substantial investments in harnessing knowledge. It places great importance on knowledge as a factor of production. It corresponds to new and emerging areas of science and to entire new markets. It is characterized by a high level of risk and provides opportunities for government support to lead markets. This sector is where high-value-added and commodity sectors of the future are being created.

### **Demographics Facilitating Change**

A key observation concerning the future of Irish agriculture was the observation that approximately 40 % of farmers in Ireland would retire in the next 10 years and that almost all farms would change hands at least once by 2030. This pointed to an opportunity to use the unavoidable dynamic of retirement and property transfer to restructure the farming sector so that land as a natural resource could make the greatest possible contribution to the economy. This would include enabling successful farmers to increase the area they manage and less successful ones to move on perhaps using models based on leasing.

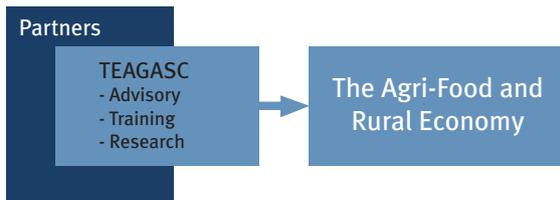
Discussions arose about “future farmers” and “foresight farmers”. It is possible that the land transfers that will happen in the coming years will give rise to a younger, better educated and more international generation of farmers. Armed with agricultural MBAs, or degrees in bio-technology, many will approach farming as a business more than a family tradition or vocation. Their approach would be less sentimental and



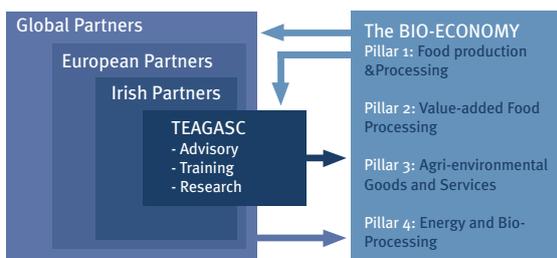
more scientific-entrepreneurial. Such farmers represent very different clients for Teagasc than those it has served before.

### Leadership, Partnership and Governance

One of the most important currents of debate throughout this foresight exercise concerned the traditional push-approach to technology transfer, the so-called “linear model”. The old approach was summarized as follows



whereas Teagasc in 2030 would need to focus on innovation support that would resemble something more like this:



One challenge that emerged was the need to become more demanded as an organisation. Another challenge emerged from the recognition that no organisation can meet all of its research or knowledge needs internally and that an increasing share of these would need to be sourced outside. This is something that traditional research organisations are not used to doing, and, in future, they will need to engage both private and public service providers, as well as cooperate with international knowledge networks.

The vision that emerged for Teagasc as an organisation in 2030 was that of an organisation suffused with a culture of support for innovation by its clients, capable of:

- providing **leadership** where necessary on innovation-related issues,
- developing and maintaining the **partnerships** required for research, innovation, technology transfer and education,
- employing **governance** mechanisms to assure relevance and accountability to its clients and stakeholders.

### Creation of a Permanent Foresight Unit

In many ways, the implementation of the action plan started even before the exercise was finished. A part of the action plan is a natural continuation of consultations with major stakeholder groups that was started as part of the foresight process. The most immediate and tangible result was the

creation of a permanent foresight unit within Teagasc to oversee the implementation of the Teagasc 2030 action plan and to support other foresight activities as needed within the organisation.

The action plan is outlined in the Teagasc 2030 report. It includes steps to create a broader culture of innovation within the organisation and to intensify systematic interaction with client groups and stakeholders. It addresses reform of personnel structures to enable greater mobility of staff within the organisation, facilitate transdisciplinary work and align incentives with the needs of clients. Other structural reforms include a focus on network-based activities, as well as time-limited project-network-like interventions such as technology platforms and commodity working groups that pool the resources of partners and involve stakeholders in management.

The general message of Teagasc 2030 is a positive one based on the opportunities offered by the KBBE, not only for actors currently involved in the agri-food and rural economy, but for a whole new generation of bio-entrepreneurs who may have no prior link to the land.

The key to success continues to be innovation. What is new is the pace of innovation and the need for organisations such as Teagasc to operate simultaneously on several fronts in a more international context and in shorter time frames. The challenge for Teagasc in the future will be to increasingly channel its efforts and resources towards support for innovation, in particular for the development of the knowledge-partnerships required by clients for innovation in the KBBE.

## Sources and References

All background papers, scenarios and proceedings as well as the final report are available from the Teagasc 2030 website at: <http://www.teagasc.ie/foresight/>

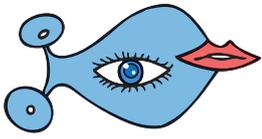
The papers and presentations of the Radical Thinkers Workshop are available at:

<http://www.teagasc.ie/publications/2007/20070725/index.asp>

<http://www.teagasc.ie/publications/2007/20070725/Crehan.ppt>

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# US Families 2025: Trends and Alternative Futures

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Sponsor:	NA		
Type:	Workshop, research and writing project		
Organizer:	Alexandra Montgomery		
Duration:	2005-2006	Time Horizon: 2025	Date of Brief: August 2008

## Purpose

*In response to a call for papers on the future of feminism from Futures, the international scholarly journal of Futures Studies, an informal workshop was organized to explore changes to US families and how the roles of men, women and children might be influenced by such forces. The “US Families 2025” workshop was conducted entirely on a volunteer basis and provided opportunity for both newcomers and experts in the field of futures studies to engage in foresight and futures methodology. The outcomes of the workshop were analysed from the perspective of futures literature and feminist theory to arrive at the article “US Families 2025: In Search of Future Families” published in Futures issue number 40 (2008) for the purpose of broadening the insights to and interpretations of the future with particular regard for gender as it relates to roles within marriage, reproduction, childhood and parenting.*

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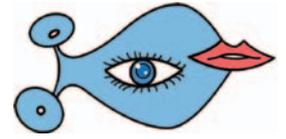
## Gender, “Family Values” and the Future of the American Nuclear Family

In January of 2005, George W. Bush was inaugurated to his second term as President of the United States. The red state (conservative) vs. blue state (liberal) divide seemed to influence a prevailing mood of culture wars, a contentious environment of leadership wielding power (and threatening to use it) over matters such as women’s reproductive freedom, children’s access to public education and a “marriage amendment” legislating the rights to wed – or not wed – the spouse of one’s choice. To outlaw abortion, ban gay marriage, cut off funding for children’s healthcare and starve social spending on education seemed an assault on the American family, not a championing of it. The sense that the US family had been exhaustively exploited as a pawn for political gain contributed to the idea behind US Families 2025: that an organized effort to explore fundamental changes impacting the family unit provided an opportunity to work on implications for the future of gender and offer social critique, as well as offer recommendations toward addressing various challenges of social inequality in the US.

## Project Background

There are two parts to the project: a workshop and a research/writing endeavour. The workshop US Families 2025 set out to achieve two objectives. The first was to provide an event for interested participants to explore the future of families. An open invitation was extended to a futurist community via university listserv. All who wished to attend were welcomed as voluntary participants. In this sense, the objective was to engage any and all individuals in the local futurist community who felt the topic was of importance. The workshop was designed to collect and organize information about trends and emerging issues as they relate to US families.

There was an informal guiding process, but the exercise was mainly an openended exploration of family – including marriage, childbirth, divorce, cohabitation, caretaking, domestic life and cultural norms – as reflective of wider social patterns, and the driving forces shaping the future of the US family unit. Families were defined as households with or without children, including single parents, “traditional” two-parent households, same-sex partners, unmarried cohabitating couples, and arrangements of anything other than a single person living alone. Lists of trends, emerging issues and four briefly outlined alternative futures were the output of the workshop.



The workshop was held with the intent of publishing the results and workshop participants were invited to contribute to the writing.

The second part involved analysis of the workshop outcomes with special attention to the implications for the future of feminism. The scenarios were interpreted with the role of gender in mind, supported with feminist theory and relevant futures literature. The desired end result was a publishable submission for the journal *Futures* in a special issue on gender.

## Workshop: US Families 2025

Workshop attendees were all from the Houston, Texas area, associated in some manner with the University of Houston-Clear Lake (UHCL) graduate program offering a Master of Science degree in Studies of the Future. Participants in the workshop were drawn from the student population, alumni and faculty.

The workshop followed a simple format of brainstorming, trend identification, and discussion of emerging issues and led up to a follow up session for outlining four future scenarios based on a Global Business Network (GBN) methodology. The workshop was facilitated informally, eliciting responses from the participants based on a worksheet called “Big Questions about the Future” designed by Dr. Peter Bishop of UHCL. A second meeting consisted of group collaboration on a GBN scenario exercise. Important uncertainties about the future of US families were identified; discussion of driving forces and four scenarios emerged.

Although the workshop was not largely publicized, the stakeholders may be defined as the entire US society at large. The topics of family and gender equality have impacts at personal and political levels. The ideas explored in the study might be of interest to policy-makers, market researchers, family counsellors, activists and individuals making conscious decisions about family organizations. Religious, political and educational leaders may find the topic relevant to their audiences. As a contribution to the futures literature on the study of women and society, the subject is relevant to students and practitioners of futures studies with an interest in social change.

## Four Alternative Futures

Four future scenarios resulted from the US Families 2025 Workshop, resulting from a GBN-inspired scenario exercise where the two main uncertainties (economic conditions and culture wars) are represented in the axes. The horizontal axis describes two extremes regarding future financial conditions: scarcity and long-boom economics. The vertical axis reflects

the two camps in the culture wars: progressive and orthodox, which may also be seen as liberal vs. conservative or so-called “traditional family values”. The table below illustrates the scenario quadrants and their characteristics:

**US Families 2025**  
The Culture Wars: Progressive

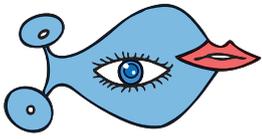
ECONOMIC SCARCITY	Mr. & Mrs. Right Now	the Marriage Market Place	LONG BOOM ECONOMY
	The New Waltons for the 21 <sup>st</sup> Century	Desperate Housewives	
The Culture Wars: Orthodox			

The scenarios each represent a quadrant of the GBN matrix in which two uncertainties were compared: economic conditions and the status of the Culture Wars. Each scenario reflects an extreme interaction of the two major uncertainties, a tactic that helps intensify the scenarios and generate urgency about the role of gender equality in terms of social/family structure.

Each of the scenarios also addresses a set of trends and emerging issues about the future of families. The trends are interspersed throughout the alternative future storylines and gain direction from the plot of the scenario. A conscious effort was made to cover economic, social/demographic and technological changes with the potential to impact the future of US families, and likewise be impacted. Emerging issues, such as the matter of workplace policies on employee absenteeism due to caretaker responsibilities, were addressed in terms of how resolution of the issue in one direction or another would impact social patterns.

### Selected Trends and Emerging Issues

- Smaller families having fewer children.
- Workplaces appealing to need for work-family balance.
- Number of single parent households, both male and female, increasing.
- Increasing status of fatherhood.
- Gender selection of offspring technology being utilized.
- Growing perception of demonstrable skills required for marriage and parenting.
- Merging/blending of office and home spaces.
- Increased use of government-funded financial incentives for marriage between men and women.
- Workplace absences due to caretaker responsibilities gaining attention as policy matter.
- Increased number of households located in exurbs and edge cities.
- Continued late age of parenting and marriage.



- Highly educated women participating in childrearing rather than careers.

### Scenario Descriptions and Implications

The intent of the scenario analysis is to offer insights along the lines of the future of the nuclear family, marriage, childbearing, childrearing, nurturing and caregiving, and the relationship between domestic/household arrangements and the status of women in society.

#### 1. Mr. And Mrs. Right Now

Transient relationships and equal economic partnerships between spouses amidst a backdrop of socially recognized non-kin emotional bonds characterize the scenario. There is an emergence of sharing economic and emotional resources to meet familial needs, particularly those of children.

**Implications:** In this future, adults beyond biological parents are permitted greater and more intimate access to children's lives. The implications of the dissolving of nuclear households could be either negative or positive for children, but it could balance the domestic responsibilities between men and women. Men gain appreciation for nurturing and care-giving with children and the elderly, which improves the empathy between men and women.

#### 2. Marriage Marketplace

Arguably a "baseline" scenario in which contracts, resumes and proven competencies determine partnerships formed for the purpose of reproduction, cohabitation, marriage and childrearing.

**Implications:** Marriage Marketplace hints at the potential for children to become valued only as material possessions, while men and women exist solely as commodities of the marketplace. The exaggeration of masculine and feminine is possible. Genetic trait selection, breeding and strict technological control over reproduction and offspring are possible.

#### 3. The New Waltons for the 21<sup>st</sup> Century

Named for a popular 1970s television programme celebrating the "traditional" American family, this scenario observes the extinction of dual-income families and the nuclear household.

**Implications:** Arranged marriage and polygamy threaten female autonomy while extended family households bear greater responsibility for survival of the domestic unit. As a consequence, there is widespread marginalization of any family forms beyond male-headed households. Furthermore, children are subject to strict behavioural expectations based on gender norms.

#### 4. Desperate Housewives

Women's rights to reproductive freedom, employment and divorce are challenged in this future. Men obtain elevated

status based on the number of offspring they claim. Financial incentives for marriage and childbearing are distributed as government stipends; the US childbirth rate explodes.

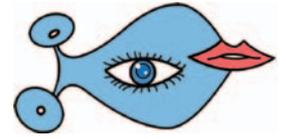
**Implications:** The elimination of extended family ties amidst overt patriarchy fractures contemporary women's liberation. For men, a large number of children bolsters one's social status; for women, they represent their lost access to birth control. Both women and men who deviate from the socially-prescribed gender norms are alienated.

Trends, critical uncertainties and emerging issues were taken to extremes to develop unexpected ideas about the future. For example, arranged marriages emerge in the New Waltons scenario as an expression of economic scarcity combined with stridently orthodox cultural values. Evoking such an unlikely event challenges the audience. The strategy of introducing seemingly implausible connections between gender and social equality to alternative methods of family and domestic social organization has the capacity to generate change in the present.

Important cultural differences exist between the US and the rest of the world in terms of families and relationships. At the onset of outlining the scenarios it was clear that many of the family forms we could project into the future probably already exist in other cultures. For example, while extended family is a norm in many cultures, it is all but obsolete in the US. However, immigrants from Latin America challenge the nuclear family with their extended households. Meanwhile many young children today are being raised by aunts, uncles and grandparents in the absence of biological parents. So the study avoids trying to identify anything "new" about families. In fact, it may be impossible to construct anything new at all about families. The value of foresight to raise awareness about the present – for instance, conduct social critique – while imparting a sense of change, is strengthened by the potential to increase cultural sensitivity.

## Feminist Theory: Alternative Family Futures and Visions of Gender Equality

Feminist social critique of the US has often identified the family and women's role in it as central to women's disenfranchisement. This analysis of the US Families 2025 scenarios, in terms of the future of gender equality, acknowledges mainly just one feminist premise: women's reproductive, marital and domestic roles define her social status. Multiple theories for the advancement of female equality exist, thus there are multiple frames of interpretation applicable to the scenarios. Each particular theory may be viewed as representing a utopian "vision" for the future of female equality. New social implications are drawn out of



each alternative future under the theoretical “lens” lent by a given “feminism”. Furthermore, this approach offers the suggestion that new theories of gender equality will continue to emerge and challenge women’s roles in society.

**Liberal feminism** can be defined as legal equality for women. From this view, the Marriage Marketplace scenario may be most preferable, since men and women have equal access to the marriage and family life of their choice. Family roles are flexible and impermanent, unlike the New Waltons future where matrimony suggests females are the property of men. Similarly, the Desperate Housewives alternative strips women of their right to divorce at will. The harsh economic conditions of Mr. & Mrs. Right Now offer the opportunity to cooperate with male (or female) partners, although there is also the threat of highly competitive conditions emerging.

**Utopian feminism** maintains that women’s unique characteristics are a form of social power. The potential for all women to express their autonomy is erased by the patriarchal slant of New Waltons and Desperate Housewives. A celebration of feminine qualities is observed in Mr. & Mrs. Right Now, since men and women alike take on childrearing as a valuable and essential task. The value of nurturing activity, meanwhile, becomes more complicated in the Marriage Marketplace. Marriage and childrearing are separate roles with different qualifications and neither may be entered without consent and understanding of the terms under which these roles will be enacted.

**Marxist feminism** looks upon the US capitalist system as a hindrance to female equality. Mr. & Mrs. Right Now demonstrates a future where capitalism largely suffers, suggesting this as a preferred future for Marxist feminism. Marriage Marketplace is a capitalist haven where women’s authority over their own fate is respected and equal access to capital is the norm. Marxist feminists may not condone the freemarket approach to gender equality, though. Desperate Housewives and The New Waltons commit women’s fate to reproductive and domestic slavery, thus a far cry from the Marxist school of thought concerning women’s rights.

**Postmodern feminism** interprets the marginalization of women as a by-product of the worldview where man is “self” and woman is “other”. Only the Mr. & Mrs. Right Now scenario pulls away from this duality by the introduction of communal households and childrearing. In the Marriage Marketplace, women can slip into commodity status, while the New Waltons and Desperate Housewives futures portray women as little more than baby-making servants. The New Waltons in particular emphasizes the role of fathers in objectifying women by strategically marrying-off daughters to ensure their own social status.

**Radical feminism** takes the position that women are universally oppressed by virtue of their sex. There is little

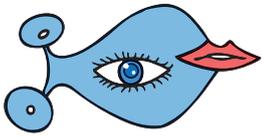
to be optimistic about in all four alternative futures in light of this view. Radical feminists might highlight the opportunities in the Marriage Marketplace and Mr. & Mrs. Right Now to avoid men altogether by entering all-female domestic arrangements. There is also the potential to enact a revolution in the face of blatant patriarchy evident in the Desperate Housewives future scenario. Women’s complete subservience to men under the New Waltons conditions may also work to emphasize the importance of gender equality.

### ***In Search of Feminism in Public Discourse***

The premise that female equality was secured by the women’s movement of the 1960s and 70s contributes to the dismissal of gender equality in mainstream public discourse. There is a tendency to overlook the interaction between family and women’s status and emphasize educational and employment opportunities as demonstrative of the advancement of female status. However, the rights of women are routinely challenged by efforts to restrict reproductive freedom, workplace policies that minimize women’s labour through unequal pay compared to men and by fringe social movements toward returning women to their “rightful” place as second-class citizens under the control of husbands and fathers. A more deliberate articulation and understanding of theories of feminism can correct the misconception that women’s equality has already been achieved. Furthermore, with a concerted effort to bring women’s rights to the table, it is possible that new theories of feminism will emerge. The application of genuine, practical and purposeful thinking about women and their social status will empower not just women but men and children as well.

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# Constructing Dark Scenarios for Privacy Policy Formulation

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Sponsor:	European Commission / DG Information, Society and Media			
Type:	Field/sector specific			
Organizer:	IPTS, Seville			
Duration:	2005-2006	Budget: € 399,797	Time Horizon: 2017	Date of Brief: July 2008

## Purpose

*In the last few decades, scenarios have provided a way of analysing the implications of alternative futures, especially as they might be impacted by new technologies. This has been no less true of ambient intelligence (Aml), which may be embedded everywhere in the not so distant future. Most of the scenarios developed by Aml enthusiasts have been rather “sunny”, showing how new technologies promise to make our lives more productive and enriching. A European project called SWAMI (Safeguards in a World of Ambient Intelligence) deliberately developed “dark scenarios” to highlight the threats to privacy, identity, trust and security and inclusiveness posed by new technologies. This brief describes the SWAMI scenarios and the methodology used to construct and analyse them.*

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## SWAMI Dark Scenarios

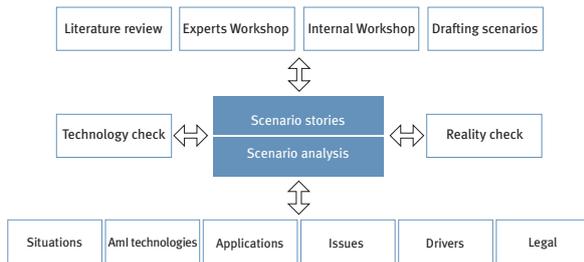
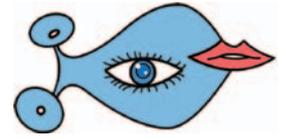
While most Aml scenarios paint the promise of the new technologies in sunny colours, there is a dark side to Aml as well. In a way, this dark side is inherent in the very nature of Aml, for instance, the fact that Aml technologies will deliver personalised services to users means that somewhere a lot of personal information needs to be stored about the user. That being the case, there are risks that the user's personal information can be abused, either accidentally or intentionally. These risks have been recognised by policy-makers and researchers, and were at the heart of the SWAMI project, funded by the European Commission under its Sixth Framework Programme.

The project began in February 2005 and finished 18 months later. The SWAMI consortium had five partners: the Fraunhofer Institute for Systems and Innovation Research (Germany), the Technical Research Center of Finland (VTT Electronics), Vrije Universiteit Brussel (Belgium), the Institute for Prospective Technological Studies (IPTS, Spain) of the EC's Joint Research Centre, and Trilateral Research & Consulting (UK).

One of the tasks of the project was to create and analyse four dark scenarios that highlight the key socio-economic, legal, technological and ethical risks to privacy, identity, trust and security posed by new Aml technologies. They were called “dark scenarios”, a term coined to signify things that could

go wrong in an Aml world, because they present visions of the future that we do not want to become reality. The objective of the scenarios was to expose threats and vulnerabilities as a way to inform policy-makers and planners.

The process in constructing the scenarios began with an extensive review of existing Aml-related projects and studies. Following a workshop with other Aml experts to discuss the most important threats and vulnerabilities posed by Aml, the SWAMI partners had a brainstorming session until we agreed on the rough outlines of four contrasting scenarios. We then developed these outlines into scenario stories or scripts. To ground the scenarios in reality – to ensure that they were not too far-fetched – we did a “technology check” (are the technologies referenced in the scenarios probable?) and a “reality check” (are there press reports of events similar to those mentioned in the scenarios?). Then each partner reviewed all of the scenarios in order to eliminate doubtful points, unnecessary wordage, irrelevancies, etc., and to sharpen them to illustrate the points to be emphasised. Once the scenarios were “stable”, we performed an analysis of them, including a legal analysis. The scenarios and associated analyses were presented at a second SWAMI workshop in order to benefit from the comments of other experts. This scenario-construction process can be depicted as follows:



The resulting four scenarios, elaborated in our book, *Safeguards in a World of Ambient Intelligence* (see the references below), are the following:

**Dark scenario 1:** A typical family in different environments – presents Aml vulnerabilities in the life of a typical family moving through different environments. It introduces dark situations in the smart home, at work and while taking a lunch break in a park.

**Dark scenario 2:** Seniors on a journey – also references a family but focuses more specifically on senior citizens on a bus tour. An exploited vulnerability in the traffic system causes an accident, raising many different problems related to both travel and health Aml systems.

**Dark scenario 3:** Corporate boardroom & court case – involves a data-aggregating company that becomes the victim of a theft of personal Aml-generated data that fuel its core business. Given its dominant position in the market, the company wants to cover this up but ends up in court two years later. The scenario also highlights the disparities between countries with Aml networks and those without.

**Dark scenario 4:** Risk society – from the studios of a morning news programme, this scenario portrays the Aml world as a risk society. It presents an action group against personalised profiling; the digital divide at a global scale and, related to environmental concerns, the possible vulnerabilities of Aml traffic systems and crowd management.

## Elements in the SWAMI Scenario Methodology

The SWAMI consortium devised a methodology, an analytical structure for both constructing and deconstructing scenarios, not only the SWAMI scenarios, but many other technology-oriented scenarios. The analytical structure comprises the following elements or activities:

### Framing the scenario

This first step summarises the scenario in question and explains its context – who are the main actors in the scenario, what happens to them, what they do, how far into the future is the scenario, where does it take place and in what domain

(home, office, on the move, shopping, etc.). It identifies the type of scenario (trend, normative, explorative) and key assumptions (e.g., intelligent technologies will be embedded everywhere in rich countries, but not in poor countries).

### Identifying the technologies and/or devices

Next, the most important Aml technologies and/or devices used and/or implied in the scenarios are identified.

### Identifying the applications

The analysis then considers the applications that emerge in each scenario and that are supported by the technologies mentioned in the previous step.

### The drivers

The analysis identifies the key drivers that impel the scenario or, more particularly, the development and use of the applications. Drivers are typically socio-economic, political or environmental forces, corporate ambitions or personal motivations (e.g., greed).

### Issues

Next, the major issues raised by the scenarios are identified and explicated. A discussion of the issues considered the threats and vulnerabilities exposed by the scenario, their impacts and legal implications.

### Conclusions

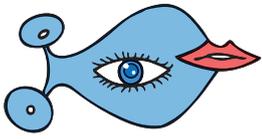
The final step is a reality check of the scenario itself (how likely is it?) and a consideration of what should be done to address the issues it raises.

## Large-scale Data Availability Multiplies Threats and Vulnerabilities

The SWAMI scenarios highlighted many of the threats and vulnerabilities that we foresee afflicting the Aml world. The principal difference (in our view) between an Aml world and that which we know today is the scale of the data available. When everything is embedded with intelligence, when Aml is pervasive and invisible, when everything is connected and linked, the threats and vulnerabilities that we know today will multiply. In an Aml world, we can expect to be under surveillance (“transparent”) wherever we go because the permanent and realtime registration and processing of our presence and behaviour is the precondition – the “code” – of ambient intelligence.

The threats to our privacy, however we define it, can come from many different sources. Here are some of the principal ones that affect us today and we can assume will still be threats in an Aml world:

- hackers and attackers,
- function creep,



- surveillance,
- profiling,
- lack of public awareness or concern about privacy rights,
- lack of enforcement and oversight of privacy rights,
- erosion of rights and values,
- uncertainties about what to protect and about the costs of protection and privacy erosion,
- government and industry are less than forthright about the personal data they collect and/or how they use that data.

## Is Protection Feasible? – Safeguards

The multiplicity of threats and vulnerabilities associated with Aml will require a multiplicity of safeguards. We grouped safeguards into three main approaches:

- technological,
- socio-economic,
- legal and regulatory.

### ***Technological Safeguards – Need for Sophisticated Methods for Controlling Data Collection and Use***

The main privacyprotecting principles in network applications are anonymity, pseudonymity, unlinkability and unobservability. The main difference between existing network applications and emerging Aml applications is two-fold: first, in the former case, the user has some understanding of which data about him or her are collected, and has some means to restrict data collection: e.g., to use a public computer anonymously to access certain web pages; to switch off his or her mobile phone, to pay cash instead of using a web service, etc. In the latter case, with the environment full of numerous invisible sensors (and video cameras), it is difficult, if not impossible, for users to understand and to control data collection and to achieve unobservability, anonymity and pseudonymity. Intelligent data processing, limiting linkability and implementing strong access control to collected data seem to be the main ways of protecting privacy in such applications. However, such applications present potential privacy threats anyway if the police, intelligence agencies, family members or criminals can search through devices that store personal data.

A second important difference between existing network applications and emerging Aml applications is that neither mobile devices nor web usage penetrates through such strong privacy-protecting borders as walls and the human body, but physiological, video and audio sensors, proposed for Aml applications, will have much stronger capabilities to identify a person and to reveal personal activities and feelings.

Consequently, future Aml applications will require stronger safeguards, many of which are not yet fully developed.

Hence, we proposed research on developing privacy-protecting safeguards such as:

- communication protocols which either do not require a unique device identifier at all or which require authorisation for accessing the device identifier;
- network configurations that can hide the links between senders and receivers of data;
- improving access control methods by multimodal fusion, context-aware authentication and unobtrusive biometric modalities (especially behavioural biometrics, because they pose a smaller risk of identity theft) and by liveness detection in biometric sensors;
- enforcing legal requirements and personal privacy policies by representing them in machine-readable form and attaching these special expressions to personal data, so that they specify how data processing should be performed, allow a privacy audit and prevent any other way of processing;
- developing fast and intuitive means of detecting privacy threats, informing the user and configuring privacy policies;
- increasing hardware and software capabilities for realtime data processing in order to minimise the lifetime and amount of raw data in a system;
- increasing software intelligence by developing methods to detect and to hide sensitive data;
- developing user-friendly means for recovery when security or privacy has been compromised.

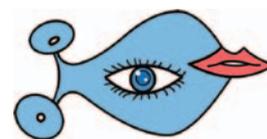
### ***Socio-economic Safeguards Require Cooperation***

Cooperation between producers and users of Aml technology in all phases from R&D to deployment is essential to address some of the threats and vulnerabilities posed by Aml. Among the socio-economic safeguards we proposed were these:

- standards,
- privacy audits,
- codes of practice,
- trust marks and trust seals,
- reputation systems and trust-enhancing mechanisms,
- service contracts with strong privacy protections,
- guidelines for ICT research,
- raising public awareness,
- including privacy, identity and security issues in the professional education curricula of computer scientists,
- media attention, bad publicity and public opinion.

### ***Legal and Regulatory Safeguards – Transparency Is Key***

SWAMI identified some serious legal problems when applying the existing legal framework to address the intricacies of an Aml environment. We found that most of the challenges arising in the new Aml environment should be addressed by transparency tools (such as data protection and security



measures). Transparency should be the default, although some prohibitions referring to political balances, ethics and core legal concepts should be considered too.

A set of rules needs to be envisaged to guarantee procedural safeguards similar to those currently applicable to the protection of our homes against state intervention (e.g., requiring a search warrant). Technical solutions aimed at defending private digital territories (the private sphere of the individual no matter where he is) against intrusion should be encouraged and, if possible, legally enforced. The individual should be empowered with the means to freely decide what kind of information he or she is willing to disclose. Such protection could be extended to the digital movement of the person, that is, just as the privacy protection afforded the home has been or can be extended to the individual's car, so the protection could be extended to home networks, which might contact external networks.

All employees should always be clearly and a priori informed about the employee surveillance policy of the employer (when and where surveillance is taking place, what is the finality, what information is collected, how long it will be stored, what are the (procedural) rights of the employees when personal data are to be used as evidence, etc.).

The status of pseudonymity under the law needs further clarification, whether pseudonyms should be regarded as anonymous data or as personal data falling under the data protection regime.

The obligation of data protection law to inform the data subject about when and which data are collected, by whom and for what purpose gives the data subject the possibility to react to mistakes or abuses, and enables him to enforce his right in case of damage. It would be desirable to provide the individual not only with information about what data are processed, but also what knowledge has been derived from the data. This might imply a rethinking of data protection law.

A means to prevent data laundering could be envisaged which would create an obligation for those who buy or otherwise acquire databases, profiles and vast amounts of personal data, to check diligently the legal origin of the data. An obligation could be created to notify the national data protection authorities when personal data(bases) are acquired. Those involved or assisting in data laundering could be subject to criminal sanctions.

Profiling practices and the consequent personalisation of the ambient intelligence environment lead to an accumulation of power in the hands of those who control the profiles and should therefore be made transparent.

Simply identifying safeguards is not sufficient, of course, so the SWAMI consortium went further and specifically addressed recommendations to the European Commission,

member states, industry, academia, civil society organisations and individuals. The reader interested in more details should consult the references below.

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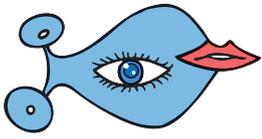
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# Germany 2020 – New Challenges for a Land on Expedition

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Type:	NA		
Organizer:	Deutsche Bank Research		
Duration:	2006-2008	Time Horizon: 2020	Date of Brief: Jan. 2008

## Purpose

*The brief provides a short overview of a project in which Deutsche Bank Research has combined its own foresight expertise with inputs from the bank’s business strategists and external experts in order to develop scenarios for the future development of the German economy and society against the backdrop of intensifying structural change.*

## Germany on the Path toward a “Project Economy”

Deutsche Bank and its clients require knowledge about the future for their investment decisions. Deutsche Bank Research provides this “corporate foresight”. A multi-disciplinary team develops and applies a wide range of methods to identify long-term macro trends. These foresight results, which are achieved on the basis of structured, process-based, quantitative and qualitative analyses, are fed into discussions with strategic management and clients as well as into public debate on broader economic, societal and political issues.

The next two decades will be crucial for determining the path Germany will take over the long-term. Will German society be able to cope with the demographic pressures bearing down on the economy and the state’s finances? Will Germany succeed in redefining its role in the rapidly changing global economy and world order? Will Germany be a leader or a laggard on the road to a knowledge economy?

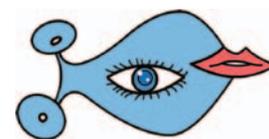
Our first step was to sketch four alternative scenarios outlining how the German economy and society may have developed by the year 2020 (“Expedition Deutschland”, “Wild West”, “Drawbridge Up” and “Skatrunde (Playing Cards) with the Neighbours”). In the second step, we used broadly-based trend analysis to examine **which of these four future scenarios is the most plausible.**

## The “Expedition Deutschland” Scenario – Knowledge and Cooperation Are Critical

The core elements of the “Expedition Deutschland” scenario for 2020 (formulated from the perspective of the year 2020) are the following:

In 2020, the “project economy” delivers 15% of value creation in Germany (in 2007 the figure was about 2%). The “project economy” refers to usually temporary, extraordinarily collaborative and often global processes of value creation. For many companies, this type of cooperation is in many cases the most efficient way of doing business. This is because product life cycles have shortened further; the breadth and depth of the knowledge necessary for developing and marketing successful products have increased rapidly; successful products are increasingly the result of convergence between different fields of technology and knowledge; and many companies and research institutes are even more strongly specialised in 2020 than they were in 2007.

Consequently companies collaborate ever more frequently on joint projects, often in the form of legally and organisationally independent project companies. They delegate specialised employees or parts of their organisation to these projects, invest capital or put their knowledge and networks at their disposal. In this way, companies can respond flexibly to the considerably higher demands on knowledge and rapidity in the global markets while sharing the costs and risks. This is often – but by no means always – their key to success: in 2020, too, collaboration generates considerable personal



and strategic tensions. Factors that help to reduce the frictions on the technical side are mature, highly standardised information technologies.

The project economy is closely intertwined with the traditional way of doing business. In 2020, many companies are continuing to go it alone with the market launch of their products. Often, though, these same companies cooperate in other markets – for instance the innovation-intensive ones – by taking the project economy approach. Germany's small and medium-sized enterprises (SMEs) benefit in particular from the project economy. SMEs can use their advantages of specialisation and organisational flexibility – and are additionally boosted by a renewed surge in start-up activity.

Open innovation processes helped to conquer new markets. In 2020, Germany has caught up with its competitors in markets for cutting-edge technology and knowledge-intensive services. Today, innovation is Germany's core competence, with "Created in Germany" often being first choice, especially in Asia and the Middle East. Some of the main reasons for this success are collaborative innovation as well as intelligent sharing and exchange of knowledge and intellectual property. A project-economy approach to work has proved efficient especially in the early innovative and thus particularly knowledge-intensive phases of value creation. Moreover, many German corporations (and their local and international project companies) have benefited over the past few years from having more closely integrated the generation of "sovereign customers" into their processes. These customers are well networked via interactive forums and have up-to-date knowledge of prices and qualities in the areas that interest them.

By contrast, many business investments in long-term research and development will have fallen by the wayside by 2020. They are often poorly adapted to the more short-lived value-added patterns of today.

Knowledge is traded in efficient markets in 2020. Knowledge about customers, markets and many other topics is valued and traded much more efficiently today than back in 2007. The operators of such knowledge-based services are flourishing. Intellectual property has become a commonly used asset class: investors may choose from a broad spectrum of topic-oriented patent funds, copyright securitisations, etc. Moreover, intellectual capital has swung into the focus of company valuations: the capital market now takes interest not only in a company's traditional balance sheet ratios but also its research efficiency, education and training budget, and cooperation ratings.

The young and seasoned minds that house this intellectual capital benefit from efficient learning markets in 2020. Private operators of learning services prosper. Also, the public universities and other educational facilities have become more efficient following a wave of consolidation. Furthermore,

they are more strongly involved in the market for modular education and training.

### ***From Direct Regulation to Co-regulation***

Government reduces its intervention and there is more co-regulation. Co-regulation closely integrates citizens and companies. On the one hand, legitimisation problems have motivated the state and still tight fiscal constraints have compelled it to cede part of its mandate to others. On the other, the regulatory issues have become increasingly complex. More than ever before, the state needs to tap the knowledge of citizens and companies to be able to set suitable framework conditions.

Regulatory regimes that emerge in this way are more intelligently geared to the needs of business and society. They are more transparent for people and companies alike and ease the struggle into new markets. In general though the state's abandonment of parts of its mandate has resulted in social transfers now coming with strings attached. In addition, more and more social services (e.g. long-term care) are organised on a private basis. Germany has become a "stakeholder society" based on reciprocal action.

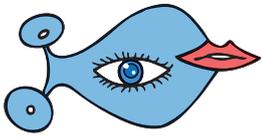
### ***Successful New Middle Class – Low Earners Lose Out***

A new middle class emerges in German society by 2020, but the lower periphery falls behind. The middle class celebrates its comeback. The new opportunities for upward social mobility and the higher risk of social decline, both being the consequence of increasingly global and volatile value creation, have clearly shown the middle class the value of knowledge. Many Germans with a mid-range income therefore invest heavily in education – and thus gain qualifications for the demanding, but at the same time well-paying jobs in the project economy.

Well-educated older people also benefit as they are intelligently integrated in the working world in 2020. By contrast, low earners have only limited access to the new learning markets, and young and old alike often have to fear for their livelihoods. International competition has an even more incisive impact on this group than on others. Many low earners are compelled to organise themselves in self-help networks and many have lost their faith in politicians.

### ***Globalisation, Diversification in Energy Supply and Digitisation Are Other Key Trends***

These elements, however, are interrelated with three other aspects of structural change which are already well under way and which, in our view, have rather trend-like characteristics.



- Globalisation leads to new centres of gravity in the international value creation chain.
- Energy supply shows a broader mix and decentralised production.
- Digitisation enables networked goods flows in the new Internet.

Given the structural changes outlined here on the way to “Expedition Deutschland”, we expect Germany’s gross domestic product to grow at an average rate of 1.5 % per year up to 2020. From a 2007 perspective, these changes will pave the way to extraordinary opportunities for business, society and politics, but also harbour substantial risks. Some key fields of action for business include, for instance, a structured analysis of collaboration options, a more systematic assessment of intangible investments, broader acceptance of new forms of education and training, and an increase in lifelong learning activities.

## Innovative Methodology to Deal with High Complexity in Scenario Analysis

The guiding question for our scenario analysis is **how will structural change have affected the German economy by the year 2020?** In order to answer this question, we applied a methodology based on a simple scenario approach. Normally, one identifies the two key drivers to build a “scenario matrix”. Each field in the scenario matrix represents a different combination of attributes (high/high, high/low, etc.) of these two drivers, and one scenario is developed from each of their respective interactions (see Figure 1, for an overview of the different elements of our scenario analysis see box on page 113). In addition to these drivers, whose future development is uncertain, there are a number of trend-like drivers – whose future development is comparatively predictable (in the following they are referred to for short as “trends”) – which impact on all four scenarios. These trends show similar developments in all four scenarios.<sup>1,2</sup>

But our scenario question is multi-faceted; the number of relevant drivers and trends is high. To cope with this complexity without losing too much information, we have advanced the above approach: we have aggregated drivers that are thematically related and whose development is correlated into “dynamics” (the trends, too, are aggregated into “trend like dynamics”, see the figure **Deriving scenarios by reducing complexity**). Instead of taking individual drivers, we build the scenario matrix **with the two key dynamics**. Further information and a discussion of

the merits and drawbacks of this approach can be found at [www.expeditiondeutschland.de/en](http://www.expeditiondeutschland.de/en)

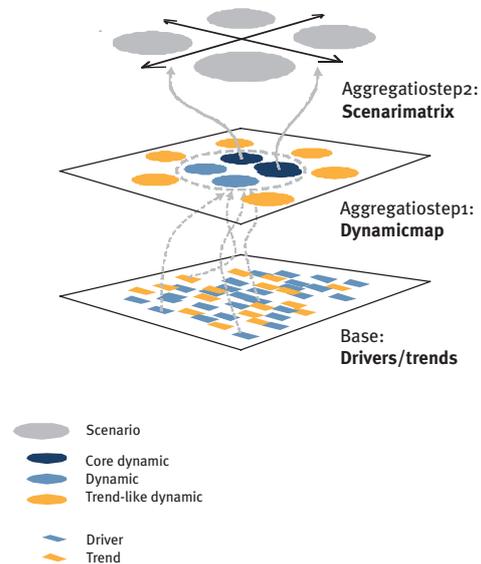


Fig. 1: Deriving scenarios by reducing complexity in two aggregation steps

### Concept of the “Most Plausible Scenario”

Classic scenario analysis examines alternative future developments – but without highlighting any one of the depicted scenarios as the most probable scenario. For good reason since the scenario method does not in itself deliver any (or sufficient) indications as to which picture of the future is the most probable.

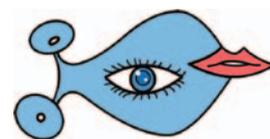
We are deliberately breaking with tradition of future research here: we identified a number of trends or trend-like dynamics that have an exceptionally strong influence and whose general future development can be predicted particularly reliably. They are driving Germany in the direction of one of our four scenarios and therefore make it particularly plausible. We refer to this scenario as the focus scenario and call it “Expedition Deutschland”. These trends relate to developments in a broad spectrum of fields in business, society and politics as well as in science and technology. They partly reinforce each other, a factor that has further encouraged us to focus on this one scenario.<sup>3</sup>

Our focus on this scenario should therefore not be seen as a normative statement: our message is not that we are placing this scenario in the spotlight because it is the “most desirable” one in our view. But, despite all the plausibility bonuses derived from our trend analysis in favour of this scenario over the other three, the following needs to be stressed:

<sup>1</sup> Nonetheless, through interaction with the other drivers, the trends can develop or impact slightly differently or at a different pace in each scenario.

<sup>2</sup> In the scenario method these drivers are often referred to as “determinants” and the trends as “premises”.

<sup>3</sup> We have systematically analysed the interactions between many of these trends in the earlier project “Global Growth Centres 2020” (see Bergheim, Stefan (2005), loc. cit.).



Our focus scenario is not a forecast. In 2020, Germany will look only in parts like we have described in our scenario. Rather, there will be a mix of elements of all four (and maybe other possible) scenarios.

#### Elements of our scenario analysis

- **“Driver”**. Important factor of influence on future structural change in Germany whose future development is **difficult to predict**.
- **“Trend”** (trend-like driver). Important factor of influence on future structural change in Germany whose future development is **reliably predictable**.
- **“Dynamic”**. Aggregation of (mostly non-trend-like) drivers which are thematically related and whose development is correlated. The future development of a dynamic as a whole (without drawing on additional information) is **difficult to predict**.
- **“Trend-like dynamic”**. Aggregation of (mostly trend-like) drivers that are thematically related and whose development is correlated. The future development of a trend dynamic as a whole is **reliably predictable**.
- **“Scenario”**. An, in itself, consistent picture of the future (in this case of the German economy and society) derived from a given combination of developments of the dynamics considered (and the expected developments of the trend-like dynamics). “Consistent” means here that the interaction of the various elements has been taken into account.
- **“Focus scenario”**. The one of our four alternative scenarios for Germany in the year 2020 which we consider to be the most plausible owing to the future impact of some of the above “trends” and “trend dynamics”.

Our message is that, as far as we can judge today, it appears plausible that Germany is more likely to resemble our focus scenario than the other pictures of the future developed here.

#### Illustration of the Scenarios

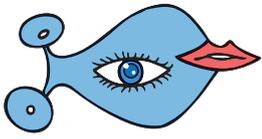
We have developed posters to sum up the content and convey an intuitive image of the key messages of our four scenarios. They depict the behaviour of businesses and citizens (as persons), the market playing field (as environment/terrain) and the regulatory framework (as sky/weather) in 2020. To give an example, here we show the poster for the “Expedition Deutschland” scenario discussed above.



#### Sources and References

[www.expeditiondeutschland.de/en](http://www.expeditiondeutschland.de/en)

[www.dbresearch.de](http://www.dbresearch.de)



# ERoSC – The Socio-economic Impact of Emerging Social Computing Applications

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<b>Type:</b>	Exploratory research (internal research scheme)		
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<b>Duration:</b>	April 2007 – July 2008	Time Horizon: 2010	Date of Brief: June 2008

## Purpose

*ERoSC is an exploratory research project that aims at studying the socio-economic impact of emerging social computing applications. The exploratory research scheme of the European Commission Joint Research Centre's Institute for Prospective Studies (IPTS) is an internal instrument aimed at building up competence in strategically relevant scientific fields. The ERoSC project has been awarded as the IPTS 2007 Exploratory Research project. Its purpose is to identify and discuss current and future socio-economic implications of social computing and to identify policy options for Europe.*

## A Multi-faceted Approach to Socio-economic Impacts of Social Computing in European Context

In less than five years, social computing (SC), that is, digital applications that enable interaction and collaboration, whereby users are participants (co-creators not end-users) and interconnected (the network as a collective resource), has shifted from a niche activity into a phenomenon engaging tens of millions of Internet users. Nevertheless, there is very little research and evidence on the socio-economic impact of SC in the European context.

Set in this context, the main objectives of ERoSC can be summarised as follows:

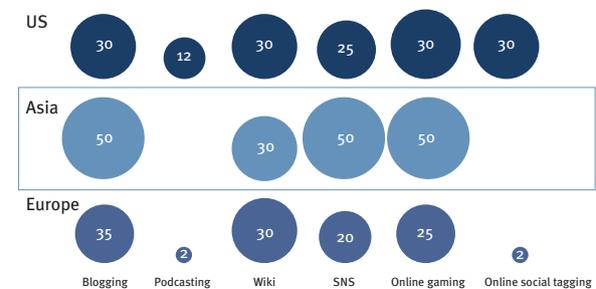
- explore the socio-economic impact of social computing;
- assess the sustainability of social computing applications (business models and viability);
- assess the position of Europe in this field; and
- identify options for EU research and innovation policies.

Technological innovations have been scanned for available supply and demand data. Usage and the impact of SC in specific sectors have been explored using different analytical techniques, such as case studies, comparison of existing data and indepth interviews. Finally, an expert workshop was

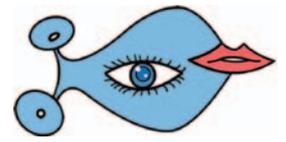
conducted to validate the data. Peer reviewing by experts was used as an additional quality management tool.

### Measuring and Analysing Social Computing

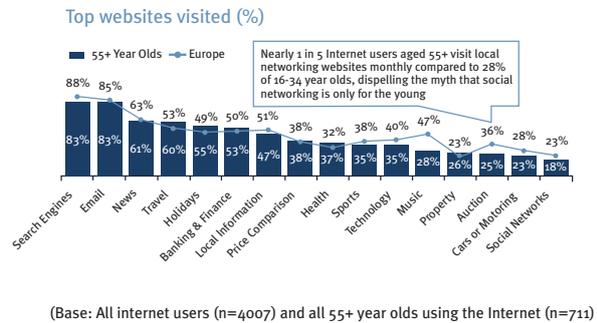
Social Computing is entering into a new stage of development. Blogging, photo- and video-sharing, social networking and social gaming have been adopted by some half of Internet users worldwide (around 25 % in Europe), and high levels of growth in Europe have been reported in areas like blogging or online video. New social platforms are emerging that enable people to create more and richer content, which in turn generates network effects.



Source: IPTS based on existing surveys (in % of Internet users)



Social computing activates new market segments, for instance women or “silver surfers” (people aged 55 or older).

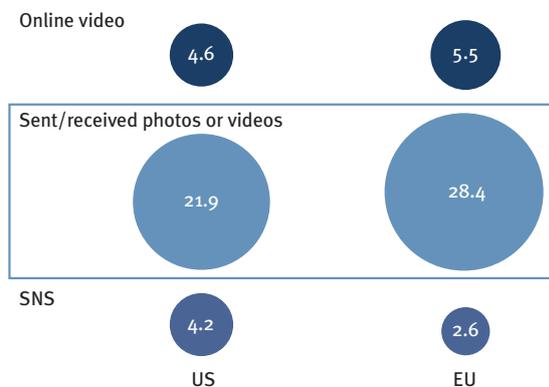


Source: EIA Mediascope Europe “Silver Surfers” report 2007

People interplay with technology in many different ways. The majority of users tend to be “free riders”, that is, using SC content created by a “thin” layer of core users (the “creators”). In Europe, roughly a third of Internet users also make use of SC contents, 10 % provide feedback, 10 % share contents, and only around 3 % are those “creators”. Moreover, the intensity of use of SC applications is very diverse, for instance, people can be at the same time “creators” and “free riders”.

### Mobile – the “Next Frontier”?

A lot of innovation is taking place around mobile social computing. Mobile social computing, however, does not mirror the user participation of desktop-based social computing. Only a small user base has so far adopted mobile social computing, though there is evidence of growth. In the EU (selected countries), almost a third of mobile subscribers upload videos or photos on video/photo-sharing sites, with only 2.6 % accessing a social network via their mobile phones and 5.5 % watching video online. Teens are the most active users of mobile social computing.



Source: IPTS based on existing surveys (in % of Internet users)

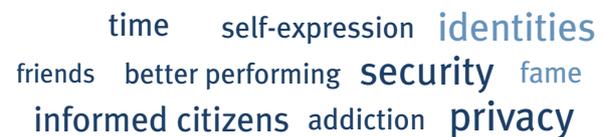
### The “Tag Cloud” of Social Impacts of Social Computing

Social computing allows for more room for personal and social creativity, and it is a new means to develop and construct personal identities. Moreover, identity is now transformed by technology.

The “always-on” trend raises concerns about this new form of dependency, where people need to first communicate with others to feel their own feelings. The networks of virtual “friends” becomes as significant as “real” life ones, evolving into new forms of social capital that is, social computing will encourage social networks that are well connected (bonding social capital) rather than bridge between different networks (bridging social capital). The proximity of celebrity condition gets closer (“my 15-minutes of fame”).

Social computing allows for enhanced social participation, for instance in politics, and better informed citizens for different roles in society, such as as a voter, learner, patient or consumer.

At the same time, the dynamics of privacy is changing. Personal data recorded in databases are “perfectly transferable in space, [and] indefinitely preservable in time” (Poster 1995). New social threats are emerging such as stalking and bullying or chains of suicides.

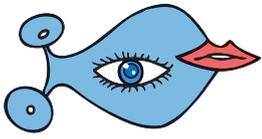


Source: IPTS – A tag cloud of social impacts

### Economic Impacts of Social Computing

Social computing provides sources of revenue both for users and platforms. More important, social computing is a driver for competitiveness. Impacts can be observed on industry itself, for example media or ICT industry, but also on other industries using SC. More targeted marketing and user research, both based on user profiles and content interests, are opening new channels to markets. New employment possibilities are emerging through social networks and new opportunities to utilize user innovations for product development or as an interface between companies and customers and for more efficient work processes.

In order to realize the potential positive impact, there is a need to meet a number of challenges of productivity, security and training.



## Policy Options for Europe

In order to put forward informed policy implications, proper measurements are needed. There is a lack, however, of internationally comparable data on social computing from national statistical sources, while data is available coming mostly from non-official sources. This points to the need for better and systematic measurements and internationally comparable data. Improvement of official statistics (e.g. OECD, Eurostat) by adding categories of Internet use by activity questions to surveys could be one possible avenue for meeting this need.

The implications of social computing for policies for education, health, inclusion and for the policy-making process itself should be considered. In addition, policies could be developed to provide the necessary framework conditions that would favour people and companies (in particular start-ups) staying in Europe, including promoting entrepreneurship and dealing with intellectual property rights (IPR) and copyright issues that might prevent the further development of SC.

There is also room for policy activities to address social cohesion and exclusion of groups of people such as elderly and migrants, to support democratisation and eParticipation processes.

Another European strength lies with mobile technologies and mobile connectivity, together with a marked lead in mobile devices, hence providing a possibility for Europe to further develop relevant services, applications and platforms for mobile 2.0.

An opportunity for Europe would also be to provide better access to public data, as such data are typically used in SC applications (e.g. mash-ups) to provide added value. Opening public data sets to allow citizens to create their own services could provide a boost to the use of SC, providing privacy and security concerns are adequately accommodated.

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<http://is.jrc.ec.europa.eu/> is the main website where all reports and other information will be made available.

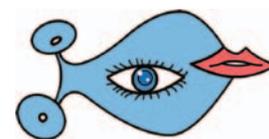
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# Transregional Foresight to Improve and Coordinate Regional Innovation Strategies in Europe

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<b>Sponsors:</b>	European Commission (FP6) and participating regional organisations			
<b>Type:</b>	Transregional exercise			
<b>Organizer:</b>	Navarra Government, Pamplona, Spain, Mr Rafael Mugerza, rafael.mugerza.eraso@cnavarra.es			
<b>Duration:</b>	01/2007-12/2008	Budget: € 800,000	Time Horizon: 2018	Date of Brief: Sept. 2008

## Purpose

*Empowering the strategic development of Europe's regions is a critical requirement for transforming the EU into a competitive knowledge-based economy. To this end, regional decision-makers need to be enabled to design and implement better RTDI policies, and also to benefit from a better coordination of regional, national and EU policies. By developing and testing a new model of transregional foresight, the ForTransRIS project supports this aim. It thus contributes to the improvement of regional innovation strategies (RIS) through a transregional perspective. The transregional foresight model to upgrade RIS is tested in the five partner regions taking the issue of transregional knowledge and technology transfer as a concrete case.*

## The Role of Regions in Increasing EU Competitiveness

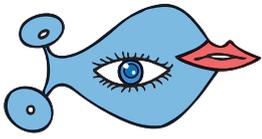
The systematic regional application of foresight and related approaches both in the public and the private sector is increasing in importance because the regions have a vital role to play in the EU's drive to develop a common European Research Area (ERA). EU goals include achieving the 3% of GDP target for investment in research, technological development and innovation (RTDI) set by the European Council (Barcelona 2002) and the optimisation of research programmes and priorities envisaged by the Commission (Green Paper on New Perspectives for the ERA, 2007). In this context, empowering the strategic development of Europe's regions is a critical requirement for transforming the EU into a competitive knowledge-based economy.

Foresight exercises appropriately adapted to distinct regional conditions and capabilities can effectively aid decision-makers in designing and implementing better RTDI policies and investment strategies. They support regional authorities in continuously reviewing and developing the institutional features, strategic capacities, and the organisational skills and

expertise to design and implement research and innovation policies that can increase the regions' competitiveness. This is important not only for the regions' own economic well-being but also because of the cohesion "risk" it could pose for the European Community if some regions remain marginal in terms of knowledge-based activities. An additional contribution to a more competitive EU is achieved when the strategies in the different regions are developed in a way that leads to an overall optimisation of programmes and priorities in the EU, at and across governance levels.

## Benefits of Applying Foresight for Regional RTDI Policy-Making

A comprehensive uptake and application of foresight and related tools (such as technology assessment, evaluation, benchmarking etc.) is needed so that decision-makers can master the mounting pressures to deliver tailored and future-oriented RTDI policies. The advances made in this respect have encouraged policy-makers in some territories to use the tools more systematically to produce customised intelligence and know-how, thereby facilitating innovation and learning processes in their economic systems and societies. In so doing, they benefited from:



- the timely identification of new science and technology developments and possible areas of their beneficial application in all policy fields;
- the elaboration of a solid information base for RTDI policy-making, taking into account the general context as well as good practice from elsewhere;
- the formulation of policies explicitly aimed at stimulating science and technology and its application integrated in the innovation systems;
- the effective introduction of a user perspective on the application of science and technology for economic growth and social enhancement.

The strength of a foresight approach to RTDI policy-making stems from bringing together specialised technical expertise (both technology expertise and foresight process know-how), diverse, distributed local know-how and broad participation of stakeholders. The complexity of the policy challenges requires technological expertise; local knowledge and broad stakeholder participation serve to feed and anchor expert deliberation and ensure the relevance of such expertise to the outcomes and the implementation of the foresight exercise; the process know-how ensures that successful strategies are formed as a result of the comprehensive collaboration of all these different resources.

The policy-makers thus need to move from the traditional top-down, reactive approach to one that is proactive, participative, evidence-based and uses transparent methods in finding solutions to the modern policy challenges. The new approach embraces foresight and related tools not only to gain access to difficult-to-acquire strategic information for decision-making but also as socio-economic mobilisation tools to raise awareness and create consensus around promising solutions.

The strategic know-how generated in this way is crucial at two levels:

- enterprises rely on business and economic intelligence in order to define future business models and to generate common visions and activities with innovation partners (e.g. in “business ecosystems” or clusters) based on the permanent and worldwide competition for the future;
- innovation policies rely on policy intelligence that enables all actors to develop shared visions and long-term commitment between the triple helix stakeholders (university – industry – public actors) in the innovation system.

Successfully linking strategic knowledge on both levels will lead to better economic decisions, which in turn lead to increased and sustained business and regional competitiveness. This challenge necessitates the tailored application of foresight exercises on all decision-making levels, from European, national to (trans-)regional, cluster and individual company levels.

Especially the regional level with its specific abilities and potential should be taken stock of to align governance levels both horizontally and vertically. To do so, there is a need for more systematic regional foresight applications. Thus, further progress is needed in various respects to facilitate the use of foresight approaches on the regional level by 1) adapting foresight methods and related tools, 2) adapting and tailoring the implementation of foresight exercises, 3) positioning regional foresight exercises in the respective policy context and, finally, 4) improving regional foresight exercises through transregional cooperation.

## The ForTransRIS Project – Transregional Foresight to Improve Regional RTDI Policies

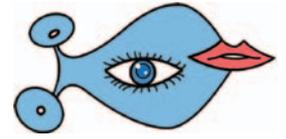
The FP6-funded project ForTransRIS, which ran from January 2007 to December 2008, concretely tackles the aspects outlined above and especially deals with improving regional foresight exercises through transregional cooperation.

The project aimed to raise awareness among decision-makers in Europe’s regions and encourage them to benefit from the knowledge and experience that can be gained by applying foresight in their own regions. Participants were regional policy-makers and development agencies from Navarra (Spain), Stuttgart (Germany), Brittany (France), Stockholm (Sweden) and Liguria (Italy), supported by foresight expert partners in each region.

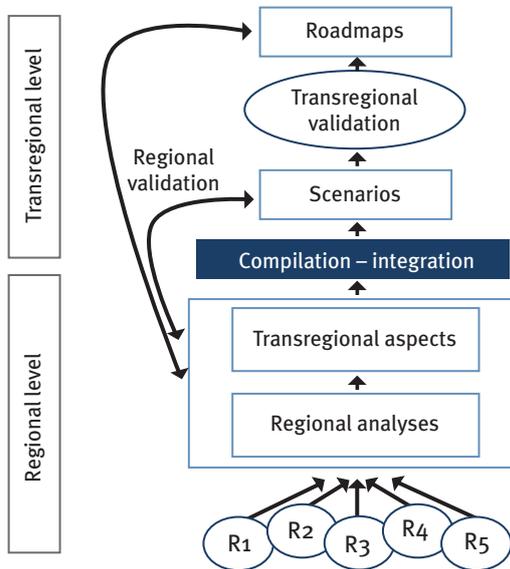
The ForTransRIS project developed and tested an approach to improve regional decision-making by applying regional foresight in a transregional perspective (see graph below). The transregional foresight exercise was developed building on the experiences and needs of the participating regions and aiming to enhance the individual regional innovation strategies as well as the general ability to apply foresight for regional RTDI decision-making by way of this cooperation.

As a first step, the overall approach on how to conduct individual foresight exercises on the regional level and then further elaborate and transfer the results to a joint transregional level was developed. It was decided to test the approach by applying it to the field of knowledge and technology transfer and its ability to enhance regional innovation and competitiveness. Approaching this issue from the regional *and* transregional dimension was expected to be especially useful because of the high innovation benefits that all actors can gain by cooperating within and across regions.

In the ForTransRIS project, transregional knowledge and technology transfer (TKT) was defined as “the process through which the scientific and technical knowledge (either



tacit or codified), generated in one organization (source), is exploited economically by a firm by means of a complex interaction and cooperation between the source and the firm and, usually, other players.”



Source: ForTransRIS project, own adaptation

Once the structure of the exercise had been set up, an analysis of the five regional innovation systems was carried out by the regional partners. They conducted desk research and interviews with all relevant regional innovation systems actors by using a structured questionnaire to identify the innovation needs, barriers and future aspirations as seen by the stakeholders. In addition, opportunities and challenges for knowledge and technology transfer within and among regions were identified, which (can) result from and facilitate transregional cooperation.

In a next step, the foresight experts synthesised and compiled the regional analyses into a smaller number of drivers to find out which issues are most relevant for each region and at the same time most promising to be dealt with on a transregional level.

The drivers were categorised into the following groups:

- economic system,
- RTDI policies,
- knowledge system,
- human resources, and
- social issues.

The regional actors then evaluated the drivers during a workshop according to their future relevance and probability of occurrence. Then, each region developed a vision based on these drivers about how knowledge transfer should look like in the region in the future. Based on these visions, the evaluation results and the input from the regional analyses, the most relevant aspects for developing transregional scenarios were identified.

The most relevant aspects the scenarios built upon are

- a fragmented vs. integrated governance system;
- the degree of propensity to business risk and innovation among the regional innovation stakeholders.

By combining these opposite situations for the two aspects, four scenarios give different pictures of what the future could look like depending on the development of the drivers.

In order to facilitate the analysis, only two scenarios were elaborated in more detail: the “stormy” scenario, which can be seen as the extrapolation of today’s situation based on the enhancement of its negative features; and the “sunny” scenario, which can be seen as the most favourable framework for TKT (optimal scenario).

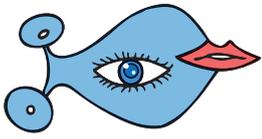
The other possible scenarios, “rainy” and “cloudy”, describe intermediate situations. They might be a transient state in the evolutionary process from “stormy” to “sunny”, or, realistically, the most likely situations when systematic strategic cooperation between the different regional actors fails to be established.

The main issues affecting TKT considered in the scenarios are the following:

1. SMEs’ business models (related to product/process innovation; approach to market; internationalisation)
2. SMEs’ ways of networking and interactions with knowledge providers (ways, tools, trust)
3. Human resources: training and management policies and attraction of talents to a region
4. Start-ups (by researchers, women, young people)
5. Entrepreneurship of universities and public research organisations (entrepreneurial spirit, responsiveness to SMEs’ needs, quality of research)
6. Regulations especially for intellectual property rights and standards (for environment, communications, administrative procedures, etc.)
7. Infrastructures at European scale (transportation, communication, etc.)
8. Structure of the European market
9. RTDI policies of governments (EU, national, regional) and tools to adequately implement them
10. Territorial identification (citizens, institutions), social and political culture, consumption patterns (sustainability)
11. Competitive position of regional firms against new rivals from emerging countries.

The scenarios display what knowledge and technology transfer within and among the regions could look like and how it might be facilitated by transregional activities in the future. They can be used to raise awareness among regional stakeholders concerning which future state they deem preferable and discuss what can be done to achieve it.

In ForTransRIS, this was done during scenario validation workshops in each partner region. There, it was discussed if



the scenarios were indeed feasible for the region and which issues were most relevant. The most relevant issues from each region were then matched to find out which issues were most relevant for all regions.

The three issues identified were:

- new business models for SMEs,
- networking, and
- entrepreneurial attitudes of public research.

During a transregional panel workshop attended by stakeholders from all partner regions and complemented by external experts and stakeholders from other regions, these issues were discussed and further elaborated (main characteristics, possible transregional actions, ...) as a basis for the roadmap development to follow.

The foresight experts in the project then used the scenarios, the input from the regional scenario validation workshops and the outcome from the transregional workshop to develop a roadmap for each of the three issues. The roadmaps display how each region can improve its innovation system by drawing on the knowledge of other regions and by cooperating on knowledge and technology transfer issues. This aims to guide the regions towards the implementation of joint actions in these fields.

In parallel to the implementation of the transregional foresight exercise, the lessons learned during ForTransRIS and the approach used were synthesised in the *ForTransRIS Methodology Guide* to enable other regions to benefit from the experiences made during the project.

## Transregional Foresight as a Strategic Policy Resource

The experiences made and the know-how gathered during the ForTransRIS project shows how regional decision-makers can make their regional innovation systems and policies more viable and competitive by applying strategic know-how more frequently and consistently, for example generated by transregional foresight activities. This is especially important in the increasing global competition for infrastructure, enterprises and highly qualified human resources.

Using a tailored set-up for transregional activities enables the participating actors to take stock of the comprehensive knowledge available in other regions, to raise awareness and mobilise all relevant regional stakeholders, to identify the most relevant issues for their concrete regional needs, and thus tailor regional policies and programmes for the benefit of long-term competitiveness and innovativeness of the region.

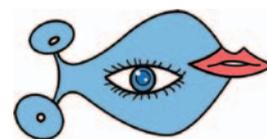
Accordingly, the ForTransRIS approach ensured that the transregional foresight exercise was adapted to the regional needs and expectations and that, in turn, future regional foresight activities can benefit from the transregional experiences as well as the other region's expertise.

Thus, by applying foresight systematically to shape regional policies regional decision-makers will contribute to both the successful development of their own region and to fostering the coherence and success of European programmes, priorities and policies.

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Project website [www.fortransris.net](http://www.fortransris.net)

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# EU-Africa Energy Partnership: Implications for Biofuel Use

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Type:	Single issue, energy policy	
Organizer:	NA	
Duration:	Time Horizon: 10 years	Date of Brief: July 2008

## Purpose

*This brief intends to provide an overview of the rationale underlying the EU-Africa Energy Partnership, in addition to an analysis of the potential implications of this policy on the development of sub-Saharan African nations. It is posited that the partnership could have potentially negative repercussions if critical uncertainties are not sufficiently taken into account, and that it is in the EU's best interest to ensure that outcomes are genuinely equitable. The research also has implications for other developing nations around the world seeking to further their economies and raise living standards by means of engaging in the global biofuels industry.*

## Europe, Energy Security and Biofuels

It is widely acknowledged that the energy security of the EU, as a whole, is deficient with respect to meeting future energy requirements. At the same time, the EU has resolved to decrease its carbon footprint and wean itself off from environmentally damaging fossil fuels. A further concern is that even if the developed world manages to arrest the proliferation of greenhouse gas (GHG) emissions the developing world will still continue to pollute.

To address these important issues, the EU has developed the EU-Africa Energy Partnership. The rationale, broadly speaking, is twofold:

- Secure the EU's energy supply and allow its member states to meet challenging emissions reduction targets.
- Provide sub-Saharan African economies with a further export market, in addition to allowing these nations to leapfrog to lower-emissions technologies.

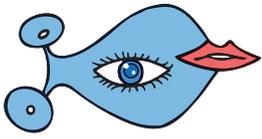
Although the partnership deals with renewable energy in its broadest sense, there appears to be great emphasis on the cultivation of biomass used in the production of renewable fuels such as ethanol and biodiesel, for which there is increasing demand within the EU. Despite the ostensibly sound intentions of the policy, it remains to be seen whether the energy partnership will truly be mutually beneficial.

The aim of this brief is to examine the critical uncertainties that could potentially damage the workability and equitability of the energy partnership. A key consideration, here, is that the partnership has seemingly been formulated under *ceteris paribus* conditions. Thus, the partnership's success is predicated on the continuation of existing trends, such as growth in biofuel demand and the ability to cultivate biomass at market-friendly prices in the future. Yet, the increasing complexity of technological systems, the advent and potential adoption of new technologies, in addition to climate change, means that it cannot be assumed that all things will indeed remain equal.

### EU Biofuel Policy

The EU has set targets for biofuel usage within the member states. Policy measures designed to stimulate biofuel use were introduced in 1992. The overall aim has been to reduce the cost of biofuels in comparison with conventional petroleum products, which otherwise would be higher given the production costs and economic risk associated with fluctuations in oil price and the value of biomass-derived by-products (Cadenas and Cabezudo, 1998).

The EU Commission set a political target of substituting 20 percent of conventional biofuels by 2020 (European Commission, 2001, p. 45). The even more ambitious COM(2006)845 proposed that biofuel targets **for transport fuel** should be 20 percent for the same year. The EU Biofuels Directive (2003/30/EEC) requires member states to ensure that a minimum proportion of fuels sold are biofuels (see Faaij, 2006).



The aim is to ensure that 5.75% of conventional fuels are replaced by biofuels, although the Biomass Action Plan (BAP) has concluded that these targets will not be reached (Commission of the European Communities, 2006, p. 6).

There is thus a growing requirement for biofuel production within the EU and indeed a growing demand for biofuels (especially biodiesel). Since the EU member states do not have the capacity to increase biomass cultivation without causing an increase in food prices (a politically unpalatable outcome), it has been deemed necessary to look for alternative ways to satisfy this demand.

### Energy Partnership

In this context, the EU-Africa Energy Partnership emerges as an important component of the EU's aim to increase the use of biofuels for transport within the member states, thereby allowing the EU to meet challenging biofuel targets, contribute to global GHG mitigation strategies (such as Kyoto), and address concerns regarding energy security. The partnership is argued to be mutually beneficial, since it will also promote economic and social improvement in sub-Saharan African countries and allow such nations to switch to more environmentally friendly patterns of energy use.

The partnership is intended to promote greater interconnectivity between energy systems and ensure a diversity of energy options (Commission of the European Communities, 2006, p. 15). Although there is reference to alternative energy sources, such as hydropower (ibid.), there is clearly an emphasis on greater biomass cultivation and biofuel production, perhaps to the detriment of other energy solutions.

Energy security is obviously an important component of the partnership. Sub-Saharan Africa thus has the ability to supplement volatile supplies (and pricing) of OPEC oil with biomass cultivated in the region. Although the sub-Saharan region is also clearly not especially stable, it at least has the capacity to offset some of the risk associated with dealing with OPEC countries.

### Production Processes

Given the current high cost of second-generation biofuel production processes (which use the whole organic matter as a feedstock), it can be assumed that the bulk of the biofuel feed-stocks grown in sub-Saharan Africa would be used in arguably inefficient first-generation production processes. Here, only the sugars and starches (rather than the whole plant) are used for ethanol production, while only the extracted vegetable oil is used in biodiesel production (Charles et al., 2007).

## Critical Uncertainties

It is necessary to look at the critical uncertainties that could impact on the success of the EU-Africa Energy Partnership.

### Climate Change

The energy partnership, in as much as it relates to promoting sub-Saharan Africa as a source of biofuel feedstock, assumes that current climatic conditions will prevail. Yet climate change could mean that climatic conditions in areas currently suitable for agricultural endeavour might militate against profitable biomass cultivation.

There are a number of critical factors associated with climate change that need to be taken into account:

- **Increased uncertainty with regard to rainfall patterns:** This will problematize when to plant and place pressure on water use, with potential social repercussions.
- **Increased and more severe meteorological phenomena:** Floods could wipe out entire fields; storms could damage or destroy harvests, while uncontrolled fires (resulting from co-factors of drought, thunderstorm activity or human action) could do likewise.
- **Increased incidence and severity of pestilence:** Changed climatic conditions could make crops more susceptible to pests, thereby increasing the need to employ pesticides (with cost penalties and potential impact on the local environment and human health).

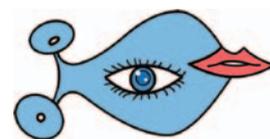
These factors, when taken together, suggest that it will be more difficult to plan for weather-related phenomena into the future. Thus, claims of increased energy security within the EU resulting from the partnership need to be tempered with the realization that traditional agricultural techniques do not guarantee constant and predictable harvests, while climate change may exacerbate uncertainty.

### Environmental Impacts

Agriculture has brought about widespread environmental degradation around the world. Thus, it is important to bear in mind the potentially negative impacts that intensified farming practices will have on ecosystems in sub-Saharan nations, in addition to the region as a whole.

The possible factors that could lead to negative environmental impacts are as follows:

- **Increased use of fertilizers:** Run-off from fertilizers increases the incidence of algal bloom in aquatic environments; fertilizers lead to an increased level of atmospheric  $N_2O$  harmful to the ozone layer; and fertilizer production and distribution is energy inefficient and contributes to greenhouse gas proliferation.



- **Increased use of pesticides:** Pesticide run-off pollutes local watercourses, results in a loss of biodiversity when food supplies for higher organisms are reduced, can flow throughout food-chains, thereby leading to chemical build-up in higher organisms, especially avian fauna; production processes and distribution incur GHG penalties, can be harmful to human life and can contaminate water supplies (of particular importance in developing nations).
- **Increased threat of deforestation:** Expanding biofuel markets may prompt changes in land-use, potentially leading to deforestation, entailing significant biodiversity and CO<sub>2</sub> penalties.

These factors could be aggravated if a greater demand for biofuels in the EU member states is occasioned and if changing weather patterns result in a need to “make hay while the sun shines”. Such a demand could effectively see the EU exporting local environmental degradation from its member states to sub-Saharan Africa. Environmental degradation could also lead to opportunity costs resulting from a loss of potential eco-tourism income.

### **Technological Change**

Biofuels, at best, will be an important component in a future energy mix. There are no indications that biofuels will ever replace petroleum-derived products on a one-for-one basis (Di Lucia and Nilsson, 2007). Biofuels enjoy a clear advantage over other potential energy solutions, especially since they take advantage of existing infrastructural systems (Foresight Vehicle, 2004). This ensures that switching costs are reduced.

On the other hand, there is the threat that biofuels will be rendered redundant by other technologies. There is much evidence throughout history to suggest that over-reliance on a single natural resource for a nation’s prosperity is not sustainable over the long-term. For example, Chile, which prospered on the basis of its export of sodium nitrate (saltpetre), lost this advantage when scientists developed a synthetic alternative.

Some threats to the increasing importance of biofuels are as follows:

- Increase in use of **nuclear energy** (and thus “clean” electricity).
- Switch to cleaner **second- (and third-) generation biofuel production** processes.
- Development of a **hydrogen economy** (predicated on the availability of clean, renewable energy, such as from the sources listed below).
- Other energy paradigms, for instance, **geothermal, hydroelectric, photovoltaic, wind**, etc.

Thus, over-capitalization in biomass cultivation for first-generation production processes (in particular) may lead

to unsustainable increases in foreign debt, in addition to severe job losses and resultant social upheaval. In a worst case scenario, more efficient technologies, if they become widely adopted around the globe, could lead to the biofuel industry’s collapse.

### **Opportunity Costs**

Even if the biofuel industry remains important, over-emphasis on biomass cultivation could result in a failure to develop industries that have the potential to contribute greater value added to sub-Saharan African economies. This would especially be the case if insufficient attention were paid to processing the feedstock in sub-Saharan Africa, as could occur in nations traditionally focussed on exporting natural resources.

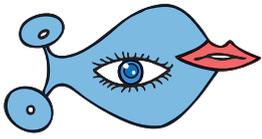
Biomass cultivation, in the event of an ever-increasing demand for biofuels, would not merely translate into sub-Saharan African countries gaining an OPEC-like significance on the world stage. This is especially the case given a) the potentially wide dispersal of biomass cultivation and b) the high likelihood that biofuels would remain one of several alternative energy solutions. African biomass would also have to compete with that cultivated in North and South America, and also in South-East Asia and the Indian subcontinent. Given that these regions are already more highly industrialized than most sub-Saharan African nations, it is plausible that greater value added would occur in these regions.

There is also a danger that biomass cultivation in sub-Saharan Africa could engender an increased dependency on multinational corporations involved in agribusiness. There are already substantial links to agriculture in developing nations and the research-intensive products, including seeds, support systems and expertise, being offered by multinational agribusiness entities.

### **Export Commodity Dependency**

Sub-Saharan Africa has a long history of supplying European nations with raw materials to be used in value-adding production processes. There is thus the potential for this situation to continue if Europe resolves to view the region merely as source of inexpensive feedstock for biofuel production, rather than as a knowledge-intensive producer in its own right.

Many of the economic and social problems faced today in sub-Saharan Africa are deeply rooted in history. When the European colonial powers partitioned Africa, they viewed the colonies as suppliers of raw materials for their factories. Farmland traditionally used for food cultivation, even after the independence of the former colonies, was turned over to cash crops such as cocoa, cotton, coffee and rubber. The result was that Africa exported what it did not need, and



imported what it did, thereby leading to substantial trade deficits and continued indebtedness (Carmody, 1998). This is because the low price obtained for cash crops rarely if ever matches the relatively high price paid for imported food, in addition to luxury goods and hardware desired by affluent members of society.

It is important to be awake to the potential for ongoing commodity dependence to occur, especially if the EU pays insufficient attention to developing sub-Saharan Africa as an energy producer rather than merely an agricultural supplier.

## Investing in Sub-Saharan Future

It is possible to formulate a number of potential policy implications that would add rigour to the energy partnership.

- **Moving away from first-generation biofuels:** A continued emphasis on first-generation biofuel production processes reinforces sub-Saharan Africa as a supplier of cash crops. There are inherent problems with first-generation biofuel production processes. A failure to address these and move demand towards more efficient second-generation processes could lead to a global undermining of confidence in biofuels as a source of renewable energy.
- **Ensuring environmental sustainability:** This is tied closely to the previous consideration, but also with the necessity of preventing local and regional environmental degradation as a result of poor farming practices or indeed wide-spread change in land-use. There is a need to develop mechanisms to ensure that increasing demand for biofuels within the EU does not lead to catastrophic environmental impacts in sub-Saharan Africa.
- **Investing in sub-Saharan Africa's future:** The energy partnership should be used as a component in an overall strategy to enhance economic development in the region. A failure to do so will result in greater amounts of environmental degradation (including greenhouse gas emissions) over the long-term.

In short, the nations of the region need to acquire their own energy security and processing infrastructure. The EU-Africa Energy Partnership must serve as a vehicle to promote these ends. To achieve this end, sufficient political will over the long-term to propagate cleaner biofuel production processes is required. If not, the biofuels market could be irreparably compromised and the partnership with it, with grave implications for not only the EU and sub-Saharan Africa, but also the planet as a whole.

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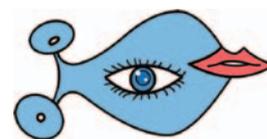
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# Strategic Capacity Building in Clusters to Enhance Future-oriented Open Innovation Processes

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<b>Sponsors:</b>	European Commission (FP6/FP7), DG ENTR / DG RTD; regional bodies and enterprises			
<b>Type:</b>	Cluster foresight exercise			
<b>Organizer:</b>	Steinbeis-Europa-Zentrum, Stuttgart, Germany (responsible for the project parts described in this brief)			
<b>Duration:</b>	06/2006-10/2010	Budget: € 370,000	Time Horizon: 2020	Date of Brief: Sept. 2008

## Purpose

*For the purpose of increasing and sustaining business and regional long-term competitiveness, information and training modules were developed to enrich cluster development policies with tools that give incentives for and facilitate “outward-looking” (open innovation) and forward-looking (foresight, technology assessment) activities and thus provide strategic guidance for developing future-proof, open innovation processes. After testing the tools in ICT, mechatronics and life sciences clusters, they are now being applied in a transregional foresight approach to develop a joint research agenda for clusters in the economically more and more important creative industries.*

## Regional Cluster Development to Systematically Boost Innovation

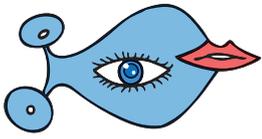
In the globalising knowledge economy, regional clusters are increasingly understood – in particular with respect to their “non-regional” dimensions – as local nodes in global knowledge flows. The Innobarometer 2006 on clusters’ role in facilitating innovation in Europe confirmed that companies situated in clusters are more innovative and competitive than companies outside. In strategically guided and well-managed clusters, the enhanced innovativeness and competitiveness at the firm level finally results in sustainable regional economic development. Thus, policy-makers at all administrative levels use cluster support instruments to systematically boost innovation and competitiveness of both businesses and regions.

The cluster concept captures current discussions of managing (regional) innovation systems and open innovation processes at both the regional and business level. At the business level, management professor H. Chesbrough claims a fundamental shift in innovation paradigms from closed to open innovation and advocates collaborative and open innovation strategies and open business models to take the full benefit from collaborating with external partners. More and more, (in

particular multinational) enterprises take into account, in addition to internal resources, the competences of external partners to meet the challenges of increased complexity of research, technological development and innovation (RTDI), growing global competition leading to shortened “time to market” etc. Regional clusters as “innovative hot spots” and local nodes in global innovation networks play an important role for companies looking for external partners to form strategic RTDI collaborations.

The business strategy of collaborative and open innovation at the micro-level poses considerable challenges for macro-level innovation policy. For example, new complex interactions and relationships emerge and continue to evolve between public research organisations and industry, which in turn lead to new ways of organising and managing R&D and innovation by all stakeholders in an innovation system. Thus, horizontal and vertical coordination of policies and support of cross-sectional linkages and networks are imperative for systemic and interactive.

RTDI policy-making. In this respect, (trans-) regional cluster development is broadly seen as an adequate and effective instrument to enhance and coordinate knowledge flows and collaboration between regional stakeholders coming from industry, science and public administration.



### **Linking Forward- & Outward-looking Approaches**

Both the discussions on open innovation business strategies and on systemic regional innovation policies emphasize the vital role of strategic intelligence for innovation and point to the value added of linking forward-looking and open-innovation-focused approaches.

To develop and implement successfully future-oriented collaborative and open innovation processes, businesses rely on strategic economic and business intelligence in order

- to generate common visions about longer-term market and technological developments,
- to derive promising new products and services and define future business models, and
- to develop and agree on joint innovation projects with external strategic partners.

Thus, in a world of open innovation, future-oriented technology analyses – comprising foresight and technology assessment activities – are decisive for strategic knowledge generation and transferring it into new products and services. The faster and easier businesses gain access to strategic knowledge and integrate it in their company strategy, the more successful they will be. This becomes evident in “business ecosystems” where businesses co-evolve their capabilities around new technologies and jointly design a kind of “mass customization” of new products and services to satisfy individual customer needs and to succeed in the worldwide “competition for the future”.

Though, many enterprises (in particular SMEs) mostly rely on more easily accessible, short-term market information (e.g. from their clients). They often do not know how to sustainably realise their full market potential by

- thinking and acting more in a longer-term perspective and
- developing strategic alliances and networks.

Due to restricted internal resources, most of them would have to use external strategic knowledge if they realise the need to change their business-as-usual approaches.

In this context, strategic cluster support instruments can help these enterprises meet future challenges and support strategic capacity building in the region. Strategic cluster support combines forward- and outward-looking approaches (e.g. in cluster foresight type activities) to facilitate knowledge creation processes contributing to long-term competitiveness and sustainable economic development. Specifically, it

- promotes knowledge exchange and strategic learning processes between cluster stakeholders in order to create a localised and unique knowledge stock,
- facilitates cross-cluster, trans-regional and transdisciplinary knowledge flows and strategic business linkages to enrich and refresh the local knowledge pool with external

impulses and to leverage complementary assets and capabilities of clusters in different regions, and

- enables cross-cluster policy learning and pursuit of common aspects of strategic cluster policies.

### **Orchestrating Business and Cluster Strategies**

The sustainable success of cluster development depends substantially on the concerted actions of many different actors – multiple levels of government and public agencies, companies, educational and research organisations, etc. In this context, it is crucial to develop a common vision and to implement a cluster strategy that

- reflects the specific needs of the cluster stakeholders,
- focuses on the most promising international technology and market development perspectives, and
- integrates a broad range of (European, national and regional) public policies and private sector activities.

Combining forward- and outward-looking approaches also means

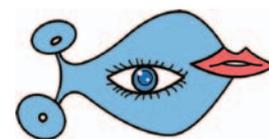
- to provide the regional stakeholders with strategic longer-term orientation by taking stock of available strategic knowledge from both public (e.g. regional foresight) and private actors (e.g. from corporate foresight or roadmapping activities in large companies) and
- to align business strategies and longer-term regional cluster strategies.

To summarise, succeeding in linking forward- and outward-looking approaches and creating a multi-actor, multi-level coherence of strategies and congruent activities means leveraging synergies. Multiplier effects can be achieved (e.g. bundling forces to boost innovation effectively), and better – because broadly based and mutually strengthening – economic decisions lead to increased and sustained business and regional competitiveness.

These positive impacts can be made sustainable if, in addition to facilitating access to external strategic knowledge, the strategic capacities of the innovation actors themselves are systematically built up in a way that takes into consideration their different absorptive and knowledge management capabilities.

## **The Connect2Ideas Approach – Strategic Capacity Building in Clusters**

The FP6-funded project Connect2Ideas (June 2006 to May 2008) aimed at fostering transnational technology transfer – mainly between multinational enterprises (MNEs) and SMEs – by enhancing future- and open-innovation-oriented



thinking and acting in SMEs, related business networks and clusters.

In this context, the Steinbeis-Europa-Zentrum (SEZ) developed a series of two consecutive workshops on **Strategic Capacity Building & Open Innovation** and tested it in three regional clusters in Baden-Wuerttemberg, Germany with varying open innovation regimes and institutional settings (ICT, mechatronics and life sciences clusters).

The strategic experience and knowledge of MNEs, for instance through corporate foresight, strategic planning and open innovation, should be used to improve strategic capacities also in their business environments (clusters, regions and institutions)

- to overcome mostly short-term orientation by recognising the strategic relevance of future-oriented collaborative and open innovation activities,
- to develop common visions concerning future trends and challenges (using horizon scanning techniques with a time horizon of ten years) and, based on these results,
- to derive joint innovation projects aiming at sustainable long-term cooperation.

Target groups and participants were MNEs (e.g. Siemens, IBM, SAP) with deep roots in the region, SMEs, research and education organisations and other regional stakeholders including representatives from public RTDI funding agencies and public administration.

The preparation phase included

- identifying and mobilising MNEs, company networks and business clusters and
- analysing in an innovation audit type approach the strengths and weaknesses of the cluster-related innovation system with specific focus on the barriers to open innovation processes.

### **Common Vision about Trends and Challenges**

The first workshops introduced various methods, concepts and approaches to strategic “future management” and then focused on the development of a common vision about future trends and challenges using specific foresight and TA elements and techniques such as

- SWOT (strengths, weaknesses, opportunities, threats)/ STEEPV (social, technological, economic, environmental, political and values) analyses to identify key global trends and (based on local strengths and weaknesses identified in advance) to discuss common longer-term challenges and opportunities, and
- impact analyses to assess the impact of the most relevant trends with a specific focus on business perspectives: for instance, future markets (customer needs), business models, innovation and value creation processes,

requirements with regard to human resources (qualifications, skills), etc.

### **Future-oriented Open Innovation Processes**

Based on the results of the first workshops, the subsequent workshops and follow-up activities focused on the development of joint innovation projects aiming at sustainable long-term cooperation using techniques such as

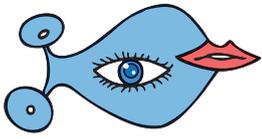
- technology watch/scouting to identify existing or wanted technologies in the international business environment,
- value chain analysis to identify potential international cooperation partners in the respective global value chain and innovation network, and
- partner search and search for funds to identify potential strategic cooperation partners for the cluster stakeholders including relevant funds (e.g. FP7, CIP, ERDF, national, regional) for subsidising the strategic collaboration.

### **Success Factors and Outcomes**

Critical success factors of the workshop series included the comprehensive preparation in close coordination with the responsible cluster organisations (e.g. preparing a draft SWOT and value chain, motivating the relevant cluster stakeholders, attracting high-reputation external experts for keynote speeches, etc.). The quality of the introductory statements of the keynote speakers was also important to stimulate a constructive debate on future trends, specific impacts and open innovation processes. These workshops could only prepare the ground for forward- and outward-looking thinking and acting. Thus, interested cluster actors and stakeholders were provided with ongoing advice and assistance for implementation.

The pilot workshops in Baden-Wuerttemberg contributed to increasing the strategic capacity at the firm level as well as at the level of regional economies and decision-makers:

- They provided a basis for collaborative innovation projects with regional and international partners in the specific cluster and regional value chain (e.g. in the context of the German “Excellence Cluster” competition).
- The involved ministry decided to continue the workshop series in the framework of its participative regional innovation and new cluster policy. In this respect, the workshops served as a trigger for further cluster foresight activities in Baden-Wuerttemberg.



## Outlook: From Connect2Ideas to CReATE

The Connect2Ideas approach highlights the fact that strategic guidance enriches traditional regional RTDI policy instruments by generating a creative atmosphere and a seedbed for ongoing learning processes. Thus, it provides – independent of different local open innovation regimes and institutional settings – a genuine value added – both for businesses and cluster policies.

The **Strategic Capacity Building & Open Innovation** workshops demonstrate how linking forward-looking and open-innovation-focused approaches can support strategic capacity building in clusters and thus enhance future-oriented open innovation processes at the business and regional levels:

- Businesses overcome their mostly short-term orientation by recognising the strategic relevance of longer-term perspectives and collaboration with external partners.
- Regional RTDI policy-makers take into account the specific needs of the cluster stakeholders with respect to future challenges and opportunities, and, on this base, create long-term, sustainable competitiveness perspectives and framework conditions for the innovation systems.
- Aligning future-oriented business strategies and longer-term regional cluster strategies lead to better, broadly based and mutually strengthening innovation processes contributing to increased and sustained competitiveness.

Based on the Connect2Ideas experience and in the context of the German (national) “Excellence Cluster” competition, SEZ developed specific training modules for facilitating and improving strategic cluster development at multiple levels:

- cluster level: developing a common vision and strategy for the cluster and defining an action agenda that reflects the unique needs and capacities as well as the most promising international technology and market development perspectives;
- “sub-cluster” level: refining the cluster strategy, adopting the strategy and agenda to the specific needs and capacities of the respective “sub-cluster” network and implementing concrete joint actions;
- single firm level: training in future-oriented strategic innovation management results in an endogenous base for competitive, business specific roadmaps and strategies.

This triad in developing innovation-related strategies in clusters leads to aligned innovation processes and therefore increases the impact of coordinated RTDI actions. To avoid negative rigidity and lock-in effects and to create a climate conducive to visionary, out-of-the-box thinking, the knowledge exchange with external partners is an important element in all strategy processes.

In this respect, SEZ took up the Connect2Ideas approach and elaborated for the FP7-funded “Regions of Knowledge” project CReATE (March 2008 to October 2010) a methodology to develop a transregional joint research agenda for clusters in creative industries sectors. Creative industries already contribute substantially to economic value creation and employment, and their importance is expected to grow further. So far, however, only some regions benefit from the economic stimuli of creative industries. In addition, enterprises in this sector highly depend on transregional and transdisciplinary collaboration. Addressing both issues, CReATE aims at boosting the sector as a whole in Europe, especially by stimulating future-oriented open innovation processes between the stakeholders of creative industries clusters.

The CReATE methodology uses a modified Connect2Ideas approach to define research priority areas decisive for the future innovativeness and competitiveness of the clusters. Agreeing first on regional priority areas (based both on regional excellence and “aspirations”), a transregional joint research agenda will be elaborated in a coordinated process of interlinked regional and transregional phases. By integrating the broad spectrum of stakeholders (including funding bodies), regional and transregional project ideas will be developed. The impact aimed for is to improve the innovativeness and international competitiveness of the creative industries in the participating regions, but also to stimulate growth beyond them in the EU. Processes of learning from and dissemination of the approach and findings beyond the project frame will be secured by tailored training workshops on future-oriented strategy development for companies and cluster managers.

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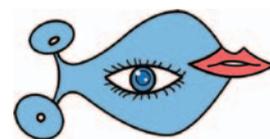
Project website CReATE: [www.lets-create.eu](http://www.lets-create.eu)

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# Furniture Foresight Centre – CEFFOR®

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<b>Type:</b>	Foresight Centre		
<b>Organizer:</b>	AIDIMA (Furniture, Wood and Packaging Technology Institute, Spain)		
<b>Duration:</b>	Unlimited	Time Horizon: 10 years	Date of Brief: July 2008

## Purpose

*CEFFOR was created to promote the sustainable development (in terms of all three pillars: economic, social and environmental) of the furniture industry in countries with high costs of production. CEFFOR is to accomplish this task by means of contributing strategic information to the social agents and companies who participate in determining enterprise strategies and industry policies.*

## Furniture Foresight Information System: CEFFOR®

The CEFFOR® (Furniture Foresight Centre) strategic scenario analysis is a unique response to the future challenges that the furniture industry in high cost countries (HCC) will face. An important factor in this respect is the globalization of markets and its impact on industries located in high cost countries.

CEFFOR® is part of the **Business Intelligence System** of AIDIMA, which was commenced in 1998 and is based on the work of more than 150 international experts from all over the world. It covers seven knowledge areas: consumption, management, marketing, supply chain, materials, product and competitive environment. CEFFOR® is geared toward identifying future trends in each knowledge area and analysing their relation to the respective business models of the furniture industry.

CEFFOR® has a global scope and counts on the work of professionals, researchers and experts situated in different parts of the world.

The main objectives of CEFFOR® are

to create a foresight information system using a European foresight approach by constructing the possible competitive scenarios of the furniture sector in the high cost countries between now and 2016 and utilising foresight methodology for a systematic analysis of the constructed scenarios to identify possible futures of the furniture sector (macroeconomic, sector-based and business models scenarios);

- to identify the key variables of the future that guarantee the economic, social and environmental sustainability of the furniture sector in high cost countries;
- to generate information on opportunities for high value added, supporting strategic decision making processes of the companies in the furniture sector;
- to promote the adoption of proactive attitudes in facing changes in the competitive environment;
- to formulate strategic recommendations to public administrations and business associations of the furniture industry in high cost countries;
- to follow the evolution of the furniture industry's competitiveness in low cost countries (LCC), assessing the existing competitive gaps to high cost countries.

There are three different phases of CEFFOR®:

- 2005-2007: strategic foresight – scenario definition, identification of key variables.
- 2008: foresight on future business models in the furniture industry – mapping out the territory for actions at company level.
- From 2009 on: strategic foresight oriented toward evaluating the sustainability of business models and scenarios from an industry and a policy-makers point of view.

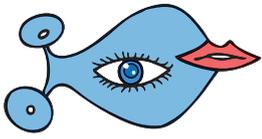
### Phase 1:

**Step 1** Defining CEFFOR global scenarios 2016: demography, territory, agents, macroeconomics, market, global relations and consumers

**Step 2** Identifying key variables at a sectorial level

**Step 3** CEFFOR morphological and FAR analysis: Round 1 expert panel

**Step 4** CEFFOR cross impact analysis



**Step 5** Defining BAU, Contrasted & Rupture Furniture Industry 2016 scenarios

**Phase 2:**

**Step 6.1.1.** Round 1: Generalist Expert Panel: open questions in each knowledge area

**Step 6.1.2** First Round: Sectorial Expert Panel: Evolution 2016 by knowledge areas

**Step 6.1.3** Second Round: Sectorial Expert Panel: impact evaluation along the value chain

**Step 7** Defining the future (2016) furniture business models

**Phase 3:**

**Step 8.1** Defining the sustainability indicators for the furniture sector in HCCs

**Step 8.2** Defining reference business models by scenario

**Step 8.3** Weighting geographic differences of sustainability & measuring the indicators for all scenarios

**Step 8.4** Sustainability – feasibility matrix

**Step 9** Selecting the desirable scenario: involving the institutional committee

**Step 10** Defining the pathway only considering the desirable future: industrial policy

1. Political situation internationally
2. Retailer strategy
3. Economic policy on the furniture industry
4. Demographic evolution
5. International competition in the furniture industry
6. Consumer behaviour in the furniture market
7. Social evolution of home attitudes

The problem is examined at two different levels of detail in order to obtain a better definition. At the first level of dimensions are the seven key variables external to companies (i.e. PREDICS above) on which they have little (or no) influence. At the second level of components are the 32 values (in total) that the seven dimensions can have, which represent different possible evolutionary paths into the future and which together model the evolution of each dimension. Both levels of detail can be seen in Figure 1 (page 131).

The totality of every possible combination of these variables generates the so-called “morphological space”, which is obviously very complicated, having (as it does) many thousands of formal combinations. The next step therefore was to “reduce” this morphological space to a more tractable form by removing illogical, implausible and improbable combinations. This crucial task was undertaken, in the first instance, by performing seven independent morphological analyses at the level of dimension. That is, within each of the seven major dimensions, a morphological analysis sought to eliminate inconsistent or illogical combinations within that particular dimension (deferring further consistency checking between the dimensions to a later time). The challenge in methodological terms is to generate output that is understandable for people outside the process and, at the same time, models the wicked problem without (as it were) leaving “blank” areas. This is no easy task.

The internal team performed the analysis with Michel Godet’s morphol software, making use of additional exclusion criteria generated by the experts based on assessments of greater or lesser probability for the various combinations. That is, only logical and plausible combinations that were not also considered to have a very low probability were included. In this way, the whole wicked problem was reduced to the FAR sector/factor matrix. Each of the seven PREDICS dimensions (called “sectors” in FAR terminology) has been reduced to between three and five plausible and probable values (called “factors” in FAR). These sector/factor values form the basis of further morphological/FAR analysis to identify the mutually consistent combinations among these 2,187 (i.e.  $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ ) formal combinations. This constitutes the starting point for building the sectorial scenarios. Ultimately, they are used as a basis for discussion with companies and policy-makers in order to begin the necessary process of initiating real change within the furniture industry.

## The PREDICS® Model: Morphological/FAR and Cross-impact Analysis in CEFFOR®

For determining the (external) global and sectorial scenarios for the furniture industry, only variables related to the external context of a company were selected. Since the variables considered pertain only to the competitive environment and consumer market at the levels of the domestic and global furniture industry, not all of these variables are at the same level of controllability from the industrial players’ points of view. In order to execute the morphological/FAR (Field Anomaly Relaxation) analysis, only the variables with a low level of control on the part of the industrial players were considered.

In FAR, one of the “arts of usage” (Rhyne, 1995) is to make use of a constructed acronym as a sort of “meta-language” for the problem under investigation in order to make it easy for the technical team involved in the scenario generating process to remember to consider all the dimensions of the problem (Coyle, 2003). The CEFFOR technical team has found an acronym very appropriate to its objective: “PREDICS”, which consists of the following dimensions:

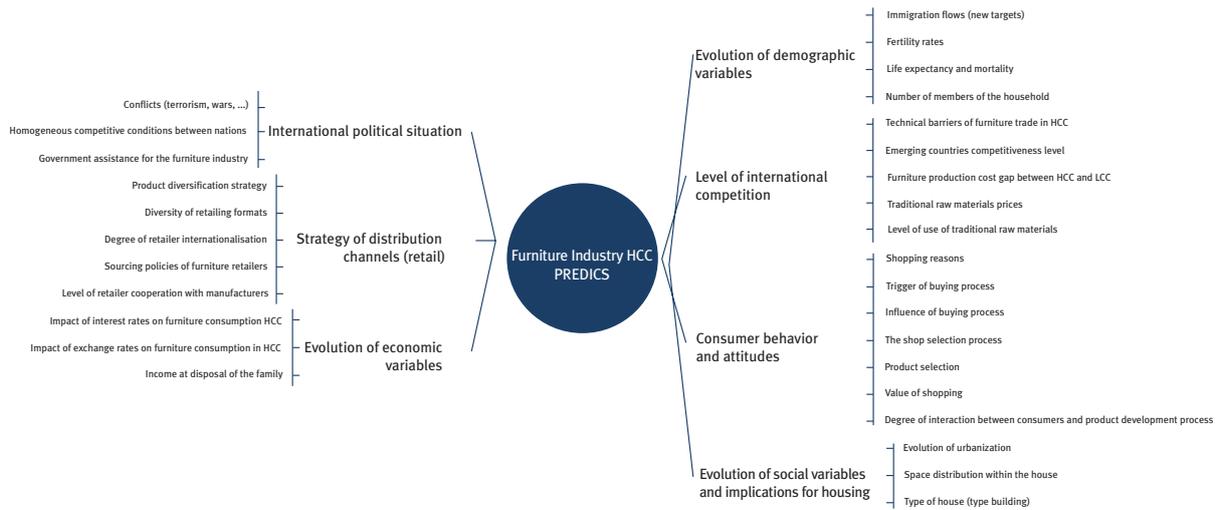
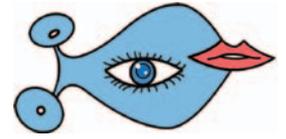


Figure 1: The PREDICS model – mindmap

## Context of the Foresight System

The furniture industry operates in a turbulent, competitive environment, with companies lacking experience in strategic planning and/or the use of foresight information, focusing on the short term, and showing scepticism towards new ideas differing from current reality. In this business situation, price has become the most important strategic variable, and the irruption of low cost countries into the competitive environment has revolutionized the industry worldwide. Organized distribution, also pressured by an enduser who values low price in an oversupplied market, has taken advantage of economies of scale, beginning a seemingly unstoppable process of buying product in these low cost countries as trade and logistical barriers are being overcome. The effects of this situation have been catastrophic for the traditional furniture manufacturing industry in the developed countries, which has found itself incapable of competing on costs with these countries, which have gradually improved their quality and design. The progressive loss of market share, both domestically and internationally, and the growth of imports has caused a steep drop in the profitability of businesses – and the beginning of a worrying trend: the closing of companies and the subsequent rise of unemployment. The key question in this context is: “Can the household furniture manufacturing industry survive in the developed countries or is it doomed to disappear?”

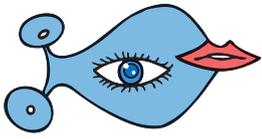
## Three Sectorial Scenarios in the Furniture Industry

### *Smart Solutions – Sweet Home & Innovations*

1. Revitalisation of the US economy and economic acceleration within the EU by 2010 in the wake of the Lisbon Treaty. Full employment and extended retirement age. Controlled immigration as a massive resource.
2. Growing urban-rural harmony. Urban polycentrism. Very fast development of communication and information technology. Demand for intelligent housing
3. More investment in housing. Home as a manifestation of values such as security, sociability, respect for the environment, etc. Spread of avant-garde lifestyles. Life expectancy remains high while society experiences a moderate rejuvenation due to immigration. A growing furniture market.

### *Retail Brand – Global Suppliers & Value Chain*

1. Economic slowdown 2008-2010 and a new expansive cycle after that. Reorganization of the economy.
2. Little global institutional progress in economic policy. Moderate antitrust progress (competition law). Offshoring manufacturing of standard products.
3. High level of furniture retailing consolidation. Conventional purchase of furniture by end-user is focused on the product itself without any value added during the buying process. In the consumer mind, the furniture brand is equivalent to the brand of the retailer.



### **Low Consumption – Budget & Basic**

1. Severe recession in both the USA and EU. Slow recovery after that.
2. Increasing economic instability. Employment stagnation. Immigration pressure. Wage moderation. Decrease of disposable income.
3. Households: Single-functional housing spaces and conventional lifestyles. Lengthening of the furniture usage cycle in households. Function and price as decisive factors of purchase. Consequence: a diminishing furniture market.
4. Retailers searching for the best combination of low cost furniture. Grave crisis of mature manufacturing sectors. Constant “antidumping” conflicts.

### **Foresight Information System – a Useful Model for Policy-Making**

Foresight scenarios are not an objective in themselves. It is also necessary to implement a follow-up phase in order to facilitate furniture companies using this foresight information in their decision-making processes.

Scenario building methodologies should not be used in a rigid, mechanical way. When a foresight exercise starts, there is a risk of proceeding directly to methods and using more than we in fact need. Rationality and rigour do not imply a need to use a lot of methods. Sometimes the ad hoc nature of our problem indicates that it may be more convenient to use a combination of methods as presented here.

The presented foresight methodology used by CEFFOR® Furniture Foresight Centre can serve as a feasible model for foresight processes in other traditional industries upon suitable adaptation. Unfortunately, the current situation in other traditional industries is similar to the one that the furniture industry finds itself in. From the point of view of policy-makers, it would be ideal if the main players in the rest of the traditional goods sectors decide to implement a similar foresight information system. In this instance, policy-makers would have better access to information essential for anticipating and developing a sustainable industrial policy.

## **Partnerships within CEFFOR**

AIDIMA is the Furniture, Wood and Packaging Technology Institute in Spain and leads the development of CEFFOR®. For this purpose, AIDIMA counts on the collaboration of international partners:

- FPINNOVATIONS-Forintek Division (Canada’s Wood Products Research Institute).
- Research Centre CRC-Wood Innovations of The University of Melbourne in Australia.

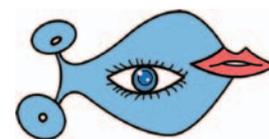
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# Combining ICT and Cognitive Science: Opportunities and Risks

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Sponsors:	European Commission, DG Joint Research Centre, Institute for Prospective Technological Studies, Seville		
Type:	Research project		
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Duration:	2005-2007	Budget: € 250,000	Time Horizon: 2015 Date of Brief: August 2008

## Purpose

*Many experts think that the technological convergence of previously separated sciences like nanotechnology, biotechnology, information and communication technologies and cognitive sciences will have a deep, long-term impact on society and economy. Key actors in society need to become aware of the challenges linked to converging applications (CA) and take decisions in support of developing them. By analysing CA-related opportunities and risks at a very early stage, we hope to contribute to reducing possible adverse effects in the future.*

## New on the Agenda: Converging Technologies and Applications

Quite often, societal concerns about technological convergence are polarized into extreme positions. Supportive positions, like the one by the National Science Foundation (NSF) in the USA, see converging technologies/applications as a solution for many (societal) problems and dilemmas. They expect much cheaper and cleaner technologies that will lead to improved human health and welfare. They argue that the convergence of technologies and applications will bring rapid improvements to “human performance”. Others, however, stress the possible detrimental effects of converging technologies and applications on health and safety, equity, environment and privacy. Currently, only a few non governmental organisations (NGOs), like the Canada-based ETC Group, have expressed a formal position on converging technologies. In the ETC Group’s view (2003), neither governmental programmes on converging technologies nor any of the specific projects proposed in the NSF report should go forward without a broad process of social consultation.

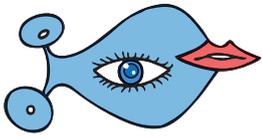
In 2004, the European Commission published the so-called CTEKS report in reaction to the report by the NSF and the technology-driven discussion in the United States and as a contribution to the debate from a European perspective. It identified four characteristics of converging technologies and applications:

**Embeddedness:** converging technologies (CT) will materialize in services and products that are pervasive and inconspicuous. The combination of nanotechnology devices with information and communication technology (ICT) infrastructures (mobile), intelligent actuators and sensors allow to construct an artificial environment by which CT devices are embedded within the human environment. For instance, CT devices can be injected into blood vessels and used for microsurgery and communicating and controlling specific bodily functions, as they are almost invisible.

**Unlimited reach:** the potential of CT devices is almost unlimited and they could be used to enhance human functionalities in ways that were previously impossible. This may relate to internal functionalities (pertaining to the control of specific diseases for instance) or to external functionalities such as human communication patterns.

**Engineering the mind and the body:** CT devices may be used in micro-scale engineering, and they may extend its domain from “traditional” micro-scale engineering, such as DNA-replication, towards engineering of the mind. The CTEKS report makes a plea for engineering *for* the mind (and the body), rather than the more threatening engineering *of* the mind. This clearly indicates the normative challenges that CT will pose for society in the future.

**Specificity:** the instruments developed at the crossroads of biotechnology, nanotechnology and ICT enable a focused and specific use in, for instance, binding pharmaceuticals to specific DNA-profiles so that unwanted side effects can be avoided.



These four characteristics offered a starting point for a preliminary analysis on opportunities and risks of converging applications as a broad pilot study.

### **Objectives: Improve the Quality of Debate**

The research project had the following objectives:

- to review existing literature and structure information in order to initiate discussion on opportunities and risks resulting from converging applications;
- to provide a starting point for setting priorities for discussion on research and strategy within and between the various fields;
- to formulate and structure relevant open questions on opportunities and possible risks of CA;
- to contribute to a balanced discussion on opportunities and risks and further work on this topic.

### **Methodology: Literature Review and Expert Interviews**

The analysis is based upon a literature review complemented by ten expert interviews carried out over the telephone. The interviewees were natural and social scientists familiar with the topic of converging technologies and applications.

As CA is a very wide and diffuse field to analyse, the main focus in this foresight brief will be on the impact of the convergence of ICT with cognitive science (CS). The CTEKS study identified the cognitive sciences as an important emerging field of converging technologies and applications. For the sake of clarity, this brief will focus on three specific areas at the intersection of cognitive science and ICT, as identified by bibliometrical research as major foci of mutual benefit between ICT and CS:

- human brain interface,
- speech recognition,
- artificial neural networks.

## **Main Findings**

### **Human Brain Interface**

The brain-machine interface (BMI) is an example of a medium to long-term application field with wide-ranging consequences and a number of concrete challenges. In addition, ethical aspects are very important according to an international study group that developed a roadmap of neuro-IT development. Recent progress in fundamental neurophysiological research gives the impression that, in the near future, visions from science fiction movies like implanted electrodes may become possible (**technological-scientific dimension**). The human brain could be directly interfaced with computers or embedded in external devices. Information gathering and processing devices could be incorporated in the human body. However, we are still a long way from these applications in real life.

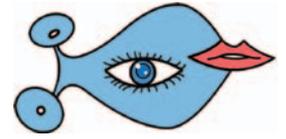
All current prototypes are basically one-directional, generally from the brain to the external environment, with no feedback loops, that is, two-way information transmission. For real life applications, like the control of paralyzed limbs or complex prosthetic devices, bi-directional interfacing will be necessary so that the brain can use its sophisticated feedback control strategies. In addition, a number of technological challenges, such as better sensory input or better understanding of neural coding of primary motor regions, have to be solved before this highly invasive technique can be applied to humans.

Bi-directional brain computer interfacing (BBCI) holds great promise in the treatment of neurological and trauma patients (**health dimension**). Before doing this kind of treatment, it is necessary to identify the exact brain regions for electrodes to use BBCI for specific tasks. Furthermore, real-time encoding/decoding software for brain input/output signals are needed. Further work on improving BBCI techniques, and also alternatives to implanted electrodes, must be done.

As regards the **ethical dimension**, science, society and business in Europe have to decide what should be done if invasive technology causes brain damage. If it does, would it be acceptable to patients? Would surgical interventions be acceptable only to disabled or also to healthy people? When is it acceptable to the public? How could the public or stakeholders be involved in such a discussion? In addition, it may be that brain plasticity interferes with the normal operation of the human brain. These are all open questions to be addressed when shaping this converging technology.

This is an example of a converging application that could also have a great impact on European society (**social dimension**). There may also be clear cases of misuse. Mentally upgraded individuals (as shown in some science fiction movies and novels) could theoretically establish new collective forms and dominate society. Although this is still only fiction, it might be worth thinking about the **legal dimension** and European regulatory issues (**political dimension**) at the very early stages of development in order to avoid controversy similar to the one surrounding green biotechnology, where balanced views have been hard to come by. Another interesting question concerns the possibility of arising social pressure; for instance, under which circumstances should disabled people or their healthy peers have the opportunity to reject using BBCI and be able to continue their lives as they did before.

Since interfaces to the human brain are in the very early stages of development, the long-term **economic dimension** of these converging applications is not clear. A number of scientific, business and social questions are still open and would need to be addressed before assessing the economic impact. They include: Is there a critical mass of scientists and private companies for developing human brain interfaces in Europe? What role do large companies and SMEs play? What is the economic potential of human brain interfaces and what



are the economic risks? What kind of public funding (**political dimension**) is necessary for the development of applications and products that are competitive on international markets? How could stakeholders be involved in finding a common ground for applications and products that are broadly accepted by the public?

### Speech Recognition

From an economic perspective, speech recognition is very promising since it is a major development in the convergence of ICT and the cognitive sciences in the short and medium-term and has enormous implications for the way we will work and live in the future (**economic dimension**). According to Lawrence Rabiner, speech recognition aims to accurately and efficiently convert a speech signal into a text message independent of the speaker or the speaking environment. The challenge is to make speech recognition systems robust irrespective of the surrounding acoustics so that they also function well in cars or environments where cellular phones are typically used. A range of signal-processing methods for speech enhancement, noise removal, speaker normalization and feature normalization have been proposed to solve the problems associated with noisy environments. The key challenge is to develop easy-to-learn interfaces between humans and machines for advanced services that are as simple as voice telephone is today (**technological-scientific dimension**).

In the next few years, this area of converging applications is expected to play a major role in cars, mobile phones, personal computers, handheld devices and even household equipment, for instance washing machines. International companies like IBM, Philips or Miele and a number of European SMEs are very active in this field. According to a market prognosis by Frost & Sullivan, the market volume for 2006 in speech recognition technology will be \$ 700m in the US alone and further growth is expected in the following years. The market volume and the growth tendency is about the same (**economic dimension**). International agreement on standards for software and hardware would be beneficial for rapid deployment and exploitation of this market potential.

Widespread use of speech recognition applications would not only save costs for the businesses concerned but would also have profound implications for the way we work. Speech recognition would make working with personal computers much easier and thus more productive. In addition, the nature of office work could change as certain “simple” and repetitive tasks would be reduced (**social dimension**). For this reason, a discussion on upside (deskilling of work) and downside (reskilling of work) adjustment between the stakeholders might be very useful to find new satisfying concepts of work for highly skilled and less skilled workers. Additionally, it is difficult to predict how social life and privacy could change. Abuse or misuse of this converging technology seems

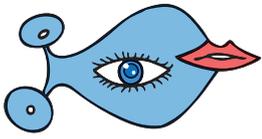
possible. Would speech recognition provide better learning tools for instance for learning a foreign language in a more efficient way? Would everybody who wants to have access to such systems (**ethical and social dimension**)? As regards the **political** and **legal dimensions**, how could public authorities support the development of international standards? Furthermore, it could be very important to find new ways of funding basic and application-oriented research on speech recognition.

### Artificial Neural Networks

Artificial neural networks could be widely used in industrial applications in the long-term (**economic dimension**). However, according to the roadmap of the international “Neuro-IT” network, in the majority of cases industrial applications have been very specialized and of limited economic significance. The difficulty of moving from the laboratory into the field is at least partially due to a number of intrinsic weaknesses in current technology, which in many cases coincide with areas where artificial models have little resemblance to natural processes. Traditional artificial intelligence (AI) applications, such as machine translation, data mining or intelligent software agents, have been far less successful than originally forecasted because of unresolved technological hurdles. To overcome this, it will be necessary to make substantial progress in complex algorithms that can emulate human and animal cognitive competencies in artificial neural networks (**technological-scientific dimension**). There seems to be an increasing perception that established software engineering concepts are not sufficient to overcome these scientific challenges and that it would be beneficial to explore the suitability of alternative – yet less developed – models and methods of evolutionary biology (e.g. gene regulation and expression in the evolution of novel phenotypes, the roles of gene duplication). Artificial neural networks are based on abstract models of biological neuron and synapse functions. An important aspect is that the artificial neural networks are able to learn and to generalise from what they have learned.

Future applications and products (**economic dimension**) could, for instance, be “elastic” designs for autonomous robots, highly flexible software for pattern recognition and categorization, self-adapting systems for the protection of autonomous systems against threats or hybrid chemical-computerized development environments. Currently, it seems that there is enormous future economic potential should a number of technological-scientific breakthroughs materialise. Besides, it seems that introducing the advantages of these types of technologies into the debate with stakeholders might also be a necessary element in the process of technological evolution (**social dimension**).

As some research into artificial neural networks is driven by the long-term vision of creating artificial intelligence, the **ethical dimension** becomes important. Would this



development lead to the “end of nature” as Bill McKibben feared in 1990? Or is it an illusion that the world is human-generated and human-managed independently of nature? These and other more fundamental questions have to be considered when discussing the “intrinsic limitations” of human beings. Apart from this, long-term **legal and social questions** arise – for instance, what legal status should artificial neural networks in Europe have? And finally, what kind of public funding and decision making process (**political dimension**) is necessary for an ethically sensitive development of competitive applications and products?

## Prospects of Successful Utilization

### *Expectations*

Many experts believe that technology convergence will lead to ground-breaking innovation in science, business and society in the 21<sup>st</sup> century. The prospect of large potential has generated a high level of expectation, particularly on the side of researchers and industries likely to exploit it. Tangible products, however, are still in their early stages since converging applications are less developed as compared, for example, with more “traditional” biotechnology applications and products. For any possible strategy, it is necessary to take into account the long-term nature of CA, the long-term time schedule for socio-economic returns and the risk of pushing a short-term hype.

### *Economic Potential*

The innovative potential of converging applications can be leveraged when technological possibilities are matched with real user needs. To analyse these “matching patterns”, adequate platforms of cooperation between science, industry and other relevant stakeholders are necessary. This would allow the identification of “show stoppers” (in the sense of innovation obstacles and dangers) at an early stage. Such platforms could be based on round-table discussions between all relevant stakeholders (also including the representatives of NGOs). A differentiated monitoring of the economic potential may point out trends and possibilities, which may facilitate investment and (public) funding decisions. The predicted economic potential may be analysed, for instance, in health care, entertainment and markets for the European ageing population.

### *Sectorial Considerations (the Case of Health Care)*

In times of an ageing population throughout Europe, the health care system may benefit from using converging applications and products. New diagnostic and therapy

procedures offer various opportunities for patients as well as for the health care systems in general. The various uses in medicine could be stimulated by an analysis of the broad spectrum of medical applicability and preventive medicine.

### *Technology Acceptance*

One option for promoting the acceptance of CA in the ageing European societies is to highlight the potential for future applications by referring to existing products, such as pacemakers or hearing aids. For this, scenario building exercises might be very helpful. From short, medium or long-term societal scenarios we could learn more about societal and individual requirements and reservations concerning converging applications. It might also be interesting to think about how to integrate the perspective of intergenerational justice between young and old, rich and poor, and non-disabled and disabled into the analysis.

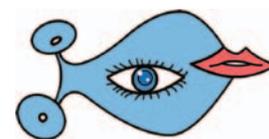
The relevant stakeholders, like science, business, politics and NGOs, follow different logics of action. Therefore, societal scenarios could also contribute to a common language, clear parameters for the scientific community and a better understanding of the real needs of users and the product world. Furthermore, it might be asked, how successful dialogue processes between experts and citizens can be organised. The effects of converging applications on special policy areas and their specific structures (e.g. economic policy, health policy, social policy and housing policy) are unexplored. It is worthwhile to get more information about the possible impact of converging applications in special policy areas. Converging applications could be one very interesting model for tackling the challenges of ageing societies in Europe.

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# Extremadura Regional Foresight Exercise

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<b>Sponsors:</b>	Extremadura Regional Government (Junta de Extremadura) and European Commission (FP6)			
<b>Type:</b>	Regional exercise			
<b>Organizer:</b>	Foundation for the Development of Science and Technology in Extremadura, Badajoz, Spain, Luis Casas			
<b>Duration:</b>	01/2007–03/2008	Budget: € 160,000	Time Horizon: 10-20 years	Date of Brief: June 2008

## Purpose

*The Extremadura region has carried out the first regional foresight exercise to help devise a global strategy for the socio-economic development of the region so as to enhance economic growth. The main agents involved in regional development set out to plan a desirable future for the region and clearly define investment priorities. The Extremaduran foresight exercise aimed at projecting the position of key sectors and technologies in the context of future international trends.*

## Preparing Extremadura for Technological Innovation and Economic Development

The region of Extremadura, in the southwest of Spain and bordering with Portugal, has historically been characterised by a poor agricultural livestock economy, high levels of emigration and a high unemployment rate. Extremadura has been defined by a low population density. The structure of businesses in the region is marked by the fact that less than 1% employ more than 50 workers. The regional economy today is characterised by the greater importance of the service sector as opposed to the traditional weight that agriculture has had in the region. The region currently qualifies as a Convergence Region under the EU funding rules. However, economic indicators and the standard of living are growing year by year at a rate above the Spanish average, although this convergence phase has not reduced the differences to other regions.

As the industrial revolution bypassed the region, the main agents involved in regional development decided to invest great efforts in order to develop a Global Strategy of Regional Socio-economic Development based on the information and telecommunication technologies and innovation. One of the latest decisions was to carry out the first foresight exercise in order to help regional players map out a desirable future and to pinpoint investment priorities for the region. The Regional Operational Programme was the starting point of the regional foresight exercise.

The objectives of this foresight exercise included the preparation of strategic plans involving the relevant stakeholders of the region, identification of future trends and key technologies as the basis for these plans, while taking into account the

challenges the region faces and the opportunities and benefits that might arise from tackling these challenges.

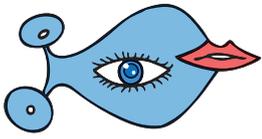
## Extremadura Regional Foresight: the Set-up

### Expert Panels as Key Instrument

Extremadura decided to use the Regional Foresight Strategic Policy Intelligence tool due to its potential for providing valuable inputs to strategy and policy planning for the region and for mobilising collective strategic action. Moreover, regional foresight is a means for those sharing a common territory to better shape and control its future development.

The regional foresight exercise had a dual focus. On the one hand, the exercise concentrated on science and technology, placing emphasis on technological development, market opportunities and social needs, and, on the other hand, the exercise aimed at developing key sectors, stressing economic growth.

Based on the recommendations of the OPTI Foundation, the RegStrat project partners, the Compendium and the Guidelines elaborated within the RegStrat project, and having as a reference the Technology Foresight in Ireland, we selected the expert panel as a method building on expert knowledge to develop long-term visions. This method is commonly used in national and regional foresight studies and is very valuable for compiling information and knowledge, stimulating creative views and new insights, and more widely diffusing the results as well as awareness of and familiarity with the process.



The Extremadura foresight exercise brought together more than 90 regional key players from public administration, science, technology and the private sector in order to design better policies and improve the RTDI investment decision-making process in the region based on perceived long-term challenges and opportunities.

The panel-based exercise covered four sectors in which Extremadura should build expertise, which were selected by regional experts. The sectors are

- the food-farming industry,
- information and communication technologies,
- energy,
- materials.

Moreover, biotechnology was analysed as part of both the food-farming industry and energy sector, and the environment was studied as a crosscutting issue involved in all sectors.

Two expert panel meetings took place for each sector. The first meeting of each panel aimed at assessing the current situation in the region concerning the respective sector and defining the envisioned future, while considering the strategic challenges to be faced. In the second panel meetings, the critical factors for reaching these visions of the future were identified, together with the necessary actions and actors that need to be involved in view of each factor. The second meetings resulted in a series of roadmaps that have helped to plan the strategic responses necessary to address the challenges and to realise the most favourable scenarios for the region.

The time horizon for the exercise was set at 2020. The exercise itself was completed in twelve months.

## Visions of Regional Future in Four Industrial Sectors

The regional foresight exercise focused on the above-mentioned four key sectors. The panel experts selected them according to two criteria: attractiveness of the sector and its current position in the region.

Subsequently, the eight expert meetings (two for each sector) were conducted. In the following, the visions for the future of the region for each of the four key sectors are outlined, together with the challenges to be faced and the actions and actors to be involved in the process.

### *Food Farming Industry Sector*

Firstly, the experts identified as visions for the future of this sector:

1. Add value through technological innovation in products and processes.

2. Restructure agricultural land in support of developing alternative uses and sectors.
3. Market supply concentration to reach a critical mass.
4. National quality guarantees for global markets and an Extremaduran trademark for the domestic market.

In order to achieve the visions, Extremadura has to successfully face the following challenges: increase low investment rates in research and technology, intensify networking and cooperation, meet financial needs, overcome farmer inertia due to involvement in other non-agricultural activities (e.g. in tourism), and cope with an economic structure marked by small and dispersed companies.

Furthermore, the attendants discussed the actions necessary for achieving the desired future of the region. The actions were directed at encouraging business cooperation, promoting RTD projects and providing customised information and personalized training. In addition, experts agreed on the fact that Extremadura should conduct market studies to identify possible market niches and orientate marketing toward promoting the regional characteristics and skills.

Finally, the actors that should be put in charge of carrying out the actions were listed. Among them are the public administration, RTD regional centres, private companies, the University of Extremadura, agricultural cooperatives, business associations, regional investment institutions and local action groups.

### *ICT Sector*

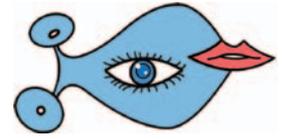
The information and communication technology (ICT) sector is one of the most dynamic regional sectors.

The desirable visions identified during the exercise for the future of the ICT sector are the following:

1. Develop a local ICT sector with a global scope based on applications and services oriented toward other sectors.
2. Develop innovative digital contents with market leading potential.
3. Establish Extremadura as a global reference node in ICT.

According to the experts, successfully achieving each of the three visions would require Extremadura to address the following challenges: small size and dispersed companies, need to increase cooperation, absence of marketing business models, and lack of identity and outside recognition.

Apart from the need for promoting the capacities of Extremadura to face the new challenges of the sector, the experts further agreed on the necessity of facilitating the creation of new financing instruments to support these technologies and of creating an innovative environment for ICT businesses within the existing institutional framework of society by fostering a social climate that values leading technologies and supports their dissemination. The experts also emphasized



the crucial role of cooperation in the evolution of the sector and the importance of training in marketing strategies to effectively promote the products and services offered.

Finally, among the actors to be involved in developing the appropriate measures, the experts identified the following: the regional government, intermediary foundations, the University of Extremadura, ICT research and technology centres, regional clusters, ICT companies, ICT associations, private training centres, end users and chambers of commerce.

### **Materials Sector**

To improve Extremadura's future position in the materials sector, the experts identified the following measures:

1. Establish regional companies on the construction market by means of new and improved products.
2. Enhance productivity by implementing technology.
3. Establish a distinguished position on the market for recycled and environmental friendly products by means of an own brand.
4. Create a sector for biomaterials development.
5. Create a sector for plastic materials production.

Among the challenges to be confronted on the path toward realizing these visions, the experts mentioned the low investment rates, the difficult access to external markets, the need to improve the innovation and productivity culture and the need for a global scope. Moreover, there is no consolidated market for recycled materials and products and a functional business model is lacking. In order to create a sector for biomaterials development, the region has to consider the business risk involved together with the long time period necessary to convert products into marketable commodities. All experts agreed that this requires an entrepreneurial commitment with a medium to long-term focus.

Among the actions recommended for tackling these challenges are the identification of demand for new products, enhancement of value added locally by developing innovative products in the region, and the hiring of scientific and technical personnel, reinforcement of the support lines for regional financing of process innovation, creation of a technology watch unit and a market observatory, identification of reference projects and companies to foster business cooperation, design of a precise training plan and workshops and seminars on specific technologies, experiences, opportunities and best practices.

The regional actors to be involved in the development of the action plan are the research and technology centres and intermediaries, the University of Extremadura, business associations, regional clusters, investment companies and institutions, the Energy Agency of Extremadura and the Health Service of Extremadura.

### **Energy Sector**

The future of Extremadura's energy sector lies in areas such as biomass, biofuel, solar systems for buildings and bioclimatic architecture.

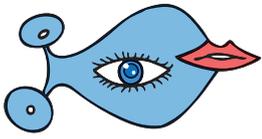
The future visions for the development of the sector are:

1. Biomass as an option for rural development in the region.
2. High general level of knowledge on renewable energies.
3. Development of a local supply that sustainably integrates every link along the value chain.
4. Development of a stable and coherent energy policy.

The experts considered these visions to be limited by aspects such as the small size of farming. Moreover, they highlighted aspects such as general unawareness and farmer's resistance to change, the lack of initial investment linked to the need for financing, the need of bringing technology up to date, high logistic costs together with the need for coordination between all the agents involved in projects.

The experts agreed on the idea of giving incentives to local biomass demand and for energy crops in addition to promoting forest waste collection and creating a biomass storage centre. In addition, studies of the different types of biomass and an inventory of regionally available biomass and its distribution are to be conducted in support of these measures. Moreover, the experts considered activities directed at disseminating knowledge very important, such as informative technology workshops addressing agricultural cooperatives, technical experts and citizens, as well as the design of a training plan for university (graduate and postgraduate levels), vocational and other types of training. Finally, technology transfer and technology watch services as well as assessment of the energy efficiency in projects were additionally viewed as very important measures to be considered.

The actors to be involved in developing the energy sector toward the envisioned future are the University of Extremadura, research centres, the Extremaduran Energy Agency, the regional government, the representative bodies of the two provinces ("Diputación de Cáceres" and "Diputación de Badajoz"), investment companies and institutions, agricultural cooperatives, the Professional Association of Architects and Industrial Engineers, electrical fitter associations, construction companies, municipalities, business associations, technology suppliers, energy suppliers and consumers associations.



## Foresight: Policy Tool for Enhancing Regional Competitiveness

Extremadura has just started implementing the roadmaps resulting from the foresight exercise in a series of actions aimed at achieving the desired visions for the future of the region. The actions are detailed in the following sections.

### *The Innoveex Plan*

Promoted by the regional government, the Innoveex Plan is a business organization model for innovation in regional companies. The plan seeks to increase the competitiveness and productivity of the regional companies while developing products and services based on RTDI and supporting new business opportunities.

The plan is based on a cluster model that encourages collaboration between the regional entities from the same sector or work area. Each regional cluster will be supported by a research and technology centre, incubators and marketing and management organization experts. In addition, the plan intends for establishing new industrial scientific and technological infrastructure in the region.

### *Creation of New Clusters*

The foresight exercise has emphasised Extremadura's need for business cooperation and networking between regional agents. There are currently six clusters in the region: Ornamental Rocks, Building Materials, Metal Mechanic, Wood and Furniture, Knowledge, and Packaging.

Recently, another cluster on Energy has been created with the aim of dynamising this key sector and fostering cooperation and exchange of professional and business experience among the members. Moreover, a Food-farming Industry cluster will be created this year.

### *Technology Watch Units and Observatories*

The plan includes the creation of technology watch units and market observatories related to the key sectors as other actions to achieve the regional visions.

Fundecyt will implement a general technology watch unit based on the four key sectors. This unit will provide the necessary information to the regional companies to improve the definition of and approach to the RTD projects.

Moreover, other specific market observatories have also been established:

**ICT sector** – The Extremaduran observatory on ICT is an instrument of the regional government to follow up on and

analyse the evolution of a knowledge society in the region, carrying out studies, surveys and other activities designed to provide knowledge of the present situation and the impact of incorporating information and communication technologies into the different sectors of society.

**Food-farming sector** – Here, a technological observatory on fruit has been established as a strategic management system. Two food-farming industry research and technology centres in the region are responsible for its operations. This service will allow Extremaduran companies to access information on research trends and identify market niches and sector opportunities.

**Materials sector** – In the Metal Mechanic cluster, a technology watch service has been installed with the objective of providing the necessary information for developing RTD projects and identifying technological needs and innovation opportunities.

### *Science and Technology Park*

In order to foster collaboration between technology companies and researchers, a science and technology park will be established in Extremadura in 2009. This park will involve RTD companies and will be situated next to the university. The park will have two headquarters, one of them located in the city of Cáceres and the other in the city of Badajoz.

### *Achievements*

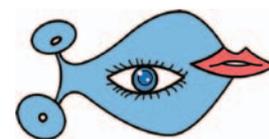
Apart from creating awareness for the foresight process in the region and enhancing learning and knowledge of the foresight process's methodology, the exercise has been used as a policy tool for both its value in providing difficult to acquire strategic information for decision-making and in creating consensus on promising ways of exploiting potential opportunities. The results of the exercise have contributed to the coordination of the regional system of RTD and innovation.

Extremadura has started down the path toward the desired future by taking the first actions as devised by the foresight exercise. Extremadura will implement an innovation system that will increase Extremaduran companies' competitiveness, support their research and innovation needs, promote business incubators and support internal organization and marketing.

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Extremadura 2020. Key Sectors and Future Technologies for Extremadura. The report can be obtained from [belen@fundecyt.es](mailto:belen@fundecyt.es) and [luis.casas@fundecyt.es](mailto:luis.casas@fundecyt.es)

The RegStrat Guide and Compendium (see [www.regstrat.net](http://www.regstrat.net)).



# Looking Forward in the ICT and Media Industry – Technological and Market Developments

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<b>Sponsor:</b>	The European Parliament's Panel for Scientific Technology Options Assessment (STOA)			
<b>Type:</b>	A European technology assessment/foresight project based on desk research and expert opinions			
<b>Organizers:</b>	Institut für Technikfolgenabschätzung und Systemanalyse (Institute for Technology Assessment and Systems Analysis) as member of ETAG, the European Technology Assessment Group ( <a href="http://www.itas.fzk.de/etag/">http://www.itas.fzk.de/etag/</a> ) Contacts: Knud Böhle, ITAS, boehle@itas.fzk.de; Leo Hennen, ETAG, hennen@tab.fzk.de			
<b>Duration:</b>	Nov. 2007-June 2008	Budget: € 40,000	Time Horizon: 2008	Date of Brief: Nov. 2008

## Purpose

*The project was an activity within the framework contract between the European Parliament and ETAG, the European Technology Assessment Group, to carry out TA studies on behalf of the Parliament's STOA Panel in view of the growing importance of a European science and technology policy. The purpose of this particular project was to identify current and expected technological and market developments in the field of ICT with an impact on the media industry and to indicate regulatory challenges and requirements stemming from the anticipated changes. The main target group are the Members of the European Parliament; the wider addressee is the interested public.*

## Context and Objectives of the Study

### STOA, ETAG and ITAS

Like many other parliaments in Europe, the European Parliament at the end of the 1980s set up an institution for scientific advice regarding complex social, ecological and economic implications of modern technology and scientific research. At the European Parliament, the process of consulting was and is organised by the so-called STOA Panel (Scientific Technological Options Assessment), a parliamentary body consisting of 15 Members of Parliament representing several parliamentary committees.

In 2005, the European Parliament decided to support STOA's activities by establishing permanent co-operation with a group of institutions with relevant expertise in the field of technology assessment. Since October 2005, this group, the European Technology Assessment Group (ETAG), has carried out studies on behalf of the STOA Panel.

The study presented here was carried out by the Institute for Technology Assessment and Systems Analysis (ITAS), the leading partner of ETAG.

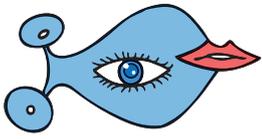
### Objectives and Focus of the Study

The aim of the study was to identify current and expected technological and market developments in the field of information and communication technology (ICT) with an impact on the media industry and to indicate regulatory challenges and requirements stemming from the anticipated changes. The thematic focus of the study was on computer based networked electronic media and particularly on Web 2.0 and user generated content (UGC) developments. Although the study is not targeted to support a specific policy action, it has to be seen in the context of activities of the European Commission related to "creative content online" and "user created content".

## Methodology and Approach

The study combines descriptive stock-taking efforts with more in depth analysis of selected policy relevant issues and an assessment of some future-oriented visions of ICT and media development. It combined (1) desk research, (2) expert enquiries and (3) a workshop with experts and Members of the European Parliament.

- (1) The desk research could draw on many sources from scientific literature to online sources like blogs, newsletters etc. Special attention was given to those sources framing



and influencing the political discourse at the European level, such as studies commissioned by DG Information Society and Media in the context of the i2010 initiative, documents of the European Technology Platform “Networked and Electronic Media” (NEM), Commission staff papers accompanying Communications of the European Commission, and papers initiated by the Networked Media Systems Unit of DG INFSO.

- (2) Statements from 25 experts could be taken into account for the final report of the project. The experts were contacted by e-mail and asked to respond to discussion statements attached. Discussion statements were part of the interim report of the project addressing visions and controversial socio-technical issues. The length of the nine discussion statements was between one page and seven pages. Experts were selected either on the basis of existing contacts or based on their scientific reputation in a given subject area. 35 experts were addressed by e-mail with one discussion statement each attached corresponding to their particular expertise; they were asked to comment on this statement. The 25 responding experts in most cases used e-mail for their answer, some preparing comments of a few pages. In some cases, the feedback led to phone conversations and further written communication to clarify the feedback.
- (3) On 26 June 2008, a workshop attended by around 30 people took place in the European Parliament, Brussels, on “ICT & Media Industries in the Times of Web 2.0”. Members of Parliament, MEP assistants, commission staff, representatives of the European Technology Platform NEM and various other stakeholder organisations attended. The workshop was meant to get feedback from MEPs, to validate interim findings of the project, and to gain further insights from the four invited speakers and the expert discussions.

The three activities described above were the basis for the final report of the project.

## Findings with Respect to Web 2.0, UGC and Media Industry

### *Web 2.0 as New Media Environment*

Web 2.0 is shorthand for recent trends in web technologies, a changing networked media landscape with new business models and perceived changes in the way people communicate via the Internet. Web 2.0 can be regarded as an environment in which – based on a homogeneous underlying infrastructure – the local and the global, the stationary and the mobile, the private and the public, the commercial and the amateurish, playing and working can be arranged and composed in almost unlimited ways. This Web 2.0 environment presents countless

business opportunities for media companies, telecommunications and IT industries.

Underlying the new media environment and the wealth of networked electronic media are technical innovations. The fundamental framework is provided by the open architecture of the Internet and Internet standards, which enable large-scale interoperability and globalisation of services and applications. Developments in hardware influence the creative content industries by improving the connectivity and performance of distribution channels. In parallel, Web 2.0 technologies have developed that embrace advances in client-server communication, advanced programming tools (web services, AJAX, API, etc.), social software, and easy-to-use and inexpensive tools for content creation enabling new forms of communication, of media, and of co-operation (e.g. virtual communities). Web 2.0 technologies also enable increased user control over their media consumption: the desktop and the browser have turned into the user’s powerful media content control centre allowing the personalisation of the networked media experience.

### **Use Generated Content Platforms**

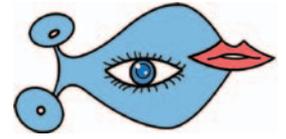
In Web 2.0 environments we see the emergence of many new types of networked electronic media. One class within these new media are so called UGC platforms. These new media are far from being non-profit. Although UGC is intuitively associated with a certain amount of creative effort of users, this understanding does not adequately cover the many ways in which users can be involved in the value production of networked electronic media – including even the involuntary production of commercially exploitable data traces.

User generated content in principle serves a niche market. UGC platforms host numerous niches. On the basis of aggregating and integrating niches, these platforms become a new form of networked media. The role of the user is not only to upload original content, but also to act as a broker between supply and demand by tagging, recommending, etc. Today content on UGC platforms often stems from users and the media industries.

Whether UGC will be a threat to existing media players is still uncertain. There are some markets that have been heavily impacted by the rise of user generated content services. The most notable examples are encyclopaedias, the online adult industry and the market for music videos. In other markets UGC complements the existing supply. All major media companies are in the process of setting up UGC services or taking over successful grass roots initiatives.

### **The Audio-visual Sector**

There are clear indicators that the Internet as Internet of media is turning into the growth motor of the media and entertainment industries. Traditional media migrating to the



Internet are able to compensate for lower growth rates or losses in the physical world, but digital born content like video games is showing the highest growth rates. Forecasts see EU27 members from Southern and Eastern Europe as most dynamic in the region. International comparison of media companies shows the importance of US-based global players (Google, MSN, Yahoo), but also the strength of national actors often belonging to incumbent media industries in Europe.

The audio-visual sector is being faced with upheavals due to digitisation. On-demand viewing is likely to be driven by TV-based platforms including IPTV rather than public Internet platforms. Radio broadcasting traditionally has a very strong regional element. Due to uncertainty on future standards, existing broadcasters are currently showing little interest in the transition to digital. The adoption of online radio is slow due to lack of adequate affordable broadband access in parts of Europe and the slow diffusion of suitable listening devices.

### ***The Gaming Sector***

After a period of comparative neglect, online video games are a rapidly growing segment of the mainstream media and entertainment sector with huge business opportunities. Web-based and mobile online video games are turning the games sector into a distinctive type of networked electronic media. Online video games have thus the potential to become mass media for everyone – not just for youthful male aficionados, but also for women and older people. On the one side, online games are competing with other mass entertainment media, TV and movies in particular, and, on the other side, with device dependent games (e.g. consoles).

The Internet enables efficient distribution platforms for online games and the typical approaches to profitable business on the Internet – subscription models, micropayment/advertising, and indirect revenue streams – are now being applied to the game business as well. The most important segment of online games in economic terms is still Massive Multi-Player Online Role-Playing Games (MMORPGs), meaning a persistent, always-on shared game world designed to be played by hundreds, thousands and even hundreds of thousands of users. The fastest growing segment within the online game segment is probably casual games. The ability to just drop in and spend a little time having fun is very convenient.

## **Issues, Visions and Policy Options**

### ***A Mobile Internet Good for Content Industries***

Available facts and figures indicate that the importance of data services is growing in Europe. For content industries,

the pace of change however is too slow. It would be beneficial for the content industries if European operators were to encourage more use of Internet standards. In particular a shift from expensive SMS to cheap e-mails with links to sites on the Internet could push the use of the mobile Internet. Lessons from world leader Japan suggest that increased competition and policy measures encouraging competition could help.

To bring about more competition and by this cheap mobile Internet services sooner, a **Europe-wide provision of wireless Internet services** allowing for Voice over IP – without roaming fees – is proposed as well as a **European spectrum regulation** beneficial for the content industries. Radio spectrum policy could provide support by the means of long-range unlicensed spectrum, the provision of pan-European licenses, the provision of licenses to new competitors, and the enforcement of technology neutrality with regard to radio technologies. Such spectrum policy could in particular focus on re-using “beachfront” TV-spectrum.

### ***Online Games and Educational Content***

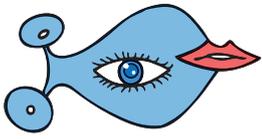
There have long been examples of computer games with learning value for children and adults. However, based on the evidence of time spent by users, online games seem to be overall more attractive and compelling than educational software. While users spend literally thousands of hours exploring and playing the former, educational software tends to be put aside after a few hours.

On the one hand, educational software can learn from online games. On the other hand, it might be in the public interest if game developers were willing to integrate educational elements in games primarily intended for entertainment. There might be greater potential for the use of educational software outside compulsory education, e.g. in further education and adult education.

To make optimum use of the potential benefits provided by educational programmes and games with educational elements, it would be useful to develop Europe-wide recommendations on uses and applications for various levels and types of school. As a measure to diffuse and optimise the utilisation of networked electronic media for educational purposes, a start could be made by inventorying such media and by creating platforms for the exchange of experience at the European level.

### ***Yet No Need for New Payment Systems on Web 2.0***

It is true that there is a lack of interoperability of cross-border standards, and of a common infrastructure for dedicated micropayment schemes. However, it is also true that the demand for dedicated micropayment systems has decreased. Current demand is at present not sufficient to push micropayment



systems any further. As long as the lack of market demand is so obvious, there is no need for policy to intervene.

However, although “free content” and advertising based business models dominate the World Wide Web today, and, as many payment schemes exist, the quest for new payment schemes and a micropayment infrastructure is not obsolete and may gain renewed importance in the near future, because current schemes do not support a wide enough variety of content, do not support payments to small content creators and person to person payments sufficiently. In the medium term, current interpersonal payment systems may develop towards more cash-like P2P payments. There is a need for policy to monitor these developments, to analyse the low value payment issue from a societal perspective and to reflect again the regulation of prepaid low value payment schemes.

### **Copyright Policies Relying on Forensic DRM**

Forensic digital rights management (DRM) is gaining importance on Web 2.0: first, as a supportive technical mechanism within business models that sell “DRM-free” content but wish to control circulation of copies and curb infringement of copyright; second, as a means intended to avoid uploading of unauthorized copies. Also mere access providers are expected to apply this type of forensic DRM technologies for “filtering”.

Despite the advantages of forensic DRM, the privacy risk is very visible. Other shortcomings are high numbers of false positives and false negatives. Forensic DRM does also not solve the problem that certain uses under copyright law are perfectly legal. Human moderation and judgement, either by the service provider or a third party, will stay necessary to make a distinction between illegal and legal use (think of the exceptions in copyright law). Current techniques can be helpful, but should not be implemented with the idea of an automated control mechanism in mind. Better techniques are needed before it is reasonable to enshrine this type of approach into law.

### **Exploitation of “Prosumers”**

The user’s social capital in Web 2.0 environments consists of three value sources: personal profile and contacts, content contributions and data traces. This implies a risk of “triple exploitation”. The involvement of “prosumers” in the value chain of Internet media therefore requires further reflection on adequate compensation, fair revenue sharing, and protection of the users’ privacy. In particular, the large-scale monitoring and aggregation of a user’s online personal and intellectual activities brings with it threats to privacy.

### **The Impact of the Semantic Web on the Future Media Internet**

Semantic technologies have made considerable progress. The enabling technologies have now come of age, and important standards and specifications are available. Semantic web technologies have already proved to be useful in specific communities, among them segments of the media industries. In most cases, the applications are, however, still at an experimental stage.

Semantic technologies could reinforce a general trend, namely the automatic production of secondary media. Exploiting the semantic relations of resources, radio stations on the Internet or movie channels could harvest the Internet and elaborate programmes for their customers almost automatically without even employing personnel for this purpose. A step further, inference and reasoning machines would be able to autonomously generate new knowledge from that already existing.

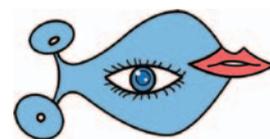
The capabilities of semantic technologies to harvest interrelated content across resources and repurposing it raise crucial questions of copyright and digital rights management. In addition, the knowledge that semantic search engines would be able to collect about persons, their behaviour and their preferences might turn into a nightmare for privacy if not monitored and regulated appropriately.

The enrichment of the Web with semantics appears today as an evolutionary process linked with other developments: bridges between the “syntactic web” and the semantic Web are required; also user involvement is crucial for the development of the semantic web because without user involvement the billions of documents will never be semantically annotated and because human intervention is needed as a corrective to automated processing of meaning.

The vision of a global semantic search engine appears, however, to be far from reality. Further improvements of search engines will not only depend on semantic descriptions based on ontologies. There are many more approaches to improving web searches, based on web mining, “semantic web mining”, “observational metadata” or “similarity detection”. Improved search engines are likely to take the best of all approaches and combine them.

### **Lack of Sound Statistics and Reliable Surveys**

As others have noticed before (e.g. OECD), there is a lack of sound statistics and reliable surveys about the new sector of networked electronic media. There is no such thing as a European Networked Media Observatory. In particular, we do not know in much detail how media consumption and behaviour is changing, and there is still no economic measurement of



the “networked electronic media sector” in which many industries and many actors are jointly generating economic value. On one side, as technology companies (Telcos, ISP, Internet companies) tend to move up the value chain towards content, the convergence of providers would have to be taken into account. On the other side, the broader creative content sector producing original content in an amateur fashion, or in a semi-professional or professional way deserves more attention in media statistics and research.

## Sources and References

STOA homepage: [http://www.europarl.europa.eu/stoa/default\\_en.htm](http://www.europarl.europa.eu/stoa/default_en.htm)

ETAG homepage: <http://www.itas.fzk.de/eng/etag/etag.htm>

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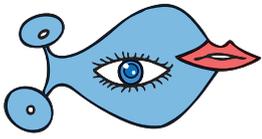
<http://www.itas.fzk.de/tatup/082/stoa-news.htm>

The workshop presentations can be downloaded from:

<http://www.itas.fzk.de/eng/etag/stoa-workshop-080626.pdf>

### Note

The project was led by Knud Böhle, senior researcher with the Institute for Technology Assessment and Systems Analysis, Karlsruhe. The project was supervised by Malcolm Harbour, MEP and Vice-Chairman of the STOA Panel, and Dr. Jorgo Chatzimarkakis, MEP. STOA staff in charge was Miklós Györffi.



# A Roadmap for the Commercial Development of Medicinal Plants of the Andean Region of South America

Author:	Carlos Aguirre-Bastos / carlos.aguirre@arcs.ac.at		
Sponsor:	United Nations Industrial Development Organization and Government of Spain		
Type:	Multinational foresight exercise		
Organizer:	UNIDO, official in charge: Ricardo Seidl da Fonseca, r.seidl-da-fonseca@unido.org		
Duration:	2006-2008	Time Horizon: 2020	Date of Brief: Oct. 2008

## Purpose

*The main objective of the project was to establish a future vision (2020) and define the best means for the production, commercialization and innovation of products on the basis of medicinal plants of the Andean region of South America that would contribute to its social and economic development.*

## The Andean Highlands: Rich Biodiversity but Extended Poverty

The Andean highland regions of Bolivia, Ecuador and Peru are rich in biodiversity, containing unique natural resources, but at the same time face severe poverty. In this region, there is a recognized potential for improving income through the development of region-specific products, but knowledge on what products to develop, what technologies to employ for improving production and how to approach markets is lacking.

To raise production levels, increase productivity and competitiveness of products originating in this region, it is mandatory that the related industrial sectors be organized as productive chains incorporating the necessary institutional framework for modern industry, financial services, wholesale markets, price information, quality standards, transport facilities and a series of other appropriate conditions for their operation. To capture this complex reorganization process, future studies and trend analyses are in demand so as to cover structural and functional change scenarios as well as technology development. Against this background, a foresight study was conducted that could contribute to raising awareness and building consensus and agreements among key stakeholders to pursue such reorganization. The project set the goal to assist the participating communities in making decisions on future directions in the production of local products that might increase economic and social wealth in the region. It aimed to help identify strategic technology areas for selected products and industrial sectors, to raise their competitive

advantage and to enable the national products to better access regional and global markets.

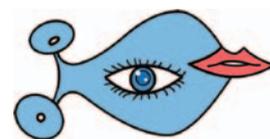
In the particular case of global markets, the world trade of medicinal plants already exceeds 14 billion dollars per year. The yearly growth rate from 1994 to 2006 was between 10% and 20% while the preferred markets were in Europe, US, Japan and China. In Europe alone, nearly 2000 species were commercialized. Such figures pose an important incentive for enhancing the production of the Andean medicinal plants and their products.

In this international context, the project considered it a priority to support the consolidation of the presence of Andean natural products in these growing markets.

## The Project's Specific Objectives

The project had the following specific objectives (UNIDO, 2008):

- Facilitate the economic development of the region by enhancing and modernizing the production of medicinal plants.
- Establish a database that collects information on all the initiatives, programmes and activities in the region, providing an information and knowledge pool and serving as the centre for the exchange of experience.
- Increase the cooperation and communication among stakeholders responsible for the production, commercialization and innovation of products based on medicinal plants.



## A Roadmap as Methodological Tool

The project elected to draw up a roadmap as the key foresight tool. It was built in four phases:

- a) An analysis of the present situation.
- b) The establishment of future visions.
- c) The identification of barriers.
- d) The definition of measures and solutions to overcome such barriers.

For the first phase, a detailed study of the situation (production, collection, marketing, transport, technologies) in each individual country was conducted and the results integrated into a single regional strength, weaknesses, opportunities and threats (SWOT) analysis.

The next three phases were developed in a participatory exercise that consisted of one workshop at the country level and two workshops at regional levels for each country. All stakeholders participated in the workshops at both levels.

For establishing the future visions, two additional studies were made available dealing with the norms existing in the USA and Europe, respectively, for the commercialization of medicinal plants-based products.

## The Regional SWOT

The regional SWOT analysis was built around four areas:

- a) Factors that condition production: land, labour, technology and transport.
- b) Factors that condition demand: behaviour and functioning of national and international markets.
- c) Strategies, structures and competence: promotion and support policies, legislation, forms and associative mechanisms of primary and secondary producers, traders and exporters, and degree of sector institutionalization.
- d) Related industries and services: sector of primary transformation and production of pharmaceuticals and foods, services to industry and to primary producers.

## Visions and Barriers

Based on the SWOT, four visions (2020) and the respective barriers for achieving them were identified as shown in Table 1.

Table 1: Visions and Barriers

### Vision 1: Andean Medicine and its products are recognized internationally

- Lack of a joint vision
- Limited use of traditional knowledge
- Lack of confidence in traditional medicine
- Restrictive legislation
- No diffusion of benefits from traditional medicine
- Lack of international support for diffusion
- Weak socio-cultural integration among the countries
- Social prejudices
- Dispersed information (no systematization)
- Lack of leadership for the development of the Andean pharmacopoeia

### Vision 2: The products derived from Andean biodiversity have their own trademark in all markets

- Lack of characterization and uniform requirements for certification of an Andean trademark
- Lack of standardization of primary vegetal materials and by-products
- Lack of confidence in the products' results
- Lack of validation of properties to promote medicinal (and nutraceuticals) products
- Lack of clinical essays to determine counter-uses
- Lack of studies of efficacy and clinical security (lack of preclinical security and non-compliance with WHO norms)
- Lack of scientific publications in international journals to avoid bio-piracy

### Vision 3: The multinational sector research and innovation system is consolidated

- Lack of financing for R&D
- Lack of information on research and innovation capacities of the region's institutions
- Limited supply of trained personnel
- Lack of state policies for promoting and favouring research and innovation

### Vision 4: A sustainable production cluster exists

- Lack of sustained water management
- Lack of articulation and integration among the agents of the cluster
- Dominance of conventional agriculture threatens biodiversity
- Bio-piracy
- Lack of technologies appropriate to the region's conditions
- Lack of documentation and appreciation of ancestral knowledge and technologies

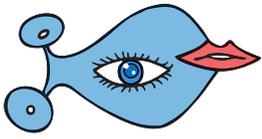


Table 2: Roadmap for Vision 1

<b>Andean medicine and its products are recognized internationally</b>	
<b>Short-term</b>	<ul style="list-style-type: none"> <li>- Create an information system</li> <li>- Launch diffusion campaigns</li> <li>- Establish a regional forum</li> <li>- Identify R&amp;D centres</li> <li>- Create a coordinating centre to group stakeholders</li> </ul>
<b>Mid-term</b>	<ul style="list-style-type: none"> <li>- Conduct market studies</li> <li>- Develop financial mechanisms for the transfer of technology</li> <li>- Create a holding of regional R&amp;D centres for a regional programme</li> </ul>
<b>Long-term</b>	<ul style="list-style-type: none"> <li>- Establish regional and international cooperation networks</li> </ul>

Table 3: Technologies and Tools for Vision 1

<ul style="list-style-type: none"> <li>• ICT for the management of networks and diffusion of information</li> <li>• Field technologies for managing specific crops</li> <li>• Entrepreneurial management tools</li> <li>• Tools for promoting association</li> <li>• Culture of cell lines for specific tests</li> </ul>
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Table 4: Roadmap for Vision 2

<b>The products derived from Andean biodiversity have their own trademark in all markets</b>	
<b>Short-term</b>	<ul style="list-style-type: none"> <li>- Promote the creation of an Andean Council</li> <li>- Create an institution for certifying the denomination of origin</li> <li>- Develop a technical standard for medicinal products</li> <li>- Search for financing</li> </ul>
<b>Mid-term</b>	<ul style="list-style-type: none"> <li>- Develop external markets and eliminate obstacles to international trade</li> <li>- Develop and harmonize sanitary norms</li> </ul>
<b>Long-term</b>	<ul style="list-style-type: none"> <li>- Develop new products</li> <li>- Diversify</li> </ul>

## A Multinational Roadmap

A multinational roadmap was developed and the technologies and tools were identified for each vision as shown in Tables 2-9 for the short (5 years), mid (10 years) and long-term (15 years). The illustrations of the roadmap show only the main actions of the many discussed.

Table 5: Technologies and Tools for Vision 2

<ul style="list-style-type: none"> <li>• Standardization of laboratory analysis methods</li> <li>• Creation of specialized laboratories to determine Andean ingredients</li> <li>• Create pilot plants to develop new products</li> <li>• Scale-up technologies for innovation</li> </ul>
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Table 6: Roadmap for Vision 3

<b>The multinational sector research and innovation system is consolidated</b>	
<b>Short-term</b>	<ul style="list-style-type: none"> <li>- Prepare a regional directory of research groups</li> <li>- Create an interactive network of research and innovation centres</li> <li>- Create a regional R&amp;D institute</li> <li>- Generate a regional fund for R&amp;D</li> </ul>
<b>Mid-term</b>	<ul style="list-style-type: none"> <li>- Strengthen the research lines of the regional institute</li> <li>- Consolidate the regional research and innovation system</li> <li>- Establish training programmes</li> </ul>
<b>Long-term</b>	<ul style="list-style-type: none"> <li>- Create permanent foresight mechanisms</li> </ul>

Table 7: Technologies and Tools for Vision 3

<ul style="list-style-type: none"> <li>• Domestication techniques for local species and post-harvest production</li> <li>• Agricultural management tools</li> <li>• Transformation technologies (collection, drying and powdering, extraction, etc.)</li> <li>• Biological validation technologies</li> <li>• Technologies to identify bioactive composites</li> <li>• Technologies for the extraction of active principles</li> <li>• Chromatography equipment</li> <li>• Germplasm bank and sequencer</li> <li>• Pilot plant for the elaboration of phytopharmaceuticals and nutraceuticals</li> <li>• Micro-array technology for the study of gene expression</li> </ul>
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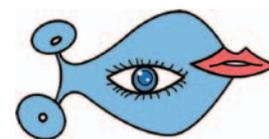


Table 8: Roadmap for Vision 4

<b>A sustainable production cluster exists</b>	
<b>Short-term</b>	<ul style="list-style-type: none"> <li>- Prepare a best practice manual for each product</li> <li>- Prepare an equipment infrastructure plan for the value chain</li> <li>- Develop an information system for producers to integrate their activities and negotiate</li> <li>- Train producers in management and cooperative culture</li> </ul>
<b>Mid-term</b>	<ul style="list-style-type: none"> <li>- Produce a regional agreement on commercialization systems</li> <li>- Define market strategies</li> <li>- Promote the creation of regional clusters</li> </ul>
<b>Long-term</b>	<ul style="list-style-type: none"> <li>- Develop a collaborative innovation culture</li> <li>- Develop technology management capacities</li> </ul>

Table 9: Technologies and Tools Relative to Vision 4

<ul style="list-style-type: none"> <li>• Management tools for implementing best practices</li> <li>• Tracking tools</li> <li>• ICT for training</li> <li>• Tools to develop capacities for association</li> </ul>
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## A Regional System of Innovation

The highlands and central valley regions of the three Andean countries Bolivia, Ecuador and Peru are characterized by a rich biodiversity but also by extreme poverty. The roadmap aims at supporting the countries' policies and strategies to face the challenges of poverty by creating improved conditions for primary production, industrial transformation and exports of value-added products into a growing world market. The project is geared toward attaining the first Millennium Development Goal of poverty reduction.

The project has been able to identify the whole set of problems that affect this key social and economic sector where more than ten million people depend on the production and commercialization of both medicinal and nutraceuticals plants and make extensive use of traditional medicine. The roadmap is a key guideline for policy-makers and has made an important inroad into the study of research policy in the three countries involved.

The process followed in preparing the roadmap permitted a most inclusive participation of stakeholders in the course of which the roadmap recommendations were fully validated. Of particular value to policy-making is the fact that the regional roadmap provides ample room for the adoption of multinational norms, thus complementing those already existing in the Andean integration process.

Further, the results of the project provide an excellent example of how a regional system of sectoral innovation can function, thus providing guidelines to policy-makers for the configuration of such a system, in particular in terms of measures to be adopted for creating and strengthening new research and innovation capacities.

### Restructuring Clusters and Value-chains

The results of the project show the need and importance of restructuring the national and regional clusters and value-chains, starting from the collection of primary products, to the modernization of industry and the improvement of marketing channels. For this purpose, all three countries will require access to international cooperation to obtain both financing as well as technical and human resources.

### Short-term Priority

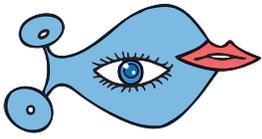
The highest priority is given to the creation of a Regional Observatory for Medicinal Plants as a permanent network structure whose main tasks will be to generate, coordinate and distribute information and knowledge on medicinal plants of the Andean highlands and central valleys. It is to provide specialized advice and training to all agents involved in the medicinal value chain (or cluster), conduct policy analyses and help establishing contacts inside and outside the Andean region.

### Critical Factors

A critical factor in shaping the future is the creation of a technology and market-oriented culture among primary producers of medicinal plants in the region and the active participation of research and innovation centres in support of a better knowledge and understanding of the clinical effects of medicinal plants for promoting the acceptance of Andean traditional medicine and its products at the international level, much as is already done today with some Oriental medical practices. The growing world demand for natural, biological products is a very strong incentive to move in this direction.

## Sources and References

UNIDO, 2008 Final Report "The Future of the Products of the Highlands and Central Valleys of the Andes: Medicinal Plants", in Spanish, UNIDO, Vienna. The report is available at: <http://www.unido.org/foresight/andean-study>



# Healthy and Safe Food for the Future – A Technology Foresight Project in Central and Eastern Europe (Futurefood6)

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<b>Sponsors:</b>	European Commission – United Nations Industrial Development Organization (UNIDO)			
<b>Type:</b>	Multi-country foresight			
<b>Organizer:</b>	UNIDO, Ricardo Seidl da Fonseca			
<b>Duration:</b>	02/2007-01/2009	Budget: € 725,000	Time Horizon: 2020	Date of Brief: Nov. 2008

## Purpose

*Futurefood6 is a project developed to assist Central and Eastern European countries in reaching international standards throughout the whole food chain and, in turn, to enhance overall European competitiveness by developing an industry that stands for safety, diversity, sophistication and products of a high quality. It mobilises stakeholders from the food industry, research, academia, the state and public sector, decision-making bodies and the public to create a desirable set of future visions for the food industry in Central and Eastern Europe (CEE) for 2020.*

## Securing Food Quality in Processes of Transition

The process of integrating the food industry of Central and Eastern European countries into the single European market presents significant economic and political opportunities and challenges. Food quality and safety are crucial aspects of human life and are, therefore, prime policy objectives of the European Union. Food quality and safety have to be secured through regulations for inputs, production processes, outputs, transportation, storage, packaging, labelling, documentation of origin and the like, for creating an adequate infrastructure for food markets and their smooth development. The food industries in CEE are undergoing sweeping ownership, technological, organizational and financial changes. The new decision-making processes should put a strong emphasis on safety and quality standards. Substantial changes in financial services, wholesale markets, commodities exchange, price information, transportation facilities and infrastructure are also needed. A foresight process is highly instrumental in tackling these complex issues. By bringing together the relevant stakeholders – business, researchers, policy-makers, consumers, NGOs – with their wide range of expertise and accumulated skills, it is possible to identify emerging technological and market opportunities and threats, consider science, technology and socio-economic factors in their entirety, and thus devise appropriate policies and strategies, based on consensus among these stakeholders.

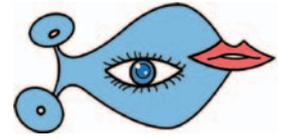
The EC, within the Sixth Framework Programme, decided to support Futurefood6 as a foresight exercise dedicated to the definition of policies and strategies to promote and guarantee healthy and safe food for the future. Six countries in the CEE region were selected as the focus of the exercise. The United Nations Industrial Development Organization (UNIDO) is the coordinator of the project.

## Methodology

The project applies the UNIDO methodology for multi-country foresight, which inter alia involves the participation of high-level decision makers from governments, enterprises and the innovation sector during the whole exercise. Their involvement enables integrating the findings and recommendations into the policy guidelines for the targeted food industry.

These are the key axes of the project's methodology:

1. Mobilization of a variety of actors from different stakeholder groups with experience in relevant economic, science and technology fields, business and societal issues as well as policy-makers from Bulgaria, Croatia, Czech Republic, Hungary, Romania and Slovakia to share their assessment and expectations for the future of the total food chain in these countries.
2. A socio-economic scenario building exercise to collect the views of business, consumers and other societal groups concerned with the food industry and the impact of different technologies. This exercise is designed to also identify the major drivers for the food chain.



3. Interviews with specialists from different disciplines and affiliations (industry, academic institutions, public authorities, etc.) to gather information about the current situation of the sector, the industry's needs, problems and future prospects.
4. A survey on key technologies to address challenges associated with the innovation needs of the industry. Special attention is devoted to identifying and analysing all aspects relevant to food quality and safety. Traceability and sustainability issues are a specific concern throughout the project.
5. A vision building exercise to depict multiple possible future states, based on the views, experience and aspirations of stakeholders, consumers and other societal groups, business people, researchers and policy-makers.
6. Roadmapping to consider in detail implications for innovation for achieving possible future states and to identify appropriate actions for exploiting opportunities and alleviating threats.

The project will close with a final conference (27 January 2009, at Tech Gate Vienna, Austria) to provide an opportunity to evaluate the results of the project and discuss concrete recommendations for the future development of the food industry in the participating countries.

## Sources and References

For more information, please visit the website [www.futurefood6.com](http://www.futurefood6.com)

Also see the websites:  
<http://www.unido.org/foresight>

<http://etp.ciaa.be/asp/home/welcome.asp> and

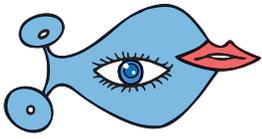
<http://cordis.europa.eu/fp6/dc/index.cfm?fuseaction=UserSite.FP6HomePage>

## Promoting a New Decision-making Culture for Food Quality

The project is expected to influence and shape the national policy of the countries involved, as well as the CEE region as a whole. The policy-oriented goals of the project are the adoption of new concepts along the whole food chain geared toward producing healthy and safe food and identification of areas with competitive advantages, strengthening long-term thinking on strategic issues, improved exploitation of science, technology and innovation (STI) results by policy-makers and businesses, establishment of a food quality and safety platform as a new way of networking and cooperation between the six CEE countries.

The main results of the project will be compiled in a final report with policy recommendations and a manual for assisting small and medium enterprises in implementing those recommendations. The project website presents the full range of the results and offers an opportunity for public online debate and collecting expert views and feedback. The exercise is expected to consolidate a knowledge community on future trends and visions for enhancing food quality and safety in the region.

The ultimate objective of the project is to promote a new decision-making culture among managers and policy-makers in order to place quality and safety issues at the centre of food chain management and to identify future key technologies and new business models for promoting the quality and safety requirements in food production in CEE countries.



# Roadmap Robotics for Healthcare

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<b>Sponsor:</b>	European Commission, DG Information, Society & Media			
<b>Type:</b>	Preparation of international applied research programs on innovation in healthcare in the area of information and communication technology			
<b>Organizers:</b>	TNO Innovation Policy Group (main contractor), Vilans, Fraunhofer Gesellschaft-ISI, VTT and EuroAct			
<b>Duration:</b>	2007-2008	Budget: € 250,000	Time Horizon: 2025	Date of Brief: Nov. 2008

## Purpose

*The main aim of this study was to provide key research policy recommendations for the application of robotics in healthcare in the research programmes of the EC. The study also aimed at raising awareness about important new developments in this field among a wider audience. To this extent, a roadmap of promising applications of robotics in healthcare and associated R&D was developed, taking into account the state of the art as well as short and long-term future possibilities with a time horizon ending in 2025.*

## Targeting Future Research Programmes of the EC

### Why Robotics for Healthcare?

For the last two decades, the European Commission (EC) and, in particular, the Directorate General Information Society and Media have strongly supported the application of information and communication technologies (ICT) in various sectors of society by means of their research programmes (as part of the consecutive Framework Programmes).

The EC sees healthcare as an important domain, where ICT can play a key role in solving societal issues. Challenges like the reduction of labour costs, improving quality of care and longer independent living of the elderly exemplify just three examples where ICT can play an important role. These challenges are expected to grow in the face of demographic developments (ageing of patients and personnel), epidemiological developments (e.g. increase in chronic illnesses), expected shortages of healthcare personnel, demand for improving the quality of life for the elderly, chronically ill and disabled, and the demand for a further increase in the quality of medical care, enabled by new technologies such as high precision surgery.

On the other hand, robotics is still an emerging field of technology. Due to the further miniaturization of crucial key technologies like sensors and actuators, robotics now enters the second stage of development. Some visionary experts, such as Bill Gates, are already talking about a new technology wave following biotechnology.

The combination of healthcare and the new developments in robotics create opportunities to stimulate innovation in the domain of robotics for healthcare. Several programmes and networks dedicated to research on robotics are already focusing part of their efforts on applications in healthcare.

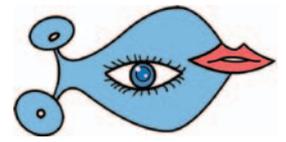
### What is “Robotics” and What Area is Studied?

In this study, robotics is considered the domain of systems able to perform coordinated mechatronic actions (force or movement exertions) on the basis of processing information acquired through sensor technology, with the aim of supporting the functioning of impaired individuals, medical interventions, care and rehabilitation of patients and also individuals in prevention programmes.

The focus of the study is on solutions that support the key objectives of healthcare:

- To contribute to quality, safety and efficiency of care.
- To promote the shift to preventive and personalized care.
- To support the availability of long term care for people in need.

Because the application of robotics in healthcare is not only an issue of technology but also heavily depends on societal acceptance, safety and reliability issues as well as regulations, special attention was paid to these aspects.



## Methodology and Deliverables

According to the EC specifications, the required methodological approach for this study included literature research, surveys and interviews with experts and stakeholders as well as an evaluative workshop with a representative group of experts and stakeholders for drafting the roadmap.

The study was divided into four work packages (diagram below):

- The development of a state-of-the-art analysis report.
- Development of a roadmap consisting of six sub roadmaps.
- In depth analysis based on three case studies (from the six sub roadmaps).
- Evaluation of results in an expert workshop.

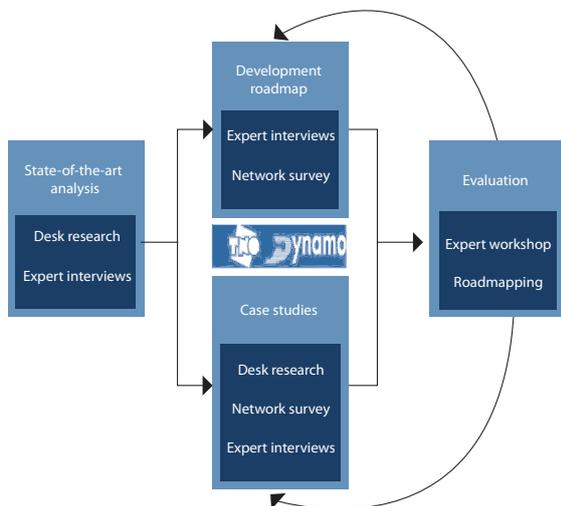


Figure 1: Overview of the approach

During the project, desk research was complemented by consulting more than 50 internal and external experts.

The state-of-the-art report (SOTA report) presented the state of the art in robotics for healthcare on a large number of applications and enabling technologies.

A catalogue was developed with over 300 applications and 100 organizations developing robotics (for healthcare). These were stored and profiled in the Dynamo database.

Based on the research, 25 innovation areas were identified. Out of these, six innovation themes were further analyzed. For three areas a case study was developed. These were chosen in close consultation with the EC in order to provide further insights on the driving factors of and barriers to the development of robotics for healthcare, the role of the stakeholders and possible ethical and legal issues.

In this way six draft roadmaps were developed. They were evaluated during a two-day expert workshop with 45 experts. The results of the workshop were used to finalize the roadmaps.

With regard to dissemination and raising awareness beyond the closely involved experts, a brochure was developed to be distributed amongst the relevant community.

## Major Findings: Six Innovation Areas

During the analysis of the field of robotics for healthcare, **five innovation themes** were identified:

- Robotics for medical interventions.
- Robotics supporting professional care.
- Robotics assisted preventive therapies and diagnosis.
- Robotics assistive technology.
- Robotics for rehabilitation treatment.

Within these innovation themes, 21 **innovation areas** were identified, as shown in Figure 2 (see page 154).

Based on a survey among stakeholders and in close cooperation with the EC, the six most relevant innovation areas were selected as potential priorities for the EC in their Framework Programmes, based on the criteria **market and industrial potential and relationship to the e-Health domain**:

- Smart medical capsules (for endoscopy, biopsy and targeted drug delivery).
- Intelligent prosthetics for upper and lower extremities.
- Robotized patient monitoring systems.
- Robotized surgery (a combination of the areas related to the facilitation of the surgeon in the operating room).
- Robotized motor coordination analysis and therapy.
- Robot assisted mental, cognitive and social therapy.

### Mapping Key Technologies for Robotics in Healthcare

Robotic systems are very complex. They depend on many enabling technologies and pose many challenges of how to integrate these into a functional system. These technologies and challenges require a significant amount of R&D, are dependent on each other and progress at different speeds. Human-machine interface designs, sensor systems, mobile energy supply, energy efficiency and biocompatible materials are some of the main topics. The key technologies identified are presented in Figure 3, next page.

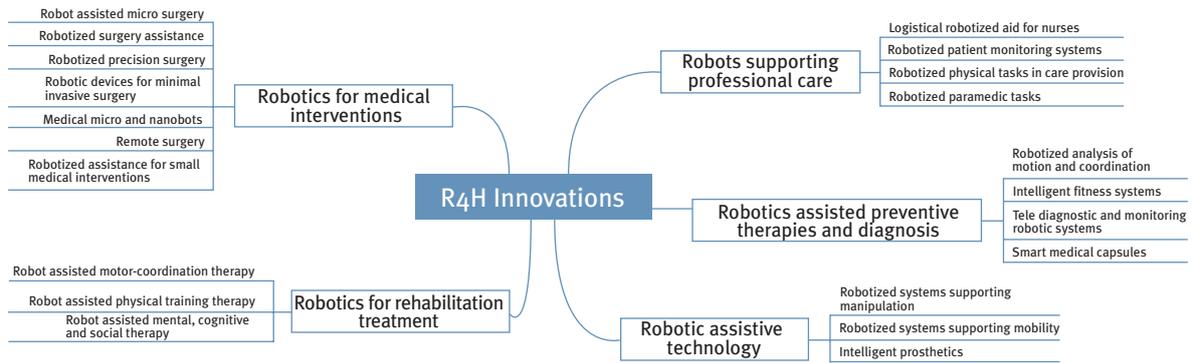
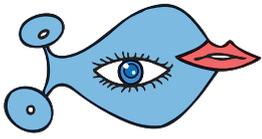


Figure 2: Innovation areas

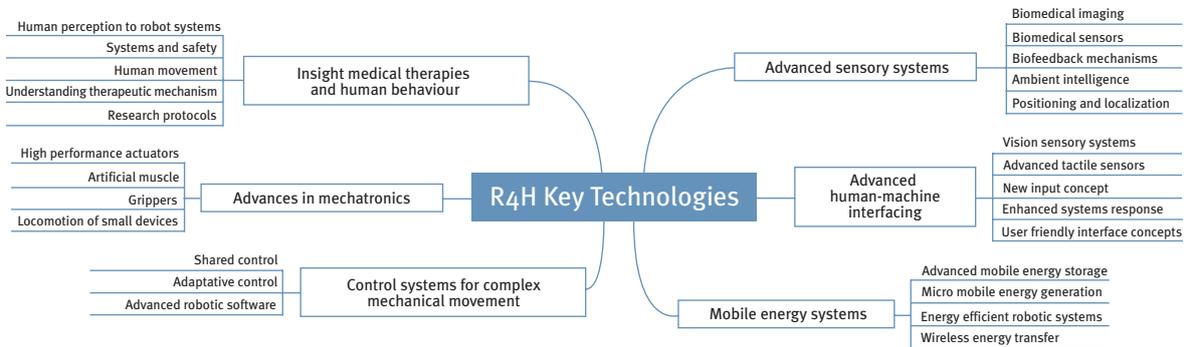


Figure 3: Key technologies for application of robotics in healthcare

## Constructing the Roadmaps for the Six Innovation Areas

During the two-day workshop with stakeholders the findings about the six selected innovation areas and key technologies were discussed and integrated into a roadmap diagram. As an example, the roadmap of one of these innovation areas, smart medical capsules, is shown in Figure 4 (see page 155).

## The Potential of Robotics in Healthcare and the Role of Stakeholders

The field of robotics for healthcare is driven by the expectation that robots will be able to play an important role in helping societies to cope with a number of the big challenges and trends of the next decades. The study has shown that the application of robotics in healthcare is in many areas a young but promising field with different segments progressing at different speeds. Only a few products have actually reached the stage of large-scale market introduction, the real measure for successful innovation. Many applications are still very expensive. In many instances, it is quite difficult to identify the reasons for discontinued and unsuccessful projects, since multi-dimensional factors like legal issues, regulations, enabling technologies, social acceptance and unforeseeable disruptive incidents play key roles.

The first commercial products on the market may serve as a signal for a greater development to follow. The market is expected to grow, as the following examples indicate. The U.S. market for prosthetics, orthotics and cosmetic enhancement products is expected to increase from \$6.8 billion in 2005 to \$10.8 billion in 2010. Smart medical capsules may even take over the whole market for classic colonoscopy screenings, as prices for smart medical capsules will drop below the current \$450 per unit.

Since the overall sector of robotics in healthcare is still an emerging area with successes and failures, a final conclusion about the future trajectory cannot be made at present. Nonetheless, the identification of drivers, barriers and challenges is helpful to guide the development into a desired direction for achieving higher quality, safety and availability of care and a shift to prevention.

From the side of the stakeholders, e.g. patients, doctors, hospitals, care institutions, health insurance companies and authorities, it appears that most of them see the developments as very interesting for the future, but very few of them show any urgency to switch to these new applications right now.

The role of suppliers is becoming more important, as it should, but patient involvement in research and development is (too) little. Although government is not considered a key market player in this area, governmental funding for related R&D is crucial.

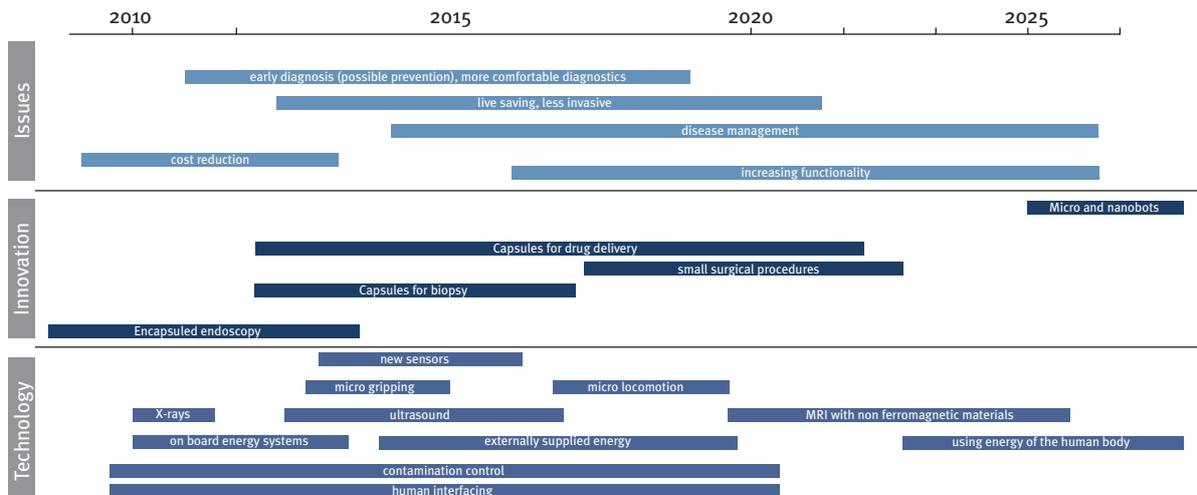
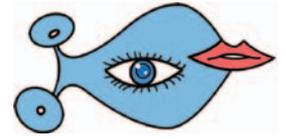


Figure 4: Example of a roadmap diagram for smart medical capsules

## Key Policy Recommendations

Given the findings, the main recommendation to the EC is to further develop this area in the Framework Programme. This recommendation is strengthened by the fact that only a few research programmes exist that specifically focus on this area. Further arguments to support this conclusion are:

- The field is **still in its infancy**, but some products are already commercialised. This supports the conclusion that there is a market but that this market has just entered its growth phase.
- The “Robotics for Healthcare” network in Europe is relatively small, but the authors believe that it has **critical mass** (both within research and industry).
- Robotics is seen to be the origin of the **next potential Kondratiev** wave. Therefore, further influential developments in the field can be expected, also boosting other areas.
- Looking at the broad enabling robotic technologies, **cooperation** with other robotic application fields should be facilitated (e.g. through the EURON network).
- The field also needs the further enhancement of the “Robotics for Healthcare” network to establish a sound **multidisciplinary** community.
- The model of innovation used should incorporate not only research but also a **combination** of research, development and application to ensure actual use of the research.
- To be an effective program, it would be advisable to add **“horizontal” lines** to the programme: one on legal and one on ethical issues.
- Because the field is very new, acceptance and implementation will be complicated. To raise awareness and promote involvement of stakeholders, **awareness activities** should accompany any innovation programme.

- The current methodology to prove the effectiveness of medical interventions with robotic systems seems very burdensome and costly. Methodology, like evidence-based medicine, originally designed for medicines, should be **adapted** to the characteristics of (robotic) devices.
- The programme must include some mechanism that guarantees that it not only attracts researchers interested in long-term possibilities, but also companies and/or health institutes that have an urgent interest in practical applications.

## Impact and Policy Implications

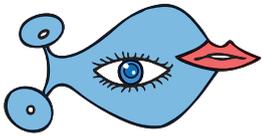
The final report and all the other deliverables from the projects have been well accepted and approved by the European Commission in October 2008. Parts of the results have gone into the further development of the working programmes of FP7 and the new FP8.

In the Netherlands, the results are being used for further development of a TNO vision of TNO’s role within robotics for healthcare and have also initiated discussions at several ministries.

## Sources and References

The final report and an illustrated brochure about the project have been made available on the website of the EC.

Information about the other deliverables can be obtained from the project leader (maurits.butter@tno.nl).



# MONA: A European Roadmap for Photonics and Nanotechnologies

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<b>Sponsor:</b>	European Commission			
<b>Type:</b>	European Roadmap for Photonics and Nanotechnologies			
<b>Organizer:</b>	MONA Project Consortium ( <a href="http://www.ist-mona.org">www.ist-mona.org</a> )			
<b>Duration:</b>	06/2005-11/2007	Budget: € 950,000	Time Horizon: until 2015	Date of Brief: Dec. 2008

## Purpose

*Photonics and nanotechnologies are highly multi-disciplinary fields and two of the principal enabling technologies for the 21st century. They are key technology drivers for industry sectors such as information technologies, communication, biotechnologies, transport, and manufacturing. Photonics/nanophotonics and nanomaterials/nanotechnologies can benefit from each other in terms of new functions, materials, fabrication processes and applications. The MONA Roadmap identifies potential synergies between photonics/nanophotonics and nanomaterials/nanotechnologies. The challenge of mastering nanoelectronics and nanophotonics science and technologies at an industrial scale is of utmost strategic importance for the competitiveness of the European industry in a global context.*

## Context and Objectives of the MONA Roadmap

The MONA project (Merging Optics and Nanotechnologies), funded by the European Commission, is the first concerted effort to coordinate work in two of modern science and technology's most important areas: photonics and nanotechnologies. Six European countries and regions have been involved in the execution of MONA, under the leadership of the CEA-LETI (Electronics and Information Technology Laboratory of the French Atomic Energy Commission), with input from important industry and research players like Acreo, AIXTRON, Alcatel-Thales, ASMI, the European Photonics Industry Consortium (EPIC), IMEC, OpticsValley, Schott, VDI Technologiezentrum (VDI TZ), and Yole Développement.

This project has established a roadmap for photonics and nanotechnologies that includes technologies, fabrication processes, and applications as well as research needs for the future. Correspondingly, this project has dealt with the following questions: How will the field of optics be affected by the emergence of various nanotechnologies? Which opportunities for optics arise from nanotechnology? How will the processes and the equipment, the materials and the technologies change

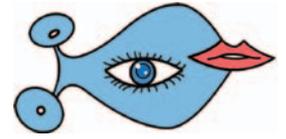
with nanotechnologies entering the production process in photonics? What are the key issues related to the fabrication of nanophotonic devices?

There were three principal objectives for the MONA Roadmap:

1. Create a consensus viewpoint on the development of research, technologies and innovation in the areas of photonics and nanotechnologies.
2. Promote the timely worldwide exchange on scientific results, market development perspectives, and technology trends related to photonics and nanotechnologies.
3. Contribute to the intelligent deployment of resources at the regional, national, and European levels for the development of photonics and nanotechnologies.

## MONA Roadmapping Methodology

A roadmap describes a future environment, objectives to be achieved within this environment, and plans for how these objectives will be achieved over time. It lays out a framework, or architecture, as a way of understanding how the pieces of a complex technological system fit together, interact and evolve. It links applications, technical challenges and the



technological solutions together, and it helps set priorities for achieving the objectives. Roadmaps generally must answer a set of “why-what-how-when” questions to develop action plans for reaching the objective (see Figure 1). The first part (the “know-why”) can describe the domain of the roadmap in terms of markets and applications for nanophotonics. The second level (“know-what”) defines the nanophotonic products needed for level 1. The third part (“know-how”) can be split in two: technology and infrastructure. This part describes the evolution of the technologies and resources that will be needed to achieve the products. The fourth plan (“to-do”) defines the action plan and risks. It identifies key development actions, resources required, the technology investment strategy and recommendations. All parts of the roadmap are laid out over time (the “when” of a roadmap).

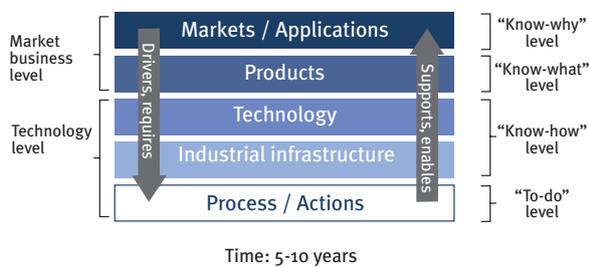


Figure 1.: The different levels of a roadmap

## Devices

The analysis highlights the most important devices that European industry should focus on for the different applications of nanophotonics. In the table below, key devices for major applications are identified. For displays, the nanophotonic devices that are expected to have a large technical impact are LCD backlighting with CNT or LED. OLEDs are a particular case. Although the technical impact will not be so strong, there are strong competencies in Europe that justify OLEDs as a key device for Europe (both for FPDs and light-ing). For the lighting application, it is LED with II-VI quantum wires (ZnO) and III-V photonic crystals. For datacom and telecom, the effort should be put on high-index-contrast-Si photonic devices (laser, waveguide, switches and detectors), active fibre (amplifier) with nanoparticles and nanophotonic devices using CMOS semi-conductor process. Optical interconnects should take benefit from development on laser sources and gates with Si nanocrystals, nano-photonic devices using CMOS semiconductor process and lasers with III-V quantum dots. For photovoltaics, it is III-V quantum-dot solar cells that will have a large impact. Infrared photodetectors with III-V quantum dot (QDIP) and plasmonics are important for imaging. Fluorescent markers with quantum dots and biological or refractive-index sensors using plasmonics will be important for next generation of biosensors.

## MONA Roadmap Findings

### Nanomaterials

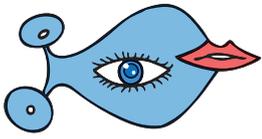
The MONA roadmap identifies key nanomaterials having the strongest impact for nanophotonics. They are:

- Quantum dots and wires in Si, III-V and II-VI
- Plasmonic nanostructures
- High-index-contrast Si and III-V nanostructures
- Carbon nanotubes
- Integration of electronics with photonics
- Nanoparticles in glasses or polymers.

### Equipment

Equipment and processes are crucial for the improvement of the performance of nanophotonic devices.

- The processes that will have the highest potential impact on nanophotonics and at the same time have potential for mass production are MOCVD, CNT CVD, colloidal synthesis, nanophosphor fabrication, solgel synthesis, OVPD, UV lithography, nanoimprint and etching.
- The types of equipment and processes with the broadest field of applications are MOCVD, MBE and colloidal chemistry as bottom up technologies and UV lithography, e-beam lithography and nanoimprint lithography as topdown technologies.



APPLICATIONS (2009 market value)	KEY DEVICES	EU POSITION		RISKS	TECHNICAL RECOMMENDATIONS	BENEFITS
		R&D	Industrial			
Displays (\$90 B)	CNT	+++	+	H	Improve manufacturability	Improved performance (lower power consumption, better image quality)
	Organic LED	++	+	L	Improve packaging	Flexible and thinner displays are possible
Photovoltaics (\$50 B)	Quantum dots III-V based solar cell	+++	+	M	Better QD formation control	Improve efficiency
Imaging (\$10 B)	CMOS image sensors with plasmonics	+++	++	H	Improve photon-plasmon coupling sensitivity	Increased sensitivity in VIS
	III-V QD infrared imager	+++	+++	L	Improve responsivity	Improved performance Potentially simpler fabrication process
Lighting (\$6.8 B)	ZnO nanowires- based LED	++	++	M	Improve p-doping, carrier injection and manufacturability	Excellent materials quality
	LED with III-V photonic crystal	+++	+++	M	Achieve low-cost process	Optimized light extraction
Data/Telecoms (\$4.5 B)	High index contrast Si photonic devices	+++	+	M	Improve packaging and coupling for PICs Integration with silicon. Need for generic technology for a broad range of functionalities	Lower cost More compact devices
	Active fibre with nanoparticles	++	++	M	Improve manufacturability and performance	Low losses
	Electronic/photonic integration	+++	++	M	Low-cost, wafer-scale approaches to incorporate III-V devices on Si	Low-cost, high-performance optical links Low-cost optical transceiver possible
	All Si link	+++	++	H	Manufacturing issues (CMOS compatibility)	Compactness and high performance
Sensors (\$4.2 B)	Fluorescent markers with QD II-VI	++	+	L	Accurate control of size distribution, production up-scaling	Enhanced sensitivity for biosensors Longer lifetime
	Plasmonic biosensors	++	+	M	Integration with existing technologies (e.g. Si-platform), integration on chip	Enhanced sensitivity Ultra-small sensors (dense sensor arrays)
Optical Interconnects (\$0.8 B)	QD III-V laser source	+++	++	M	Improve manufacturability and CMOS compatibility, temperature stability	Compact devices High performance (data rate) Microelectronics manufacturing equipment can be used
	Si QD-based laser source	+++	+	H	Control of the size and density of Si nanocrystals	Compactness and high performance Light emission from silicon can be obtained
	Chip to chip link with flip chip source	+++	++	L	Low-cost solution needed	Mature process
	Link with hybrid integrated source	+++	++	M	Improve manufacturability (CMOS compatibility)	Compactness and high performance
	All Si link	+++	++	H	Improve manufacturability (CMOS compatibility)	Compactness and high performance

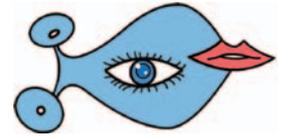
## MONA Roadmap Policy Recommendations

MONA's key recommendations are:

- Provide support services for displays such as R&D and process equipment (CVD for carbon nanotubes for example) since strong European competencies exist in the field of carbon nanotubes, glass substrates and display systems. Moreover, Europe could benefit from OLED rigid display development by providing R&D services, materials and equipment. There is also room for innovation on

flexible displays that have not yet reached the stage of industrial production.

- Develop quantum-dot technology for solar cells. The photovoltaics market is growing.
- Maintain R&D on visible and infrared sensing in various application areas. There are industrial players in Europe (STM, ezv). Moreover, in infrared sensing, Europe has key players like Sofradir. These companies could be interested in III-V quantum dots as an alternative to MCT and conventional QWIPs.
- Intensified R&D for lighting. There is a large market for nano-photonics; so securing a successful industrial development appears as an important objective. Moreover,



the presence of two major European players (Osram, Philips) is a major asset.

- Maintain R&D for datacom/telecom (Bookham, 3S Photonics and many start-ups), specifically for further integration of optical and electronic chips.
- Europe should maintain its R&D on microstructured fibres, II-VI quantum dots and plasmonics for nanophotonic-based sensors (for example, surface plasmon resonance instrumentation has been successfully commercialized by Biacore in Sweden).
- Maintain R&D competence in optical interconnects. This effort should be continued in order to compete with the USA where DARPA, big microelectronics companies (Intel, IBM) and start-ups (Luxtera, Kotura) are already very active.

## MONA Roadmap Conclusions

One of the nanophotonics' challenges would be to share and combine the efforts in order to create synergies between different applications. This could be done by common work on nanophotonic devices that are similar for different final application fields. We have identified two potential synergies resulting from commonalities between devices.

For display and lighting applications, the objective is to generate and distribute light with high brightness and efficiency. In both fields, there is an increasing requirement to reduce power consumption and meet Kyoto protocol goals. The main devices under development, which will be impacted by nanophotonics, are: LED, CNT-FED and OLED.

That means that future development efforts on those three devices will benefit both fields of application. Europe has a strong industrial position in lighting with two major players (Osram and Philips). Although the display market is currently mainly dominated by Asian players, the growing light source business and the development of flexible displays could provide European players an inroad into that market. For OLED displays, it is unlikely that Europe could become a large OLED manufacturer, but it could have a strong position as a supplier for materials and technologies.

The second synergy identified is for optical interconnects and data telecom. In both applications, indeed, photonics have either been substituted or the aim is to eventually substitute them for the traditional metallic connection in order to manage an ever-increasing amount of data. Datacom/telecom deals with long distances above the chip-to-chip or board-to-board scale whereas optical interconnect is below the board-to-board scale in medium to short distance and even inside chips. Datacom/telecom has been using photonics for twenty years whereas optical interconnect is in its infancy. The shorter the distance, the more entrenched is the metallic connection. However, in both cases, the light is generated, filtered, transported, received and treated as an information

unit. Hence, nanophotonics will impact common devices to both application fields: laser source, wave guide, switches or gates, links or fibres, transceivers, and detectors. Nanophotonics will allow improvement of datacom/telecom devices to reach data rates higher than 40 Gb/s, whereas it will be the "must have" in the optical interconnect small dimension world. However, in the latter case, very harsh competition with copper electrical links exists and low cost, high volume fabrication processes (e.g. CMOS compatible process) are mandatory in order for photonic devices to replace electrical counterparts. Moreover, high index contrast structures and quantum dots nanophotonic material play a strong role in both applications fields.

There are also synergies between organic solar cells and OLEDs because challenges related to encapsulation and lifetime are similar. As for displays, these two application fields are facing similar manufacturing challenges related to the fabrication and positioning of nanostructures on very large area substrates. The situation is thus different from nanoelectronics where the wafer and the device sizes are kept about one order of magnitude smaller (e.g. cm<sup>2</sup> range for device, dm<sup>2</sup> for the wafer).

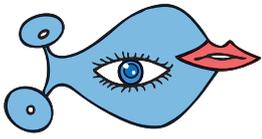
Although Europe's position in manufacturing nanophotonic devices is not so strong compared to Asia and the US (except for LEDs with Philips and Osram) and the majority of the manufacturing of semiconductor or photonic devices is done outside Europe, there is a strong equipment industry in Europe. This is the case for MBE, MOCVD, lithography, ALD, etching, OVPD, CNT CVD equipment and also for equipment required for more exotic processes. European players are among the top ones for MOCVD with Aixtron (DE), MBE with Riber (FR), CVD/PVD with Oerlikon (CH), Photo-lithography with ASML (NL), NIL with Obducat (SWE), (deep) etching with STS (GB), Adixen (FR), ALD with ASM (FI).

To strengthen the European position in nanophotonics, actions could be taken through Photonics 21 and by the European Commission. However, since the funding from the European Commission represents less than 5% of all European RDI spending, a serious effort is needed to convince industry and national/regional commissions to read and implement the MONA roadmap.

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[http://www.ist-mona.org/pdf/MONA\\_v15\\_190308.pdf](http://www.ist-mona.org/pdf/MONA_v15_190308.pdf)



# ForeSec: Europe's Evolving Security

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<b>Sponsor:</b>	European Commission, DG Enterprise		
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<b>Duration:</b>	2008-2009	Budget: € 942,000	Time Horizon: until 2025 Date of Brief: Jan. 2009

## Purpose

*The objective of ForeSec is to tie together the multiple threads of existing work on the future of European security in an attempt to provide a more coherent guidance, orientation and structure to all future security-related research activities. It aims at enhancing the common understanding of the complex global and societal nature of European security in order to preempt novel threats and capture technological opportunities. The project takes a participatory approach in an attempt to facilitate the emergence of a coherent and holistic approach to current and future threats and challenges to European security. ForeSec builds a pan-European network around the European security foresight processes and helps foster a societal debate on European security and security research. As this brief is published, ForeSec still has a few months of project work lying ahead. Accordingly, all results presented here are merely intermediate.*

## Addressing EU Security Challenges

Global trends and threats have a direct impact on European societies through, for example, illegal immigration, regional instability that spills across borders, or energy shortages causing economic vulnerability and instability, which can lead to radicalisation or social marginalisation. Unless these issues and their root causes are understood in a holistic manner, it will be impossible for the EU and member state governments to properly address them with targeted policies.

Although the international security environment has diversified, the characteristics of the threats to European security should lead to a coordinated response from EU member states as pressures for cooperation mount. In essence, asymmetry, anonymity, deterritorialisation and interconnectedness **could** be translated as meaning that all EU member states are affected by the contemporary threats to European security in more or less the same way. States are becoming increasingly unable to provide security on a national basis because of the nature of the threats and challenges they face and the degree to which they find themselves inextricably bound to each other.

These developments underline the need to intensify cooperation between different sectors of national administrations and

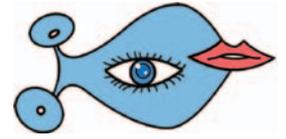
between different EU institutions and Directorate-Generals (DGs) within the European Commission. Traditionally, security policy has been the prerogative of ministries of foreign affairs and defence, but today justice and legal issues, environment, development cooperation, immigration etc. also play a strong role in the security field.

The ForeSec consortium comprises organisations from six member states (Finland, Austria, Sweden, UK, Bulgaria, Italy). Six additional member states were covered in the course of the research phase: Germany, Spain, Estonia, Poland, France and Slovenia – to have a fair representation of large and small states, new and old member states as well as an equal geographical spread.

## World Café as Kick-off

ForeSec takes a participatory approach in the sense that at various occasions stakeholders from all fields relevant to civil security are invited to participate. The ForeSec team has worked out a concise mix of foresight methodologies that includes:

- state of the art scan of security relevant issues, actors, infrastructures and strategies in the twelve countries;
- an inventory of stakeholders who are experts in security related fields (public administration, research, first responders, industry, infrastructure, etc.);



- interviews with stakeholders;
- kick-off event to give the stakeholders a chance to learn of security issues in different fields and various member states. This was conducted in the World Café format to enable close networking and thematic interaction;
- an online Delphi on the future of civil security in the EU among security experts all over Europe;
- scenario building: sketches of possible futures under the assumption of context chains;
- an Internet platform for exchange and interaction among stakeholders and experts in between meetings; Delphi studies and focus groups where expertise on a specific issue is collected and analysed;
- a report to suggest a shared perspective of what “security” may mean in the future to the EU, its member states and citizens (“concept of European security”);
- a final conference in autumn 2009 to share the findings and recommendations of the project.

## Lack of Common European Security Approach

The kick-off seminar with representatives from different stakeholder groups generated very valuable results. Next to taking the first steps for building a European security foresight community, the most prevalent drivers, threats and challenges were named and discussed. The basis for this discussion had been laid in the previous twelve ForeSec country reports and in a report on global challenges. Looking at the EU level, a growing need for concerted interagency processes is recognized across Europe as national security research (and foresight) activities are uncoordinated.

There is increasing overlap of threat assessments across the EU member states surveyed, accompanied by the blurring of internal and external security. Migration, terrorism, social cohesion, natural catastrophes and rising new power centres were seen as the most general trends for threats and challenges most member states have in common. However, the perception of what these key challenges entail differs, often depending on geography and history. In more detail, the following issues came up:

- Demography: migration (within the EU and from the outside from Asia and Africa), growth/decline of population, aging population, brain drain.
- Economy: economic globalisation, economic disparities within countries, within Europe and across the world.
- Environment: climate change, access to resources (e.g. water, food, energy), environmental problems/pollution.
- Science and technology: bio- and genetic technology, information technology, nanotechnologies, surveillance.
- Social values and identity, regionalism/nationalism within Europe, radicalisation and marginalisation of social groups (e.g. driven by ideologies), illusion of 100 % security.

- Governance and order: fragile states, organised crime, composition of EU/lack of political cohesion, failure of global political institutions (World Bank, etc.), emerging powers (role of Russia, China in the long-term), changing public-private balance (e.g. ownership of critical infrastructure).

Stakeholders repeatedly identified the following areas as requiring improved collaboration:

- Border security.
- Research on radicalization and organized crime.
- Research and development of security related technologies.
- Integration of civil and military approaches, on the one hand, and of internal and external approaches, on the other.
- Integration of the drivers of the member states’ national security policies.
- Management of diversity – similar concerns but differences in priority and approach.
- Development of a widely shared set of liberal values.
- Ensuring trust in institutions; good governance.
- Building of a European identity.
- Discussion of the limits of enlargement.

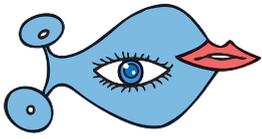
It was indicated that the role of industry with respect to security issues is changing as well. Some country reports indicate that the civilian sector may become the main innovator in the security field – from defence to security industry. The role of industry in terms of defining research priorities is significant – in some countries user organizations find it difficult to play a role in priority setting.

At the same time, government’s exclusive responsibility for security is decreasing and private sector ownership of critical national infrastructure is on the rise.

## Potential of Positive Effects

Discussions with stakeholders either in interviews or at the kick-off workshop not only brought threats and challenges to the fore but also opportunities for the following developments:

- Diversity of cultures: migration might have positive impacts; change of behaviour is probable, giving rise to a more community-oriented culture.
- A Europe speaking with a single voice in security matters and building shared capacity and common approaches for crises management.
- Rise to the state of the art in the development of new technologies for problem-solving and economic benefit.
- Reaching social cohesion among Europeans through dialogue.
- Filling the power gap left by the US.



## First Delphi on Civil Security

The ForeSec Delphi is the first Europe-wide Delphi on civil security and is expected to be finished in March 2009. It involved two rounds and was conducted among different stakeholders with expertise on civil security in almost all member states. About 270 experts participated. They were asked to assess approximately 70 statements on Europe's future of civil security in the fields of societal changes, political changes, economic changes, environmental changes and technological changes.

Only a few preliminary findings and trends can be indicated here:

- Almost half of the respondents (48 %) were of the opinion that **continued US focus on Asia and the Middle East** up to 2025 is *very important* (and 33.9 % that it is *rather important*) to European security.
- A clear majority (58.3 %) thinks that it is *very important* for Europe's security to benefit from **secure resources and stable conditions for economic growth**. Another 17.3 % finds this *crucial*. The vast majority also thinks that it is *rather probable* or *very probable* that these conditions will stabilize.
- If **Russia were to experience continued economic growth** and domestic support for a strong and centralized political leadership, this would be *very important* to European security, find 55.1 % of the respondents – plus another 11.8 % consider this *crucial*.
- Almost the same percentage of respondents (52 %) find it *very important* to European security if the **EU were to be confronted with a more assertive Russia**, having considerable influence on European politics and economies. An additional 17.3 % find this of even *crucial* importance.
- Opinions on the future of EU decision-making processes and institutions concerning security issues are less definite. For instance, it is contested among the participants whether **the EU will be able or unable to reform its decision-making structures by 2025** and if that would cause a loss of support for the EU among its citizens.
- A more definite tendency of opinion came out on the question whether **fragile states neighbouring the EU will be unable to control their borders** and will increasingly find themselves unable to offer basic services to their populations. 46.5 % think that this is *rather probable*, plus an additional 31.5 % find this *very probable*. 54.3 % consider this as *very important* (plus, 13.4 % that this is *crucial*) for European security issues of the future.
- Rather contested were also a few statements on societal issues, for instance, on the probability of **shrinking birth rates and an aging population that is able to live longer**, meaning that the proportion of workers compared to individuals reliant on state support in the EU will decrease substantially compared to 2008.
- With regard to **brain drain**, where poor prospects at home lead to a significant number of highly educated people

emigrating from the EU, the respondents answered to 51 % that this was *not probable* by 2025. On the other hand, it was undecided whether the ability of top European research institutions to continue attracting highly educated students from the developing world and a global process of “brain drain circulation” leading to the replacement of emigrated European researchers would be of importance to European security.

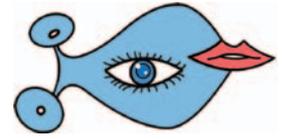
- With regard to environmental changes, almost half of the respondents (49.5 %) expressed the opinion that the occurrence of **sudden and severe natural disasters like storms and floods leading to the devastation of entire regions** within a few hours or days are *very important* to European security (plus, 9.7 % think they are *crucial*). However, on the probability of such events the opinions were much less unequivocal.
- With regard to modern technologies and their impact on security, an overwhelming majority of respondents think that **surveillance technologies are deployed substantially** in the EU (39.6 %: *very probable*; 42.6 %: *almost sure*). 49.5 % find this *very important* for European security and an additional 13.9 % find it *crucial*.
- Almost the same degree of consensus is reached concerning the **illegal reproduction of sensitive personal data**, which is becoming a major business opportunity for IT criminals: 50.5 % think that this development is *very probable*, 25.7 % think that it is *almost sure*! We have the same picture with regard to importance: 47.5 % believe that this is *very important* to European security in the future, plus 28.7 % that it is *crucial*.

## Towards a European Concept of Security

As the project has conducted about 50 % of its tasks, there are still a few milestones to reach and several workshops to organize in order to get input for what in the end will produce the report on the “European Concept of Security”. A tentative definition of security has been formulated by the ForeSec team as an input to stimulate further discussion:

EU security refers to the ability and efforts of all sectors of society to protect individuals and infrastructure within the EU from threats, risks, and hazards that may endanger their survival.

Concerted efforts from the ForeSec team and the community of experts and regular feedback from the European Commission will support the process of defining a new concept of civil security in Europe that will be able to respond to today's challenges and hopefully to those that are lying ahead as well.



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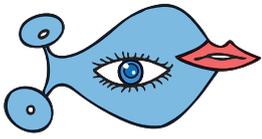
Project website: <http://www.foresec.eu>

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# Future Jobs and Skills in the EU

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Sponsor:	European Commission – DG Employment, Social Affairs and Equal Opportunities		
Type:	European futures study on jobs and skills		
Organizers:	TNO, the Netherlands (Frans van der Zee), SEOR, the Netherlands & ZSI, Austria		
Duration:	12/2007-04/2009	Time Horizon: 10-15 years	Date of Brief: Dec. 2008

## Purpose

*The renewed Lisbon strategy stresses the need for Europe to place more emphasis on anticipating skill needs. Globalisation, technological change and demographic developments (including ageing and migration) pose huge challenges in that respect, comprising both risks and opportunities. At the same time, a lack of information on future skill needs has been a long-standing concern in Europe. With specific targets set in the Lisbon strategy, the need for regular forward-looking assessments has gained momentum. Subsequently, this resulted in the recent New Skills for New Jobs initiative by the European Commission, and related European projects aimed at identifying future job and skills needs using quantitative modelling approaches. While having advantages of robustness, stakeholders as well as the European Commission identified a clear need for complementary, more qualitative forward-looking analysis. Consequently, the European Commission (DG EMPL) earlier this year commissioned a series of 17 future-oriented sector studies (Horizon 2020) on innovation, skills and jobs following a qualitative methodology. The final results of these studies will become available in spring 2009, and will be followed by a number of other initiatives over the year to come and beyond.*

## Future of European Employment

The future of European employment is shaped by two overarching developments: globalisation as well as an ageing population. With both determining demand and supply of future skills, they provide the background to this study. The large number of “baby-boomers” retiring over the coming decade will cause the working-age population to decline. At the same time, many industry sectors in Europe are currently exposed to pressures from globalisation forcing substantial restructuring processes. These developments should be placed in the broader context of securing and improving the EU’s competitiveness, redeploying the European economy to new activities with new and better jobs. In order to be successful, this redeployment should be underpinned by a strategic management of human resources, encouraging a more dynamic and future-oriented interaction between labour demand and supply. Otherwise, there is the risk that bigger shortages, gaps and mismatches of skills will result in structural unemployment.

## 17 Sector Studies, One Methodology

As a first step, the results of this study aim to provide guidance in launching further EU and other actions to promote the strategic management of human resources and to foster stronger synergies between innovation, skills and jobs, encouraging adaptations to national and regional level. The study comprises 17 sector studies, including a pilot study, analysing emerging competences and economic activities. Of these, 11 were carried out by a consortium led by TNO (Delft, the Netherlands), SEOR Erasmus University (Rotterdam, the Netherlands) and ZSI (Vienna, Austria).

To validate, add and complement the findings of the project and to increase impact, results are disseminated as broadly as possible across Europe. Relevant stakeholders including relevant social partners were involved in the project from the beginning and were asked to provide information during the research phase and for feedback in the interim review process. Furthermore, they participated along with experts from industry and academia in a final workshop organised by the EC to validate the results and develop recommendations. The sectoral partners will also play a key role in the follow-up process.

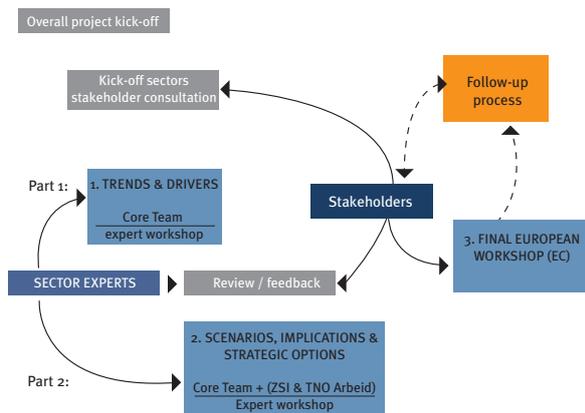
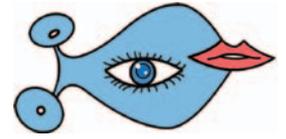


Figure 1.: Overall project setup

With different contractors conducting the studies, a uniform methodology, designed by Prof. Rodrigues and further developed by the consortium led by Dr. van der Zee and his colleagues, was employed to ensure comparability of results. The methodology consisted of two parts: a mainly backward-looking part, identifying trends and drivers, and a forward-looking part, including scenario building, identification of emergent skills and strategic implications. Throughout, results were discussed with internal and external experts and stakeholders. A final workshop, organised by the Commission and Eurofound staff, served to bring together European experts from industry, academia and sector organisations to validate and refine the recommendations.

Based on the common methodological framework, each contractor proceeded in eight defined steps, starting with the mapping of main trends, key drivers of change, emergent competences, leading to scenarios and their implications and subsequent recommendations. Many of the steps were based on predefined tables filled in by experts to allow comparisons across sectors but also to enable easily updating results over time. Furthermore, such a predefined structure allows other actors in the future to repeat and adapt this exercise to local needs.

## From Backward- to Forward-looking

### Trend, Developments and State of Play

The main purpose of this analysis was to provide the factual background to identify key drivers for the subsequent scenario development. Consequently, part 1 of the report analyses recent sector developments and trends and, at the same time, depicts the current state of play in the sector with an emphasis on innovation, skills and jobs. It is based on an analysis of available time series data and relevant existing studies and is both backward- and forward-looking in nature. It analysed

1) structural characteristics (production, value added, employment in various dimensions and related factors), 2) the value chain, 3) technological change and innovation, 4) trade and international competition as well as 5) regulation.

The results of all sections were summarised in a SWOT analysis (strengths, weaknesses, opportunities and threats) and were used as input for a workshop to identify key drivers. During the workshop, experts were asked to assess a generic list of 26 drivers grouped in DESTEP categories (demographic, economic, social, technological, environmental and political). They were further requested to assess drivers for their relevance, uncertainty, their impact on the level of employment, the composition of employment, and the impact on new skills. Additionally, for each driver, the expected short, medium and long-term impact, as well as differences between groups of countries and subsectors were assessed. Where adequate, also sector specific drivers were identified to complement the generic list.

#### Knowledge, Skills and Competences Defined

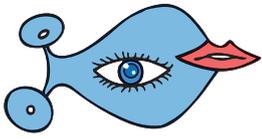
**Knowledge** – refers to the outcome of the accumulation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.

**Skills** – refers to the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

**Competence** – refers to the proven ability to use knowledge, skills and personal, social and/ or methodological abilities in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy.

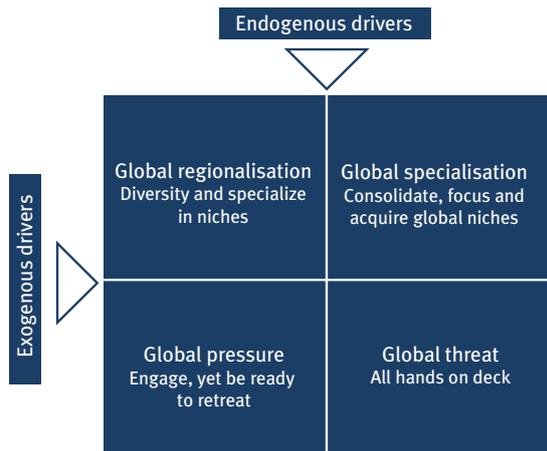
### Qualitative Scenarios

This second part of the study consisted of scenario development and implications of the scenarios for different occupations between 2008 and 2020. In a first step, the drivers identified in the workshop were clustered in relevant exogenous and endogenous drivers to construct the scenarios. Endogenous drivers were defined as representing factors that can be directly influenced by EU policies. For each sector, 3-4 scenarios were developed (see example from the chemicals, pharmaceuticals and rubber and plastic products sector below).



## Implications of Scenarios

Scenarios were built to assess the implications for the level (absolute demand) and composition (relative demand compared to other job functions) of employment. Additionally, new and emergent skills required by different job functions were identified using, as before, standardised tables to ensure comparability between job functions and sector studies.



Rather than producing a full and exhaustive list of all competences required for each job function, the key focus was on identifying and describing key and critical competences for the future. For that purpose, job functions were derived from the Eurostat Labour Force Survey (LFS) based on four criteria: employment shares, closely related job functions, the strategic role in the sector as well as emergent job functions not yet covered and/or brought fully to light by current statistics. In a further step, sector experts assessed tables for each job function inquiring about emergent skills. These formed the basis for the strategic choices subsequently identified.

### Strategic Choices to Meet Emergent Competence Needs

Each sector study assessed possible strategic choices in terms of feasibility and actor involvement, based on a standardized list of 13 options. The options comprise recruiting workers from other sectors, countries (EU & non-EU), recruiting graduates, training employed workers as well as changing work organization. Additionally, options requiring action from sector organisations, educational institutions and governments, including adapting vocational education and training, providing better information and improving cooperation between actors, were assessed.

Generally, rather than focusing on one single solution, a set of linked strategic choices is prime in most cases. Prioritising both in time and in allocation of resources is necessary to guarantee that skill needs are targeted and solved. Skill needs can be identified at various levels, ranging from assessments at the

national or even European sector level – which are by nature rather general – to more precise assessments at the regional and company level. Especially for large enterprises not only the identification of skills needs but also the search for adequate solutions will be an integral part of an overall longer-term business strategy. Some solutions will be found within the company itself, for instance by reorganising functions within or between plants, by offering (re)training trajectories and by active global sourcing of personnel. For SMEs, and especially for micro-enterprises, such longer-term, more strategic human resource management often will be more difficult to put in practice. It is to emphasize that at all levels a range of actors need to act, preferably in close concert.

### Skills Needs, Skills Shortages and Skills Gaps Defined

**Emergent skills needs** are defined here as the change in skills that is needed to adequately fulfil a certain job function in the future. Addressing emergent skills is required in order to avoid skills shortages and/or skills gaps in the future.

**Skills shortages** exist where there is a genuine lack of adequately skilled individuals available in the accessible labour market. A skill shortage arises when an employer has a vacancy that is hard to fill because applicants lack the necessary skills, qualifications or experience.

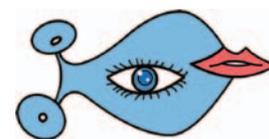
**Skills gaps** arise where an employee does not fully meet the skills requirements for a specific job function but is nevertheless hired. This skills gap needs to be closed through training. Skills gaps can arise where new entrants to the labour market are hired and, although apparently trained and qualified for occupations, still lack some of the skills required.

## Recommendations

Each sector study contains specific recommendations to the sector to be published by the EC in spring 2009. But with the studies analysing Europe as a whole, the recommendations remain general and need further action at national and regional level. The intention of the project, especially in the follow-up phase, is to stimulate stakeholders at lower territorial levels to flesh out results in more detail, rather than providing standardised solutions. However, with many industry sectors experiencing similar pressures from globalisation, some general tentative recommendations can be distilled:

### Intensify cooperation between relevant stakeholders

The challenge to overcome sectoral skill gaps and shortages will only be met sufficiently if industry, research institutions,



training providers, social partners and public authorities act in close concert, both at the national and the European level.

### Invest strongly in human capital

Enhanced investment in human capital is required. Cost sharing mechanisms between actors, such as public authorities, companies and individuals, need to be developed and life-long learning throughout the life cycle promoted: learning must be made more attractive to all, e.g. via tax incentives.

### Standardize regulations

Environmental, health and safety regulation (sector dependent) differ in many European countries, lowering the possibilities for job mobility (migration) and posing additional training costs for workers moving between countries. Standardization potentially increases labour mobility within Europe.

### Attract top international talent through universities

European universities enjoy a good reputation, attracting considerable international talent. This opportunity should be used to keep top talent in Europe in research and industry. The search for excellence in university education and research should be continued and further stimulated. Strict immigration regulations currently make it difficult for the sector to keep the wanted talent. An effective EU “blue card” could enhance further mobility of top talent in Europe. At the same time, attracting and keeping top talent requires more flexibility from national governments and cooperation between universities and the sector (firms).

### Enhance VET to increase social mobility

Social mobility in many European countries is low with the vocational education and training (VET) system playing a key role for people to move up the social ladder. It is especially important to exploit the potential of late developers that in the first instance did not reach tertiary education. To accomplish that, the VET system should be enhanced to facilitate the option for people to continuously up-skill especially in light of lifelong learning.

### Coordinate national and European vocational qualifications

With different VET systems in Europe having their own merits, standardization is difficult to impossible. But there is a strong need for coordination to increase labour mobility. One option is to complement the European and national framework already in place with a sectoral framework.

### Diversify personnel and take positive action

Female workers as well as ethnic minorities are still greatly underrepresented in certain sectors (e.g. chemicals). A main recommendation therefore is to implement an active strategy of diversification of personnel in all job functions. This goal is to be met through a broadening of the recruitment scope.

## Next Steps

While this project provides a full sectoral analysis on future jobs and skills, the most important thing is to implement actions. For that purpose, it is crucial to see the results so far as only a first step in a much longer, ongoing process. Several actions are foreseen for the dissemination of the results:

- 1) As part of the Restructuring Forums organised by the European Commission, a large **forum** in the second half of 2009 will present key findings to European social partners and public authorities at all levels.
- 2) “**National**” seminars in each EU country will bring together stakeholders of the sector. About 100 representatives of education and training institutions, national, regional and local authorities relevant for the sector as well as national social partners will be invited. The seminars will provide the opportunity to discuss the results of the studies and have an exchange of views on their possible adaptation to national and local contexts.

Beyond specific steps, in the long run, these forward-looking assessments should be performed regularly, with the key stakeholders of the sector (e.g. companies, social partners, local authorities) building partnerships and developing joint actions with a common goal of adapting the management of human resources to face future needs. Furthermore, in addition to the sector studies, links between sector activities will be identified in a follow-up to depict possible labour movements between sectors. This study will be launched in 2009 once the sector studies have been completed.

## Sources and References

It is planned to publish studies on the DG EMPL website Anticipedia, the new tool for pooling all relevant information related to the anticipation of change and a forum for stakeholders concerned by the issue. The website will be online in the first half of 2009.

TNO – New Skills and New Jobs:

[http://www.tno.nl/content.cfm?context=markten&content=markt\\_nieuwsbericht&laag1=280&item\\_id=2008-07-17%2018:15:53.0&Taal=2](http://www.tno.nl/content.cfm?context=markten&content=markt_nieuwsbericht&laag1=280&item_id=2008-07-17%2018:15:53.0&Taal=2)

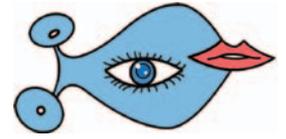
European Commission links:

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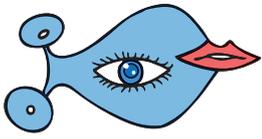
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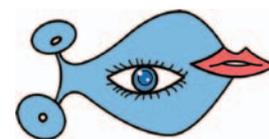
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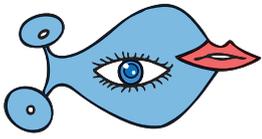
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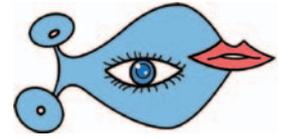
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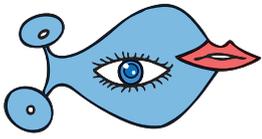
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