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TECHNICAL REPORT



TECHNOLOGY FORESIGHT SUMMIT

*Budapest, Hungary
27-29 March 2003*



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
economy environment employment

TECHNICAL REPORT
TECHNOLOGY FORESIGHT SUMMIT

Budapest, Hungary
27-29 March 2003

Organized by
UNIDO in cooperation with the Government of Hungary

Co-financed by
the Government of Austria



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna, 2004

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Foreword

Recent years have been marked by the dramatic impact of numerous technological innovations, which have brought about major changes in economic structures and in daily life.

The growth in productivity spurred by innovation and technological change is the main driving force in the process of economic growth, both in industrialized and developing countries, and its contribution will increase in the future. The United Nations Industrial Development Organization (UNIDO) has embarked on an interactive discussion among member States and different actors about the formulation of economic policy, geared in particular to identifying the determinants of innovation and technological progress in developing countries. The aim of the Organization is to stimulate studies to map out the challenges and opportunities involved and to develop and disseminate methodologies to face those challenges. Technology foresight is one of the most promising means of doing this, as the experience of industrial countries and corporations has eloquently demonstrated.

UNIDO promotes the concept of technology foresight as a tool for forward-looking strategic decision-making and policy formulation that will improve the conditions for innovation and induce economic growth, thus enhancing the quality of life in developing countries and countries with economies in transition.

In attempting to foresee the future—what the economy or industry will be like in 20 or 30 years' time—it is often thought that there is only one given future and in order to be prepared for it one must attempt to predict what it will be like as intelligently as possible. Yet actually there are several possible versions of how the future could and would evolve, depending on what is done in the meanwhile, what choices are made, what decisions taken. Technology foresight is a methodology and process based on this latter approach.

In this context, the Technology Foresight Summit 2003, held in Budapest from 27 to 29 March 2003, played a very important role.

With this Summit we are launching an annual event to provide a platform to Central and Eastern European countries and the Newly Independent States for a more sustainable and innovative development aimed at fostering economical, environmental and social benefits at the national and regional levels.

This Summary Report presents the major concepts, experiences and discussions of the Summit as well as its conclusions and recommendations.

We would like to offer you this Executive Summary as a reference material to help improving the decision making in member countries for a enhanced quality of life in the future.

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Background

The Technology Foresight Summit is a flagship annual event of the Regional Initiative on Technology Foresight for Central and Eastern Europe and the Newly Independent States of the United Nations Industrial Development Organization (UNIDO). It is intended to respond to the need for a vision of the midium- and long-term development of the region as well as for a more technology-oriented focus in the relevant national and regional knowledge-based institutions.

The 2003 event brought together 310 policy representatives at the highest level, top business leaders and heads of research institutions to discuss future trends, strengths, weaknesses, opportunities and threats facing their countries, companies and regions, which can be addressed through early mobilization of technology and knowledge. A major objective of the annual summit is to involve the business sector as closely as possible in the discussions and deliberations. Each summit is devoted to a challenging highlight area. For the 2003 Summit, biotechnology was selected as the highlight area. This Summit has also addressed the impact of European integration on the local industry in a development perspective.

The 2003 Summit was organized in cooperation with the Government of Hungary and co-financed by the Government of Austria.

The Summit consisted of four components:

- **Technology foresight panels** (including Plenary Session and Thematic Panels), presenting best practices in developing and applying technology foresight for strategic decision-making, concentrating on practical issues for local industry;
- **The Biotechnology Prospective Forum** is the highlight area, where biomedical, agricultural and environmental aspects of biotechnology were presented, with emphasis both on legislative, regulatory, educational issues and on consumer acceptance and European Union conditions. Outreach lectures focused on selected future scientific achievements and the industrial market;
- **A Ministerial Round Table** brought together top governmental decision makers dealing with technology as a tool to enhance the productivity and competitiveness of the economy at the national and

regional levels. The focus of the 2003 ministerial round table was European integration and the effect of the integration process on the industrial development of the region;

- **The Fair of the Future**, where chief executive officers (CEOs) and industrial decision makers presented their visions of the future, their views on the likely development of their respective industries and on industry-led future trends and perspectives in the highlight area.

Major research studies described present conditions and future prospects of selected industrial sectors, such as the automotive industry and agro-food processing. Significant outcomes from the Summit are:

- Enhanced awareness among decision makers of the importance of technology foresight in fostering competitiveness and innovation in the region;
- Important recommendations for high-level decision makers to encourage, initiate and implement foresight exercises in selected highlighted areas;
- Identification of specific and relevant regional "hot" issues.

Main achievements

Technology Foresight Panels

The technology foresight panels represent the thematic core of the annual summit. In Central and Eastern Europe (CEE) and the Newly Independent States (INIS) it is widely recognized that introducing foresight as a policy instrument to reach consensus among diverse societal actors is a very timely and important exercise as part of the transition process.

A further objective is to promote joint foresight activities in different countries. The resulting foresight networks will foster cooperation between countries and between regions within countries.

So far most technology foresight exercises have been conducted at the national level. The summit has pioneered efforts to take the benefits of foresight to be gained at the regional, supranational and sub-national levels.

The technology foresight panels presented best practices in developing and applying technology foresight for strategic decision-making and was intended to serve as a platform for building common visions to face future challenges and opportunities for strategic industrial production chains in the region. The panels conducted sector-specific scanning of "hot" issues in the region and prepared recommendations to decision makers. The results of the panel discussions will form the basis for specific technology foresight studies on the respective sectors.

The technology foresight panels consisted of the following elements:

- *Plenary session.* The plenary session introduced the foresight exercise as a decision-making and consensus-building tool for creating a knowledge-based society and enhancing industrial innovation, and its specific role in countries with economies in transition.
- *Thematic panels.* The thematic panels provided a framework for discussion and analysis of the challenges and opportunities expected to arise over the next 5-20 years in Central and Eastern Europe and the Newly Independent States in strategic areas such as:
 - National and sub-national technology foresight;
 - Corporate and regional-level technology foresight;

- Transportation and logistics;
- Environmental protection;
- Information and communication technology and electronics;
- The automotive industry;
- The agro-food industry.

Biotechnology Prospective Forum

Biotechnology was the highlight area of the 2003 Summit and its future role in countries with economies in transition was discussed in a forum event. The Prospective Forum provided an overview of future challenges and opportunities in biotechnology in the context of the region of Central and Eastern Europe and the Newly Independent States.

The objective of the Forum was to help governmental and industrial decision makers to formulate and strengthen their vision of perspectives and options and to promote interactivity among key biotechnology players in the region with a view to shaping their future.

The Biotechnology Prospective Forum consisted of four consecutive sessions covering:

- Human health and the pharmaceutical industry;
- The agro-food industry;
- The environment;
- Cross-cutting issues such as regulation, legislation, patenting, public perception; and intellectual property rights.

The results of the event were:

- An interactive overview of the field, which increased the awareness of decision makers and the foresight community as a whole of the problems of biotechnology and its specific use for countries with economies in transition;
- The promotion of biotechnology foresight studies in countries of the region;
- Identification of specific problems to be addressed by foresight studies and other governmental/non-governmental decision-making means;
- Development and strengthening of ties and enhanced cooperation among scientists, the biotechnology industry and Governments.

Taken together, these elements are expected to have a very positive impact on the development of biotechnology in the region.

Ministerial Round Table

Concept

The Ministerial Round Table was held on the last day of the Summit and served as the formal forum for ministerial participation.

The focus of the ministerial round table was the effects of the European integration process on industrial development in the region.

Within the framework of the Summit, the ministerial round table is intended to build networks with top-level leaders from Governments, academia and business in the region. The ministerial round table contributed greatly to achieving the final goal of the Technology Foresight Summit: responding to the need for a vision of the medium- and long-term development of Central and Eastern Europe as well as for a more technology-oriented focus in the relevant national and regional knowledge-based institutions.

Achievements

The Ministerial Round Table counted with the participation of 12 countries, six of which were represented at the cabinet minister level (Croatia, Hungary, Ireland, Poland, Serbia and Montenegro and Turkey), three at the state secretary level (Lithuania, Romania and Slovenia), three at other high official level (Cyprus, the Czech Republic and Slovakia). Ministerial level participants also included, the Director-General of UNIDO and the Executive Secretary of the United Nations Economic Commission for Europe. In keeping with the high level meeting, the Moderator of deliberations of the MRT was former Austrian Chancellor Franz Vranitzky.

The presence and participation of the ministers and state secretaries was a statement itself. The MRT was the highest-level gathering ever of top governmental decision-makers dealing with technology foresight. It was the first supranational regional foresight event in Central and Eastern Europe to address issues of European Integration as a development perspective through the eyes of the pre-accession countries.

In harmony with and a primary event of UNIDO's Regional Initiative on Technology Foresight for the Central and Eastern European Countries and the Newly Independent States, it was an effort to respond to the need for a vision of the medium- and long-term development of Central and Eastern Europe.

The MRT explored efforts and articulated the further need to look at the benefits of regional, supra-, and sub-national level Technology Foresight exercises and cooperation in this area.

It encouraged a more technology-oriented focus in the relevant national and regional knowledge-based institutions.

All-in-all it promoted cooperation among countries with economies in transition for a more sustainable and innovative development aiming at fostering economic, environmental and social benefits at the national and regional levels.

It has empowered ministers to use and apply technology foresight as a tool and process and as a policy instrument, to make informed and intelligent decisions for quality industrial development that yield optimal economic, environmental and social benefits and as one that enables them to interact with the business and research communities. They explored the impact of integration on industrial development in general and the foresight process in particular and on how the foresight process can help meet criteria for integration.

Based on the proceedings and experience of the Summit and the Ministerial Round Table, they are to be established as a flagship annual event to bring together the highest-level policy representatives, top business leaders and heads of research institutions to discuss future trends, strengths, weaknesses, opportunities and threats to their countries, companies and regions, which can be addressed through early mobilization of technology and knowledge.

The co-host of the TFS, Hungarian Minister of the Economy, Dr. István Csillag announced Hungary's readiness to host annual TFSs, important flagship events of UNIDO's regional initiative on TF for the next years.

Fair of the Future

Concept

As an industry dedicated event of the 2003 Summit, the Fair of the Future presented an opportunity for players of the biotechnology industry and research to present their ideas, concerns, products, achievements and markets in three forms:

- Physically, through prototypes, state-of-the-art exhibits and visual concepts;
- "Virtually", through posters, videos, DVD displays and internet café; and
- Oral presentations.

The Fair of the Future covered various fields of biotechnology from pharmaceutical products to environmental cleaning. Companies were able to present their views on important subjects for the biotechnology industry in Central and Eastern Europe and the Newly Independent States. The Fair also served as a platform for presentation of market opportunities for those who are aiming at setting up biotechnological companies or finding partnerships. In that context, the Fair provided participants with practical information on how to set up and manage biotechnological enterprises in a professional way. Such information were provided by leaders of biotechnology venture capital funds, of pharmaceutical companies, the agro-food industry and agro-food processing and biotechnological companies. Contributions were also made by experts working in the governmental sector and dealing with assistance provided for the biotechnology sector and representatives of biotechnological companies present in the region. The Fair of the Future was intended, finally, as a tool to promote discussion on competition, innovation and strategic decision-making, to promote interaction between the governmental, business, finance and research communities and to encourage CEOs and industrial decision makers and venture capital funds to present their own achievements and perspectives.

To facilitate all these activities, exhibition booths, meeting rooms with PC with Internet connections and LCD projectors for videos, DVD and PowerPoint presentations were made available.

The Fair was open to the public and to participants at the Summit for the whole duration of the event.

Achievements

- Principal achievement of the Fair was highlighting the importance of regional biotechnology funding mechanisms and encouraging Governments to identify sources of financing to support the growth of the biotechnology sector in their respective countries.
- The Fair of Future covered, in addition to the pharmaceutical issues, the EU regulatory system, role of venture capital in biotechnology, experience of big companies and small countries. The scope of the presentations was much wider as expected. This gave an opportunity for the audience to get a more complex view on biotechnology in the present and the future.
- The Fair hosted lecturers from nine countries: Belgium, Czech Republic, Estonia, Germany, Hungary, Israel, Italy, United Kingdom and the United States.
- During the Fair and after the event the participants reported having made interesting business contacts. This is mainly applicable for the Hungarian companies and the big biotech companies participating.

- Although the participation in the exhibition fluctuated during the Summit, about 30 persons on average attended each presentation.
- As a co-organizer, the Hungarian Biotechnological Association contributed enormously to make this event a success. The exhibition had 10 exhibitors, of which nine were from Hungary and one from the UK. Sixteen presentations were made. The Fair of Future was active during the entire Summit. Twenty-two companies, were present virtually on the screen displaying PowerPoint presentations and 10 companies used the opportunity to show, demonstrate and circulate printed materials and CDs.
- The list of the participants and the kind of participation are shown in table 1.

Table 1. List of participants

<i>Company</i>	<i>Visual</i>	<i>Exhibition booth</i>	<i>Lecture</i>	<i>Distribution of material</i>
Hungarian Biotechnology Association	✓	✓	✓	•
IBM	✓		✓	•
Millennium Pharmaceutical	✓		✓	•
Medical Technology Promed Consulting GmbH	✓		✓	•
Biopolis Consulting GmbH	✓		✓	•
ComGenex	✓	✓	✓	✓
SOLVO	✓	✓	✓	•
Biotissue Technologies AG	✓		✓	•
Institute of Baltic Studies	✓		✓	✓
ICGEB	✓		✓	•
Farkas & Rieder Kft.	✓		✓	•
EuropaBio	✓		✓	•
SOTE	✓	•	✓	•
Baxter AG	✓		✓	•
i&Mark Ltd.	✓	✓	✓	•
City of Vienna	✓		•	✓
Agricultural Biotechnology Research Centre, Gödöllő	✓	•	•	✓

<i>Company</i>	<i>Visual</i>	<i>Exhibition booth</i>	<i>Lecture</i>	<i>Distribution of material</i>
Hungarian Innovative Technologies Fund	✓		•	•
Biotechnology Centre, Szeged	✓	•	•	✓
IRC West Poland	✓		•	
Thales Nanotechnik	•	✓		✓
RecomGenex	•	✓	•	✓
ComDrug	•	✓	•	✓
PREST University of Manchester	•	✓	•	•
TOMTEC	•	✓	•	•
IDG Hungary	•	✓	•	•
ChemAxón	✓	•	•	•
Genodia	✓	•	•	•
Bureau for International Research and Technology Cooperation (BIT)	•	•	•	✓
The Economist	•	•	•	✓
Total	22	10	16	10

The feedbacks as to the level, the quality and the interest of the exhibition and that of lectures were very positive and satisfactory from all interested parties. All of them would be interested to participate in the next event to be organized in 2004.

Opening Address

*Haruko Hirose, Deputy to the Director-General and Managing Director,
Programme Coordination and Field Operations Division, UNIDO*

The economic environment is increasingly shaped by globalization, growth in trade and international competitiveness. The trade growth is mostly occurring in the production segments that are technology intensive and driven by innovation. The services are also becoming technology driven and FDI growth is higher in services. WTO norms require that countries are strong in intellectual properly assets.

The increasing competition and globalization and the need to be focused in world trade are factors that are making the business context highly dynamic. This will demand from every economic region to be strong in certain competences and necessitate a comprehensive forward-looking developing process. The most up-stream element of such a process is Technology Foresight. It provides inputs for the formulation of technology policies and strategies that guide the development of the technology infrastructure.

Technology Foresight activities in different sectors of the economy have been implemented in almost every OECD country. The countries with economies in transition in Central and Eastern Europe and the Newly Independent States have become aware that Technology Foresight is a useful tool in policy formulation, planning and decision-making. Some countries, such as Hungary, Czech Republic and Ukraine, have started applying Technology Foresight in their strategic decision making process.

In response to requests by our member countries, UNIDO has been implementing national and regional initiatives on Technology Foresight. Technology Foresight is one of the main initiatives we have carried out in UNIDO during the past few years. As you are aware, Technology Foresight has increasingly been recognized worldwide as a powerful instrument for establishing common views on the future development strategies among policy-making bodies. Its novelty stems from a wide participation of major actors, namely, the government, science, industry and NGOs to systematic foresight of the long-term trends in development of science, technology, the economy and social needs with the aim of identifying the emerging technologies with highest potential of contributing to economic and social benefits.

UNIDO embarked on the Technology Foresight initiative in December 1999, when we launched the first Technology Foresight Conference focusing on Latin America. Many countries in that region recognized the value of the initiative and a programme for Latin America is currently under way, with financing from the Governments of Italy and Spain and Governments of some Latin American countries. Argentina, Brazil, Chile, Uruguay, and Venezuela have already decided to invest their own resources in developing the programme. In several countries in Latin America, Technology Foresight has increasingly been applied as an instrument for awareness building towards

allocation of resources for science and technology as well as identification of national priorities.

Following a recommendation of our member countries, UNIDO was encouraged to extend the Technology Foresight activities to other regions to address common issues related to regional development. For Central and East European (CEE) countries as well as the Newly Independent States (NIS), the application of Technology Foresight has become of crucial importance for strengthening the transition process. In this connection, UNIDO launched a Regional Initiative on Technology Foresight for CEE and NIS countries in 2001. Technology Foresight Summit is a flagship annual event of this Regional Initiative.

This Technology Foresight Summit 2003 offers the participants a possibility to update information on trends and opportunities in technology based business as well as to build relationships and networks with top-leaders from Governments, industry and research communities.

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Part one

Technology Foresight Panels

Plenary: Knowledge-based Society, Innovation and Technology Foresight

Issues

- Foresight practice as a tool for enhancing competitiveness and innovation on corporate, sub-, supra- and national levels;
- Main global scientific, technological and social trends, taking into consideration the findings of the various national foresight studies.

Abstracts

Foresight Concept and Practice as a Tool for Decision-making

Luke Georghiou, Executive Director, PREST, University of Manchester, UK

Technology foresight at a national level may now be seen as a policy instrument which is approaching maturity. Since the early 1990s the practice has diffused widely to the point that most industrialized countries and several advanced developing countries have experience of some form of foresight exercise. Many have been through more than one iteration, while others are about to do so. Despite this spread of experience there has not so far been a serious effort made to understand the effects of the wave of foresight activity. In particular, foresight has not been systematically evaluated as an instrument of science and innovation policy. After some consideration of what foresight is, the problems and issues involved in its evaluation are discussed. Some experiences of efforts to evaluate individual programmes are considered and some emerging lessons for foresight as a policy tool are discussed.

As a starting point in assessing the international experience, it is important to stress not only what is common to foresight activities but also the ways in which they differ. In reality, what we term foresight covers multiple activities and purposes sharing a name. In terms of purpose, some common goals for foresight are:

- Exploring future opportunities so as to set priorities for investment in science and innovation activities.

- Reorienting the Science and Innovation System.
- Demonstrating the vitality of the Science and Innovation System.
- Bringing new actors into the strategic debate.
- Building new networks and linkages across fields, sectors and markets or around problems.

The modalities of foresight may also differ strongly. All of the above goals may be pursued at organizational, local, regional, national or supranational levels. The timescale of foresight ranges from the immediate future to the far horizon. The range of actors involved, the process and methods used, and even the status of the activity varies considerably. Foresight ranges from methodological experiment through to major politically driven initiatives.

In conclusion, the current decade will bring its own challenges and the foresight community will have to be well-prepared to contribute to meet the foresight characteristics, such as innovation in public services, integrate foresight in policy and strategy. Foresight must be subject to rigorous evaluation and the evaluation must feed back into new design.

***Innovation: A Bridge Between R&D and Industry—
A Bottleneck in CEE & NIS countries***

Lajos Nyíri, Executive Manager, ZINNIA Group LP, Hungary

The countries in transition in Central and Eastern Europe (CEE) have faced double challenges at the very beginning of the deep social, political and economic changes in the early 1990s. Firstly, all of them needed to create a stable platform and social basis for market oriented economies and parliamentary democracies, adapting solutions applied in the modern Western societies. Secondly, adjusting this process to the fast changing global environment, especially to the challenges resulted by the social transformation from industrial society to knowledge-based one. During the past years in the transition the CEE countries focused mostly on the first challenge, and only very limited efforts have been devoted to the second.

The countries in CEE aimed to manage the institutional transition toward market economy with the smallest possible social price, and to create the basis for growth by integration to the global production, trade and technology networks. After more than 10 years of transition CEE as a market has fully integrated by financial and trade terms into the global system. As the integration of production is concerned, the picture is much more colourful: a growing differentiation is going on among these economies. The process is powered mostly by foreign direct investments (FDI), but the subcontracting links also play an important role.

The technology integration is usually weak or in many cases absent in CEE. In order to catch-up with the industrialized nations more effort and

time are needed for change in the innovation policy approaches and targets than it was expected 13 years ago.

The future policies on developing the national system of innovation in CEE should aim at: strengthening the in-house R&D capacities of firms, improving the academy (university)—industry links, and promoting technology cooperation among companies.

The membership in the EU will create only better conditions for this process, but it will not automatically result in *effective and successful adjustment strategies* reacting to the challenges of the knowledge-based society. All the nations in CEE should find their own way and reactions to these challenges.

Debate

The most important messages of the plenary can be summarized as follows:

- Foresight occupies the space in which planning, futures studies, and policy development overlap. It does not displace existing decision-making and planning processes. Rather it complements them and increases their effectiveness.
- Foresight and its relationship with the implementation is essential.

The future policies on developing national systems of innovation in CEE should aim at:

- Strengthening the in-house R&D capacities of firms.
- Improving the academy-industry links.
- Generating new knowledge is important (and expensive), but disseminating, understanding, adapting and exploiting new knowledge are essential.
- Promoting technology cooperation among companies.
- Promoting foreign direct investment which depends strongly on the innovative capabilities of the receiving country.

In formulating future SME policies more emphasis should be given to the following targets:

- *Developing the financial markets* to ease investments, provide necessary guarantees, increase the risk taking capabilities of investment funds to innovating projects.
- *Special focus on firms, which have real potential for growth and high R&D/knowledge intensity* combined with global market potential.

Panel 1: Foresight at National and Sub-national Level

Issues

- Role of Foresight as a tool for strategic decision making and consensus building;
- How to raise the ability of society to shape the future rather than waiting for it to happen;
- The importance of foresight exercises in Central and Eastern Europe and in the NIS countries for enhancing innovation and global competitiveness of industry;
- Anticipating issues related to political, economic, social transition;
- Outcome of foresight: the “products” (reports, studies) and the process itself;
- Ways to disseminate the culture of foresight to the society.

Abstracts

Foresight at National Level: The Experience of Sweden and Its Contribution to the Foresight Process and Culture *Lennart Luebeck, Sweden*

Swedish Technology Foresight was conducted during 1999 and 2000 when more than a hundred experts—women and men of all different ages from the private business sector, research community and public sector—worked in eight panels, studying and discussing their respective Foresight sectors.

The project had two major objectives: to strengthen a futures-oriented approach in companies and organizations and to identify areas of expertise with potential for growth and renewal in Sweden

The results of Technology Foresight were presented at a final conference in presence of the Swedish Prime Minister in March 2000. The eight panel reports contain very extensive and varied material that portrays a number of conceivable future scenarios. The reports have tried in different ways to describe the possible impact that various technical developments have on society and people. Their purpose is not to use these descriptions as a basis

for trying to create a forecast of Sweden's development. Instead, they focus on important areas of change and single out a number of central issues.

It has recently been decided to start in Sweden a second Technology Foresight, which will include an update of the previous results but also include new dimensions. The purpose of this second foresight project is similar to the first one, i.e. to create the basis for priority setting for technology-related R&D and educational issues central to Swedish sustainable growth and to economic, social and ecological sustainability.

Based on the first Swedish Technology Foresight a wealth of information now exists on all practical issues relating to the management of a foresight project in Sweden. This information will be very beneficial now that the second Swedish Technology Foresight is about to start, but it could also be of help to other countries which are in the process of undertaking a foresight project.

There is one particular aspect, which should be brought to the attention of those contemplating a foresight in the GEE & NIS region. That is what has been named as "the mission definition": Who are the most important users? Which are the questions to which they really need the answers? Which process can find these answers? This mission definition is also the major argument for undertaking a foresight effort in an individual country or a specific region, rather than relying on what is being done elsewhere.

Another recommendation is that it might be useful to examine foresight results bearing in mind mistakes that have been made by futurists of the past. Here a Swedish study was made which discusses various difficulties and sources of errors that should be borne in mind.

In conclusion there is a strong conviction in Sweden that Technology Foresight is a worthwhile tool, as demonstrated by the decision to go ahead with a *second foresight*, and thus we feel rather safe in recommending Technology Foresight to the CEE and NIS region.

Foresight Project as a Tool to Enhance Regional Development

Gordon Ollivere, Managing Director, RTC North Ltd., UK

The overall concept of regional foresight should be distinguished from both the national programmes that have dominated the debate up to now, and the city-based initiatives which are part of local planning. Typically the national programme is established first but then takes ongoing responsibility for analysing global technology and market trends as well as producing high level policy instruments and expensive resources for dissemination. Regional programmes, on the other hand, translate and adapt policy, identify key target groups, develop delivery plans and ensure that foresight takes account of environmental issues, social inclusion etc.

The UK is generally recognized as having a strong national foresight programme, but attempts to "roll out" its policy instruments have met with limited success. The North East of England is an exception because of its

early decision to establish a dedicated Foresight unit (1996) responsible for converting policy into action, initially by targeting industrial companies and technology clusters; subsequently by focusing attention on young people, education and social issues.

Another issue in this contrast is in which degree the knowledge gained in running successful foresight programmes in one country can be transferred to others, especially CEE and NIS countries. Dissemination of best practice between countries is positive. Although there is no universal, "one size fits all" solution to the application of regional foresight, knowledge is now sufficient to create models appropriate to different political, economic and social environments. Regions with a need for cultural change have greater potential to benefit.

Based on on-going good experiences would be possible to produce a template of all the essential steps in setting up a regional foresight project. A successful regional foresight programme will take many years of time and effort to establish. It normally requires a "champion" or lead agency with good contacts and resources, supported by government and delivered through a complex network of external facilitators, expert groups and intermediaries. If the process is well managed, foresight will produce remarkable results and in time, will come to be regarded, not as the exotic pastime of an intellectual, but as a perfectly natural way for ordinary people to solve problems and exploit opportunities.

The Role of Technology Foresight in Economic Transformation in Ukraine
Michael Zgurovsky, Rector, National Technical University,
Kiev Polytechnical Institute, Ukraine

Challenges and threats of the modern world in which severe competition is dominating make it necessary to foresee, on an objective basis at least, indicative scenarios of future events. The first attempts to get objective knowledge of the future were mostly connected with development of new and application of traditional mathematical and statistical methods, namely, the method of time rows, regressive analysis methods, both one-dimensional and multi-dimensional, the methods of imitation modeling, econometric models and others. All these methods belong to so-called quantitative forecast methods, and they are used for approximate "determination" of future "behaviour" of some variable or a system of interrelated variables for the time period defined in advance.

The foresight process can be formed with the help of more universal mathematical, logical and software platform named scenario analysis platform, which is the complex of knowledge, mathematical, software and logical tools for determination of the sequence of their application, their interconnection and in general formation of the foresight process. This platform is the methodological body of the National Foresight Programme.

As participants of innovation development and connections between them in each country have their peculiarities, it is practically impossible to find two identical systems in the world. As a result, the outputs of technology foresight and conclusions drawn for different systems would principally differ. Therefore, each country, and in the first turn Ukraine, should independently sort out the problem of innovation development. The “generated” technologies, which will be created with the help of technology foresight, will have a revolutionary impact upon industry, economy, society and environment during the first decades of the 21st century. By definition these technologies depend directly upon scientific and technological progress, which, in its turn, depend upon them. If these technologies are foreseen at the early stages, the government and interested parties will be able to direct their resources at strategic research and preparation of the adequate material facilities. It will promote rapid innovation development of society.

The Rationale and Methodology of the Turkish Foresight Programme (Vision 2023)

Turgut Tümer, Associate Vice-President, Scientific and Technical Research Council of Turkey—TUBITAK

In a rapidly changing environment, it becomes extremely important to anticipate future changes and developments. A key element of strategic action and policy-making is now to recognize the possibility of alternative futures, and to implement policies that make the best alternative possible. The policy making in this era also needs to be based on systematically gathered information with the active participation of all the stakeholders. It is, therefore, no coincidence that technology foresight activities have proliferated in the last decade. Another factor behind the growing interest in technology foresight is the need to set priority in R&D in the context of the increasing cost of research and the tightening public budget for research. R&D efforts also need to be directed towards fulfilling social needs at the same time as providing sources of innovations that contribute to sustainable growth, competitiveness and job creation. Technology foresight is a tool that can be used to match future needs with the supply of science and technology.

The Turkish Supreme Council for Science and Technology, underlining the fact that science and technology is the determinant factor in increasing welfare of the society, has decided that new national science and technology policies should be formulated, and priority areas should be set for the time period covering 2002-2023, which marks the 100th Anniversary of the foundation of the Turkish Republic. TÜBİTAK, as the general secretariat of the SCST, has accordingly detailed the project entitled *Vision 2023: Science and Technology Strategies*. The implementation of the *Vision 2023* project started in January 2002, and its completion is planned by December 2003.

The objectives of the "Vision 2023" project are to:

- Build a science and technology vision for Turkey;
- Determine strategic technologies and priority areas of research and development;
- Formulate science and technology policies for Turkey for the next 20-year period.

The methodology adapted for the technology foresight project involves; panels, a two-round Delphi survey to be executed by the project office in coordination with the panels, and a prioritization scheme similar to the one used in UK and Czech exercises. Panels are formed on certain socio-economic fields, as well as on cross cutting issues and at a later stage, on generic and emerging technological areas.

The rationale behind this national exercise is "shaping the future" rather than "adapting to the future shaped by the others".

Debate

International cooperation is extremely useful to share information, exchange experience, compare methods and achievements, i.e. to learn from each other. Foresight has now reached a point, at which different approaches can be compared to highlight 'good practices': what has worked in certain circumstances (level of development, challenges and hence policy aims), and thus what set of tools and approaches are likely to be useful in different environments. Another, more ambitious and more difficult aspect of international cooperation would be to conduct joint programmes on issues which go beyond national boundaries, such as the upcoming enlargement of the EU, its global competitiveness (i.e. the success of the Lisbon strategy), environmental challenges, etc.

The success of foresight depends on the match between its context (level of development, and hence the goal of the programme) and the methodology applied. The two recent Central European cases vividly illustrate this point. Hungary took a broader approach, and hence methodologies were similar to the ones applied in the UK, while the Czech programme focussed on identifying S&T priorities, and thus applied a modified version of the so-called key (or critical) technologies method.

A successful foresight programme will take many years of time and effort to establish. It normally requires a lead agency with good contacts and resources, supported by government and delivered through a complex network of external facilitators, expert groups and intermediaries.

Panel 2: Foresight at Corporate, Multi-country and Network Level

Issues

- Integration to the European Union and globalization: new drivers of longer-term thinking;
- New trends in "foresighting": networks of foresight programmes as a first step towards a supra-national or European foresight;
- Recent initiatives to introduce foresight exercise (method and culture) in Central and Eastern-Europe and in the Newly Independent States;
- ERA (European Research Area) as a tool to enhance competitiveness of Europe;
- Experiences of future oriented programmes and strategic thinking at corporate level; what foresight can offer for both small-enterprises and multinational organizations;
- Trans-border regions in Central and Eastern-Europe and in the Newly Independent States—an opportunity for cooperation;
- The regional dimension on technology foresight process.

Abstracts

Experiences with Foresight Methods at Corporate Level.

Hans Graf, Director, Centre for Futures Research, St. Gallen, Switzerland

The dynamics of change in the corporate environment have increased strongly during the last decade. Not only several sectors of industry but also the global economy as a whole are characterized by fundamental change. Major causes for such change are the reduction of protectionist measures on a national level, a newly introduced, market oriented order for nearly 3 billion people on a world-wide scale, the creation of new global institutions, all in combination with newly developed technological possibilities and institutional structures. Within this framework it has been widely recognized that only those having

correct and relevant information about their framework can take correct decisions and actions.

The quality of decisions taken today depends largely on the correct assessment of the future, because the effects of decisions will only become evident in the future. For decision making in increasingly complex and dynamic environments, scenarios are the most important instruments for dealing with the future. Market and competition-related scenarios are of central interest to companies, because they provide for decision making by focusing directly on the investigation subject. The investigation of alternative futures as a preparatory step for making decisions in a company has to deeply consider the relationship of causes and effects within a market or sector. Based on external scenarios, developed and understood as images and models of the external world as framework for corporate activity, specific internal or corporate scenarios will be developed, taking into account possible measures and developments that may be shaped by the corporation itself. Such scenarios reflect the specific corporate goals and are developed within the external future framework, showing at the same time possibilities for one's actions.

Networking of Foresight Programmes

Gustavo Fahrenkrog, Head, Technology, Employment, Competitiveness and Society Unit, Institute for Prospective Technological Studies—IPTS, Spain

In the context of the work on EU Enlargement, the IPTS launched a project to identify through prospective methods the main contemporary challenges for accession countries and discuss their consequences for three policy areas: Science/Technology, Competitiveness and Employment. The project has been entitled "Enlargement Futures" and structured around four clusters of challenges and opportunities in the next 10 years:

- Economic transformation;
- Technology, knowledge and learning;
- Employment and societal change;
- Sustainability, environment and natural resources.

The project has been aimed at contributing to a better understanding of the various problems that European countries will face in the coming decades and the ways in which they can be analysed. This will help develop the capacity for prospective analysis, which is crucial for employment, research and regional policy in the European Union. It includes experts from the accession countries that work on the implications of the enlargement for the achievement of the Lisbon process.

Emerging Foresight Programmes in the CEE region

Günther Clar, Principle Officer, European Commission DGRTD K2

DG Research, European Commission promotes cooperation in foresight type activities in order to strengthen the strategic basis for development, taking into account the following principles:

The development of (Regional, RTDI, etc.) policies is based on (implicit or explicit) visions of the future of science, technology, and society as a whole. Cooperation in developing this visions, delivering strategic knowledge to all actors involved and affected, will contribute to the method of "open-coordination" necessary for moving towards a European Research Area, and for achieving the Lisbon goals. This does, evidently, not call for a centralized approach, because interpreting the significance of the strategic knowledge developed, and transforming it into concrete implementation measures will be strongly influenced by local "resources" and priorities.

A number of projects have already been financed by DG Research to facilitate networking among policymakers and foresight practitioners:

- FORMAKIN:** as tool for knowledge management and innovation;
- EUROPTA:** to explore and develop participatory methods in Technology Assessment (TA) and technology decision-making;
- TAMI:** TA in Europe: between method and impact
- ITSAFE:** Integrating technological and social aspects of foresight in Europe
- ASTPP:** Advanced S&T policy planning (distributed intelligence);
- EUROPOLIST:** Scenarios for evolution of European S&T policies;
- FOREN:** Foresight for regional development (22 regions);
- FOMOFO:** Foresight in the "4 motors for Europe" regions;
- eFORESEE:** foresight in smaller enlargement countries
- FORETECH:** foresight in larger enlargement countries.

Technology Foresight for Central and Eastern Europe and the Newly Independent Countries: Regional Dimension and Initiative

Ricardo Seidl da Fonseca, Programme Manager, Industrial Promotion and Technology Branch, UNIDO

Technology foresight offers inputs for the formulation of technology policies and strategies that guide the development process. It also supports innovation by strengthening networks and cooperation, leading to enhanced competitiveness of firms and their growth. In response to requests by member countries, UNIDO is implementing a global initiative on technology foresight that draws on regional initiatives. The result will be the capability of using technology foresight as a practical tool in designing policies and strategies that exploit emerging and critical technologies for the benefit of countries with economies in transition. A special feature of UNIDO technology concept is its

regional—supra-national—dimension. The core idea of the regional initiative is to use the foresight process as a tool for defining regional research and development programmes.

Currently, UNIDO promotes two regional initiatives, one dedicated to Latin America and other to Central and Eastern Europe and the Newly Independent States. The main objectives of the Regional Technology Foresight Initiative for Central and Eastern Europe and the Newly Independent States (NIS) are: to raise awareness of the critical importance of technology foresight for improving the competitiveness of industry by exploiting emerging and future trends in science and technology; to develop and adapt methodologies and tools for technology foresight in the region; to establish and strengthen national and regional knowledge as well as the capability of using technology foresight for designing policies and strategies that focus on innovation; to undertake demonstrations of regional studies for specific sectors or themes; to assist national programmes to generate comparable data for possible aggregation at the regional level; to provide solutions to relevant problems in the region that can be addressed through the appropriate application of technology. Special attention will be given to those less economically advanced countries in the region.

Debate

Foresight can be a relevant policy tool at various levels: local, regional ('domestically'), national and supra-national. A number of major challenges—e.g. the competitiveness of the EU, together with mobility and human resource development to underpin that; sustainable development; the new, enlarged EU, etc.—are transborder issues by their very nature. Adequate policies, therefore, can only be devised and implemented if they are assisted by transborder foresight activities.

As most CEE countries are relatively small, and have not accumulated much experience with foresight, the national level seems to be most appropriate one, with some elements of supra-national cooperation.

Apart from UNIDO Regional Foresight Initiatives and EU Programmes, concerning multi-country projects and/or foresight networks a number of new foresight exercises and foresight-initiated projects are currently starting in the candidate countries, such as:

- CGRF Country Guides for Regional Foresight (based on FOREN template-guide);
- Foresight Academy;
- ERA-NET Cooperation and coordination of national or regional; research and innovation activities (i.e. programmes);

- Foresigh Academy;
- Foresight Bridge.

Cooperation in the wider European neighbourhood is also planned.

A closely related question is the breadth and depth of participation in foresight programmes. Here we are faced with a trade-off: the broader the geographic scope of a programme is, the more difficult and costly is to maintain its participatory character. When participants are coming from a large, and diverse area, or indeed, from different countries—in terms of level of development, norms, ways of thinking, values, behavioural routines—it is not only a question of travel time and costs to *organize and facilitate meaningful workshops*. In this case potential communication problems should be taken into account carefully when preparing these meetings: possible gaps should be identified in advance, and efforts have to be made to bridge them as well as to remove other obstacles to fruitful discussions.

When developing scenarios for a company the following is recommended:

- Developing scenarios for a company is a learning process, it should be organized and executed as such
- The scenario work should closely fit into the normal planning process in order to involve all relevant hierarchical levels of a company
- *The working team should not only consist of people in the planning department but also include persons from marketing, finance, research and—above all—top management*

Panel 3: Emerging Technologies for Transportation and Logistics

Issues

- Foresight practice as a tool for enhancing competitiveness and innovation on corporate, sub-, supra- and national levels;
- Response to the need of different groups of CEE countries and NIS for a mid- and long-term development vision on the transportation sector and logistics services;
- Dissemination of the best practices, experience, results and lessons of technology foresight in the field of transportation and logistics;
- Development of more technology-oriented long-term strategies as regards to relevant national and regional transport system development for decision makers of public and private sector, such as NGOs, governments and local authorities, R&D institutions, NGOs and business community;
- Consideration of the main objectives of EU common transport policy and evaluation of regional specialities and circumstances in order to bring together the initiatives which are able to meet the new challenges and can provide assistance for a sustainable mobility;
- Selection of the main priorities to be applied in the transportation and logistics system development in CEE and NIS.

Abstracts

Transport, Traffic and Logistics Connecting Countries

Roger Vickermann, Director and Jean Monnet Professor of European Economics, Centre for European, Regional and Transport Economics, University of Kent, UK

The implications of EU enlargement on the transport and logistics market were investigated by the author. Analyses and evaluation were conducted, based on the comparison of the situation of the EU member countries and the NAS, that increased integration has implications for the organization and

supply of transport and transport improvement decisions would depend at least in part on their impact on economic integration and growth in the wider EU and in the candidate countries in particular.

The examination of the existing situation identifies the different ways in which transport, logistics and the economy interrelate. The trends in the way transport was changed by the process of transition and integration were analysed. It looked at the challenges and opportunities for the CEE and explored ways in which the wider aspects of transport improvement could be measured. The deep investigation resulted in a few key recommendations on the way in which a sustainable transport development policy could be developed.

The main conclusion of its analysis was the need of recognizing that decisions on transport would shape the economic and spatial structure of the economy. This fact provides a major opportunity to create a new relationship as part of the process of transition.

This will require transport planning to be conceived as an integrated whole and related more carefully to the emerging structure of the economy in terms of its sectoral structure, employment structure and competitive structure. Traditional forecasting methods for transport, and particularly for freight traffic, are inadequate in this context. There are important and difficult policy and political decisions to be taken in which some short-term pain is clearly necessary if long-term gain is to be achieved.

Emerging Technologies for Transportation and Logistics

*Włodzimierz Rydzkowski, Chairman, Transport Policy Department,
University of Gdansk, Poland*

A real breakthrough in transport technologies came about with the introduction and spread of container transport. In every branch of transport new vehicles and reloading equipment were developed to handle containers. The popularity of containers resulted in unprecedented growth of road transport. Assuming that new logistic systems are in fact new technologies, new European enterprises restructured their logistic systems through technological changes. The need to introduce such changes results from a number of factors: tougher international competition, higher customer requirements with regard to quality and reliability of services, high inventory costs and enhanced transport and telecommunications systems. There are a list of examples for the success of new technologies in the different branches of transport, like Ryanair, EasyJet or Go, the cheap low-budget airlines, which had recognized that separated market segments could serve the public more efficiently by offering different products. The future of restructuring process of the road freight carriers market in the accession countries depends on identifying the main influencing factors of the changes. If the necessary investments for technology development would not be provided by central budget sources before the States joining EU, then there is a danger for the

State-owned railway companies to become obsolete. The integration with the EU would force enterprises operating in all branches of the economy to increase their competitiveness. One way to achieve this is outsourcing transport and logistic services. The tendency will favourably contribute to the development of the logistic services market.

It is important to emphasize the urgent need of the candidate countries for road infrastructure development and discussion of a paradox that has been identified while comparing different trends. The integration of candidate countries with the EU creates unique opportunities for the development of the transport services and logistics sector. A wider and more up-to-date range of logistic services should enable clients to separate distribution and other logistics functions from the core operations. Analysing potential opportunities and threats associated with the integration of EU, the enterprises from the candidate countries must be seen particularly with cautious.

A Brief Analysis of Romania's Transport Strategy

Attila Gönczi, Associate Professor of University Politehnica Timisoara, Faculty of Management in Production and Transportation, Department of Transportation and Logistics, Romania

The transport network is of great importance for every society. It is vital for the well functioning and the development of the economy. The creation of reliable strategies for the transport sector based on the reality but having courageous vision, is of great importance for a sustainable but continuous economic growth. The share of the transport sector in the GDP of Romania at the beginning of the transition to market economy was around 7.5 per cent. The Romanian transport infrastructure has two different faces. On one hand, there are important developments in which an increasing level of technology is involved. On the other hand almost all the infrastructure is in poor condition, the auxiliary technology and equipments are obsolete in the entire transport sector. The length (78,492 km), the density (32.9 km/1,000 km² and 3.61 km/1,000 inhabitants) and the distribution of the road network are well under the EU average. At the end of 2001, there were about 4 million motor vehicles, which means that the level of motorization was about 185 motor vehicles per 1,000 inhabitants. This value is about one third of the EU average. The railway network consists of 10,958 km with standard gauges having a very uneven territorial distribution. Approximately 35 per cent of these railway tracks are electrified and the proportion of the double tracks sections is 26 per cent. The average commercial speed in the case of the passenger trains is 44.8 km/h while for the freight trains is 26.2 km/h. The main goal is to improve train speed and safety on more than 1,200 km of tracks between 2002 and 2015. The overall estimated costs will be US\$ 4.5 billion. But there are important plans to modernize a number of 13 major railway stations which will need about US\$ 44 million and to introduce electronic interlocking in 17 railway stations which will costs about US\$ 120 million.

Romania has a poorly developed transport system from every point of view: vehicles, infrastructure, organization and human and financial resources. In order to improve the circumstances courageous but realistic strategies and efficient policies are needed. To facilitate these goals it is important to study different scenarios and to create different long-term forecasts based on technology foresight too. A well-realized analysis is important to avoid entering vicious-circle-type scenarios and to offer to the decision makers the opportunity to choose the best transport development strategy to be harmonized with the overall development of the society and economy.

It is important to decide what type of model do Romanians want? An environmental friendly "green alternative" seems to be the most appropriate to Romania instead of a Western-European or North-American type fully motorized model.

Debate

To attain the medium- and long-term environmental goals of the sustainable transportation system, the adoption of a number of measures and political means is required.

The access of the candidate countries to the European Union necessitates—among others—to conform their transportation policy to that of the EU.

The comments highlighted that the White Paper issued on the common transportation policy of the EU had called the attention to the following fields in connection with the conditions of sustainability:

- Reduction of traffic congestion on the main thoroughfares and moderation of regional unbalance;
- Necessity of rearranging the division of labour in transportation,
- Preference of elimination of bottlenecks;
- Focusing on road users, putting their interest into the foreground;
- Handling the impacts involved by the globalization of transportation.

In conformity with the above goals, the national transportation policy as one of the most important means of structural policy and macro economy regulation has to function as a control over economic processes by managing transportation developments, and in this way, it has to play an integrating role between the partial economy policies. Its role is decisive with respect to its contribution to the structural change in production, to the attainment of political goals of foreign trade, to the encouraging of innovation, to regional developments, to employment policy and the environmental management policy.

Since in spite of the results of the social-economic change achieved so far, the development stage of the domestic transportation in these candidate

countries is lagging behind the European Union average, therefore the domestic transportation development strategy in general is focusing—with the simultaneous observation of EU compatibility—on the improvement of infrastructural supply and quality services, while through the increased subsidization of public transport, railway transportation, telematic applications, it tries to counteract the loss of market share concerning the environmental-friendly solutions of mobility.

The adoption of a right pricing method reflecting the real social expenditures, the external impacts and the actual expenditures of infrastructure utilization has to be the key action for providing the sustainable mobility in the extended European Union.

With this influencing possibility recognized, in the session of the European Council at Göteborg in 2001, there was passed a resolution stressing that measures should be taken to ensure that the utilization charges (toll for infrastructure use) of the different transport modes can reflect better the expenditures imposed on society up to 2004.

Transport infrastructure and services

- Main development directions of the transportation network must consider the requirements of the EU CTP and the local interests have to be integrated to them;
- The financing of transportation infrastructure developments is to be placed on wider base, including public-private partnerships (PPP);
- The adoption of modern technology esp. IT has to be promoted;
- Different tools for mobility management (economic, legal, and physical) are to be used;
- Reforms have to be implemented in a consistent way.

Special comments on developing logistic services

- Improving logistic strategies of SMEs;
- Cooperative planning of goods transport, establishing freight alliances;
- Forming chain(s) of logistic terminals, network(s) of logistic centres;
- Applying geographical information systems (GIS).

Municipal and/or local tasks:

- Supervising the conceptual planning of city-logistic systems;
- Monitoring and harmonizing of supply and demand on logistic services;
- Ensuring funds to private financing of infrastructure developments;
- Initiating and managing of transport alliances.

Panel 4: The Future of the Environment: the Environment of the Future

Issues

- Public expectations and reality for cleaner production and healthy environment;
- Environment and quality of life: prospects for improvement and threats;
- International economic relations and environmental management: the need for common visions and agreements.

Abstracts

Zero Emission Techniques and Systems—Innovations towards Sustainable Development

Hans Schnitzer, Professor for Process Engineering, Graz University of Technology, Austria

The European system of production is not sustainable and has not begun to address in a substantive way how competitiveness can be achieved within the framework of sustainability maintaining an acceptable quality of life. Industry will play an important role to meet economic competitiveness, social importance and environmental impact. The future economic power of the European Union will be based on the capability to produce goods and services combining environmental friendliness and competitiveness. In order to make industrial production more environmentally and social compatible, three main strategies have to be considered:

- Minimizing natural resources and energy consumption;
- Towards Zero Waste Production;
- Changing production and consumption patterns.

A sustainable society needs an industry that do substantial modifications (radical changes) in production and consumption patterns leading to Zero Emissions Techniques and Systems (ZETS). Sustainable entrepreneurship is a

precondition for production technologies and systems within a Sustainable Development. Zero Emissions Techniques and Systems (ZETS) is a target of business and not of environmental policies. The entrepreneur decides about technologies, products and partnerships; policy has to define the legal and economic environment where the decisions are made and have to fit in.

Countries in the CEE and NIS region face a rapid economic growth and change in industrialization. In the world economy, these countries were often forced to focus their industrial development in such a way, that they could target the advanced countries markets in Western Europe and America. This usually means development of industry types aimed at mass consumption products, with easy access to production technologies, and with "low threshold" core technologies. The problem with this type of industries is, that they are generally very energy intensive and have high environmental impact.

Industry in the developed countries went through a long way from polluting processes via end-of-pipe technologies to eco-efficient production nowadays. Industry in evolving economies should try to avoid this way and to leapfrog from their present production technologies straight to wasteless alternatives. At least in places where innovation has to take place, radical changes should be searched for. A slow and continuous adaptation of existing technologies to EU standards will not help to step towards Sustainability on its three pillars: economic advantage, social responsibility and integration into the ecosystems around us.

Common Problems and their Solutions for Environmental Protection in the CEE and NIS Region

Adam Budnikowsky, Director, Institute of International Economics, Warsaw School of Economics

CEE/NIS countries have struggled for decades with non-democratic and central planning political systems. In 1989-1990, CEE/NIS countries embarked on a system transformation that contributed to a major reduction of environmental degradation and helped increase the efficiency of environmental protection. The result was a more efficient ecological policy, decrease of raw material and energy consumption and foreign environmental assistance. The prospect of EU accession is an additional incentive for CEE/NIS to step up their care for the environment. Adaptation to EU environmental protection requirements will make it possible for candidate countries to derive a large number of economic and social benefits. Similar to other countries, the state of the CEE/NIS environment was primarily the outcome of economic development.

CEE and NIS countries differ vastly in the size, language, religion, history, tradition, economic growth and the advancement of transition. They have huge differences in the level of economic development. For example, Slovenia and the Czech Republic reported a per capita GDP of US\$ 10,500 and US\$ 5,250 respectively in 2002; in contrast, Romania and Republic of Moldova reported a GDP of US\$ 1,670 and US\$ 400 respectively.

Many experts agree that one of the positive effects of system transformation is a more efficient ecological policy. This results from two basic factors. First, the existing ecological policy tools have been put in order, accompanied by the introduction of new tools and better enforcement of the new regulations. Second, businesses have introduced full-fledged market rules to their day-to-day operations. Ecological policy was first upgraded by those countries which were first to embark on the radical restructuring of their political and economic systems at the start of transition. These included the Czech Republic, Hungary and Poland. Later other CEE and NIS countries followed suit, especially those scheduled to join the EU in 2004. All of them have made considerable progress in this area.

In their environmental management systems, CEEC and NIS countries rely on a wide range of legal measures and economic policy tools. Economic tools include environmental fees, taxes, penalties and subsidies. Even though these instruments existed in some CEE countries previously, they did not become fully efficient until the start of transition.

Another important outcome of transition, with significant implications for the environment, involves decreased consumption of raw materials and energy per unit of GDP. In addition to the more efficient ecological policy, the governments introduced realistic prices for fuel, energy and raw materials, accompanied by the removal of soft budget constraints, the winding up of some enterprises and business divisions, and the phasing out of whole sectors of the economy.

In conclusion, economic opening in the CEE/NIS coincided with globalization, producing a number of environmental threats and suggest that CEE/NIS should try to avoid some ecological risk related to the opening of their economies in the period of globalization.

Participatory Multicriteria Decision Aid in Regional Foresight

Tatiana Kluvánková-Oravská, Institute for Forecasting, Slovak Academy of Sciences

Nowadays, planning and decision making requires the construction of formal and informal dialogue process among major stakeholders. Multicriteria Decision Aid (MCDA) is a participatory methodology based on these assumptions. MCDA is understood as a process (rather than product) oriented methodology for long-term planning addressing real policy and management problems in regional context.

Several applications of MCDA were undertaken in regional development projects in the Slovak Republic with particular focus on the conflict between nature conservation and economic development. The "Slovensky raj" park established in 1988 is known for its unique water karst, deep canyons and waterfalls. This is the only park in the Slovak Republic registered as candidate for the Pan Parks (prestigious European network of protected areas). Over 300 individuals are involved in the project: 10 experts from the area of nature conservation, regional development and forestry and representatives

of six stakeholder groups. Five scenarios were designed to address major conflicts and problems of the park, each one offering solutions for crucial policy issues, e.g. decision making; management of the park; economic activities and financing. Scenarios were design according to conflicts and problems of the park identified in the initial part of the project and discussed with various experts in the field. Both groups evaluated the scenarios according to five grade verbal scale, and results are interpreted in actors matrix (stakeholder analyses) and expert matrix (expert analyses). These results revealed that the major problem is related to communication and cooperation among various stakeholders. In both cases respondents supported the scenario based on sustainable practices, e.g. sustainable tourism, but they failed to implement it. Lack of funding has been the main barrier to implement the project goals, however further studies have proven that it is rather a question of inefficiency of allocation mechanism.

Debate

Forced environmental development in transition countries

- At the start of transition, the CEE/NIS environment was characterized by a high level of pollution in many industrial regions, accompanied by relatively good environmental standards in many poorly populated and non-industrial regions. Economic opening in the CEE/NIS coincided with globalization, producing a number of environmental threats on one hand, but the past decade has seen an improvement in the quality of the environment—due to the transition
- The accession of some CEE countries to the EU, planned for 2004, will help these nations improve their environments. In order to use the opportunity the CEE should continue the transformation of their economies combining it with the implementation of a sustainable development concept, put more stress on the environmental issues in the social and political life, provide appropriate financing of environmental projects in order to get access to the EU sources and try to avoid some ecological risk related to the opening of their economies in the period of globalization.
- Because of the EU accession CEE countries are expected to carry out expensive environmental investments even though in many respects their environment might be in a better condition than in Western countries. The EU often set targets without taking into consideration the differences in the status of the environment of the country.
- When it comes to the development and implementation of environmental policies, diverse and varying geographic, social and economic conditions make the consistent application of the principles of regionalism indispensable. Regional inequality in the quality of environment

is closely linked to other socio-economic differences suggesting that a well-conceived regional and municipal development strategy can play a crucial role in preventing the degradation of the environment. Some existing environmental problems can be explained by the undeveloped infrastructure in certain countries while, at the same time, the potential negative environmental effects of inevitable economic growth can be offset by integrating environmental concerns in regional development plans and projects.

- Cleaner production is, per definition, more efficient solution than end-of-pipe technologies, in terms of both environmental and economic efficiency. Then, however, it is hardly understandable why the dissemination of these kinds of preventive technologies is so slow. It is worth to underline three types of problems:
 - Shortage in financial capital available for SMEs;
 - Missing public and regulatory pressure;
 - The contradiction in the demand and the supply in environmental technologies.

Shortage in financial capital available for SMEs

- SMEs in the majority of developing countries are short in financial capital. The older but "cheaper" technology and equipment economically and ecologically are not efficient. As a consequence the profitability of these industries is very low. The obsolete technologies having a high maintaining cost are inappropriate in terms of energy efficiency and emission as well. Due to low profitability SMEs very often bankrupt. Banks are unwilling to give them loans, or ask for high interest rates.
- The production line consists of different units according to the age of the equipment. Some parts or others are obsolete but they are never on the same development level. Merging them into one production line is extremely difficult, because they are different not only in terms of age but in production capacity, as well.
- The economy of scale is hardly beneficial for SMEs in environmental terms. For certain technologies (like painting) the cleaner and more efficient, more quality oriented solutions are economical only above a certain capacity level.

Missing public and regulatory pressure

- SMEs are mainly diffuse polluters, so there is no regulatory or public pressure forcing them toward implementing environmental measures other than economic rationality in the form of cost reduction.
- There are no data available for the contribution of the SMEs to the total pollution in CEE. One could hardly find such figures even in the

OECD countries. Existing monitoring systems cannot handle this problem. The SMEs contribution to the pollution is much higher than their contribution to the GDP, while this pollution stays mainly out of control. Policy makers do not pay attention to this sector being a very difficult task: transaction costs are very high, and public support is very low because of the high number of people adversely affected via tax or cost increase.

Unmatched demand and supply for environmental technologies

- The main obstacle is that supply from the West and the demand inside of the CEE countries did not meet. The typical environmental technologies in the market tend to be end-of-pipe technologies. Among them the most frequent ones are waste incinerators, sewage treatment facilities and the soil clean up technologies, and certain waste management technologies. These are the "industries" where new entrepreneurs are wanted by foreign investors or one can buy technology and equipment with good financial conditions. This market is totally supply driven. Among the supporters of these investors one can find multinational consultant companies as well as producers of these technologies. They seek to attract or establish an SME for this business while the other side for this activities the contractor is the local government or the Ministry of Environment with whom it is not easy to make business. The other type of technologies offered in the market includes second-hand technologies or technologies with high environmental risk. The demand would be almost the opposite. SMEs raise a huge demand for small scale technologies and for low costs end-of-pipe technologies. Also there is a huge demand for state of the art technologies for producing consumer goods i.e. food products.
- The discrepancy in supply and demand exists in the consulting business as well. Most experts coming from US and Western Europe are specialists in end-of-pipe but not in cleaner production. Probably the only exemption is the energy field where positive examples exist as well.
- While the companies are manly against organizational changes, they are open for technological innovation, so good consultants should start with the latter, even if these are more expensive.

Panel 5: Information and Communication Technologies: Pervasive Electronics

Issues

- Foresight practice as a tool for enhancing competitiveness and innovation on corporate, sub-, supra- and national levels;
- Emerging paradigms for electronics and computing technologies (nano-, molecular-, quantum-, bio-technologies);
- Increasing intelligence and connectivity in all kinds of devices;
- The future of communications, perspectives of broadband and mobile technologies, global connectivity;
- Pervasive electronics and computing technologies and development of multi-platform applications;
- Industrial possibilities and challenges with special attention to the CEE/NIS region.

Abstracts

Changing Economy, Changing Technology, Changing Opportunities *István Fodor, Chairman, Ericsson, Hungary*

The three social, economic and technological processes—although in different time and to different extent for each country—are determinant factors in the development of the following 20 years. European integration has to be added to these, or to be more precise; they have to be encompassed by the complex programme of the latter. This means that trends and phenomena connecting to certain processes have always to be analysed and interpreted from the aspect of the continental integration process.

Special attention should be conducted to the economic and industrial trends as applied to the countries of the CEE/NIS region and to the challenges and opportunities following from this situation. Main emphasis is given on the consequences of the changes to the industrial policies of these countries in the environment of globalization and in the emerging information society

(regarded as an economic and not only as a social phenomenon). The decision makers in the CEE and NIS countries should regard technology development intending to provide utilizable notions for their long-term economy development programmes.

The most important challenge for the CEE/NIS countries is, for example, whether they are able to reach the average level of the EU economy or to what extent they are able to approach it until 2020. It belongs to the primary interests of the developed world—the developed part of the continents—that regions lagged behind catch-up with the others. But this does not mean, of course, that the developed part will fulfil this task instead of those lagged behind.

Information and Communication Technologies: disruptions to look for and their impact on countries evolution strategies

Roberto Saracco, Director, Future Centre, TILAB, Italy

Whilst evaluating the evolution of certain technologies it is important to look, in particular, at the disruptions ahead from a market viewpoint. What are the impacts and what can be done to cope with them? What are the issues a regulator should be aware of and what direction would be more appropriate for investment in infrastructures? A detailed analysis may reveal the effect of several important “disruptions” on the Information and Communication Technologies (ICT) area foreseen in the future (e.g. storage, sensors, wet-ware etc.). A technology can be considered “disruptive” if it changes significantly some well established rules.

Foresight is obviously useful but it has to be applied with some “caveats” and within a set of scenarios that are dynamically evolved and result in a continuous rearrangement of actions. It is basically of no use the development of a snapshot to support a one-time strategy set up. Foresight needs to be the input for multiple scenarios. One scenario may be chosen as the leading one, based on the adopted strategy but all of them need to be kept handy and a continuous evaluation should take place to re-evaluate assumptions. However, scenarios are considered as starting point for decision making and then they are abandoned and forgotten. Any new technology should cause a re-evaluation of the scenarios.

Foresight activity and related group need to be part of the implementation processes: this is the way to really benefit from scenario activity and to improve the predictive power of the foresight activity.

How technology can give competitive advantage to a small European State: Technology Initiatives in Cyprus

Christos N. Schizas, Professor of Computer Science, Vice Rector, University of Cyprus

Cyprus is one of the States that have been approved for accession to the European Union during the Copenhagen Summit in December of 2002. During

the last two to three decades the Cyprus economy has transformed from an agricultural to a service-oriented one. The upcoming telecom deregulation, the new and very promising New Industrial Policy of the Ministry of Commerce, Industry, and Tourism, and the general high level strategic initiatives of the state for a more service-oriented economy are having profound wave-effect results. Technology is in the centre of all this movement. Cyprus has a strategic position being at the crossroads of three continents and holding a strong cultural and political position, which can become the bridge for joining Europe and the Middle East. Cyprus has given tremendous emphasis in the development of a conceptual framework and a high-level infrastructure that aims to promote, support, and "push" the development of a technology-centered economy. In this state-driven effort all the economic sectors are encouraged to actively participate and contribute.

Major high-level technology-oriented projects that are going on in Cyprus can be categorized in the following four areas:

- Information Technology and Telecommunication
- Research Innovation and New Enterprises
- Health Services Sector Technologies
- Education and Culture Services Technologies.

The technology services sector is growing fast during the last two decades. Also, the upcoming telecom deregulation leads to growing business activity and to new business initiatives. e-Minder is a European Union IST (Information Society Technologies) project. Its aim is to increase the level of e-Commerce activities in the island and bridge the gap between the more and the least developed European Regions. One of the major strategic initiatives of the University of Cyprus is the expansion, enrichment, and complete coverage of the full spectrum of the technology life cycle. In addition to the academic research activities, the University of Cyprus is in the process of creating a Centre of Research and Development, a Hi-Tech Incubator Centre, and a Research Park. Cyprus although at its infancy in health telematics is actively participating in a number of promising applications covering a spectrum of diseases. The standard of health of the Cyprus population can be compared to that of the European Union. Both the Cyprus government and the European Union understand the importance of utilizing and deploying advanced technologies in the educational system in all levels (from elementary to academic and to company and corporate) and they have allocated considerable funds for projects that will lead to a technology-enabled national educational system.

Trends in Telecommunication and Developments in Bulgaria

*Kiril Boyanov, Head, Central Laboratory for Parallel Processing (CLLP),
Bulgarian Academy of Sciences*

A number of factors influence the prospective to increase the speed of economic and social progress: the political stability, economic infrastructure, literacy,

healthcare, etc. There is no known proposal in the world that Information and Communication Technology (ICT) will eliminate the need of development of those areas, neither that ICT is the universal remedy for solving most of the problems. A careful analysis, however, shows undoubtedly that using right approaches and advisable proposals, ICT can insert an important influence for reaching significant economic and social goals, as well as playing a key role in achieving concrete strategic goals in various countries. What policies will Europe chose in the development of ICT? There are in parallel two possible objectives:

- Becoming a major player together with the US on the world market.
- Building up a strategy for long-term social stability while applying ICT and covering internal needs.

Special attention is given on communication technologies that must be analysed not only in a global aspect but also as a possibility for Europe to keep its leadership positions in those areas. Issues about the role of ICT in national development strategies are given as reflections to the industrial policy framework.

In conclusion, Europe continues to have a leading role in mobile communications, broadband networking, IP over fibre, voice over IP and corresponding soft switches. In these areas, it is possible to keep a leading position in the world market and Europe should continue to invest in research on new generation mobile communications and services, optical and programmable routers network security and quality of services. There are significant opportunities in IP based application development and especially in embedded software such as software at home, software in cars and in personal devices. There are also relevant opportunities in electronic trade via mobile communications, which requires new information security features and products. Telework and distance learning are directions that will be enabled by new technology and their applications should be developed. It is evident that the new EU 6th Framework Programme presents great potential for the realization of these new areas.

Debate

Technology developments in the field of ICT will lead to the spreading of the use of micro-electronic devices in our everyday life. In outlining future technologies, the far reaching consequences of the presently seen trends and the possible appearance of disruptive technologies should be considered, including:

- Disappearing of computers, ambient computing;
- Synergy with other disciplines, first of all nano- and bio-technologies;

- Continuing convergence of IT and telecom, broadband, global connectivity;
- Web services;
- New multimedia tools, systems, and applications.

Technology developments should be seen in their "life cycle" of stages as: innovation—infrastructure—commodity—ambient (embedded)—invisible.

Developing countries would have a wide range of opportunities—if they will conduct proper ICT policies, industrial policies, and R&D Policies, and find country specific application areas.

The floor debate included an intervention from the representative of the European Investment Bank (EIB). EIB presented its readiness to finance cutting edge technology and knowledge-based applications in the private and public sector, emphasising the potential for the new Accession Countries. The EIB's initial contribution to this objective consists in its "Innovation 2000 Initiative" (i2i) strategy, which over a period of three years achieved dedicated lending of EUR 12-15 billion for innovation rich investments. The EIB is currently examining how to extend both in time and scope its support to i2i, and more specifically to launch a follow-on lending priority called "Innovation 2010 Initiative". I2i and its successor initiative encompass the current and future Member States.

Other issues raised in the discussions included:

- To consider technology areas where Europe has a leading role (e.g. mobile telephony);
- To use Private/Public Partnerships as an important tool for the financing of technology development;
- To emphasize the importance of preservation of national languages and culture in all activities around the Information Society;
- To deal with efficiently with concerns about safety and reliability of ICT tools, with issues like the responsibility of professionals, vulnerability of users etc.

Panel 6: Information and Communication Technologies: Application Trends and Social Issues

Issues

- Trends in the use of pervasive computing devices (personal networks, mobile applications etc.);
- Enterprise-wide applications in the world of global connectivity;
- The increasing role of community building and citizen participation supporting applications;
- Fighting the "digital divide", both within the countries and between regions;
- Preserving multilingual and multicultural values in the world of global communications;
- Challenges for security and trust in an increasingly ICT-dependent society.

Abstracts

Application Trends and Social Issues of Information and Communication Technologies

Zsuzsa Szentgyörgyi, ICT Expert, Adviser to the President of the National Academy of Sciences, Hungary

Starting from the last third of the former century (and continuing in the coming one-two decades) Information Technology (IT) has shown an extraordinarily rapid development and a growing spread of applications in a broadening spectrum. This progress, however, is not only beneficial but burdened with personal and societal contradictions, as well.

Hungary after World War II had experienced limited penetration in telecommunications—until the late 1980s—because of political, and partly, financial considerations rather than technological reasons. On the other hand, latent demand for telecommunication facilities was very high. In the 1990s it was

quite impressive hence the boom of cell-phones. Currently, in the early days of 2003 more than 65 per cent of the Hungarian population use mobile phones. A negative fact is, however, that the other IT facilities are not as impressive as those related to the phones: the number of PC- and Internet-users in Hungary is still low compared to EU-countries.

The most important features of IT-application trends are:

- Mass use of mobile personal tools, devices.
- General use of network facilities.
- General use and access to reasonable content supplies.
- E-services for mass use.

The main applications can be divided into two classes:

- In the economy in a general sense, including industrial and agriculture production, infrastructure, trade, finance; and
- In the public and private life.

Technology Foresight is able to produce and suggest reasonable, feasible procedures and solutions for a long time (some years, or, in extreme cases, perhaps some decades) ahead. They are always valid, however, only with some limitations. The outlook given by the Technology Foresight must be continuously corrected, refreshed since processes in IT are not only highly complicated, interconnected, but extremely rapidly changing, as well. When creating foresight studies one must be aware that the trends are often weakly predictable because of the unforeseeable divergences, ramblings of the trajectories due to—sometimes very small—differences, changes in the starting conditions.

Technology Foresight can serve as a means for CEE countries to approach ideas, to plan and work out common actions for its development in the EU. So, it is recommended to apply Technology Foresight programmes not only to countries but also region-wide as well. For this goal, it is necessary:

- To create and use uniform definitions and variables;
- To create and apply common measurement methodologies;
- To work out recommendations for future actions by national governments and the EU Commission;
- To permanently follow changes in the science and technology, brushing up foresights and recommendations.

Information Society and its Challenges to Emerging Economies

Vasile Baltac, President, ATIC-IT&C Association of Romania

The social implications of new information and communications technologies are profound. Knowledge-based economy leads to large-scale access and use

of systems based on digital technologies and has to be built for all, not for an elite. Building the information society is a challenging process for emerging economies.

There is a general concern about the increasing gap between the developed countries and the rest of the world produced by information technology. This increasing gap creates new barriers to trade and international cooperation and threatens all sides. This is why many analysts speak about the need to do something to reduce the gap between the nations who can and cannot afford the new technologies, generally known as the Digital Divide. The enlargement of the European Union is confronted, for example, also with *problems derived from various levels of deployment of the technologies related to the Information Society in the candidate States.*

Special attention should be given to the discussion of the “digital divide” issue from two aspects: the gaps between nations and between people within nations. The basic idea is that knowledge-based economy leads to large-scale access and use of systems based on digital technologies and has to be built for all, for the first time not only for an elite. Building the information society is a challenging process for the emerging economies. There is a general concern about the increasing gap produced by information technology between the developed countries and the rest of the world, as well as between various layers within society: rich vs. poor, young vs. old, normal vs. disabled, etc. *Beyond access and affordability there are also problems of mentalities, education and IT literacy that are equally important. The problem of “support vs. economic stimulus” is raised clearly and discussed among the possible solutions of the digital divide issue.*

Societal implications are needed to make substantial steps to increase IT readiness, the role of governments and ICT industry, the need for large-scale dissemination of IT skills, etc. There is a historical opportunity window for the CEE and NIS region, a not-to-be-missed opportunity offered by technologies and political developments.

Fostering Industrial Development in Catching-up Countries

Marek Tiits, Permanent Secretary, Research and Development Council, State Chancellery, Estonia

In the long perspective, no capitalist economy has been developed randomly or aimlessly, but usually gradually by increasing productivity. However, this development is not linear but dynamic with sudden leaps—caused by an extensive use of new technology which has wide expansion potential and which triggers higher productivity, i.e. by the techno-economic paradigm.

The history of economy shows that these paradigms have lasted for nearly half a century, starting with explosive development in narrow fields of technology, until the technology becomes so cheap and offers a multitude of different applications, essentially allowing all branches of industry to sharply increase productivity. Increased productivity and the ensuing scale effect

(production costs decrease as the output increases) do not result in an international price reduction, but rather in an extensive rise of wages.

The current paradigm is based on information and communication technologies (ICT), meaning that the productivity growth is greatest in the ICT sector and also gives spillovers into other sectors via introduction of ICT, inherent to it organizational and financial innovations.

The role of research and development (and also foresight) is in creating and executing ICT related national policies, and in considering these issues from the point of view of a well-developed small country (like Estonia) as well. Interesting challenges have been identified about research and innovation policies. For scientists, one of the most important challenges is to make science and technology understandable for society. It is vital to be able to communicate to the public efficiently all the consequences of possible actions (or inactions) to the future of the society.

Measuring the Information Society

Niko Schlamberger, State Under Secretary, Statistical Office of the Republic of Slovenia

The emerging information society is a development that is very much debated, but hardly sufficiently defined and rather poorly described. There are lucid accounts on how the future society will look like, how existing and various new functions will be carried out. Although there have been many discussions on information society, not very much has been done so far in practical terms, and even less has been commonly adopted to prepare for the future situations. The information society must be inserted into an appropriate historical, economical, and technological perspective. This explains the need to measure the phenomena, monitor present developments and define how to act to set up measurements internationally and nationally.

A very important problem is: how the different new phenomena occurring in the information society will be defined, observed, measured, and compared? This is needed for societies and nations to be capable to perceive, relate and compare situations with their own past and one to another. There some examples of the economic and societal indicators of information society to be measured, including issues about the digital divide. In a near future the new society will be based on information society. The information society is a necessary development that is enabled by information technology. As for the statistical measurement, it has been justified long ago and it is necessary to prepare for the measurements of the future society. Present statistics are mainly occupied with measuring of the past, i.e. rural, and the present, the industrial society, and only slowly realizing that preparations have to be made for future needs. There are already many identifiable and measurable traits pertaining to the information society already present, although they do not come in a quantity significant enough to influence the present statistics.

Debate and Conclusions

Negative scenarios should also be considered, especially regarding societal aspects of the wide use of ICT, including:

- Increasing problems with security and trust in global networks;
- Problems arising from computing devices within the human body;
- Social concerns, including employment, change of human relations, loneliness and alienation;
- Local vs. global culture, danger to (small) natural languages;
- Gap between technology development and IT utilization;
- Cohabitation of legacy systems with new revolutionary applications;
- Alteration of value chains are likely to displace honored practices and create value loss in specific areas (sectors);
- Not all countries will be able to undertake the effort to introduce the new technologies and the Digital Divide may deepen.

Industrial policies for the accession (catching up) countries should be based on:

- Increasing the role of ICT, as a key factor in productivity increase and a growing branch of the national economy;
- Making use of good education and training systems, human resources;
- Mutually advantageous cooperation with international capital;
- Development of public-private-partnership solutions, possibly with the help of international/European financial institutions;
- International cooperation for cross-border projects;
- Developing more effective production processes (merging mass market production to cut cost with customization possibility to fit specific needs) and more effective distribution chains.

Technology foresight activities should be performed in close cooperation with the creation and maintenance of national and region-wide Information Society policies. Such cooperation may help in reducing efforts, increasing innovation rate and deployment, finding country specific application areas. Also, information society policy should have a prominent role in wider national development and competitiveness strategy. Information society policy should be seen, as the package of four interdependent policy areas, which need coherent approach to:

- Research and development policy;
- Innovation policy and the take-up of modern technological solutions (including concerns such as the digital divide);

- Market transformation, new value chains, indirect business models;
- Standards and regulation.

Technological and also ethical aspects of the safety and reliability of information society services should be an important part of national policies and regulations.

Technology foresight should have strong influence on research and development policies of the accession countries:

- Catching up to the EU target of reaching the 3 per cent of GDP for R&D budget;
- Providing close cooperation of national policies with EU actions (ERA, FP6), with specific consideration of areas, where Europe has strong positions;
- Finding ways for modernization of the structure of economy and introducing more higher value-added activities;
- Providing well reasoned bases for being selective with respect to national strategies, based on actual possibilities, traditions, etc.;
- Strengthen the transfer of scientific results into the economy, including wide application and marketing;
- Establish strong connection between Universities and Industry.

Foresighting (and national policy making) activities should address all the following layers of evolution:

- Technology evolution (includes basic technology like storage but also aggregated technology like cell phones);
- Functionality evolution (includes mobility of information access, printing bits into atoms, etc);
- Service evolution. Services will be proposed (and evolve) by enterprises and are business driven;
- Ambient evolution. Ambients (being made up by services and by local situations, culture, habits) are determining our appreciation of life (quality of life).

Fighting the digital divide (while gaining economic benefits) should be a very important element of all national policies in the accession countries, both in the sense of catching up to the level of more developed countries in the use of information society services and in removing barriers of using such services within the countries between different groups of population. Most important aspects are:

- To provide meaningful applications, content and services, making worthwhile for the people to use Internet;

- Promote private and public sector investments in ICT infrastructure and services;
- Provide such services at affordable prices and conditions;
- Increase the level of awareness and training for the use of IT services, achieve mass dissemination of IT literacy;
- Establish a higher level of trust in the security of information society technologies;
- Recognizing the fact that not all people may want the digital life, it is necessary to distinguish between the setting up of enabling services that are accessible and usable by everyone and specific services that may be appealing to some but not to all.

Measurement and benchmarking of the characteristics of the information society is needed for setting up our goals more precisely and to monitor progress. Considerable efforts are necessary in all countries to define the set of meaningful measurement items and methodologies. This should be done in close cooperation with national technology foresight and policy making activities, in conformity with EU (and other international organizations) standards and directives. A comprehensive definition of information society has to be produced in order to build upon:

- Measurements of information society must cover three categories: infrastructure, content, and usage;
- It may be desirable to measure the degree of political conformity regarding practical measures and promotion of information society;
- As much as possible the measurements should be carried out by national statistical offices as this only may guarantee harmonized methods and comparable results.

Compatible, uniform definitions, variables, methods are prerequisites to common and commensurable results

Organized forms of cooperation should be established between the accession countries—in connection with such activities of the EU-15 countries—to handle problems of common interest. Some ideas may include:

- Organized exchange of best practices;
- Establish some kind of joint group (virtual “think tank”, on line forum, task force, etc) for coordinating efforts and continuous monitoring of plans in making and execution of national policies (for industrial, research, IT etc. policies). This can be seen both as a way to share info—create consensus and as a service to companies wishing to invest in Information Society building.

Panel 7: Prospects and New Technologies for Agriculture and Food Industry

Issues

- *Impacts of integration to the European Union on the agriculture and food industry of the Central and Eastern-European Countries and the Newly Independent States;*
- *Longer-term thinking on possible scenarios dealing with structural changes that will occur as a result of compliance with the "acquis communautaire" in the post accession period;*
- *Agri-environment: Environmental issues in crop production are mainly related to agro-ecological aspects, plant technologies as pollution sources, sustainability, cultivated areas as wildlife habitat and landscape management;*
- *Regional foresight programmes as potential tools for enhancing rural development and eco-tourism;*
- *Product development: bio-products, marketing opportunities and difficulties of traditional/regional specialities;*
- *Food quality and safety;*
- *New forms of cooperatives in the countries in transition:*
 - *Procurement, production, technology-equipment supply, logistics and storage, joint marketing;*
 - *Small/medium-size enterprises and multinational companies (cooperation or competition?);*
- *New role of the state:*
 - *Education and information of small-holders adult education, model farms, consultative networks;*
 - *Introduction of compliance with EU norms in quality assurance;*
 - *EU accepted methods of protecting indigenous small-holders.*

Abstracts

Challenges of Agriculture in the CEE and NIS in the Next Two Decades *Ioannis Papadopoulos, Director, Agricultural Research Institute, Cyprus*

The attitude of the European society towards food and agriculture is changing. Consumers demand safer and healthier food, quality rather than quantity, produced with methods that are financially, environmentally and socially acceptable and sustainable. Therefore, pre-accession countries are now facing new prospects and challenges that stem from joining the European Union and from the globalization of agricultural trade. The challenge is to improve the quality and increase the productivity in agriculture. These two factors, quality and efficient production, along with the ability for quick adjustment to European customer preferences and requirements, will determine, to a great extent, the competitiveness of the agriculture. Efficient production is expected to be a continuous process if rural prosperity and welfare are to be maintained and further developed with respect to people, animals and environment. This is an area in which science, technology and agricultural research in particular can play a key role. Scientific developments may promote sustainable agricultural practices and provide novel solutions to old and new agricultural problems. Biotechnological methods may provide solutions in production of cultivars with tolerance to biotic, drought, and salinity stresses, enhanced capacity of nutrient utilization and other pressing aspects in agricultural production. Enhanced innovation is also crucial to ensure competitive, multi-functional and sustainable agriculture, both economically and environmentally.

In this context, although the immediate or short-term consequence of compliance with the *acquis communautaire* is well understood, in candidate countries there is no integrated plan how to deal with the structural changes that will occur as a result of compliance with the *acquis communautaire*.

Foresight and strategic prospective policy analysis can be seen as response to the demand for more democratic and participatory approaches to public decision-making, which is increasing in Science and Technology policy. The bottom-up approach, used by foresight, by involving actively all stakeholders could help decision makers and planning for the future. Foresight methodology becomes a powerful policy tool that is used worldwide in order to scan horizons and assist decision makers. In this respect, in many countries foresight has been upgraded resulting in the creation of Parliamentary Committees or National Institutions dealing with foresight.

Future of Food Industry in the CEE and NIS

Péter Biacs, Deputy State Secretary, Ministry of Agriculture and Regional Development, Hungary

Agriculture and food industry contributes approximately 10 per cent to the gross domestic product (GDP) in the Central and Eastern European (CEE) countries.

Including some related industrial branches and some sectors of the commerce the share for the agro-business sector will be 20 per cent. Baltic countries have been strongly developing their meat and dairy industry, but they are less productive in manufacturing fruit and vegetables. Eastern European countries are still faced with food security problems, therefore they concentrate on cereal production.

Integration process to the European Union would open the market for more foreign investment:

- For building infrastructure (logistic and storage technology);
- For increasing marketing activities.

In the long-term agriculture must be regarded as a multifunctional area:

- Food production;
- Rural employment;
- Preservation of the cultural landscape.

Requirements of competitiveness and sustainable development must be kept in mind in the future. Transformation of the production structure should lead to rapid development both of knowledge- and work-intensive areas.

In this report, one of the main objectives would be the stepwise approach to the three groups: first the EU accession countries with limited differences to the EU, secondly the rest of CEE countries with structural problems of the agro-food sector and thirdly the NIS countries with food security demands. Consumer reactions are very differently motivated, but this is rapidly changing in countries with better access to food. Only a few countries in this region are able to produce and sell food additives and increase the added value related to their raw materials, but there is some progress in providing packaging materials.

High-tech systems are applied in some branches of the food industry, but new lines of processing techniques are not widely used. Traditional fermentation is in favour of some countries, but modern biotechnology (including genetic modification) is for innovation in product development using local raw materials in combination with imported food additives and aid materials. It is expected to reach a higher variation of food items on the market very rapidly (including price differences based on quality differences). Consumer demand would be the best driving force to activate the food market in NIS countries.

Foresight in Crop Science

Márton Jolánkai and András Máté, Szent István University, Budapest, Hungary

Crop production has been a main issue in all ages of history. Agriculture and food industry are related to crop production activities. Traditionally animal

husbandry and human alimentation are both based on plant products. Nowadays crop production is much more diverse in relation to economic and social utility.

Agricultural production may have several targets, however, none of them can be independent from environmental concerns. Food produced by agricultural activities is essential for mankind, but such activities should never risk our sustainability. A possible definition of sustainability is that the world conservation strategy should include management of the use of a resource in a way that it can meet human demands of the present generation without decreasing opportunities for future generations.

Sustainable agriculture should involve the successful management of agricultural resources to satisfy human needs while maintaining or enhancing the quality of the environment and conserving natural resources. Agriculture requires many resources—land, water, energy, chemicals and minerals, machinery and human resources. Many of these are finite, yet are subject to increasing pressure. The question of the world food adequacy and the interrelationships between population, high-yield farming and preservation of natural resources represent a real endeavour in crop science. Agriculture directly occupies one-third of world land surface. Because of its high-yields, modern agriculture also permits another third of the world's land surface to be left in forests, the key habitat for most of our wild species.

Organic farming cannot support either the people or the wildlife already on the planet. Organic production has no effective strategy proposals for feeding the larger human population in prospect without destroying huge tracts of wildlife habitat. Organic production represents a tiny slice of agricultural production, producing food of uncertain phytosanitary quality. It can be a source of epidemics, and may lead to land exploitation.

Many scientists have become convinced that the only way to save the world's wildlife habitat—and thus to save the wildlife—is by turning high-yield agriculture into higher-yield agriculture. Otherwise, the world's wildlife will be crowded out by people and low-yield farming. Farm chemicals, technical development and biotech applications are critically important to achieving the higher yields which will be needed. In case of plausible and strict control of its applications, high-yield farming is the only environmentally sound and sustainable system.

Current status and main goals on sustainable development of agriculture and food industry in Slovakia before and after entering the European Union

Peter Simko, Vice-Director, Food Research Institute, Slovakia

Slovakia is one of the countries of Central and Eastern Europe in which fundamental socio-political and economic changes have taken place in the past period. These changes has also brought the need for new agricultural and food policy to solve problems which have accumulated during the transition

in order to stabilize the agri-food sector and create conditions for its sustainable development after entering the EU.

The basic starting points of the concept for a new agricultural and food policy has been based on the following: identification of current problems of agriculture and food production; clarification of national interest in the development of the Slovak agri-food sector, and the anticipated external conditions influencing the development of the sector which will be effected by development of the global market with agricultural and food commodities; results of the new WTO round of negotiations on further liberalization of world trade; further development of trade within the trade agreement of the CEFTA countries, and modifications to the "double zero" agreement between the EU and Slovakia.

The main problems of Slovak agriculture and food processing industry reflect the quality of the development of the whole national economy, as well as efficiency of the measures and instruments of agricultural policy applied up to now. They are characterized as follows:

- Decline in competitiveness;
- Hampered progress in the renewal of use and handling of land titles;
- Low income level of agriculture;
- Insolvency of the primary production corporate sector;
- Underdeveloped financial infrastructure;
- Worse availability of capital, low degree and slow pace of modernization
- Progressing devastation of agricultural land;
- Low responsibility of new owners;
- Worsening of the salary parity in the sector;
- Fragmentariness and surplus of processing capacities and inadequate level of marketing of foodstuffs;
- Shortcomings of food industry in good manufacturing practice;
- Inadequate attention paid to environmental impact.

Main goals of the agricultural and food restructuralization are the European model of multifunctional agriculture, adopted by the European Union. This model presumes a focus of agricultural policy with objectives following from the production functions of agriculture, i.e. provision of affordable, high-quality and safe food for the population, as well as objectives related to the fulfilment of its other tasks, which it carries out for the benefit of the whole society, such as protection and development of natural resources, preservation of cultural character of the landscape, maintenance of employment and rural structure of settlement and social limits of production intensification, type of landscape and density of settlement.

The basic goals of the Slovak agricultural and food policy are: creation efficient, modern and competitive agriculture and food management, production of high-quality and safe food from the domestic production to satisfy the domestic demand, ensuring the use of available agricultural production resources, ensuring sufficient income level in agriculture and food processing industry, modernizing and restructuring the food processing industry, adjusting agriculture to environmental requirements. The main goals entail a number of partial objectives and tasks, which will be implemented through individual measures of the agricultural and food policy.

Debate

The Panel aimed at analysing the present conditions as well as future prospectives of the agro-food industry and to discuss them in a distinct round of experts. The experts looked into the situation of agriculture or dealt with the whole agro-food industry, including agriculture and food-processing. Altogether, a number of important topics were raised: strengths and weaknesses, opportunities and threats connected to EU accession, policy recommendations as well as the need for future research requirements.

The new, multi-functional role of agriculture was stressed by several experts and in the debate round. Apart from the production of foodstuffs and animal feed, agriculture has to perform several other important functions related to cultural and historic heritage values, rural development or ecotourism. While the awareness of this new role of agriculture has been growing in Western countries, it still has to reach the population of Central and Eastern Europe. With the collapse of communism, the farming methods used so far became a topic; new methods are now on their way into CEE agriculture as well, such as integrated farming, organic farming, biotechnology and genetic modification. These methods were described and also vividly discussed in the papers, e.g. the advantages of high-yield farming against organic farming. In fact, the real hot topic in the panel discussion turned out to be genetic modification: conflict arose from the fact that CEE countries are consumers of GM-food, but not producers, as the stringent EU rules on GM would have to be applied in the CEE countries as well. The wish for more liberal EU rules emerged in the discussion.

With regard to the food-processing industry, the key importance of the sector in the CEE economies was illustrated by several experts who stated its major role as a producer, employer and as an attractive target of foreign direct investment. Problems were addressed too, including the industry's relatively weak performance in recent years in terms of production and productivity, or its small presence on the EU market. Other problems in the food-processing industry were illustrated by the example of Slovakia, such as surplus capacities, the slow pace of modernization due to the general lack of funds, as well as shortcomings in good manufacturing practice.

Overall, the future prospects of the agro-food industry were seen to be dependent on the future accession to the EU (with the reform of the EU's Common Agricultural Policy being another element of uncertainty) as well as on the ongoing WTO negotiations. Referring to the former, the compliance with strict EU standards and rules will put strong pressure on family farms, large farms and food companies alike. Among experts there is no denying that it will be difficult for some farms/companies to find the funds they will need to improve operations and meet the EU standards. In fact, not all of them will be able to do so and will thus have to be closed down. On the positive side, food companies will doubtlessly enjoy greater sales opportunities on EU markets, broader relations with foreign companies and better product quality. The same applies to some sub-sectors of agriculture and to non-regulated products. Compliance with EU standards will call for investment in the CEE countries on a massive scale. Moreover, for some of the most important items, production quotas will restrict output expansion.

In order to cope with these future challenges and changes, the experts suggested a set of rather general policy options. These included, for instance, the strengthening of competitiveness and restructuring of the sector, a change in the support policy, improvement of the marketing infrastructure, as well as the strengthening of research and education. However, so as to give all market participants (farmers, managers, chambers, and governments) an idea of future market conditions and likely scenarios resulting from them, the need for further studies was generally expressed.

Nevertheless, assessing long-term prospects of CEE agriculture will be a difficult task. In January 2003 the EU commission has presented a package of reforms of the common agricultural policy (CAP). Discussions will be long and fierce, the forthcoming negotiations with WTO are also likely to have impact on the CAP reform. Therefore the degree to which how much the present system will survive is an open question.

The basic message of this panel is:

There is no integrated plan as how to deal with structural changes that will occur as a result of compliance with the *acquis communautaire*, no guiding vision as to what the future could be, and no strategy as how to arrive at such a future, starting with the post compliance period!

Particular remarks:

- Strict EU standards and rules will force many family farms to leave the market;
- Vis-à-vis EU 15 the accession countries record a trade surplus in farm products;
- The implementation of the *acquis* relating to health safety, quality of food, protection of environment, welfare of animals will put high pressure on domestic enterprises;

- High quality farmland land is likely to attract foreign investors;
- Enterprise modernization needs funds—from own or external sources;
- Rising input prices of agricultural raw materials, if not compensated by EU payments will increase costs in the food processing industry;
- Many farms (especially small holders) can not afford to use large quantities of agro-chemicals. This may present opportunity for organic farming, however, the use of farm chemicals, high-tech development and biotech applications are critically important to achieve the higher yields to feed the 21st Century population;
- High-yield farming must justify itself on environmental grounds vs. arguments of no scientific value;
- Fighting soil erosion is of common interest of the world's population;
- Integrated fields of research are: agro-ecology, environmental and rural management, biological bases, development in production technologies, social sciences;
- The formulation of collective strategies (clusters, unions) is of decisive importance;
- Knowledge intensity is imperative to a competitive agriculture and food industry;
- The active role of the state (and that of the local municipalities) is essential.

Panel 8: Automotive Industries at Cross-Roads

Issues

- The weight of Central Europe in the global automotive market: would a fast economic development (catching up) boost this market?
- The importance of accession countries as a production base:
 - Assembling high-volume, low-end models, and/or low-volume, high-end models;
 - Producing high value-added sub-systems for Europe and global production networks and/or low-tech, low value-added components for the local markets;
- The role of endogenous automotive firms in accession countries in the regional, European and global production networks:
 - Low-cost, efficient second- and third tier suppliers (screw-driving plants);
 - Mighty first-tier suppliers engaged in R&D and high value-added services (logistics, training, TQM, etc. for other suppliers);
- *The impacts of environmental challenges, reactions of global players and endogenous firms;*
- The diffusion of new automotive technologies (e.g. fuel cells) in accession countries, and the role of endogenous firms and R&D centres in developing them;
- *The marriage of electronics, ICT and automotive technologies;*
- New concepts for personalized transport systems and the role of endogenous firms and R&D centres in developing them;
- Alternatives to automotive transport (local, city-to-city) and their impacts on the global and endogenous automotive firms.

Abstracts

Automotive Industry—A Driving Force of the Economies of Central and Eastern Europe

István Lepsényi, President, Association of the Hungarian Automotive Industry, Managing Director, Knorr-Bremse Ltd, Hungary

The automotive industry with more than 115 years of history takes the leading role in technological and organizational development, material sciences, propulsion systems, mechanical engineering, electronic and others. The average importance of automotive industry in the economy of CEE (Central and Eastern Europe) and NIS (Newly Independent States) countries is similar to Western Europe. Both parts of Europe show signs of further development but with different pace. In Western Europe, the trend is a slight increase of new vehicle registration combined with the higher and better utilization of the infrastructure. In CEE and NIS—in line with forecasted economy development—the number of vehicles will substantially increase. The CEE and NIS market has been tagged as the new breeding ground for vehicle production. Experts say that the wheels of the automotive industry are literally driving more and more towards Central and Eastern Europe. The CEE countries will be integrated in the global automotive industry and will get benefits with the market extension and technical development. In the NIS two scenarios are foreseen: an optimistic scenario with strong local brand names with strong connection to global automotive industry, good opportunities to develop specific product and system elements and a pessimistic scenario where isolation can be the result.

The automotive industry still is the driving force of developed economies. Using new technologies, innovative materials, extended elements of electronics and telematics, the automotive industry will remain in the leading position. The environmental issues are very challenging. Some countries are 5-10 years behind with the implementation of processes and techniques to meet the international emission regulations. E-business is also a new challenge for suppliers and dealers. The e-sales may destroy the business of all small local dealers and services shops, opening opportunities for strong multinational companies. The customer needs will push the whole automotive industry but especially the vendors in order to meet the increasing R&D (Research and Development) efforts. R&D activity is getting more and more globalized and the development teams are not only inter-functional ones but working across borders, utilizing the advantages of competence, hard work, creativity, competitiveness.

Automotive Industry in the Czech Republic

Karel Sklenar, VW-Skoda, Czech Republic

In the world automotive industry, there is a trend of globalization that results in formation of gigantic producing companies. About 60 per cent of world

car production is dominated by only five producers. It is predicted that car manufacturing industry will increase annually 1-2 per cent in developed countries (North America, European Community, Australia, New Zealand, Japan and Republic of Korea) over the 10-15 years predicts. The focus of manufacturers will move to Central and Eastern Europe, China and India. In these cases, it is predicted that the dominant market will be kept by own producers in their continents. Generally, the future of the automotive industry will be influenced by high level of electronic components (integration), wide pallet of information and communication technologies, new materials and technologies. Utilization of alternative technologies as for example fuel cells or electric engines or hybride or hydrogene engine could be expected rather in year 2020.

Automotive industry becomes the fastest developing sector of Czech Republic economy. The Czech automotive industry has a very long history and tradition starting at the end of 19th century. The political and economical changes in the last 10 years in most of the Central and Eastern European countries had significant influence on Czechoslovakian automotive industry. The effort to develop innovative solutions and meet new requirements will result in serious threat of substitution of existing products (and producers) and new entries into this segment of market. Changes in automotive industry sector will be driven by society needs, tendencies and preferences. For example ecology task was transformed from just biological problem into economical preferences and society opinion. The needs of society drives the research but also keep open choice for solutions since customers seeks fulfillment of their needs not technical background.

Automotive Industry in the Slovak Republic

Jan Lesinsky, Associate Professor, Slovak University of Technology

The automotive industry and specifically the automotive component market, is one of the fastest developing sectors in Slovakia. The annual growth rate of the industry increased from 25-30 per cent in the mid-1990s to over 50 per cent at the end of the decade. The sector currently employs about 50,000 people and represents about 9 per cent of the country's entire labour capacity for production. Out of 51 world countries having car assembly plants, Slovakia comes tenth in the world in the number of cars manufactured per thousand of inhabitants (34 units/1,000 inhabitants). Slovakia is one of the CEE countries with possibility to expect advancement up to higher places of the ranking over next five years. Given the world-class supply base, high intellectual capital and ability to readily achieve European levels of productivity, the Slovak Republic can more competitively satisfy the needs of automotive components companies than any other country in Europe. In the last ten years, the automotive sector has been the biggest success of the Slovak economic transition. The Slovak Republic now hosts the third large volume car producer in Central and Eastern Europe, more then 60 high quality supplier companies,

from 1997 to 2001 production in the sector increased over 100 per cent of revenue. The potential for Slovakia is for a 100 per cent increase in output and over 20 per cent in human resources for the automotive and related parts industry.

Globalization in the supplier automotive industry may threaten small local producers but have an advantage of making use of local productions to be incorporated into global corporations. The growing investors' interest in the CEE region and the existence of local producers for supplies to the automotive industry are potentially favourable for further development of automotive production in Slovakia. The area of human resources development appears strategic from the point of view of Slovakia's further development and position following the European Union integration. Education of firm managers and staff through permanent training and qualification improvement is paramount to make the automotive industry capable to cope with, properly apply and further develop world standards. The trend in placing automotive industry in lower production cost areas with market expansion potential will continue. This offers opportunity for Slovak supplier industry development and investment inflows, with a significant role being also played by the geographic location. Slovakia can offer for system and module integrators a very large possibility as a territory for West and East trade, logistic optimization and added value increase. Investors are witnessing constant improvements by state authorities, institutions and self-governing bodies. There is a clear willingness in dealing with problems. The challenge is also how to foster entrepreneurship and sustainable development in an enlarged Europe.

Debate

The role of automotive industry has become substantial in the region since the beginning of the 1990s. By its influence on employment, export and contribution to the GDP it is the motor of the industrial development in the majority of the East European countries.

Those countries where car manufacturing had long a tradition were in more favourable positions in maintaining their place in the European automotive industry, but other countries where proper industrial and economic background were available also proved to be attractive to foreign investors, mainly to multinational car producer corporations. The automotive industry plays a key role in R&D both by setting technical standards and by cooperation with universities or existing research institutions or by establishing new research and development facilities. The quality requirements towards its suppliers' products (spare-parts, accessories) represent another—however, indirect—influence on the technical level of the local industry.

All the above vigour of the foreign investment can unfold only if proper infrastructure, skilled manpower and favorable economic conditions are available. Consequently the role of national governments is essential in creating

new incentives and measures for further investments. EU support for expanding cooperation in industry-specific research and development will upgrade the competitiveness. EU directives enforcing environmental protection will have a beneficial "by-product": promoting the rejuvenation of car fleets.

Particular remarks:

- Automotive industry is global, controlled by large multinational companies;
- Government policies have a unique role in attracting foreign direct investments;
- The long-term success of the automotive industry in the region depends on how quickly companies (and governments) can adapt to the global supply chains;
- Competitiveness based on low level wages is dangerous;
- Participation in the automotive R&D and integration in the upper tier of the supply chain is the prudent long-term strategy for SMEs in accession countries;
- A competitive automotive industry in CEE will contribute to competitiveness of EU;
- A regional TF exercise is recommended to map future trends and enhance competitiveness of the automotive industry in CEE;
- The task of the government is not only to focus on getting new Foreign Direct Investment, but also systematically provide the economic background to increase the value added especially in the lower tier of the supplier chain:
 - Technical parks (with the necessary infrastructure for production, logistic, ICT, R&D, including well equipped laboratories and temporarily R&D personal for leasing);
 - Automotive clusters and competence centres based on/connected to the internationally acknowledged universities and research centres with effective schemes for spin-off;
 - EU conform subsidies for the total innovation chain.

Part two

Biotechnology Forum

Session 1: Biotechnology and the Biomedical Industry

Issues

- The post-genomic era and the new paradigm of medical biotechnology;
- Computational and information-driven approaches in the pharmaceutical industry;
- Drug design and pharmaceutical development strategies based on genomic information.

Abstracts

Medicine and Man: Can Mankind Cope?

Friedrich Dorner, President, Baxter Bioscience, Austria

The most intriguing outcome of the Human Genome Project was the fact, that just ~5 per cent of the 3.2 gigabase genome encodes genes. It also becomes more and more apparent, that small but stable changes in the human genome, so called single nucleotide polymorphism (SNP's) are the genetic basis for different traits and i.e. for person to person variation in disease susceptibility. Genetic testing has already allowed and will continue to do so, the identification of genes involved in diseases (treatable and untreatable), genes which influence drug metabolism, variants of gene in determining intelligence, behaviour and certain addictions. This will raise many, and difficult to resolve, issues related to privacy and confidentiality of genetic data.

Two other fields promising to change the way how medicine will be applied in the future are "Gene Therapy" and the use of "Transgenic Animals" as a source of life saving organs. Both fields are still very much under investigation, however, both fields also suffer from severe setbacks i.e. public raised

concerns about a possible introduction of animal viruses into the human population by transgenic organs or the induction of cancer in patients treated by gene therapy.

There is a clear impact on the society of the capabilities of modern molecular medicine and rapidly evolving biotechnology techniques on areas like "Tissue Engineering", "Cloning by Somatic Cell Nuclear Transfer" and on "Human Embryonic Stem Cell technology". The latter three technologies or technology platforms are expected to be of major importance with respect to improve quality of life in severely sick people. In many cases, therapeutics derived from this new and for good reason highly disputed areas of molecular medicine, might prove to be the only life saving treatment available. The art will be to balance humanity, ethics and human capabilities with access to life saving therapies and financial interests.

The Role of "in silico" Biology in Drug Discovery

Jacob de Vlieg, Executive Director, Molecular Design and Informatics, N.V.Organon, Akzo-Nobel, The Netherlands

In silico tools offer challenges and opportunities to the drug discovery process. In particular the role of molecular informatics to translate genomics-based research into practical solutions will be examined. Examples include: the combined use of comparative genomics, bioinformatics and DNA microarray analysis to identify and select potential protein targets providing new mechanisms for treating diseases.

In silico ADME-Tox tools and electronic databases to profile and prioritize compounds earlier in the drug discovery process. This to identify compounds with a high (or low) chance of succeeding in the clinic.

The use of structural similarities and differences of protein target and anti-targets to design highly specific drugs and examples of virtual screening to identify small drug-like molecules able to mimic or modulate the biological activity of complex biomolecules. Pharmacogenomics to study how genetic variation influences individual responses to a drug.

In silico R&D methods to support drug development for Rheumatoid Arthritis (RA). A mathematical model is developed by Entelos—in collaboration with Organon—to stimulate the clinical symptoms and drug response of a virtual RA patient. It involves the design of a knowledge management (KM) system able to integrate data at several information levels (e.g. literature, description of disease models, data on human cell behaviour, animal data, gene knock outs, and so on). The KM system forms the basis for mathematical models to simulate clinical symptoms such as cartilage breakdown, pain and drug response in a virtual patient. The simulations appear to provide useful in silico results on the human clinical effectiveness of various interventions that may form the basis of a new therapy. They also provide better insights to the factors that drive the underlying pathophysiology, providing greater scientific understanding into the pathways most relevant for RA.

Parallel Biology: Current Aspects of Genome Research and its Application in the Pharmaceutical Industry

László Takács, Guillaume Dufresne, Manuel Duval, Guido Grentzmann, Mariana Kuras, William M. Hempel, Genomics and Bioinformatics Group and Patent Department Pfizer Global Research and Development, Fresnes Laboratories

Hypothesis free, encyclopaedic approach of information collection and subsequent interrogation of the content resulted in dramatic increase of research efficiency in multiple scientific fields throughout history. Today, we are witnessing the data collection phase of genome research in hostile economic environment and on the downhill slope of the hype generated by unrealistic expectations on the impact of the completion of the human genome sequencing projects. Parallel biology is a current trend that integrates multiple genome wide technologies and focuses on the creation of comprehensive databases. These data sets are ready for hypothesis driven and hypothesis free mining. Key elements for discovery are the size of the database and the complexity of mining tools.

Genome research is a recently developed science paradigm that well deserves definition and distinction from other fields of biology since this year marks the 50th anniversary of Watson and Crick's report on DNA structure.

"It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material."

J. D. Watson, F. H. C. Crick, *Nature* 737: 25 April 1953, ref. 1.

The ambiguity of the sentence above leaves open the question of what exactly Watson and Crick meant, allowing us to substitute the fashion resisting, current knowledge and say; for molecular biology, for modern genetics, and for genome research too, the discovery of DNA structure and specifically the paper in 1953 marks its birth.

The first question is what defines genome research and what makes it distinct from related disciplines of molecular biology and genetics? In the context of this review, the following questions are: (a) whether this new research domain is useful for the pharmaceutical industry? (b) What is the experience; is there measurable positive impact today? (c) Lastly, in the overall picture of dynamic scientific and economic change in general, and specifically in the Central and Eastern European region (CEE), could the United Nations have an influence in helping individual governments to recognize the progressive and suitable genome research trends, that will allow the desired biotechnology and healthcare progression within the current economic frames and remain driven by realistic expectations. The objective is dual: (a) lessen the existing gap between the US/Western EU and Central-Eastern EU in a few selected areas, (b) creation of working models that suit

specific local needs and serve as an example for countries in other areas of the developing world.

Although, no crystal clear path will be defined here, areas of best investments and "likely to succeed" strategies can build via detailed foresight analysis an in-depth analysis of current experiences.

In conclusion, entrance of CEE countries to the EU creates an attractive opportunity to jump in and participate in the "biotechnology revolution", support should be carefully guided by recent global trends of the biotech sector as well as the major source of funding, the pharmaceutical industry.

Comments on the presentations and debate

The first speaker, Prof. Friedrich Dörner (Austria): "Medicine and Man: Can Mankind Cope?" gave a very broad overview of the recent achievements of human genome research, gene technology and cloning technology, intended for a lay audience. After giving the necessary background information, he described the possible human and medical applications of these technical breakthroughs, as well as the ethical, legal and social controversies surrounding them. The following issues were discussed: DNA-based genetic testing, use of SNP-information, gene therapy (somatic and germ-line), new drugs and new clinical therapies based on genomic information, pharmacogenomics and transgenic animals as sources of: organ transplants, disease-models, protein drugs, tissue-engineering, "off-the-shelf" organs, somatic nuclear transfer techniques (cloning), pluripotent stem cells, research with embryonic cells, etc.

After having described each of these applications, the arguments for and against their use were enumerated and the question asked: will it improve our quality of life? Without taking sides in these controversies, the final answer of the speaker was: yes, if we can deal properly with all the difficult ethical, legal and social problems evoked by these new technologies.

The next two speakers both represented the pharmaceutical industry and they presented provocatively opposing points of views. Prof. Jacob de Vlieg (Organon, Netherlands): "The Role of *in silico* Biology in Drug Discovery" started by pointing to the enormous and rapidly growing amount of data generated by genome sequencing, DNA-microarray (chip) experiments, and high-throughput drug screening (HTS). In order to handle effectively this wealth of information, pharmaceutical research scientists must find new ways of mining and integrating datasets exchanging such results within their own teams. The speaker illustrated these "new ways" with examples from his company's results, such as:

- The combined use of comparative genomics and micro-array analysis to identify and select potential protein targets providing new mechanisms for treating diseases

- In silico ADME-Tox tools and electronic databases to profile and prioritize compounds earlier in the drug discovery process
- The use of structural similarities and differences of protein target and anti-targets to design highly specific drugs and examples of virtual screening to identify small drug-like molecules able to mimic or modulate the biological activity of complex biomolecules
- Pharmacogenomics to study how genetic variation influences individual responses to a drug
- In silico R&D methods to support drug development for Rheumatoid Arthritis (RA). A mathematical model is developed to stimulate the clinical symptoms and drug response of a virtual RA patient.

The starting point of the last speaker, Prof. Laszlo Takacs (Pfizer, France): "Parallel Biology: Current Aspects of Genome Research and its Application in the Pharmaceutical Industry" was the comparison of hypothesis-driven research with the hypothesis-free, encyclopaedic, data-collecting work which is the ruling trend in pharmaceutical research today. He emphasized the importance of the integration of the two approaches in what he called "parallel biology". This integration means that the functional analysis of single genes must go hand-in-hand with data-mining and comparison of huge data-sets, using sophisticated computational tools. He gave a brief historic overview of how these two approaches developed lately in both fundamental (academic) and applied (pharmaceutical) research. He offered a rather pessimistic view on various problems faced by the pharmaceutical industry (diminishing value of patents, hostile environment, diminishing returns on increasing investments). The perspectives of genomic research for drug discovery and development were highly overestimated, they created false expectations for "magic bullets" and "miracle cures" and so far none of these have been realized.

In the last part of his contribution he discussed the possibilities open for the CEE countries in this field. Academic excellence is available in this region, but capital investment for large-scale projects is missing. Therefore it is necessary to find those "ecological niches" where brilliant ideas can result in useful leads to be developed in cooperation with large companies.

The discussion was centred around the problems of patenting. Three problematic aspects of patenting were mentioned: (a) the question of patenting living organisms or genes; (b) the differences between the principles of patenting in the US and in the EU; (c) the lack of motivation and skills, and money required for successful patent applications by academic scientists, especially in the CEE and NIS regions.

Session 2: Biotechnology, Food and Agriculture

Issues

- The challenges and potentials of biotechnology in forming the new agriculture;
- Global and local approaches to agricultural biotechnology, meeting the needs of a growing world population;
- Regulatory aspects of agricultural biotechnology: new challenges to markets and to regulatory agencies.

Abstracts

Plant Biotechnology for Developing Countries—What Is Needed and What Can Be Done

Marc Van Montagu, Chairman, Department of Molecular Genetics, Institute Plant Biotechnology for Developing Countries, Ghent University, Belgium

The practice of intense agriculture boosted the production during the second half of the 20th century. Thanks to advances in plant breeding, the use of fertilizers, and expanded use of irrigation, agricultural production per capita increased faster than demand, while farmland area suffered modest expansion. In a global scale food production is presently adequate and consumer prices remain relatively low. However, world population continues to grow and farmers will need to at least double production over the next 25 years to meet increased global demand. Moreover, on the local scale food security is cause of concern. The Food and Agriculture Organization (FAO) of the United Nations defines "food security" as a state of affairs where all people at all times have access to safe and nutritious food to maintain a healthy and active life. Currently, 24,000 people a day die from hunger and hunger

related causes. Over 800 million people in the world are undernourished, and a larger number suffer from malnutrition, meaning that they are qualitatively undernourished. People in developing countries do not only need food, they also need food with an enhanced nutritional value to sustain a healthy life.

The need to increase food production raises questions about both the sustainability and environmental consequences of current production systems. Over the years it became clear that industrial agriculture practices have adverse environmental effects such as desertification, soil erosion, salinization, fertilizers and pesticides contamination, decreased water availability, eutrophication, and decreased genetic diversity. Although present agriculture can produce enough food to feed today's population and probably the projected 8 to 9 billion people in 2040, that achievement will come at the cost of an unacceptable impact on the environment.

Plant technology developments must be redirected to meet the food quality and quantity needs of the poor. Research should tackle key problems of developing countries such as drought, soil erosion and salinity. If these priorities are addressed, it will be possible to obtain crop varieties that fit specific ecological niches without requiring expensive and polluting inputs. We will see a rapid progress in the construction of high yielding varieties for local staple crops of the southern hemisphere. These varieties can be tailored to meet the nutritional needs of the population.

In this way, plant biotechnology will be essential for the development of a sustainable industry, the creation of a medicare affordable by third world countries, which soon will represent 85 per cent of the world population and for engineering solutions for our present and future environmental pollution problems.

The Green Genome Era: Central European Perspective

Dénes Dudits, Director General, Biological Research Centre, Szeged, Hungary

Dramatic changes in political and economic situation in the Central European countries have considerably influenced the position of agriculture and the living conditions of large population of farmers. It became obvious that the highly intensive crop production has lost its economic background and the consideration of environmental issues became a central concern. The overdose of fertilizers and plant protection chemicals could no longer be used to insure a high yield. The complete restructure of the market situation, especially the loss of the former Soviet Union as a major consumer, have forced the agricultural players to rely on the European market with increased quality requirements. Parallel with the narrowing market opportunities, extreme climatic conditions such as flooding and severe drought caused significant loss in crop production in recent years. Under these conditions the performance of the cultivars and the usefulness of genetic resources have gained high priority. Fortunately in the case of several crop species, the plant cultivating

activities could be based on a very successful tradition and introduction of new competitive cultivars providing the basis of an active seed business. This new trend has been obviously recognized by international seed companies that extended their activities in these countries. In the case of crops such as sugar beet, sunflower, maize these internationals became dominant partners in seed business. There are a few exceptions such as wheat. Hungarian plant breeders produce more than 90 per cent of the cultivars of this cereal. So this large-scale divergence in the market positions requires new strategies for both plant cultivators and farmers. Food overproduction in Europe influences directly the agricultural development in these countries. In the case of Hungary there are limited market possibilities as far as developing countries are concerned.

Under increasing competition, quality traits should be considered as the major factors in commercialization of food products. Under the Hungarian climatic and soil conditions the special traits of the cultivated stocks can insure a very high quality of cereal, fruit and vegetable production. Furthermore in vegetables, high quality seed propagation can be achieved with the help of the specialized knowledge of farmers in certain regions.

Taking the above described situation and trend analysis, and based on the experience of the Hungarian Wheat Consortium, it is possible to conclude that the rapid progress in molecular and cell biology generates a completely new situation in agricultural practice, the post-genomic activities provide the basis for genome-wide analysis of gene function and extensive use of transgenic products under safety considerations and reasonable regulatory actions will gain an increasing significance in organic farming and production of healthy foods.

The Legal and Regulatory System of Biotechnology in Poland and its Relation to EU Regulations

Andrzej Aniol, Deputy Director for Research, Plant Breeding and Acclimatization Institute, IHAR, Poland

The history of genetically modified organisms (GMO) regulation in Poland began in June 1996 when, following the initiative of the Polish Ministry of Agriculture and Food Industry, an Interdisciplinary Consultative Group was established with the responsibilities of examining legal regulations, and assessing applications for the release of GMOs to the environment in Poland (certified field trials). Polish GMO Act is a new law regulating the safe utilization of organisms in which the genetic material was changed by recombinant DNA methods. The Act specifies also the administrative structures responsible for enforcement of those regulations. The objective of Gene Act is the regulation of contained use of GMO, its release to environment and placement on the market as well as transboundary movement of GMO's. The Minister of Environment coordinates all monitoring and control activities involving GMO utilization. According to the GMO Act the GMO user is obliged to monitor risk associated with given GMO or its product. Any unforeseen

hazards or accidents involving GMO or its products must be reported to the Ministry of Environment. According to the GMO Act, public participation in decision-making on matters involving GMO is conducted by participation of two members representing NGO organizations in the GMO Commission with full access to all information.

The predominant opinion among biotech industry and research community is that EU regulations and also Poland domestic regulations on GMO utilization are very restrictive, based on unproved assumptions and voluntarily use of precautionary principle. In effect these factors severely hamper technological progress in Europe with serious consequences for the future. Despite some small signs that the acceptance of modern biotechnology in Europe is slowly increasing there is little hope for a real breakthrough in the near future.

All elements of National Biosafety Framework elaborated in Poland, the biosafety policy, regulations and decision-making mechanisms are already implemented incorporating the essential provisions of EU respective regulations as well as the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. Similar situation is found in other countries of the CEE region, which are going to be member states of EU, especially in eight so-called accession countries.

The Environmental Protection Act was amended in July 1997 and was followed by the new act "On Genetically Modified Organisms" which entered into force on 26 October 2001. Future trends in Poland will be highly dependent on tendencies in the EU but in NIS countries the development might be different and a more liberal approach to utilization of gene technologies in agriculture and industry will be taken.

Comments on the presentations and debate

Prof. Marc Van Montagu (Belgium): "Plant Biotechnology for Developing Countries. What Is Needed and What Can Be Done?", one of the pioneers of this field, started with an overview of the achievements of plant biotechnology, what are the main GM crops already in production, what developments are in the pipeline, and what are the foreseeable possibilities in the future. Based on his personal experience he emphasized the significance of GM crops especially for the third world. This is a contentious issue because the opponents of GM-technology frequently say that GM crops offer no advantage for the developing countries, they benefit only the multinational companies that develop and sell the seeds. The speaker expounded the view that this should not be the case.

Developing countries must develop their own GM-varieties, according to their specific needs (Mexico and China were cited as positive examples), train their own specialists (in this, the developed countries can help a lot), and help the farmers in the appropriate use of the technology. If the European countries want to help the third world, they should stop heavily subsidizing their agriculture instead of opposing GM-technology.

The second speaker, Prof. Dénes Dudits (Hungary): "The Green Genome Era: Central European Perspective" outlined the situation of agricultural research, plant breeding and agricultural practice in the CEE countries, especially in Hungary, after the collapse of the communist system. The disappearance of unlimited markets for low-quality mass production on one side and the unlimited possibility of seed imports from the west on the other, completely changed the picture. Hungary now imports the seeds for most of the main crops, except for wheat, where more than 90 per cent of planted seeds are the products of Hungarian breeders. He then described the work of a Wheat Consortium (consisting of eight research institutes and breeding stations) with the aim of developing better disease-resistant (*Fusarium*, leaf-rust) and drought-tolerant wheat cultivars, using gene technology and those new molecular methods of genotyping (RFLP, AFLP, QTL, microsatellites) that can accelerate and help classical breeding.

As Hungary (and most of the CEE countries) will join the EU, its policy about GM plants should adapt to the EU (that is, it must be fairly restrictive) but in the long run, GM-acceptance will certainly change (for the better), therefore Hungary must be prepared for the widespread and sophisticated use of GM-technology if she wants to exploit fully the comparative advantages offered by the favourable climatic and soil conditions of the country.

The last speaker of the session, Prof. Andrzej Aniol (Poland): "The Legal and Regulatory System of Biotechnology in Poland and its Relation to EU Regulations" described the historical developments in Poland, leading to the acceptance (in 2001) of the law on Genetically Modified Organisms. This law is in complete accordance with all EU regulations and other relevant international agreements (such as the Cartagena protocol and the Biodiversity agreement). The law requires the establishment of a "GMOs Office" and a "GMOs Commission" under the aegis of the Ministry of Environment (in coordination with the Ministries of Health and Agriculture). The speaker concluded the description of the regulatory system by pointing out that most of the necessary components of the system already exist, except the reporting and monitoring.

The law is criticized for being too restrictive but as Poland will join the EU, and as the public attitudes in Poland in the last three years became more hostile, this is considered to be necessary. The speaker expressed his hope that in the long run public resistance towards GM-crops will diminish, especially towards non-food crops. For the NIS, and non EU-accession CEE countries the situation of GM-technology is much more favourable, because in these countries agricultural productivity must be increased and the "green" organizations are less powerful. These countries are advised not to accept too restrictive GM-regulations.

In the discussion one issue taken was that if the heavy agricultural subsidies of the EU would be dismantled, as Prof. Van Montagu suggested, it would not help at all the poorest developing countries, only the big producers (Australia, Argentina, US, etc). Another issue stressed in the debate was that the main problem with GM-crops is their environmental impact.

Session 3: Biotechnology and the Environment

Issues

- Biotechnology as a challenge and a help to the environment;
- The effect of biotechnology on the new food standards: regional and global views;
- Public perception of biotechnology: what the public would like to know;
- Biotechnology and society: global and regional views;
- Genetically modified organisms and the environment.

Abstracts

Environmental and Biosafety Aspects of Commercially used GM Plants *Joachim Schiemann, Institute for Plant Virology, Microbiology and Biosafety, Germany*

The long history of safety associated with the introduction of new plant varieties indicates that (a) risks to the environment presented by crop plants are low, (b) field testing before commercial use and the institutional assessments and decisions on which plants or varieties to grow as crops have been sound, and (c) management practices in place have been sufficient to mitigate any risks associated with a new variety. Nevertheless, the use of recombinant DNA technologies to produce genetically modified (GM) plants has led to the development of governmental/institutional regulations around the world that are applied specifically to assessing the safety of such plants.

From the very early stages of genetic engineering a close relationship between basic research, biosafety research, regulation and product development has been established. At the so called Asilomar-Conference in 1975 leading scientists came to the conclusion that specific biosafety research should be performed to develop systems of biological containment, and that guidelines should be developed for the safe use of genetic engineering. In Europe, the well known Directives 90/219/EEC and 90/220/EEC have been introduced

to regulate contained use and releases of genetically modified organisms (GMO). In 1997, the Regulation 258/97 went into force, a product specific regulation covering Novel Foods including GMO and products thereof. Recently, a second round of GMO legislation started in the EU.

The GMO opinions arise from risk assessments of specific dossiers, guidance documents and individual questions posed to the Commission on GM issues.

One of the key topics in today's discussions about genetic engineering in agriculture is the next generation of transgenic plants, which are suitable for the EU market.

At an early stage in the development of GM plants, some strategies are available which may be considered best practice to reduce potential identified risks and to avoid some unidentified risks in the environment.

Based on recently developed enabling technologies and improving precision biotechnology tools the approach will not generate problems but try to generate solutions. Considering the principles of precision biotechnology early in the development of a GM plant can help to deal better with risk and uncertainty in evaluating the safety of the plants. The principles of precision biotechnology will hopefully become standard for crop improvement and for acceptance of improved crops.

Food Standards, Safety and Biotechnology: A Central-European Perspective

*Peter Raspor, Biotechnical Faculty, University of Ljubljana, Slovenia
Secretary General, Federation of the European Microbiological Societies (FEMS)*

Food technology as a profession is responsible for the technical aspects of development of food products, food processes, and distribution of these products to consumers. Since the ultimate target of these efforts is the satisfaction of the consumer, it is essential to consider not only the objective consumer needs (e.g., nutrition, safety, affordability), but also subjective aspects of consumer satisfaction (e.g., sensorial properties and consumer attitudes). It is in the area of consumer needs and wants that we encounter some of the most difficult problems in fostering rational development of food technology Europe is facing in last years. Particularly important are outbreaks of food pathogens and exaggerated concerns about GMOs. However there are still some problems open. At the moment, substantial equivalence is the main approach used to assess the safety of GM ingredients. It is based on the assumption that a new GM crop is safe if it is essentially the same as the unmodified equivalent. This is assessed by comparing the agronomic, biochemical, chemical and nutritional parameters of the GM food relative to existing conventionally produced foods. Macronutrients, micronutrients, known toxins and other anti-nutrition factors are also measured. There is no standard list, however, of what components must be analysed for each food. Based

on the results of substantial equivalence testing GM foods are divided into classes such as: (a) The food is considered to be substantially equivalent in all respects and no more information is requested. This food is considered to be different only in the genetically modified characteristics, (b) The food is not considered to be substantially equivalent, so more toxicological and nutritional data are required. Scientists critical of this approach have previously argued that gross chemical comparisons between GM foods and conventional counterparts are not sufficient to detect unexpected changes that might arise through the process of genetic modification.

The importance of bacterial pathogens in transmitting food-borne diseases has been highlighted in recent years with several well-publicized cases of food poisoning. The central goal of the European Commission is the achievement of the highest possible level of health protection for the consumers of European food. This can be achieved through: responsible feed manufacturers, farmers and food operators, traceability of food and its ingredients, proper risk analysis through risk assessment (scientific advice and information analysis), risk management (regulation and control), risk communication, and the application of the precautionary principle when appropriate. On one side it is important to question if it is needed additional proof that biotechnology is the most promising and badly needed technology for humans. On the other hand, microbiology with new food born pathogens is becoming daily incorporated into the society's ordinary life and the public should acknowledge this as part of the food production chain.

Biotechnology and the Social Environment

Tomasz Twardowski, Institute of Bioorganic Chemistry, Polish Academy of Sciences, Poland

Nowadays, biotechnology is a multidisciplinary subject. For the development of modern biotechnology, legal and sociological issues are as important as microbiology. Public awareness is critical. The significance of communication between scientists, state administration and society is very well illustrated by the recent incident on anthrax terrorism in the United States: very few tragic cases and enormous panic. Similar public perception is noticed on issues related to genetic modified food. The factors influencing public acceptance of biotechnology are hot topics for debate. Daily, the public makes use and receives information about biotechnology but, as there are many different disciplines and products associated with the term, society as a whole do not acknowledge the benefits. Novel and innovative methods for communication with the public concerning life sciences are badly needed. The main problem is: "who should communicate with the public?" and "how the issues related to biotechnology must be communicated to the public?" These points must be addressed from a local perspective respecting cultural differences in the country. The process of "teaching the teachers" is probably the one with highest impact. The media can disseminate objective information. However,

media coverage of biotechnology tends to be negative and opinions are somehow different depending on whether journalists are suited to impart information on biotechnology to the public. Journalists lack basic knowledge of science and, from a commercial point of view, news involving 'bloodshed' is generally more attractive to readers. The primary teachers must be scientists, taking into account the complexity of biotechnology. Scientists sometimes are not well-perceived by the public, they use lots of scientific jargon and usually they do not have appropriate communication skills. In many cases it is believed that the scientists' concerns do not always match the public ones. Politicians may play an important role in delivering information but frequently the public does not trust their own politicians. The role of the church is site-specific. In some countries, such as Poland or Greece, the church may play a much more important role than in other countries.

A recipe for a successful system of information on subjects related to biotechnology is not trivial to be proposed. Different groups should work together. Scientists should be sources of information and dissemination should be conducted through reliable media. A good working relationship between the groups is needed. Other stakeholders should give support to any information dissemination initiative.

Comments on the presentations and debate

The starting point of Prof. Joachim Schiemann (Germany): "Environmental and Biosafety Aspects of Commercially used GM Plants" was that the environmental impact of traditional plant varieties used to be negligible, and the safety of them had been adequately controlled. The use of GM-technology to produce GM plants led to the implementation of stricter regulations that are applied specifically to assessing the safety of such plants.

The EC established a Scientific Committee on Plants (SCP) in 1997 as an advisory body that published 32 evaluations. All evaluations have been done on a case by case basis. Recently, experts from three of the EU scientific committees that deal with different scientific issues for GMOs, the SCP, the Scientific Committee on Food (SCF) and the Scientific Committee on Animal Nutrition (SCAN), have produced a single guidance document for notifiers which systematically summarizes the strategy and the required data for proper risk assessment. This includes: (a) molecular characterization of the GM plants, (b) comparative analysis, (c) environmental risk assessment, (d) food and food safety assessment, including toxicology and allergenicity, (e) nutritional assessment of food and derived animal products.

Considering some best practice principles early in the development of GM plants can help to deal better with risk and uncertainty in evaluating their safety. Recommendations for GM plants propose to: (a) avoid or minimize plant host mutation by targeted insertion of gene sequences at pre-selected genome locations, (b) avoid or minimize the inclusion of superfluous transgenes or

sequences, (c) avoid or minimize superfluous expression of the transgene, (d) avoid or minimize the dispersal of transgenes in the environment.

Prof. Peter Raspor (Slovenia): "Food Standards, Safety and Biotechnology: a Central-European Perspective" started by defining biotechnology and commenting on the historical development in this area with special reference to safety issues. The guiding principle in the safety evaluation of novel foods produced by GM-technology is that they are safe if they are "substantially equivalent" with the traditional variety. If they are not "substantially equivalent", i.e. they contain a novel protein, then more toxicological, allergological and nutritional data are required. Critics argue however, that this principle (accepted by the United States Food and Drug Administration) is not adequate, that substantial equivalence is not a scientific concept and that these specific tests are needed for every GM product. Despite this criticism, so far no harmful effect could be demonstrated for any GM-food. The increased public sensitivity and resistance towards GM-foods sometimes leads to negligence towards more real dangers, such as microbial contamination of foodstuffs and the appearance of new foodborn pathogens. It is necessary to establish an European Food Safety Authority, to provide scientific and technical support, to harmonize risk assessment methods, to identify new food safety risks, to operate an efficient alerting system, to provide reliable information, to collect scientific data and to promote scientific studies and finally to establish and operate a common system for food and nutrition policy as well as practice.

In conclusion, the speaker emphasized that the safety-problem of GM-foods is exaggerated and food-born pathogens represent a much more serious challenge.

For Prof. Tomasz Twardoswki (Poland): "Biotechnology and the Social Environment" the starting point was that biotechnology is not just a biological discipline, but it involves social, legal and ethical aspects as well. According to the common public opinion, the rationale of legislation is the most important factor to secure our sense of security. Legislation should have significant S&T basis (e.g. food, chemicals, environment, energy). Advanced analytical requirements, e.g. in the case of GMOs, are needed. The key elements for establishing solid legislation include the international harmonization of laws; best practice of laboratory methods and their validation; international exchange programs for training and transparency as well as the exchange of data for reference.

The situation is very different in the US, in the EU, and in the CEE countries (one way gradient). Communication between the different stakeholders (scientists, biotech business-community, politicians, regulators, NGOs, lay people) is a crucial problem. The questions are: Who should communicate with the public concerning the matter of modern biotech? How to communicate with the public? What is the purpose of such communication? Who will sponsor these activities?

The principal communicators must necessarily be scientists. However, most of them are not good communicators and the lay people perceive them as remote and alien from their everyday life. They must develop and learn

better methods to overcome this problem. The media are usually hostile and this hostility must also be changed. The best methods are those that actively involve the lay public.

In the discussion some of the worn-out arguments for and against biotechnology were repeated. It was commented that scientists themselves may have lost the confidence of the public because of their financial interests in biotechnology.

Plenary: Cross-cutting Issues on Biotechnology

Issues

- Biotechnology as a new chapter of scientific and cultural evolution;
- Cross-cutting issues of agricultural and industrial biotechnology: common themes of regulation and property rights;
- Biotechnology in a developmental framework: What the developing world needs.

Abstracts

The Interaction between Academia and Industry in the Development of European Biotechnology

Frank Gannon, Executive Director, European Molecular Biology Organization, EMBO, Germany

The interaction between academia and industry has been a powerful driving force worldwide. This trend towards such complementary actions was initiated in the United States and it is now a mature way of working between two parties. In most of Europe, there has been a delay in breaking down the barrier between industry and academia. It is also now common for scientists in universities to depend on industry for support for research that is relevant to industry and for industry to look towards academics to provide cutting edge research for them.

Although the interaction may be perceived as totally compatible with the expert scientists receiving funding for the research that they would wish to perform and industry receiving information that they need, closer analysis however, points to tensions that can arise and distortions that can occur if this process is not correctly managed. The academics will suffer in the long-term if they accept money to carry out research at all costs independently of its relevance to their major interests. The possibility of academic research

being distorted to a point of being too close to development and technology and too far from the strengths of the university sector is real. Nevertheless, governments both national and at the European level use an increasing number of schemes to forge this partnership. The consequences are clearly a shift in the type of work that is carried out in the universities; the long-term consequences of which remain to be seen.

For countries within the CEE and the NIS, it is appropriate to look at the progress that has happened in other contexts. If the error of ignoring research that may have industrial consequences is clear, the error of performing research at the request of industry irrespective of its intellectual content is also clear. Irrespective of the manner in which these balances are reached however, one core aspect remains; industry will only be interested in research if the quality available within the academic world is attractive to them. It is essential therefore that the research base is built up, and in the first instance, the money for this have to come from the governments. The alternative whereby funding is obtained from industry with a supplement from the government could be a major tactical mistake.

Biotechnology: A Development Perspective

Francisco E. Baralle, Director/Trieste Component, International Centre for Genetic Engineering and Biotechnology (ICGEB), Italy

Biotechnology offers extraordinary opportunities for solving problems of health, nutrition and economic development; but, at the same time these technologies raise preoccupations for their possible impact on the environment, on human dignity, on local economies and on traditional production methods. In the last 30 years, we have seen both a scientific and an industrial revolution that has resulted in a market well above US\$ 18 billion only considering the pharmaceutical field. The first phase of the biotech industrial revolution involved what can be called replacement therapeutics. Biotechnology made possible the production, in heterologous organisms, of natural human proteins that could be administered to patients having a dysfunction in such molecules. The therapy of diabetes, hepatitis, anaemia and other diseases of worldwide importance was in this way radically changed. This first phase is responsible for most of the current recombinant pharmaceutical market. The second phase involves research, through the instruments of the so-called Structural and Functional Genomics, on natural biological processes and their pathological derangements. The knowledge so acquired is then used for the rational design of therapeutic molecules to correct the pathological process. This approach is extremely important as highlighted by the recent WHO report on genomics and already has scored its first clear successes. In particular, developing new drugs for the treatment of HIV such as protease and reverse transcriptase inhibitors and for the treatment of leukaemia with the first rationally designed chemiotherapeutic molecule, imatinib mesylate (Gleevec).

In this perspective, it appears essential to build capacities of the developing countries in this scientific field and establish an impartial forum of information. The advantages of the cutting edge of biological research are made available to the countries in an unrestricted way and aimed at solving their problems in a safe and sustainable way.

The scientific and training programmes in developing countries must be at the forefront of international scientific research, in fields covering basic science, human health, agriculture and biosafety. Resource limitation could condition the amount but not the quality of the scientific research. When governments establish scientific and industrial policies, basic science should be within their main objectives because is the foundation stone of scientific and technological independence.

The role of institution like ICGEB whose constituency is comprised in great majority by the developing countries of Africa, Latin America and Asia, as well as by the European transition economies; is to ensure the achievement of such independence.

A Vision for European Science

Maurizio Iaccarino, International Institute of Genetics and Biophysics, IIGB, Italy

Scientific knowledge has led to remarkable innovations that have been of great benefit to mankind. Life expectancy has increased strikingly, and cures have been discovered for many diseases. Agricultural output has risen significantly in many parts of the world to meet growing population needs. Technological developments and the use of new energy sources have created the opportunity to ease arduous labour as well as provided the generations with an expanding and complex range of industrial products and processes. Technologies based on new methods of communication, information handling and computation have brought unprecedented opportunities and challenges. Thus, science has been a major factor influencing technology, industrial development and, as a consequence, economic and social development.

Science, technology and engineering are the principal drivers of industrial and economic development. The difference in abilities of countries to exploit S&T through the process of innovation results in different economic performances. Innovation in all sectors is increasingly characterized by a bi-directional feedback between the basic research system and technology development and diffusion.

Future technologies in crop production will have to play a decisive role in increasing yields to maintain sustainable global output. Although the EU is presently self-sufficient in food production, it needs to maintain security in this sensitive field that is of strategic importance, as demonstrated by many wars in Europe.

EU is the largest economic power in the world and therefore a common EU policy for science can be of global influence. The EU has not yet defined

its political future, but in this context it needs to discuss the future of European science. In fact, science is important not only for industrial, economic and social development, but also for national security.

It is proposed to coin a keyword named "security" to address issues related to long-term investment in S&T. The discussion should begin convincing all citizens about priorities to European science. Possible topics to start a discussion are: strategic security, social security and security towards basic human needs.

In conclusion, it is time to begin discussing in appropriate circles what the public expects from science. If the above general areas are accepted to be covered by a vision for science in the EU over the next 50 years, the next step will be the discussion on how to include topics of a more specific nature in this general frame and how to implement the decisions through science education and through the establishment of research infrastructures. Discussions leading to an agreement on a common vision for the future of S&T in the EU could contribute to indicate the needs and means for further integration.

Comments on the presentations and debate

The plenary session was dedicated to broadly formulated issues of biotechnology, its impact on the general scientific and cultural development in various countries, the role of governments and the perspectives of global development.

Prof. Frank Gannon (Germany) presented the first report on "The Interaction between Academia and Industry in the Development of European Biotechnology". Prof. Gannon emphasized that the interaction between academia and industry has been a powerful driving force of biotechnology worldwide. A trend towards complementary actions was initiated in the United States. In most of Europe, there has been a delay in breaking down the barrier between industry and academia but it is also now common for scientists in universities to depend on industry for support for research, which is relevant to industry, and for industry to look towards academics to provide cutting edge research for them. A closer analysis points to potential tensions and distortions if this process is not correctly managed. The academics might suffer in the long term if they accept money to carry out research at all costs irrespective of its relevance to their major interests. For countries within the CEE and the NIS, it is appropriate to look at the progress that has happened in other contexts. If the error of ignoring research that may have industrial consequences is clear, the error of performing research at the request of industry irrespective of its intellectual content is also clear. The alternative whereby funding is obtained from industry, with a supplement from the government, could be a major tactical mistake.

Prof. Francisco E. Baralle (Italy) presented a report entitled "Biotechnology: Current Trends and Future Perspectives for the Developing Countries".

Prof. Baralle summarized the development of biotechnology from the developing world's perspective, including the findings of recent international conferences held on the subject. He pointed out that it is essential to build the capacities of the developing countries in this scientific field and, at the same time, to establish an impartial forum of information and debate on these subjects, so that the advantages of the cutting edge of biological research are made available to all countries in an unrestricted way, but in conditions assuring that the direction of scientific progress is in their own interest, in their hands and aimed at solving their problems in a safe and sustainable way. The biotechnology priorities formulated for developing countries point to crucial fields such as disease diagnosis, vaccination and environmental improvement, however they frequently neglect basic science as a fundamental cultural ingredient. In most developing countries the scientists lack technical/scientific supplies and this poses a problem in technology transfer. Technology transfer requires simplification of high-tech procedures and a critical attitude towards "prestige only" projects. Educational content is a very important ingredient in projects in developing countries. As he pointed out, developing countries should choose their priorities in complete freedom aiming to programmes with the highest capacity building content. There is no need to rigidly restrict this action to selected subjects such as the so-called third world diseases. Instead, we have to look favourable to research in the regional infectious diseases and peculiar pathologies but not exclusively to them. In conclusion, the scientific and training programmes in developing countries must be at the forefront of international scientific research, in fields covering basic sciences, human health, agriculture and biosafety. Resource limitation could condition the amount but not the quality of the scientific research.

Prof. Maurizio Iaccarino (Italy) presented a report entitled "A Vision for European Science". Prof. Iaccarino pointed out that virtually all major improvements in life expectancy, agricultural output or technological performance ultimately rely on scientific knowledge, consequently science has to be acknowledged as a key factor influencing economic and social development. Even though the scientific performance varies from country to country, Europe is a major player in today's science. The funding level is also variable, 60 per cent of the total funding is provided by three countries, and, as he pointed out, the EU does not have a long-term policy for science. The EU and the US spend about the same amount in absolute terms, but in the US the expenses are apparently more focused to a national policy. A coherent European science policy should take into account that Europe is one of the largest factors of global economy, and it should prepare for a scenario of decreasing population and surging immigration. On the global scene, European science should promote socially equitable development of the developing world. As he pointed out, Europe needs that S&T become the motor of economic development in developing countries. This can only happen if S&T are strengthened in these countries and Europe can contribute through the transfer of knowledge and assistance in upgrading the educational systems. Prof. Iaccarino concluded that it is time to begin discussing in appropriate circles what the

public expects from science. The next step will be to discuss how to include topics of a more specific nature in this general frame and how to implement the decisions through science education and through the establishment of research infrastructures. Such a process could be facilitated by discussion papers debated among and within the member states.

The following debate concentrated mainly on the role that governments should play in formulating priorities for science in general and biotechnology in particular. Governments should concentrate on promoting scientific excellence via measures such as providing strong support to high quality research groups, and the economy should then determine the actual biotech priorities. Governments should determine a long-range framework for the scientific development and set priorities to science and technology.

Part three

Ministerial Round Table

Statements

Franz Vranitzky

Former Chancellor of Austria

With this meeting, which is the last round of this summit, we will link technology to politics. I also would like to invite everyone on the panel, let us overcome last century thinking and let us enter into the twenty-first century or even one which is more into the future.

I have two statements of principle to make. First, I do not belong to those people, who everyday come up with some apprehension as far as the widening of the European Union is concerned.

Second, I do think that there is the risk or even the danger that the European integration model might be falsely and wrongly interpreted as just an economic union. I think and believe that what the founding fathers of the European integration model wrote into the Treaty of Rome in 1957, that the Union, once it comes up, should become a political union, is still true. It is even more true than in the past. At the time of the decision to enter negotiations with the 10, somebody used the phrase "the ins", meaning us, the 15, and the "outs" referring to those who had not yet joined. We have arrived at the stage at which we could use the phrase "the ins and the pre-ins". However, it has to be quite clear that the decisive factor inside has been that the risks and the costs of a divided Europe would by far outweigh the risks and the costs of a *United Europe*. We have to tackle an issue which is summed up in the question "what will be the pattern of the transfer of resources?" An uncomfortable general feeling of many politicians and citizens in the "ins", in the European Union incumbents was reinforced by fears of increased competitive pressure exerted by cheap commodity and services inputs from Eastern Europe, loss of jobs through either increased migration or relocation of existing production sites to the East and finally, very important, higher net national contributions to the European Union budget or reduced net receipts after the accession of the applicants. We have to tackle the problem in our own countries. In my own country, Austria, which is bordering Hungary, Slovakia, Slovenia and the Czech Republic and one way or another, Poland, this apprehension comes back almost every day. We have to tell our people that when the accession is completed, when they are all in, their chances will increase and improve and give to their own people many more opportunities.

The people of Portugal, Spain and Greece, before their countries became members of the European Union, went out of their countries in masses to work abroad. After they became members, they found their chances at home. And we also have to be quite clear and aware of the fact, that European

labour markets, perhaps in 10 or 15 years time, would be quite different. When we talk about shortage of labour, or the beginnings of a shortage of labour, within the 15, we have to be quite careful that we must not rely on those workers who come to us from other parts of Europe, because when and if they succeed to improve their standards of living and their career chances, they will, of course, rather stay at home than migrate.

If additional resources are not available because of lower than expected growth in the European Union, any candidate will have to wait or reckon with less transfers. This is a very crucial point. In the economic policies of many a country in Europe, there is one great shortcoming: there is a good deal of emphasis, led by governments, on sound public finance. Having the Maastricht criteria in order is, of course, nothing to contradict, but experts, economists, finance ministers and others should also include into their thinking economic growth. It is not just zero deficits in our federal budgets, it is economic growth that will push us forward into the future. We will not be able to cope with problems like poor labour markets, high unemployment and the like, without economic growth. In light of what has been said here during the last two days, focusing on the future, on education, on technology and scientific approaches, should be and would be the most basic elements of future economic growth.

When Austria applied for membership, the Commission told us Austria has been integrated to a large extent and it will not take us more than two years or three years to arrive at membership. It took us seven years and when I asked Jacques Delors "when will you conclude taking us in?" He said "you have to know that in the European Union, important things are always decided in the last 10 minutes but the important thing is you have to know when they begin".

Brussels, the European Union, the European Commission is not too far away from being blamed for regulating or even over-regulating us.

It would be interesting to have a look at the situation in the various countries, at domestic politics, to what extent the necessity of science and research as a prerequisite for the transition process is acknowledged on a broad basis. We have seen a lot of examples when people said science, research, development was a very good thing, but old age pensions, hospitals and the like is much more important, so let us spend the scarce money that we have got rather for the social and welfare State. There are always elections and the elections are not very open to and not very open-minded for long-term strategies. This is a great dilemma of policy-making.

Mary Harney
Deputy Prime Minister, Ireland

I belong to a school of thought that does not believe in old Europe or new Europe. I like to talk about the future Europe and I am certainly a very strong fan, as is my government, of the enlargement process. Ireland has decided

to allow workers from the new Member States from day one to come and work in the Irish economy. Hopefully that does indicate a commitment to the process. There were two referenda in Ireland in relation to the ratification of the Nice Treaty, the first was defeated, in the second the Treaty was carried very successfully and by a large majority. From this experience we learned in Ireland that we have to do an awful lot of explaining. We have to simplify what is happening. We have to try and bring people with us. All of us have to do that because perhaps we have moved in the past in a way that has left people behind. The people of Europe want to be brought along with the process. To have them feel part of the process and to begin to eliminate this democratic deficit, we have to ensure that the whole subsidiarity principle is applied to enlargement and that only those decisions move to the centre that are relevant to the centre.

I do not support the concept of a United States of Europe with the central decision-making capital and the rest of the member States simply being part of that federation. I believe in the opposite scenario of a union of independent member States. We are Irish first and European second, we are Hungarian first, and European second and these need not be in conflict.

In relation to the Convent on the future of Europe, I very strongly favour the new countries to be involved in the IGC process. I favour a period of reflection between the IGC and the conclusion of the Convent. Given the important decisions that will be made in relation to institutions and reforms. What is important is that we get it right not that we rush to make the decision.

Sometimes we over-emphasize the stability nature of the growth and stability pact. Clearly stability is important but so is growth and perhaps the pact does not allow sufficient flexibility for growing economies, for economies like many of the new countries that will come into the Union. It is not as flexible as it might be, the emphasis on the growth elements of the pact needs to come back to the centre stage.

The future of Europe to a large extent will be determined by economic performance. To become the most dynamic knowledge-based economy in the world,—even if we slip beyond 2010—huge reforms need to be put in place. In some countries, there are pension and welfare issues, there is rigidity in the labour market. I think more investment in foresight exercises and R&D is necessary, the aim is to bring spending up to 3 per cent of GDP by 2010. Many of us have a long way to go in that regard. Ireland is way below that at the moment and so are many other countries.

We need more flexibility, we need to be less regulated. Perhaps more effectively regulated and to enforce regulations already in place rather than constantly seeking to put more regulations in place. There will have to be enormous changes within Europe. Many of the new countries are already attracting major foreign direct investment. They can provide a lot of the infrastructure that industry needs and they are really competitive and I do not see that as any bad thing. We probably have to slightly think beyond member States and think in terms of regions and how we can work together as regions of the European Union. It is important that we do not have a divided Europe

of the big and small of where there is a number of big countries going in a particular direction, perhaps leaving many of the small countries behind. That would be against the whole spirit of the enterprise.

Perhaps the greatest success of the Union is that it is the most successful peace process of all times. The recent difficulties between the European Union and the United States are most regrettable. We share common values. We have so much in common. The relationship between the United States and the European Union is important. It is important for the European Union itself. I hope that we can find mechanisms to ensure that Europe and the United States can work more closely together in the future than has been the experience in the past few months.

The success that Ireland has enjoyed was no miracle: it had a 20 or 30 years in gestation. Some of the policies that were put into place took as long as 20 plus years to bear fruit particularly the investment in education. In order to compete, whether as a member State or as the Union at large, we have to put long-term strategies in place. They take an awful long time to bear fruit but certainly the result justifies the effort.

Gvozden Flego

Minister of Science and Technology, Republic of Croatia

European integration for several transitional countries means the end of isolation and some kind of normalization. Transition has at least three dimensions, namely a political, an economic and a mental one. The political transition at the normative level could end in two years, the economic one in between five to ten years, but the mental transition, the building of civil society would last at least one and a half to two generations.

For several transitional countries, the turning point in their development is sometimes what one would call the Irish strategy, namely the understanding that one should pay much more attention to education and that investment in education is an investment in the future. By education, one gets knowledge and skills as a basis for innovation and innovation is the only guarantee for development, especially in higher education, which is very dynamic, and which, as it has been developed in Western Europe, especially since Humboldt, who insisted that higher education and university teaching should be based on research. That means that science and research combined with higher education are the foundations of our development and in a way are very nice avenues for integration to Europe. Why? It is very simple. Scientists are either global or are not scientists. Scientific results are acknowledged at the global level by the scientific community. In the so-called transitional countries, there are comparative advantages in scientific research which deserve to be combined with scientific research elsewhere. That is why the transformation of transitional countries very much includes a transformation in science and higher education.

But if being scientists, people in transitional countries are acknowledged as scientists, they are already in the world of science and that means they are already in Europe. Not in terms of money, but for something much more important, more substantive. If they are scientists, they do cooperate with people in the whole world, Europe included. So through science, it seems to me that plenty of our universities and research institutes are already integrated into Europe and that is why European decision-makers should be more open for such initiatives coming from the transitional countries, opening the funds of mobility, opening the funds for researchers more often, not waiting until we would achieve a standard level that is rightfully expected, but doing it now, because the exchange of ideas and of people, getting experiences here and there is a part of integration. I hope that this will happen sooner and on a much larger scale than is the case so far.

István Csillag

Minister of Economy and Transport, Republic of Hungary

This summit is a very good event to share experiences and ideas about the future and about what has happened in our country before accession.

In our country there is an economic policy right now which is based on liberal values but which is accompanied by a social way of thinking which is always keen on the rate of growth, free access, transparency and fair competition.

The performance of Hungarian industry is almost on the same path as those of Europe: the Hungarian economy had been hurt by recession in a similar way as the larger countries, whereas after the recession if there was a recovery, we have also been able to achieve very good results.

As a liberal way of thinking was introduced in Hungary very early on, FDI has had a tremendous role, enabling the country to restructure industry, the whole of society. That is why we have been able to achieve these results, that the rate of growth has become quite substantial and these branches of industry could achieve very good results. Technologically, psychologically and ethically they have been able to catch up with the most developed countries in Europe. These are the automotive industry, the IT industry and a lot more even in manufacturing. As for the future, our most important goal is to try to diminish differences in regional terms, differences in rural and urban activities. This is based on R&D development, liberalization of different businesses and the potentials which are in turn based better education. That is why this Government introduced a new programme "Smart Hungary" To become smart is to differentiate between means and goals and to apply cross-benefit analyses in the policy-making process as well. Smart Hungary means that we would like to build a so-called circle of rings around those cities in Hungary where colleges and universities are. This also means that higher added value activities are to be transferred to other regions of the country, crossing the Danube, from historic Pannonia, a former province of the Roman empire, the most developed part of Hungary, in two words: East Wards.

The main role of the Hungarian Government is to tackle all the problems inherited. We would like to emphasize that as Hungarian industry is embedded into the European Union, the economies of the European Union because of FDI, the next steps should be taken in rural areas or those branches of industry where FDI and the process has been a little bit behind all the others.

Accession will help the strategic thinking of government, governmental agencies and partnerships between governmental agencies and the representatives of industry. The main goal is to try to achieve a new type of equilibrium, to introduce a new type of balance between the rate of growth and sustainability and identify new vehicles of growth in the country. The new vehicles are driven by the knowledge-intensive industries introducing new requirements for even civil servants and politicians. Civil servants' rigidity should be replaced by reform, reform-orientation, flexibility and partnership. These are the values of Europe. These are the values that we are able to build on as a common basis with our partners beyond the borders, but in Hungary, as well. We should give a new impetus to a reform-oriented Europe. Hungary has had a tradition in recent years of gradually being able to develop industrial policy, social policy based on partnership and reform.

The mission of the Summit, a very important component for regional initiatives on technological foresight for Central and Eastern European countries, launched by UNIDO, was that a mid- and long-term development vision should have an influence on governments, on universities and on technical schools, but on the business sector as well, because the relevant national and regional decision-making stakeholders have a common responsibility.

I am convinced that economic growth of our countries can be envisaged only within a framework of close cooperation. That is why this technology foresight summit is not only an event but can contribute effectively to the cooperation if it is perhaps continued on the same basis. So that is why the Government of Hungary is ready to host this important flagship of this event of UNIDO for the next years, if contributions of people will also give impetus to a common and better future of ourselves.

I would like to propose that the next years should take into consideration the question of environmental protection and industrial development because in a broader sense, environmental protection is a little bit more than protecting the natural environment what we have inherited. This involves social questions, healthcare questions as well and for technological foresight this could be one of the most important issues.

Michal Kleiber

Minister of Science, Chairman of the State Committee for Scientific Research, Republic of Poland

We need a strategy to meet the objectives of the Lisbon Declaration. We need a strategy to meet the social expectations in each country in the years to come. Rational foresighting in research and development is a key part of such

a strategy. The foresight outcome is needed not only to sort out national policies but also to send a clear message to society that we know what we aim at and that we know how to achieve the goal. Yet R&D policy in Poland in particular, but also in the whole of Europe in general, is, in fact, a real problem these days.

In the whole world approximately US\$ 680 billion is spent on R&D every year. Out of this, US\$ 380 billion comes from industry, more than half, that is healthy. Three quarters of that figure, which is more than US\$ 300 billion comes from the 600 biggest companies, most of them based in North America. That is a problem for Europe. There is an extreme concentration of resources for R&D in the world and it is mostly in the US. What makes it worse is that the concentration areas like IT, biotech and pharmaceuticals are leading areas in more than just R&D funding. Europe has so far not created a sufficient amount of new industry. A pan-European effort is very much required in this direction.

My first message is that we need to join forces in talking about foresight. Simultaneously with any foresight efforts we must create a much better climate for those who will pay the bill for any activities resulting out of the foresight indications. There is a need to create a better climate for small and medium innovative enterprises.

In order to improve the situation we need increased mobility in every sense of this word, avoiding double taxation. We need universities in Europe, which can compete against those in the US. At the moment, in spite of the tradition, they cannot compete, for different reasons.

Nowadays there is an upsurge in foresight activity and foresight has established itself as a key instrument of strategic policy intelligence. Recently, and rightly so, the term foresight is much more often used separately, instead of foresight in science and technology. This is correct, because foresight should be aimed at the growth spectrum of issues, education, services, health, environment and many others.

We need a collaborative effort of many organizations and not just a document written by a few experts on what they think is the best R&D policy in a given country. In the long-run the foresight process is much more important than the foresight product, a published report. The latter reports, for instance, are needed to indicate directions of diverse thinking, but foresight should be seen as a process. There is a need for dynamic strategy as opposed to static priorities.

Actually I have a more formal presentation but I am not going to show it to you describing some of the initiatives we have actually embarked upon in my country in the last couple of years. I do not think there is much that we can be proud of in Poland in terms of foresight activities, except that we have done quite a lot of different things. We were quite pragmatic in formulating our objectives, trying to implement them. So for those who are interested, I will be more than happy to answer questions.

Foresight is definitely a crucial instrument in strategic policy intelligence, in particular at the regional level. Regional foresight is very crucial. Foresight

researchers should be called upon to make further conceptual and methodological advances to achieve an improved understanding of foresight and to identify what foresight can and what it cannot do. Foresight practitioners should be urged to continue the quality of their work to help the proliferation of success stories and enhance the creation of further demand for foresight.

Dragan Domazet

*Minister of Science, Technology and Development,
Serbia and Montenegro*

It is my pleasure to be with you today. After 10 years of isolation we are learning to be together again and I hope we will be much closer in the future. We are opening ourselves to Europe and we endeavor to accept European standards as well. Our starting position is very particular. That is why we are looking for particular solutions and particular support.

Serbian GDP is now less than half of what it used to be in 1990. Industry lost the markets, technology is obsolete, there is no investment capital and most of the enterprises are in the privatization process. So it is difficult to do any long-term planning at the moment. New industries, private industries are emerging but are still weak. New institutions are in the process of building, a process interrupted in the last few weeks by the assassination of our Prime Minister. Now we are cleaning the country from mobs and crimes and the success in the last two weeks has been tremendous.

Serbia is looking for a long-term strategy that will solve a very difficult problem. We have an ageing problem and at the moment one employed is working for one unemployed. One unemployed is most likely a retired man or woman or someone unemployed, more than 30 per cent, a very high rate. It is not likely to be reduced fast. We want to build SMEs but it needs time and it needs investment. We need a strategy and build the environment, a legal one, a physical one, an infrastructure of institutions and we need investments and capital. Unfortunately, we do not have it enough. So it will take some time. We need a development strategy that will not give us gradual development, but a dynamic one with the growth that will be in the range on average of 7 to 8 per cent a year. So the question is to how to find and develop a model that is optimistic in this sense. We have just completed a development strategy for our industry that included 23 industrial sectors and we found that it is possible, there are solutions but it is not easy to find appropriate measures to implement, that is what we are looking for now.

We have very limited resources. For instance, for research and development in 2000, we allocated from our budget only 1.5 Euros per capita. Last year it was 5.6. This year it will be about 8. So we are increasing rapidly but, in fact, in absolute value it is far below the necessity, at least four times less than that of the accession countries. So we have very limited resources on one side and a pretty high education level on the other. We have about 10,000 researchers working at the universities and institutes but

the problem with them is that they produce high quality papers but more or less useless results for our economic development. It is our contribution to the general knowledge and that is good. We have a global role. But in our present situation it is a luxury for us to have a global role with no local role. So our task now is to find a way how to use the potential that we have in human capital and to give the mission to our research organization that the country will benefit.

We are now preparing a new science law. We are preparing a totally new law that will specify national innovation systems, set up institutions along our priorities, make our system productive and more useful, corresponding to the country's needs. But when we want to specify what the needs are, then again we have problems. How to identify needs and determine priorities? We need a very profitable industry for the economy because of this 1:1 ratio, that one employed must produce a lot of added value. That means we have to find priorities where we can produce a lot of profit in the future, in order to provide living conditions and standard of living as the people expect. We are in Europe, we are not in Africa, we are not in Asia, our people used to live much better, probably 20 years earlier. So how to find this? A technology foresight programme is needed, but not a national one, but a regional one, especially for the Balkan countries. We used to work together in the past and, more or less, we have to work together in the future. Sooner or later we will all be in the European Union, so why don't we start collaborating sooner rather than later and try to maximize our potentials together. So a regional study on technology foresight is needed. Probably we will need some technical assistance in this area and probably UNIDO is one organization that could provide us some help.

Now we are trying to establish institutions. We will work on that in order to find these priorities where we can allocate our very limited resources in order to maximize long-term results. We do not know exactly what they are now because we have not done a foresight study, but this is something that we are looking for and that is why I am here. Thank you.

Ali Coskun

Minister of Industry and Trade, Republic of Turkey

The future of Europe, especially in terms of global competitiveness is strongly dependent upon the success of the enlargement process. Thus, both EU members and countries of Central and Eastern Europe should not only be aware of the opportunities but also overcome the difficulties. That is to say, the accession countries should face globalization and integration.

Discussions on the regional aspects of EU enlargement and the feasibility of regional foresight studies are gaining importance. Technology has become the key factor in competitive advantage of nations as well as in competition among firms. Therefore, the countries having superiority in science and technology are progressing towards dominating the world economy. In this respect,

in improving the scientific and technological abilities of candidate countries and creating a community that can distinguish itself in this field shall be our primary strategic choice. As a tool for science and technology policy-making, Turkey attaches great importance to the technology foresight exercise and appreciates the work that has been carried out until today.

The technology foresight exercise constitutes the background of our Vision 2023 Project which lays down the technological goals to be realized by the hundredth anniversary of the Proclamation of the Turkish Republic and this project involves three more sub-projects which aim at collecting data on the current science, technology and innovation capacity of the country.

It is a great pleasure for us to mention that the training seminar on technology foresight for the Black Sea Economic Cooperation countries and the newly independent States will be organized in Ankara from 20 to 24 October 2003 by the Turkish Government in cooperation with UNIDO. The objectives of this training seminar are to provide basic knowledge on available technology foresight methodologies, application of technology foresight tools and strategic decision-making as well modalities of the implementation of technology foresight initiatives.

Enlargement is already a reality for industry and has opened up many opportunities. The challenge in the candidate countries is to develop the skills as well as the institutional and business framework that will enhance the ability of local companies to successfully integrate into international product networks.

To take the automotive industry in Turkey as an example, it is a strategic sector, having remarkable contribution to the economy in terms of the chain effect, direct investments, national production and development, employment and technology level. Motor vehicle exports have exceeded 260,000 units in the year 2003 which constitutes 7 per cent of the total exports of Turkey to the European Union.

Turkey is taking a number of important measures for sustainable competitiveness of our industry as a whole. These include policies which would ensure that Turkish industrial advisers, domestic resources, produce in compliance with environmental norms, use high quality labour, apply modern management concepts, increase R&D, create original designs and trademarks and thus improve efforts in the international markets.

I would like to stress one more time that the main target of the Turkish Republic is to become a member of the modern nations' family. To achieve this goal, Turkey has spent huge efforts and realized a big transformation from every aspect. The most important of these efforts is to become a full member of the European Union. In this context, Turkey applied for full membership on 14 April 1987 based on the agreements creating an association between the Republic of Turkey and the European Economic Community.

The Customs Union decision between Turkey and the European Community has been enforced since 1 January 1996 and it foresees the free circulation of industrial goods between the European community and the Turkish customs areas with the elimination of tariff and non-tariff measures.

Although accession of Turkey to the Customs Union, without being a member State, had negative effects for the trade balance, it has brought brand and quality focus to our industry by the liberalization of the economic legislation and adaptation to the EU norms.

Brigita Schmögnerova

Under-Secretary-General, Executive Secretary of the United Nations Economic Commission for Europe

What will be the implications for the environment of our industries after the accession countries become EU member States? What type of policies are they going to undertake after EU entry? It is important to understand that the economic environment for business will very definitely change in two ways. In some ways we will benefit from that, because we will have a more competitive stable environment and after EU accession there will be no fiscal instability, while there are some problems with the lack of a little flexibility between stability and growth.

At the same time, all accession countries will benefit from the EU structural funds, which will improve infrastructure for the business sector. At the same time there could be some increase of FDI. Businesses will benefit from the increased market and especially large companies who will benefit from the economies of scale.

On the other side, there will be new challenges and new costs and we will have to deal with that. Competition will increase to some extent and that will be beneficial, because business companies will have to respond and at the end of the day it will contribute to the decline of prices. But at the same time, on the day of entry, businesses will have to cope with some increases of costs, of considerable and gradual growth of wages. The response to this would have to be the increase of labour productivity.

Most of the accession countries expect appreciation of the exchange rate and again, there is no other response if we do not want to lose our competitiveness, but the increase of labour productivity, trying to close the gap in productivity which is still there. The companies will also have to comply with all regulations and standards, the transition in some areas will continue which means the adoption of all unnecessary standards and at the same time, the most costly standards of all, which are the environmental standards.

What will the Europe, the European Union be like, what will we become a part of and what will be the challenges? For the accession countries the implementation of the Lisbon Strategy, becoming part of the most competitive region in the world, is definitely a very challenging task. So far the acceding countries lag behind very considerably. The Central European countries will all have to work really hard in order to reach higher levels of personal computers per 100 people.

There is a need for the restructuring of the R&D sector but the accession countries which are a little bit more advanced really do have experience in

substantial decrease of both investments in the R&D sector but also in personnel, like scientists, researchers, etc. For comparison, investments in R&D in the EU 15 is 1.94 per cent of GDP, the target is 3 per cent of GDP by the end of 2010. But in the most advanced accession countries, like in the Czech Republic is 1.33 which is relatively high, but in Slovakia it is 0.67, in Hungary it is 0.80 so there is still a need for substantial increases of investments. This is not only about R&D investments in accession countries, but the whole of EU 15 lag behind, if compared to the US.

We discussed this afternoon the importance of investing and promoting SMEs and this is part of the Lisbon reform agenda with the focus of promoting especially SME growth, not in traditional industries but in the most advanced industries especially in research, development, in e-business, etc.

It is worth to mention another factor that is definitely part of the Lisbon agenda, the efforts of sustainable development, underlying the importance of technology for sustainable development. It is not only technology for the improved environment which we are most familiar with, but it is also the advancement of technology for other dimensions of sustainable development, definitely economic growth, but also social development and the improvement of health education, but also for the increase of social cohesion in this region. We have to understand that becoming part of the EU we will have to try to comply with the new efforts and initiatives of the European Union but at the same time we will benefit, not only from the funds but also from the experiences, expertise from the best practices implemented in the EU 15.

Carlos Magariños

Director-General, United Nations Industrial Development Organization

Nobody knows better what has to be done in a country than the authorities, the private sector and civil society. We are working in international organizations, we are very conscious that nowadays increased productivity is demanded of us and all these topics should be linked with concrete demands and needs of the member States.

What we are trying to learn is how to improve UNIDO interventions with these interactions in order to be more meaningful and relevant, to generate popular support for the economic reform programmes implemented in your countries, to improve the living conditions of the people.

I had the opportunity to work as Minister in my own country, in Argentina, at the beginning of the 1990s. I remember the paradigm at the beginning of the 1990s that if we open the economy and achieve fiscal balance, we will achieve integration in the world economy, foreign direct investments will flow and we will grow sustainable, spreading the benefits all throughout the society. There was also the feeling that market-oriented policies and democracy reinforced each other. Last Monday, I was invited to the opening session of the Inter-American Development Bank Annual Meeting in

Milan and it was striking to see the comments of the Minister of Finance of Latin America blaming all those policies that we implemented voluntarily at the beginning of the 1990s.

What is wrong? Is there something wrong with the policy itself? Do we need a new paradigm, a completely new one? I do not think there is anything wrong in having open economies and fiscal balance. The trick is to define a new paradigm that takes into account the reasonable and good policy advice we received during the last decade, while building a new set of policy recommendations because certainly we do need a new set of policy recommendations. It is enough to look at the extremes of the last wave of candidate countries to the European Union, currently the newest members of the European Union, namely Spain, Ireland, Greece and Portugal. Not all of them had the same success in converging towards the per capita income levels of the European Union.

The problem is basically, in our view, about productivity. If you compare what happened during the 1980s and the 1990s in the OECD countries, you will see that productivity, total productivity as an annual average, grew at the rate of 1 per cent during the 1980s and 1.4 per cent during the 1990s.

If you go to East Asia, then productivity grew at the rate of 3.6 during the 1980s and 1.6 during the 1990s because of a financial crisis at the end of the 1990s, 1997 onwards. Then look at what happened in Latin America. During the 1980s, productivity decreased at the rate of 1.4 per cent, while there was an improvement in the 1990s when productivity grew at 0.6 per cent. But that explains precisely why, at the beginning of the 1980s, we all thought that Latin America was converging in terms of per capita income to the OECD countries while East Asian countries were fading away. And what happened later, was exactly the opposite. The explanation in our view is basically this performance of productivity.

Do we know what is going on in productivity terms here in Central and Eastern Europe? Do we know what will be the result in terms of productivity improvements after the accession? Because in all the countries, even in Ireland, a country that did well, improved per capita income, converged towards the average of the European Union, there were many people doubting whether it was a good business or not to enter the European Union and there is a lot of sectoral interests and people's concern that we have to address. That is why we organized this panel because we do want to know more, over and above the political rhetoric. What will be the practical result of accession in terms of employment, exports and growth for these countries? Basically we believe that integration and enlargement of the European Union is an excellent and extraordinary tool to deliver prosperity, peace and security to all these parts of the world.

The discussions you had these two days here will help us to shape even more and better our programmes for the region, renovate the way we have been advising member States in these regions and given a renewed support to the activities related to industrial development in Central and Eastern Europe. We have been shifting from an old model of industrial policy to a

new one and I think the conversations we had were extremely useful for improving our approach.

Last year, environmental-related programmes accounted for 52 per cent of technical cooperation in UNIDO. So we do believe that the remark made by Mr. Csillag is extremely relevant and we do take into account his comments.

Let me conclude by proposing to set up a working group that could give us this renewed information about productivity performance. Maybe we can do that with the United Nations Commission for Europe and with other regional institutions. We consider that an important task to be performed by an agency like UNIDO, helping real people to solve real problems in concrete terms.

Adriana Ticau

State Secretary, Ministry of Information Technology and Telecommunications, Romania

The European Union should become the most competitive region and it should have a knowledge-based economy. Actually a lot of countries have a lot of knowledge but very few of them have a knowledge-based economy. In order to have a knowledge-based economy, it is very important to be able to produce knowledge, to share knowledge and to use the knowledge. Each government should provide the necessary regulation to liberalize the different markets, and also to develop and to encourage entrepreneurship and competition. As an example, only in the telecom field monopoly should disappear. Only very rich countries should or can afford the monopoly.

I am sure that all candidate countries have a lot to provide to the European Union, especially in the technology field. The use of the Internet and those public services to be provided also through electronic means should also be a very important way to provide and produce and to use the knowledge.

In order to be able to be integrated in the European Union, we have to, all of us, think big and to act fast. Each government should invest in research and should participate in the European programmes, should promote foreign direct investment and should develop a common long-term strategy.

Ales Mihelic

State Undersecretary, Ministry of Economy, Republic of Slovenia

I will speak about the role of government and what we are actually doing to prepare our industry for entry into the European Union. The first role of our government and of the competitiveness and entrepreneurship policy of every State is to support growth, which should be stable enough to guarantee the future development of the country and also the citizens' well-being. One of

the problematic topics is that priorities or priority directions have to be defined. In this field some structural gaps or mismatches exist. For example, in Slovenia, 45 per cent of the State tax goes to agriculture and if we ask whether Slovenia is an agricultural country, we will all agree that it is not. We are actually, we want to be a knowledge-based society.

Based on the different analyses, international and national technology mapping setting all current status and societal framework, we have defined our programme for entrepreneurship and competitiveness up to the year 2006 where knowledge for development is the key priority, increasing the competitiveness of enterprises. The second one is creating a stimulating environment for innovation and entrepreneurship.

The third one (is to create conditions for improving competitiveness). Sometimes it is very difficult to persuade even the people in government that these goals are the right ones. So we deliberately, by pointing out different problems which we have, have been able to create such a critical environment or view of society in Slovenia on different issues that even resulted in, a competitiveness scoreboard. The result of this critical mass of opinion in Slovenia resulted that we are in 38th place and, for example, with one indicator which is technology transfer from the university into industry, we are actually at the last place. We want to reorient our sciences towards the industries so we are deliberately putting this issue in front. But if you look, for example, for firm analyses based on firm date, for example, World Economic Forum, we are in 27th place so this means much higher. But nevertheless, all-in-all, we are thinking that we should develop in a further direction, we should learn to work together so this means we are now starting the clustering process, we are actually encouraging companies to be part of framework programmes. We are trying to introduce venture capital and build an infrastructure which will support productivity and innovation.

One of the last things, you know that in Slovenia we are relatively good at measuring the GDP for R&D, 1.51, from this 0.71 from the State and 0.8 from industry. We can set our goals that we want to achieve: 3 per cent by 2010. You can be sure that from the governmental side it is not a problem, 0.3 per cent of the GDP can be achieved in this period. But the most problems will be on the industrial side, so this is also one of the reasons why we are encouraging the dialogue and the view that there is not enough transfer of knowledge into our products. But by doing this we actually want to stimulate the Slovenian knowledge-base, it will come into our products so that industry will be much more interested in investments into R&D.

Slovenia is generally considered as one of the best developed CEE countries or best prepared for entry into the European Union. But when measuring costs against the most competitive European countries, we see that actually we are lagging behind. In 1999, we were 27.4 behind the best developed countries and in 2002, we were actually 45 per cent, so this means that there is still enough place and there will be enough drive from the government and also public opinion that we will manage to achieve the goals which we set until 2010.

Pavel Vacek*Ambassador of the Czech Republic to the United Nations Office at Vienna*

The Czech Government recognized the need for a systemic, comprehensive and integrated approach to R&D only relatively recently. The first half of the 1990s, the period of laissez-faire economy and of coping with the consequences of the split of the Czechoslovak federation was not too conducive to firmly incorporating Technology Foresight into governmental policies. The difficulty of transformation and fiscal austerity of the second half of the 1990s deferred the formulation and pursuance of a coherent policy in this field. The absence of a comprehensive national programme could be addressed only around the turn of the century and the input from the EU and OECD, as well as the expertise from United Nation bodies and agencies, including UNIDO, were very helpful both substantively and politically.

It should be also noted that the expenditures of the state budget devoted to R&D, in proportion to the GDP, have been lagging behind the Government objectives (the objective of 0.7 per cent for 2003 not attained). Another issue related to the resource side of the problem is the ratio between state and private funding of R&D—EU candidates generally has a higher proportion of the state budget funding of R&D as compared to the private funding than EU members. This does not say anything about the absolute sums devoted which are insufficient. Further decline of the share of private sector in funding R&D would undoubtedly have a negative impact on the overall competitiveness.

As part of its efforts to do better in R&D the Czech Government initiated the first national Technology Foresight in 2001. Generally, the main objective of the exercise was to identify the most important technologies (research priorities) likely to be demanded by the Czech industry and the service sector over the next 10-year period (till the year 2010).

The research priorities have constituted the thematic basis for the new National Research Programme (NRP), which should contribute to the achievement of strategic goals in the key sectors important for the national wealth creation and for the improvement of the quality of life while optimally using the public fund for research.

The government delegated the responsibility for the exercise to the Ministry of Education, Youth and Sports (MEYS). Based on results of a public tender, the Technology Centre of the Academy of Sciences in cooperation with the Engineering Academy of the Czech Republic were entrusted by the MEYS to manage and coordinate the technology foresight exercise.

A thorough survey of the Foresight projects conducted in other countries was carried out to devise a project methodology corresponding to the objectives of the exercise and suiting the local environment. The work of expert panels was a principal methodological component, proceeded by interviews of the users of research results and by detailed SWOT analyses of application sectors.

The exercise resulted in a proposal of a set of priorities of programme-oriented research in the Czech Republic, as well as in recommendation of

systemic measures and a proposal for the implementation of the NRP together with methodology of its operative management.

The proposed NRP consists of five thematic programmes divided into 19 thematic sub-programmes which include 90 key research directions (national research priorities):

- Quality of life
- Information society
- Competitiveness and sustainable development
- Energy for economy and society
- Modern society and its changes

The National Research Programme further includes three cross-cutting programmes divided into 19 cross-cutting sub-programmes (providing also for systemic measures):

- Human resources
- Integrated R&D
- Regional and International Co-operation in R&D

The management and implementation of the NRP will have to conform with the Act on Public Support to the Research and Development (approved by the Czech Government) of 2002. After the expected approval of the NRP by the Czech Government in April 2003, the first calls of the new National Research Programme should be launched in January 2004. It is assumed that NRP will gradually encapsulate most of the research programmes operated by individual ministries (state agencies so far). In 2005-2006, the NRP should provide about 80 per cent of total R&D public budget allocated to the project-type financing in the Czech Republic.

The Czech Republic has willingly opted for sponsoring the whole of Module II (for methodologies) within UNIDO's Regional Initiative on Technology Foresight for CEE/NIS. The hope is that an increased international engagement will generate more domestic interest in Technology Foresight. The key event under Module II will be a training seminar "Technology Foresight for Practitioners" to be held in October 2003 in Prague. The event has been organized by the Technology Centre of the Czech Science Academy. The purpose is to provide information to those directly involved in government planned and financed R&D and Technology Foresight processes and also to provide opportunity to learn from the mistakes of others.

Leading international experts were invited to deliver their expertise in the five-day training workshop. The main objective of the course is to provide participants from Central and Eastern European Countries and the Newly Independent States with guidance and practical hints for designing and conducting national and regional foresight exercises.

The practically oriented course will provide participants with the knowledge of foresight tools as well as hands-on experience in applying such tools and methodologies to address strategic questions and decisions such as:

- What technologies are likely and desirable to be dominant in national or regional economy?
- What priorities should feature national research and development programmes?
- Where should the budget for publicly funded research and development be allocated?
- What skills and competencies should be developed for the future?
- What will be the demand of society for industrial products, services, food, shelter, health, education, lifestyle and welfare over the next 10-15 years?

Additional information on the course is offered through the course promotion leaflets available to the participants of this Foresight Summit.

To conclude, the Czech Republic considers the technology foresight an important tool for strategic thinking. Foresight plays an important role in identifying possible futures, imagining desirable futures and defining strategies. Results are of principal interest to the public decision-making sphere. Thinking, debating and shaping the future is even more essential today because of the complexity of science, technology and society inter-relationships and the scarcity of financial resources.

Peter Ondrejka

*Director, Department of Strategy, Analyses and Policy,
Ministry of Economy, Slovak Republic*

The Slovak Republic obtained an official invitation to be a member of the European Union in December 2002 at the summit in Copenhagen. The real membership will become reality in May, 2004. I would like to stress that economic integration had started several years ago, since the year 1991. In this year, we had begun transformation of society and the economy from a central planned economy to a market driven economy. In 2002, the private sector contributed 86 per cent of the GDP. Nowadays, privatization of the manufacturing industry has been completed and privatization of banks and the energy sector is almost completed. Thus, integration of the Slovak economy into the EU in 2004 will not cause any serious problems for our citizens and enterprises. On the other side, the Slovak economy is confronting a period of high unemployment, about 19 per cent, and very high regional differences in unemployment, between 5 and 35 per cent, a high deficit of foreign trade, of the current account of the balance of payment, about 8 per cent

of the GDP, as well as insufficient FDI inflow. Slovakia has not achieved its full potential yet and it is behind its immediate neighbours in economic growth and prosperity. The challenge for Slovakia is to increase the level of FDI, not related to privatization and to reach the level of FDI comparable to the Czech Republic, Hungary and Poland. Nowadays, we are pursuing a new national strategy for attracting strategic investors to Slovakia aiming to encourage the existing investor and fix as many high value activities as possible from new investors. The sectors to which priority will be given over the next four years are as follows: automotive industry, information and communication technology, R&D development, health care, engineering, business services. I hope that the new strategy will help us to attract new investors.

In conclusion, I would like to say that the Slovak Republic has the potential to be a successful member of the European economic system.

George Michaelouides

Ministry of Industry, Commerce and Tourism, Cyprus

Cyprus is a tiny island with a population of less than one million. It has belonged to the European family culturally and politically for many centuries now. It has been running a free market economy for a few decades. We do face problems regarding the manufacturing industry. We have drafted a new industrial policy to cater for these problems which are basically problems related to competitiveness due to nature and some structural problems that nature and history and the way the manufacturing industry has evolved. Through this new industrial policy, we are attempting to create and develop a high-tech industry taking into account the very high percentage of university graduates that Cyprus has and the cooperation we do have with many European and US universities. We are employing a programme for the creation of new enterprises through the operation of business incubators, which we have just started, and hope that they will operate smoothly.

As regards our integration with the European Union, and what Cyprus has to offer to the Union, not only what Cyprus has to get from the Union, the highly educated workforce, it is one of the assets that I believe will be very valuable for the growth in general in the European Union. The geographical location of Cyprus and the excellent infrastructure is another asset that I believe would be very useful for Cyprus being at the opposite edge of the European Union. We have something in common with Ireland. Ireland is on the western edge, we are on the eastern edge, so there is plenty of scope of cooperation with the Middle Eastern countries and I hope that FDI will be developed in our small State.

Part four

**Conclusions and
Recommendations**

Technology Foresight

Addressed to Governments

New role of governance

The most important message of the Summit for governments in Central and Eastern Europe and in the Newly Independent States is that the transition from a centrally planned economy into a free-market does not decrease, just modifies the importance and role of the state. Integration into the European Union makes the situation even more delicate. Attracting foreign investment and technology on one hand and supporting competitiveness of local enterprises on the other, are among the most difficult tasks. Enforcing the introduction and monitoring the implementation of environmental protection measures; and to try to avoid new ecological risks related to the opening of their economies may be costly, but are nevertheless obligatory tasks.

Human resource development

The traditional education system constitutes a strong base for future development of the innovation capacities. However, some indicators related to human resource development show much worse picture in the CEE countries than in the EU. Vocational training and life-long learning systems in particular seem to be less developed, may give cause for serious concern. The market actors are not reacting effectively to these challenges in the region's societies, so public actions are needed to stimulate efficient reactions. The paramount role of knowledge society in the global competition raises the need for proper measures, including legislation, in the field of the information and communication technology and the fight against the digital divide.

International cooperation

One of the most important lessons drawn from the various panel discussions is that in spite of the fact that the majority of the countries in Central and Eastern Europe and in the Newly Independent States face the same or similar problems (for example in the agro-food sector, or in the field of information and communication technologies), and are dependent on each other (for instance environment, or transport/traffic, not to mention migration) the

cooperation between them including the contact between academic and R&D institution is surprisingly weak. By entering into the global market, the accession countries became competitors of each other on the food market in particular. Prudent cooperation among them is badly needed. Foresight cannot replace but may enhance the inclination for various forms of cooperation. As most CEE countries are relatively small and have not accumulated much experience with foresight, the available assistance of international organizations may be a valuable contribution to their social and technical/technological development. UNIDO's regional initiative in Central and Eastern Europe and the Newly Independent States (similar to the various possibilities in the Framework Programme 6 of the European Union together with the current projects and programmes of DG-RTD-Unit K2 supporting Foresight activities) may be instrumental in raising awareness and building capacity by organising expert meetings and conferences, conducting of studies, mobilizing financing mechanisms, defining counterparts and creating the coordination mechanism.

Addressed to Business Community and Industry

Foresight at corporate level

Developing scenarios for a company is a learning process, which best takes place in form of a strategic debate. In our highly dynamic and complex world, guidance by scenarios in the decision process is the best means to navigate a company securely through uncharted waters. Common longer-term thinking exercises between enterprises and their closer regional public and private environment may have a mutually beneficial effect and contribute to building a real democratic and transparent governance within the region.

Innovation capability

The financial and trade integration of the CEE nations did not result in an automatic integration in production, and it has not led to integration in technology development at all. The economic upgrading of these economies based on foreign direct investment (FDI) may reach very soon its limits as a result of lacking domestically generated R&D and technological knowledge. It is not hard to estimate that both the quantity and quality (focus and level of value-added activities) of future inward FDI in CEE will to a great extent depend on both the absorptive capacities and innovative capabilities.

Regional specialities

On enlargement Europe will be by far the largest common consumer common market. Products of the CEE region may have a comparative advantage

in trade with the EU. New markets for agricultural and food specialities, industrial products, or tourism may open—however for both directions.

Addressed to Research and Development Institutions

Innovation capability

The knowledge creation is generally worse positioned in the region than expected. Especially knowledge closely related to the market seems to be poorly generated (low level of business expenditures of R&D and patenting). The R&D supply is very modest in almost all the CEE countries. The public R&D systems have been marginalized and the national systems of innovation have become much more fragmented than before the political changes.

Basic research capability

Assessment, priority setting and financing of basic research projects and institutions is a delicate issue everywhere. The generally declared lack of funds in CEE countries is only partly justified, because there is always a variety of globally accessible funds—for attractive projects. The real problem is the obsolete way of thinking, managing—even in institutes with traditionally a good reputation.

Applied research, technical and technological development

With the disintegration of the former East European market, the big companies have lost their traditional export markets and either went bankrupt or fell apart into small or medium size enterprises—fighting for survival. By similar domino effect the traditional R&D institutions of certain industries (including those of the agro-food sector) also disappeared or lost their importance. However, the remnants of these institutions and human capabilities could be useful if revitalized by new entrepreneurs and venture capital investors.

Addressed to Civil Society

Governance

The appearance of civil organizations and public expression of individual opinion is a new phenomena in CEE and NIS. The role of the recently emerging non-governmental organizations is becoming more and more important. Their contribution is essential—albeit sometimes controversial—to building

a truly democratic society. Conflicts with traditionally deeply rooted organizations (be it political, religious, professional, scientific, etc.) may pave the way to future forms of governance. One of the prominent role of civil organizations is to highlight the environmental and technological issues in social and political life. They perceive their role to be vigilant of new threats to environment from side effects of technology development. In order to reach longer-term public acceptance, civil organizations will tend to use properly founded, reliable argumentation and data. Foresight programmes can help this exercise.

Regionalism

In the enlarged EU, the role of sub-national regions, that is areas where the essential criterion is geographical proximity (rural communities, town and city regions, historical regions marked by specific economic activities or cultural identity, autonomies, counties, provinces, including cross-border regions) is steadily increasing, thus gradually lessening the hindrances of political borders. Regional foresight can stimulate this process.

General Comments

The Summit with its multi-topic foresight panels and the ministerial round table was the first as such in the history of the foresight field. Its concept is a pioneer venture in Central and Eastern Europe.

The UNIDO Regional Technology Foresight Initiative for Central and Eastern Europe and the Newly Independent States was welcomed by the audience. For the future of accession countries the transborder cooperation of smaller regions may be useful, especially if they use the assistance and guidelines to regional foresight of the European Commission (DG RTD-K2). The principle of "variable geometry" should be followed: the current EU member States and accession countries can address certain challenges together, while other issues are best tackled by various groups of the accession countries. The overlapping of regional and enterprise levels of foresight may result in successful synergic.

Another, more ambitious, and more difficult aspect of international cooperation would be to conduct joint programmes on issues which go beyond the national boundaries, such as the upcoming enlargement of the EU, its global competitiveness (i.e. the success of the Lisbon strategy), environmental challenges. These could help to overcome potential gaps as well as to remove other obstacles to fruitful decision making. New methods should also be developed and tested to accommodate wider participation. Foresight programmes should be carefully designed in terms of their scope, goals, methods and participation. International cooperation is extremely useful for sharing information, exchanging experience, comparing methods and achievements,

i.e. learning from each other. The envisaged annual Summits represent good opportunities for that. Foresight has now reached a point, at which different approaches can be compared to highlight "good practices": what has worked in certain circumstances (level of development, challenges and hence policy aims), and thus what set of tools and approaches are likely to be useful in different environments. As a satellite event of the Summit, the Workshop "Regional Foresight for Country Guide" has been organized within frame of the European commission ForeTech programme for CEE participant countries in the eForesee and ForeTech projects. The joint timing of this Workshop and the Summit proved to be reciprocally useful and a good example of cooperation between foresight practitioners participating in different foresight-related projects. Its regular repetition seems to be desirable. The number of various foresight and related activities raises the question of the parallel activities, including the possibility of unnecessary overlaps. Harmonization and coordination of the foresight initiatives and supports of various international organizations are suggested. Recommended issues for future international foresight conferences are:

- Environment;
- Agriculture and food industry;
- Information and communication technologies.

Together with cross cutting ("horizontal") topics such as:

- Integration and globalization;
- New role of state and societal aspects;
- European regionalism.

Biotechnology

Within a wider context of technology foresight, biotechnology is a case study of paradigmatic change in science, technology as well as industrial applications. The Biotechnology component of the Summit provided a broad overview of biomedical, agro-food and environmental biotechnology with an emphasis on the Central and Eastern-European region.

The goal of the component was to help governmental, industrial and scientific decision makers to formulate and strengthen their vision on the options of biotechnology, as well as to formulate recommendations that may facilitate the development of biotechnology in the region.

The meeting concluded that biotechnology is a true success story of the last 20 years. The successful conclusion of the Human Genome Project, the advent new DNA-based diagnostic tools, development of DNA-chip technology, the new drugs produced by recombinant DNA-technology, advances in stem cell research, advances in pharmacogenomics, GMO crop plants etc. constitute

major technological advances that influence the life quality of mankind on a global scale. They also had the proved that potential of knowledge-based industries to keep well-trained working force within a country. The history of biotechnology illustrates, on the other hand, that exaggerated economic expectations and public acceptance problems may hamper the development of new technologies. It was felt that public acceptance may crucially depend on a balanced approach to public awareness, regulatory measures and the harmonization of company policies with the cultural milieu. Insufficient information, combined with unbalanced media reports and with the campaigns of activist groups, may give rise to a negative attitude on the part of the public. Education at all levels may substantially facilitate the spreading of new technologies.

Based on the above, the meeting formulated a number of recommendations for governments, the business and R&D communities as follows:

- *Education and research.* Countries that are presently weak in industrial research, especially in a knowledge-intensive field such as biotechnology, should invest in scientific education at all levels, primary, secondary, university and post-graduate. It is essential that these resources be allocated in a merit-based, transparent manner and that the system be perceived as such also by the public. Scientific research should also be considered as an educational resource, financial contributions to university-based research should also be seen in this perspective. Maximum emphasis should be placed on scientific excellence. Countries of the CEE and NIS region must place special emphasis on measures intended to keep the scientific workforce at home, and to lure back successful scientists to the region. In order to decrease the dependence of the developing countries, it is essential to educate and keep at home a sizeable technical and scientific elite in these countries, that is able to apply the benefits of biotechnology according to the home country's specific needs.
- *Regulations.* New technologies require sound and transparent regulations. The rules should be clear and should be enforced, there should also be an efficient and transparent system to change them when they become obsolete. The regulatory systems must be able to deal with various applications on a "case-by-case" basis, carefully analysing the merits and risks of each application. Biotech industries can benefit from a coherent, stable, enabling, science-based regulatory framework. In general, an efficient and legally secure regulatory framework, and a simple and internationally accepted patenting system may be crucial for the biotech companies wishing to enter the international stock market.
- *Economic measures.* Governments can help the development of biotechnology by creating a favorable and enabling economic environment, and this was considered safer as well as more important than direct

governmental financing of biotechnology. Intensive collaboration of academia and industry is considered a major novel element of biotechnology. Such collaboration can and should be facilitated via such measures as incubators, professional associations, but a direct and indiscriminate funding of collaboration between academia and industry may be counterproductive. Biotech companies are young, innovative and knowledge-based enterprises that may need specific measures in terms of tax exemptions. Development of biotech industries can benefit by the establishment of a limited number of strong habitats where the specific needs of starting companies can be secured.

- *Consumer and civil society acceptance.* It is crucial that the society at large be given proper and up-to-date information on the novel technologies as well as on their regulation. Scientists, R&D managers and government officials have to communicate efficiently with the general public as well as the media regarding new technologies, their potential risks and the necessary regulatory and safety issues. Proper—scientifically sound—communication is especially important for the third world, where the potential benefits of gene technology could be very significant. In this respect, international organizations may provide unbiased platforms that can help governments to harmonize research, education, economic and safety measures concerning new technologies in such a way that tradition and personal choice as well as the interests of industrial development are respected.

Ministerial Round Table

The ministerial round table achieved the following conclusions:

- The risks and the costs of a divided Europe would by far outweigh the risks and the costs of a united Europe.
- The participant governments, which would be members of the EU, are guided by the EU's Lisbon decision to make the EU the most competitive and dynamic knowledge-based economy in the world capable of sustainable growth with more and better jobs and great social cohesion and to allocate 3 per cent of their annual budget to R&D.
- Science and research are good and advanced channels of integration where substantive and quick cooperation results can be achieved because of the universality of science.
- Countries having superiority in science and technology are progressing towards better positions in the world economy in the future. Improving the scientific and technological capabilities of candidate countries and creating a community that can distinguish itself in this field is the primary strategic choice.

- Technology has become the key factor in competitive advantage of nations as well as in competition among firms.
- There is a need for universities in Europe that can compete against those in the United States.
- In the accession countries there is a need for the restructuring of the R&D sector but their recent experience has been in substantial decreases of both investments in the R&D sector and in personnel, scientists, and researchers.
- A highly educated work force will become an ever more valuable asset for every country.
- The EU 15, when addressing problems of a shortage of labour, have to be careful not to rely on workers expected from other parts of Europe, because when and if they succeed to improve at home their standards of living and their career chances, they will prefer to stay at home than migrate.
- There is general agreement that integration and enlargement of the European Union is an excellent and extraordinary tool to deliver prosperity, peace and security to accession countries, but the practical results of accession in terms of employment, exports growth and particularly productivity improvements will determine success for these countries.
- Many countries have a lot of knowledge, but very few of them have a knowledge-based economy.
- There is an upsurge in foresight activity and foresight has established itself as a key instrument of strategic policy intelligence, in particular at the regional level, which is deemed crucial.
- In the long-run the foresight process is much more important than the foresight product.

The statements and discussions of the Ministerial Round table resumed the following recommendations:

- Compliance with the Maastricht criteria is important, but economic growth should also be a key consideration and should be included in planning future policies. It is not just zero deficits in federal budgets, it is economic growth that will push affected countries into the future. Problems such as poor labour markets and high unemployment cannot be solved without economic growth.
- Accession countries and their industries will have to balance the advantage of declining prices as a result of increased competition and the challenge of increased costs and growth of wages by increasing labour productivity.

- The Director-General of UNIDO suggested the creation of a working group to provide updated information about productivity performance of the countries in the region.
- European decision-makers should be more open for initiatives for scientific and research cooperation coming up from transitional countries, such as funds for mobility and funds for researchers.
- Governments should pay much more attention to education keeping in mind that investment in education is an investment in the future.
- With the help of foresight as a tool, governments should strive to develop dynamic strategies as opposed to static priorities.
- Foresight researchers should be called upon to make further conceptual and methodological advances to achieve an improved understanding of foresight and to identify what foresight can and what it cannot do.
- Foresight practitioners should be urged to improve the quality of their work to help the proliferation of success stories and enhance the creation of further demand for foresight.
- A technology foresight programme is needed, but at the regional, not only at the national level, especially for the CEE/NIS countries, which used to work together in the past and will have to do so again in the future. All ultimately future EU members, they could start collaborating now maximizing their potential and pooling limited resources.
- There was agreement between the two co-hosts that future Technology Foresight Summits should address issues of the interrelationship between environmental protection and industrial development in the broader sense, involving social and healthcare questions.

Annexes



Annex I. List of Participants

Mr. Matej Adam
Life Sciences
IBM CEMA
148 00 Prague, V Parku 2294/4
Tel: +420737264001
Fax: +420272131452
e-mail: matej_adam@cz.ibm.com

Mrs. Helena Acheson
Divisional Manager
Forfas
Wilton Park House, Wilton Place,
Dublin 2
Tel: +353 1 607 3019
Fax: +353 1 607 3260
e-mail: helena.acheson@forfas.ie

Mr. Juan Lauro Aguirre
Executive President
Council for Technological and
Scientif Development of the State
of Nuevo Leon, Mexico
Greco 727 Col. Contry, Guadalupe,
N.L., 67173
Tel: (5281) 8625 6173
Fax: (5281) 8625 6098
e-mail: juanlauroaguirre@aol.com

Mr. Tibor Adler
First Counsellor for Science and
Environmental Policy
German Embassy, Budapest
H-1014 Budapest, Úri u. 64-66.
Tel: +36 1 4883500
Fax: +36 1 488 3505

Mr. Allardyce Alex
Director of Marketing, Chemaxon
Bazsarozsa ut 29, H-1141, Budapest,
Tel: +361 363 4254
Fax: +36 1 363 4254
e-mail: aa@chemaxon.com

Mr. Karel Aim
Member of the Academy Council,
Chair of ICPF Scientific Board
Academy of Sciences of the Czech
Republic
Inst. Chem. Process Fundam.,
Acad.Sci., Rozvojova 135, 165 02
Praha 6-Suchdol
Tel: +420 220 390 300
Fax: +420 220 920 661
e-mail: kaim@icpf.cas.cz

Mr. Andrzej Aniol
Deputy Director for Research
IHAR—Plant Breeding and
Acclimatization Institute
Radzików 05-870 Blonie
Tel: +48-22-7253611
Fax: +48-22-7254714
e-mail: a.aniol@ihar.edu.pl

Ms. Géza Ambrus
Chief Executive Officer
Recomgenex Biosciences, Ltd.
33-34 Bem rkp, Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: ambrus@recomgenex.hu

Mr. Andy Bailey
Manager Global Pathogen Safety
Baxter BioScience
Benatzkygasse 2-6,
A-1221 Vienna, Austria
Tel: +43 1 20100-3868
Fax: +43 1 20100-3890
e-mail:
andy_bailey@baxter.com

Mr. Péter Aranyi
Vp, R&D
Chinoin Ltd.
Tó u. 1-5, Budapest, H-1045
Tel: 3690712
Fax: +36 1 3601226
e-mail:
peter.aranyi@sanofi-synthelabo.com

Mrs. Vera Bálint
Senior Councillor
Ministry of Foreign Affairs
H-1027 Budapest, Bem rakpart 47.
Tel: +36 1 458 1946

Mr. Raghbir Bains
Emea Discovery Solutions Executive
Leader
IBM
PO Box 31, Birmingham Road,
Warwick. Warwickshire.CV34 5JL
Tel: +44 1926462002
Fax: +44 1926462535
e-mail: bainsr@uk.ibm.com

Mr. Vasile Baltac
President
ATIC—Information Technology
and Communications Association
of Romania
167, Calea Floreasca Sector 1
72321-Bucharest
Tel: +40 21 2321908
Fax: +40 21 233 1877
e-mail:
vasile.baltac@atic.org.ro

Mr. Tamás Balogh
Head of Department
Ministry of Education
H-1052 Budapest, Szervita tér 8.
Tel: +36 1 317-59-00
e-mail: tamas.balogh@om.hu

Mr. Francisco E. Baralle
Director—Trieste Component
International Centre for Genetic
Engineering and Biotechnology
(ICGEB)
AREA Science Park Padriciano 99
34012 Trieste
Tel: +39-040-3757301
Fax: +39-040-226555
e-mail: baralle@icgeb.org

Mr. György Bánlaki
Ambassador
BG International
H-2463 Tordas, Rákóczi u. 4.
Tel: +36 22 668 077
Fax: +36 22 467 077
e-mail: bginternational@matavnet.hu

Mr. Les Belady
Advisor, Technology Future Inc.,
Austin Technology Council
5802 Cannonade Court, Austin TX
78746
Tel: + 1 512.327.0421
e-mail: belady@jabis.com

Mr. Attila Bartha
Senior Research Fellow
ICEG European Center
14 Korompai Str. Budapest, H-1124
Tel: +36 1 2481160
Fax: +36 1 2481161
e-mail: abartha_iceg@axelero.hu

Mr. Ferenc Berszán
Deputy Managing Director, Hungarian
Innovative Technologies Fund
H-1023 Budapest, Rómer Flóris u. 5-7.

Tel: +36 1 315 0886, 315 0887
 Fax: +36 1 346 0056
 e-mail: berszan@hitf.hu

Mr. Miroslav Belica
 Deputy-Director
 Ministry of Foreign Affairs,
 Department of International
 Organisations
 Loretánské náměstí 5, 118 00, Praha 1
 Tel: +42 2 24181111

Mrs. Borbála Biró
 Dr. Habil., Head, Lab.of Rhizobiology
 Research Institute for Soil Science
 and Agrochemistry of the Hungarian
 Academy of Sciences (RISSAC-MTA
 TAKI)
 H-1022 Budapest, Herman O. ut 15
 Tel: +36 1 3564-644, 1 2257-496
 Fax: +36 1 2257-495
 e-mail: biro@rissac.hu

Mr. Péter Biacs
 Deputy State Secretary
 Ministry of Agriculture and Rural
 Development
 H-1055 Budapest, Kossuth Lajos tér 11.
 Tel: +36 1 301 5936
 Fax: +36 1 301 4729
 e-mail: biacsp@posta.fvm.hu

Mrs. Boglárka Bódis
 Secretary for the HNC for UNIDO
 Ministry of Economy and Transport
 H-1055 Budapest, Honvéd u. 13-15.
 Tel: +36 1374-2826
 Fax: +36 1 374-2800
 e-mail: bodisb@gkm.hu

Mr. Kiril Boyanov
 Head, Central Laboratory for
 Parallel Processing, Bulgarian
 Academy of Sciences
 Acad. G. Bonchev Str., Bl. 25-A 1113
 Sofia

Tel: +359 2 70 32 60
 Fax: +359 2 70 72 73
 e-mail: boyanov@acad.bg

Ms. Anette Braun
 Tech Consultant
 VDI-FTD
 Graf Recke Str.84,
 40239 Duesseldorf
 Tel: +49 211 62 14 491
 Fax: +49 211 62 14 139
 e-mail: braun_a@vdi.de

Mr. Adam Budnikowsky
 Director
 Institute of International Economics,
 Warsaw School of Economics
 A1. Niepodleglosci 162 02-554
 Warsaw
 Tel: +48 22 3379 361
 Fax: +48 22 646 61 27
 e-mail: abudni@sgh.waw.pl

Mr. Zsolt Bunford
 Desk Officer
 Ministry of Foreign Affairs
 H-1027 Budapest,
 Nagy Imre tér 4.
 Tel: +36 1458 1394
 Fax: +36 1 2017385
 e-mail: ZSBunford@kum.hu

Mrs. Jennifer Cassingena Harper
 Director, Policy Unit
 Malta Council for Science
 and Technology
 Villa Bighi, Kalkara
 Tel: +356 2166 0325
 Fax: +356 2166 0341
 e-mail: jharper@mcst.org.mt

Mr. Önder Çetinkaya
 EU Assistant Expert
 Ministry of Industry and Trade
 06520 Ankara, Eskisehir Yolu,
 7. km No: 154

Mr. Attila Chikán
Rector
Budapest University of Economic
Sciences and Public Administration
H-1093 Budapest, Fovám tér 8.
Tel: +36 1 217-6268
Fax: + 36 1 217-8883
e-mail: chikan@rektor.bke.hu

Mrs. Marta Cimbáková
Senior Official, Ministry Of
Education of the Slovak Republic
Stromova 1, SK-813 30 Bratislava
Tel: +4212/69 202 204
Fax: +4212/69 202 247
e-mail: mcsvt@education.gov.sk

Mr. Guenther Clar
Principle Officer
European Commission, DGRTD K2
Square de Meeus, 8-9 1050 Brussels
Tel: +32 2 2984 382
Fax: +32 2 295 88 65
e-mail: guenter.clar@cec.eu.int

Mr. Nick Constantopoulos
Dept. Head
Ministry of Development
14-18 Messogeion Ave., Athens 115 10
Tel: 201-7711.419
Fax: 201-7711.427
e-mail: nkon@gstrt.gr

Mr. Ali Coskun
Minister of Industry and Trade
Ministry of Industry and Trade
06520 Ankara, Eskisehir Yolu, 7. km
No: 154
Tel: +90 312 295 0440
Fax: +90 312 286 5325
e-mail: alicoskun@sanayi.gov.tr

Ms. Zsófia Cseke
Project Assistant, Hungarian
Institute for Economic Analysis
H-1055 Budapest, Honved u. 20/a

Tel: +36 1 474 9750
Fax: +36 1 373 0188
e-mail:
cseke.zsofia@gazdasagelemzo.hu

Mr. István Csillag
Minister of Economy and Transport
Ministry of Economy and Transport,
Republic of Hungary
H-1055 Budapest, Honved u. 20/a
Tel: +36 374 2700

Ms. Erzsébet Czakó
Associate Professor
Department of Business Economics,
Budapest University of Economic
Sciences and Public Administration
H-1053 Budapest, Veres Pálné u. 36.
Tel: +36 1 318 3037
Fax: +36 1 318 3037
e-mail: erzsebet.czako@bkae.hu

Mrs. Zoya Damianova
Programme Director
Applied Research and
Communications Fund
5 Alexander Zhendov St., Sofia
Tel: +359.2.986.7557
Fax: +359.2.980.1833
e-mail: zoya.damianova@online.bg

Mr. Sztaniszlav Dániel
Executive Officer, Pharmathesis LP
Karinthy Frigyes 4-6 II-1A Budapest
H-1111
Tel: +36 1 209-39-19
Fax: +36 1 209-9001
e-mail: cro@pharmathesis.hu

Mr. Ferenc Darvas
President & Chairman
Comgenex, Inc.
POB 73., Budapest 62, H-1388
Tel: + 36-1-214-2306
Fax: +36-1-214-2310
e-mail: df.cgx@comgenex.hu

Mrs. Ann De Beuckelaer
Partner, Biopolis Consultants
Goetheallee 23, 01309 Dresden
Tel: + 493 513126912
Fax: +493 513139254
e-mail: ann.debeuckelaer@
biopolis-consultants.com

Mr. Jakob De Vlieg
Executive Director
Molecular Design and Informatics,
N.V.Organon, Akzo-Nobel
Diosynth bv Kloosterstraat 6 Postbus
20 5349 AB Oss
Tel: +31-412-661459
Fax: +31-412-662539
e-mail: jacob.devlieg@organon.com

Mr. István Denes
President, Mercurius Association
V. Babes 12, Sf. Gheorghe 4000
Tel: +40723522945
Fax: +40267311006
e-mail: denis@mercurius.ro

Ms. Ágnes Dénesfalvy
Ph.D. Student, Mávtrans
H-9400 Sopron, Cseresznye sor 15.
Tel: +3630/3-633-533
Fax: +361/317-2375
e-mail: denesfalvy@1979.hu

Mr. Miklós Devecz
Strategic Development and
Government Relations, Hungary
Flextronics International
8900 Zalaegerszeg, Posta u.63.
Tel: +36 92 508 108
Fax: +36 92 508 031
e-mail:
miklos.devecz@hu.flextronics.com

Mr. Leon Devjak
Counsellor to Government
Government Office for Structural
Policies and Regional Development

Kotnikova 28, 1000 Ljubljana
Tel: +386 1 478 3750
Fax: +386 1 478 3760
e-mail: leon.devjak@gov.si

Mr. András Dinnyes
Head, Professor
Hungarian Academy of Sciences and
Szent István University, Research
Group on Applied Animal Genetics
and Biotechnology
Karpát u. 48., H-1133, Budapest
Tel: +36-1-320 6646
Fax: +36-28- 521 149
e-mail: andrasdinnyes@yahoo.com

Mr. Patrick Dixon
Chairman, Global Change Ltd.
1 Carlton Gardens Ealing London
WS ZAN
Tel: +44 77 68 511 390
e-mail:
patrickdixon@globalchange.com

Mr. Dragan Domažet
Minister of Science, Technology and
Development
Ministry of Science, Technology and
Development
Nemanjina 22-26, 11000 Beograd
Tel: +381 11-688-047
Fax: +381 11-361-65-16

Mr. Endre Domokos
Veszprém University
Veszprém, POB. 158. 8201
Tel: +36 88 422 022/4298
e-mail: domokose@almos.vein.hu

Mr. György Dorman
Scientific Director
Comgenex, Inc.
33-34 Bem rkp, Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: gyorgy.dorman@comgenex.hu

Mr. Friedrich Dorner
President, Baxter Bioscience
Industriestrasse 67 1220 Wien
Tel: +43-1-20100-3000
Fax: +43-1-20100-3407
e-mail: friedrich_dorner@baxter.com

Mr. Bálint Dömölki
Chairman
IQSOFT Intelligent Software Co.Ltd.
H-1135 Budapest, Csata-u 8.
Tel: +36 1 236 64 00
Fax: +36 1 236 64 64
e-mail: domolki@iqsoft.hu

Mr. Alex Drijver
Chief Executive Officer
Thales Ltd.
33-34 Bem rkp, Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: alex.drijver@thalesnano.com

Mr. Cedomir Duboka
President of Yugoslav Society of
Automotive Engineers
Faculty of Mechanical Engineering,
University of Belgrade
11000 Belgrade, 27. Marta 80,
p.f. 35-34
Tel: +381 11 33 70 358, 33 70 652
Fax: +381 11 33 70 364, 33 70 349
e-mail: cduboka@alfa.mas.bg.ac.yu

Mr. Erno Duda
President
Hungarian Biotechnology Association
H-6722 Szeged, Béke u. 5/A
Tel: +36 62 424 729
Fax: +36 62 426 098
e-mail: duda@solvo.hu

Mr. Dénes Dudits
Head
Institute of Plant Biology, Biological
Research Centre, Hungarian

Academy of Sciences
Temesvári krt. 62,
H-6701 (PO Box 521) H-6726 Szeged
Tel: +36 62 433 388
Fax: +36 62 433 188
e-mail:
dudits@nucleus.szbk.u-szeged.hu

Mr. Yerzy Dzikowicki
General Director
Polish Agency for Foreign Investment
00-559 Warsaw, al. Róz 2
Tel: +48 223349800
Fax: +4822 3349999
e-mail: jdzikowiczki@paiz.gov.pl

Mrs. Gabriella Eglesz
Programme Coordinator
Technology Foresight Programme
Office
H-1052 Budapest, Szervita tér 8.
Tel: +36 1 484-2591
Fax: +36 1 317-0249
e-mail: gabriella.eglesz@om.hu

Mr. Calin Fabian
Ambassador
Embassy of Romania, Budapest
H- 1146 Budapest, Thököly út 72.
Tel: +36 1 384 0271
Fax: +36 1 384 5535
e-mail: roembud@mail.datanet.hu

Mr. Andrzej Fabijanski
Counsellor
Permanent Mission of Poland to the
UN Office Vienna
Tel: +43 187015316301
Fax: +43 1 870 15 331

Mr. Gustavo Fahrenkrog
Head of Unit
Technology, Employment,
Competitiveness and Society Unit,
Institute for Prospective
Technological Studies (IPTS)

W.T.C Isla de la cartuja
E-41092 Sevilla
Tel: +34 95 448 83 61
Fax: +34 95 448 83 59
e-mail: gustavo.fahrenkrog@jrc.es

Mr. Francois Farhi
CMI, France
92773 Boulogne-Billancourt Cedex,
80, rue Gallieni
Tel: +33 (0) 1 47 12 53 00
Fax: +33 (0) 1 47 12 53 49
e-mail: 'f.farhi@cm-intl.com'

Mrs. Marianna Farkas
Managing Director
Tomtec Ltd.
H-1037 Budapest, Farkastorki l. 34/a
Tel: (36 1) 250 6160
Fax: (36 1) 250 6160
e-mail: fm@tomtec.hu

Mr. Károly Farkas
Prime Minister's Office, National
Regional Development Office
H-1133 Budapest, Pozsonyi út 56.
Tel: +36 1 237-4400
Fax: +36 1 329-3637

Mr. Barnabás Fáy
Retired (Frmr. Ministral Gen. Dir.)
Retired from Frmr MEA
H-1133. Budapest. Tutaj-u. 1/c
Tel: +36(1)3498-545
e-mail: fay.barnabas@chello.hu

Mr. Szabolcs Fazakas
Hungarian Inter-Parliamentary
Group, National Assembly
H-1358 Budapest, Széchenyi rkp. 19
Tel: +36 1 441 5067
Fax: +36 1 441 5972

Ms. Flóra Felsovalyi
Scientific Assistant, Comgenex, Inc.
33-34 Bem rkp, Budapest H-1027

Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: flora.felsovalyi@comgenex.hu

Mr. László Fenyvesi
General Director
Ministry of Agriculture and Rural
Development, Institute of
Agricultural Mechanisation
H-2100 Gödöllo, Tessedik S.-4
Tel: +36 28-511-610
Fax: +36 28-511-600
e-mail: fenyvesi@fvmmi.hu

Mr. Koloman Ferjentsik
Member of the R&D Policy-making
team, Ministry of Education, Youth
And Sport of the Czech Republic
Karmelitska Str. 7, 118 12 Praha 1
Tel: +42 266106657
Fax: +42 266106650
e-mail: ferjent@msmt.cz

Mr. Yiannis Fessas
General Manager, Promitheas
Business Innovation Center
28th October Ave., No. 24,
2414 Engkomi Nicosia
Tel: +35722464750
Fax: +35722658575
e-mail: ypf@promitheas.com.cy

Mr. Gvozden Flego
Minister of Science and Technology
Ministry of Science and Technology
Strossmayerov trg 4, 10000 Zagreb
Tel: +385 (1) 459 44 44
Fax: +385 (1) 459 44 69

Ms. Helena Fodor
Sales & Marketing Coordinator
Comgenex, Inc.
33-34 Bem rkp, Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: helena.fodor@comgenex.hu

Mr. István Fodor
Chairman
Ericsson Hungary Ltd.
H-1037 Budapest, Laborc u. 1
Tel: +36 1 437 72 04
Fax: +36 1 250 25 22
e-mail: Istvan.Fodor@eth.ericsson.se

Mr. István Fórián
Deputy Managing Director
Hungarian Suzuki Ltd.
H-2500 Esztergom,
Schweidel József u. 52.
Tel: +36 33 541-100, +36 33 541-111
Fax: +36 33 412-014
e-mail: iforian@suzuki.hu

Mr. Zdenko Franic
Deputy Minister
Ministry of Science and Technology
Strossmayerov trg 4, 10000 Zagreb
Tel: +385 (1) 459 44 44
Fax: +385 (1) 459 44 69

Mr. Viktor Gaisenak
Ambassador, Permanent
Representative
Permanent Mission of the Republic
of Belarus to UNIDO
A-1140 Wien, Huttelbergstr. 6
Tel: +43 1 419 96 30
Fax: +43 1 419 96 30 30
e-mail: amb@byembassy.at

Mr. Zoltán Gál
Centre for Regional Studies
Hungarian Academy of Sciences,
Transdanubian Research Institute
H-7601 Pécs, Pf.: 199.
Tel: +36 72 212-755
Fax: +36 72 233-704
e-mail: galz@dti.rkk.hu

Mr. Frank Gannon
Executive Director
European Molecular Biology

Organization (EMBO)
Postfach 1022.40 D-69012 Heidelberg
Tel: +49-6221-8891102
Fax: +49-6221-8891202
e-mail: frank.gannon@embo.org

Ms. Judit Gáspár
Ph.D Student
Department of Business Economics,
Budapest University of Economic
Sciences and Public Administration
H-1053 Budapest, Veres Pálné u. 36.
Tel: +36 1 318 3037
Fax: +36 1 318 3037
e-mail: judit.gaspar@bkae.hu

Mr. György Gazdag
Product Manager
IDG Hungary Ltd.
H-1374. Budapest 5., P.O. Box 578.
Tel: +361-474-88-51
Fax: +361-269-56-76
e-mail: gazdag@idg.hu

Mr. Márton Gellén
Consultant
Weber Shandwick GJW
H-1055 Budapest, Kossuth tér 18.
Tel: +36 1354-24-32
Fax: +36 1354-24-39
e-mail:
mgellen@webershandwick.com

Mr. Luke Georghiou
Executive Director
University of Manchester, PREST
Manchester M13 9PL
Tel: +44 161 275 5921
Fax: +44 161 273 1123
e-mail: mkzlugu@mail1.mcc.ac.uk

Mr. Raimundo Gonzalez Aninat
Ambassador Extraordinary and
Plenipotentiary
Permanent Mission of Chile to
UNIDO

Lugeck 1/3/10, 1010 Vienna
Tel: +43 1 512 92 08
Fax: +43 1 512 92 08 33
e-mail: echileat@netway.at

Mrs. Maria Gorczyca
R&D Specialist
Polfa Tarchomins S.A.
A. Fleming str. 2,
03-176 Warsaw Poland
Tel: +48 22 81180 11
Fax: +48 22 814 1473
e-mail: mgorczyca@tzf.com.pl

Mr. Tamás Gordos
Central Hungary, Regional
Development Agency
H-1399, Budapest, Pf. 701/328
Tel: +36 1 237 4232, +36 1 359 0411
Fax: +36-1 350-6694
e-mail: proregio@proregio.hu

Mr. Atilla Gönczi
Associate Professor
Department of Transportation and
Logistics, Faculty of Management
in Production and Transportation,
University Politechnica of Timisoara
Str. Rennus 14 1900 Timisoara
Tel: +40 56-190124
Fax: +40 56-191812
e-mail: agonczi@mpt.utt.ro

Mr. Márton Graf
Research Scientist
L&Mark Ltd.
Budapest, H-1117 Fehervari ut 38/A
Tel: +36-20-4388822
Fax: +36-1-209-2504
e-mail: grafm@freemail.hu

Mr. Hans Graf
Director
Centre for Futures Research,
St. Gallen
P.O. Box 32 9037 Speicherschwendi

Tel: +41 71 344 44 80
Fax: +41 71 344 34 06
e-mail: hg.graf@sgzz.ch

Ms. Anna Gryaznova
Head of Department
Institute For Complex Strategic
Studies
17, Kotelnicheskaya Emb., Office 332,
Moscow 109240
Tel: (+7 095) 725 08 26
Fax: (+7 095) 725 08 26
e-mail: griaznova@icss.ac.ru

Mrs. Judit Habuda
Prime Minister's Office
H-1133 Budapest, Pozsonyi út 56.
Tel: +36 1 237-4400
Fax: +36 1 329-3637
e-mail: judit.habuda@meh.hu

Ms. Leora Hadar
First Secretary
Economic Affairs
Embassy of Israel
H -1026 Budapest, Fullánk u. 8.
Tel: +36 12000-781, 2000-782
Fax: +36 12000-787
e-mail: isremb@axelero.hu

Ms. Ivana Halle
Head of Department
Ministry of Economy
Ul.grada Vukovara, 10000 Zagreb
Tel: 003851 6106 970
Fax: 003851 6109 970
e-mail: ivana.halle@mingo.hr

Ms. Doris Hanzl-Weiß
Staff Economist
The Vienna Institute for International
Economic Studies (WIIW)
1010 Vienna, Oppolzergasse 6
Tel: +43 1 533 66 10-32
Fax: +43 1 533 66 10-50
e-mail: hanzl@wsr.ac.at

Ms. Mary Harney
Deputy Prime Minister
Kildare Street Dublin 2
Tel: + 353 1 631 2121

Mr. Andrei Hateganu
Advisor to the Ambassador
Embassy of Romania, Budapest
H-1146 Budapest, Thököly út 72.
Tel: +36 1 384 0271
Fax: +36 1 384 5535
e-mail: roembbud@mail.datanet.hu

Mr. Attila Havas
Researcher
Institute for new Technologies
(INTECH)
Keizer Karelplein 19 6211 TC
Maastricht
Tel: +31 43 350 63 51
Fax: +31 43 350 63 99
e-mail: havas@intech.unu.edu

Mr. Balázs Hetyéssy
Referent for International
Organisations
Ministry of Informatics and
Communication
H-1077. Budapest Dob. u. 77-81.
Tel: +36-1-461-35-76
Fax: +36-1-462-44-55
e-mail: balazs.hetyessy@ihm.gov.hu

Mr. Petri Honkanen
Senior Adviser
Ministry of Trade and Industry
P.O.Box 32, Fin-00023 Government
Tel: +358 9 1606 3848
Fax: +358 9 1606 2644
e-mail: petri.honkanen@ktm.fi

Mr. István Horváth
Ambassador
Permanent Mission of the Republic
of Hungary to the UN Office
A-1010 Vienna, Bankgasse 4-6.

Tel: +43 1 535 3389
Fax: +43 1 535 61 61
e-mail: un-mission@huernbvia.at

Mr. Dezso Horváth
Deputy Head of Department
Ministry of Foreign Affairs,
Department of International
Organisations
H-1051 Budapest, Nagy Imre tér 4.
Tel: +36 1 458-1000
Fax: +36 1 207 7389
e-mail: dhorvath@kum.hu

Mr. Vladimír Huska
Senior Liaison Officer, Permanent
Secretariat for Cooperation with
the UNIDO
Entrepreneurship Promotion and
Strategy Section, Ministry of Economy
Mierová 19, 827 15 Bratislava 212
Tel: +421 2 4854 1607
Fax: +421 2 4333 0109
e-mail: huska@economy.gov.sk

Mr. Maurizio Iaccarino
International Institute of Genetics
and Biophysics (IIGB)
Via G. Marconi, 12 80125 Naples
Tel: +39-081-5932547
Fax: +39-081-725-7304
e-mail: iaccarin@iigb.na.cnr.it

Mr. Primož Ilesic
State Undersecretary
Government Office for Structural
Policies and Regional Development
Kotnikova 28, 1000 Ljubljana
Tel: +386-1-478-37-65
Fax: +386-1-478-37-60
e-mail: primoz.ilesic@gov.si

Ms. Renata Anna Jaksa
Project Manager
ICEG European Center
14 Korompai Str. Budapest, H-1124

Tel: +36 1 2481160
Fax: +36 12481161
e-mail: rajaksa@axelero.hu

Mr. Darko Javorski
Minister-Counsellor
Embassy of the Republic of Croatia,
Budapest
H-1065 Budapest, Munkácsi Mihály
u. 15.
Tel: +36 1 354 1315
Fax: +36 1 354 1319
e-mail: hrvhu1@mail.euroweb.hu

Mr. Zsolt Jekkel
Crop Improvement Manager
Bayer Cropscience Hungary
1056 Bp. Lajos u. 48-66
Tel: +36(20)5192753
Fax: +36 13672590
e-mail: zsolt.jekkel@bayercrop-
science.com

Mr. István Jenei
Phd Student
Department of Business Economics,
Budapest University of Economic
Sciences and Public Administration
H-1053 Budapest, Veres Pálné u. 36.
Tel: +36 1 318 3037
Fax: +36 1 318 3037
e-mail: istvan.jenei@bkae.hu

Mr. Márton Jolánkai
Szent István University
H-2100 Gödöllo, Páter Károly utca 1
Tel: +36 28 522067
Fax: +36 28 410-804
e-mail: mjolankai@fau.gau.hu

Mr. J.István Jóri
Professor
Budapest University of Technology
and Economics
H-1111 Budapest, Bertalan u. 1
Tel: +361 463-1748

Fax: +36 1 463-3505
e-mail: jori.istvan@gszi.bme.hu

Mr. László Kállay
Deputy Director, Hungarian Institute
for Economic Analysis
H-1055 Budapest, Honved u. 20/a
Tel: +36 1 474 9750
Fax: +36 1 373 0188
e-mail: i4sme@axelero.hu

Mr. Miklós Kálmán
Director
Bay Zoltán Foundation,
Institute of Biotechnology
H-6726 Szeged, Derkovits fasor 2.
Tel: +36 62-432251
Fax: +36 62-432250
e-mail: kalman@bay.u-szeged.hu

Mr. Ioannis Kaltsas
Industrial Economist
European Investment Bank
100, boulevard Konrand Adenauer,
L-2950, Luxembourg
Tel: 352-43798577
Fax: 352-4379-8831
e-mail: kaltsas@eib.org

Mrs. Amira Kapetanovic
Ambassador Extraordinary and
Plenipotentiary
Permanent Mission of Bosnia and
Herzegovina to UNIDO
Tivoligasse 54 1120 Vienna
Tel: +43 1 811 85 55
Fax: +43 1 811 85 69

Ms. Claudia Kaufmann
Project Secretary
Industrial Promotion and
Technology Branch, UNIDO
A-1400 Vienna, VIC, P.O.Box 300
Tel: 43 1 260263434
Fax: 43 1 260266808
e-mail: c.kaufmann@unido.org

Mr. Martin Kedro
Research Consultant
SARC
Stare grunty 52, 842 44 Bratislava 4
Tel: +421 2 654 20 337
Fax: +421 2 654 20 308
e-mail: kedro@sarc.sk

Mr. Michael Keenan
Research Fellow
University of Manchester, PREST
University of Manchester,
Manchester, M13 9PL, UK
Tel: +44 161 275 5951
Fax: +44 161 275 0923
e-mail: michael.keenan@man.ac.uk

Ms. Anna Kelemen
Junior Marketing Manager
Comgenex, Inc.
33-34 Bem rkp, Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: anna.kelemen@comgenex.hu

Mr. Nigel Kerby
Managing Director
Nylnefield Research SUS Ltd
Invergowrie, Oundee
Tel: 1382568568
Fax: 1382568501
e-mail: nkerby@scri.sari.ac.uk

Mr. Sándor Kerekes
Professor
Institute of Environmental Economy,
Budapest University of Economic
Sciences and Public Administration
H-1093 Budapest, Fovám tér 8
Tel: +36 1 218-8076
Fax: +36 1 2179588
e-mail: skerekes@enviro.bke.hu

Mr. David Keresztes
Exclusive Representative of the
Economist in Central-Europe

The Economist
H-1088 Budapest, Bródy Sándor u. 27.,
Tel: +36 1 483-2602, +36 30 954 4016
Fax: +36 1 483-2601
e-mail: dkeresztes.ujhazy@nextra.hu]

Mrs. Eszter Kertész Gécicz
IT Manager
Hungarian National Assembly
H-1358 Budapest Pf.: 2
Tel: +36-1/441-6233
Fax: +36-1/441-6979
e-mail: eszter.kertes@parlament.hu

Ms. Márta Kifer
Project Assistant
Hungarian Institute for Economic
Analysis
H-1055 Budapest, Honved u. 20/a
Tel: +36 1 373 0192
Fax: +36 1 373 0188
e-mail:
kifer.marta@gazdasagelemzo.hu

Mr. Árpád Kiss
Chief Counsellor, Deputy Chief Editor
Ministry of Economy and Transport,
Press and PR Department
H-1880 Budapest, Honvéd u. 13-15.
Tel: +36 1 374 2931
Fax: +36 1 311 5243
e-mail: kissa@gkm.hu

Mr. Michael Kleiber
Minister of Science, Chairman of
the State Committee for Scientific
Research, State Committee for
Scientific Research
ul. Wspólna 1/3, 00-529 Warszawa
Tel: +48 22628-19-44
Fax: +48-22-628-09-22
e-mail: pkb@kbn.gov.pl

Mr. Ferenc Kleinheinz
Head of Department
Ministry of Education

H-1052 Budapest, Szervita tér 8.
Tel: +36 1 317-59-00
e-mail: ferenc.kleinheincz@om.hu

Ms. Ildikó Klészátl
Secretary
Technology Foresight Programme
Office
H1052 Budapest, Szervita tér 8.
Tel: +36-1/484-2590
Fax: +36-1-317-0249
e-mail: ildiko.kleszatl@om.hu

Mr. Karel Klusacek
Director
Technology Centre AS CR
Rozvojova 135, Prague 6
Tel: +420 220 390 701
Fax: +420 220 921 217
e-mail: klusacek@tc.cas.cz

Mrs. Tatiana Kluvanková-Oravská
Researcher
Institute for Forecasting, Slovak
Academy of Sciences
Sancova 56, 811 05 Bratislava
Tel: +421 2 52495 300
Fax: +421 2 52495 029
e-mail: progkluv@savba.sk

Mr. Ondrej Kolozsvary
First Secretary
Embassy of the Czech Republic
H-1064 Budapest, Rózsa u 61
Tel: + 36 1 351 05 39
Fax: + 36 1 351 91 89
e-mail: budapest@embassy.mzv.cz

Mr. Yigal Koltin
Vice President, International R&D
Alliance Development
Millennium Pharmaceuticals, Inc.
16B Hashalom St., Hod Hasharon
Tel: +972 54 828939
Fax: +972 9 743 9126
e-mail: yigal56@bezeqint.net

Mr. Pál Koncz
Deputy Head of Department
Ministry of Education
H-1052 Budapest,
Szervita tér 8.
Tel: +36 1 317-59-00
e-mail: pal.koncz@om.hu

Mr. László Kormányos
Passenger Service Expert
MAV Hungarian State Railways
Co. Ltd
H-1062 Andrássy ut 73-75 Budapest
Tel: +36-30-347-95-36
Fax: 00-36-1-432-38-46
e-mail:
kormanyos.laszlo@szesza.mavrt.hu

Mrs. Orsolya Kotnyek
Communication and
Grant Application Officer
Chemical Research Center,
Hungarian Academy of Sciences
H-1025 Budapest,
Pusztaszeri út 59-67.
Tel: +36 1438-4136
Fax: +36 1438-4141/248
e-mail: kotnyek@chemres.hu

Mr. Gábor Kovács
Info Pharm Ltd.
H-1031 Budapest,
Légió u. 1.
Tel: +36 1 242-0506
Fax: +36 1 242-0506
e-mail: h12383kov@ella.hu

Mr. Ferenc Kováts
Chairman
Technology Foresight Programme
Office
H-1052 Budapest,
Szervita tér 8.
Tel: +36 1 484 2590
Fax: +36 1 317 0249
e-mail: ferenc.kovats@om.hu

Mr. Botond Kovári
Research Fellow
Budapest University of Technology
and Economics
Budapest, Bertalan Lajos u. 2./Z,
4. emelet H-1111
Tel: 0036-1-4631037
Fax: 0036-1-4633267
e-mail: bkovari@kgazd.bme.hu

Mr. Herbert Kroell
Director of the Department for
Multilateral Development Cooperation
Austrian Ministry of Foreign Affairs
A-1014 Wien, Minoritenplatz 9
Tel: + 43 1 53115 4449
Fax: + 43 1 53666 4449
e-mail: herbert.kroell@bmaa.gv.at

Mr. Tomas Kubala
Project Manager
CzechInvest
RRAJM, Vystaviste 1, Brno, 648 00
Tel: +420-603-498326
Fax: +420+541 159 575
e-mail: tomas.kubala@rrajm.cz

Mr. Péter Kulcsár
Director
Hungarian Institute for Economic
Analysis
H-1055 Budapest, Honved u. 20/a
Tel: +36 1 373 0170
Fax: +36 1 373 0188
e-mail:
kulcsar.peter@gazdasagelemzo.hu

Mr. Duro Kutlaca
Head of Centre
Mihajlo Pupin Institute, Science and
Technology Research Center
Volgina 15, 11060 Belgrade
Tel: +381 11 774 452,
+ 381 11 776 222/408
Fax: +381 11 775 807
e-mail: dkutlaca@labtel.imp.bg.ac.yu

Mr. Michael Landesmann
Director of Research
The Vienna Institute for International
Economic Studies (WIIW)
Oppolzergasse 6 1010 Vienna
Tel: +43 1 533 66 10-10
Fax: +43 1 533 66 10-50
e-mail: landesm@wsr.ac.at

Mr. István Láng
Academician
Library of the Hungarian Academy
of Sciences
H-1051 Budapest, Arany J. u. 1
Tel: +36 1 4116100
Fax: +36 1 331-6954
e-mail: ilang@office.mta.hu

Mr. István Lepsényi
President of the Association of the
Hungarian Automotive Industry,
Managing Director
Knorr-Bremse Ltd
H-6000 Kecskemét, Szegedi út 49.
Tel: +36 76 511 102
Fax: +36 76 481 363
e-mail: istvan.lepsenyi@knorr-
bremse.com

Mr. Jan Lesinsky
Associate Professor
Slovak University of Technology
Nam. Slobody 17, 81231 Bratislava
Tel: +421 2 5729 6306
Fax: +421 2 5296 2650
e-mail: lesinsky@cvt.stuba.sk

Ms. Dan Liang
Director
Industrial Promotion and
Technology Branch, UNIDO
Vienna International Centre,
P.O. Box 300, A-1400 Vienna
Tel: +43 1 26026 3092
Fax: +43 1 26026 6805
e-mail: D.Liang@unido.org

Mr. Zsolt Lisziewicz
Manager
L&Mark Ltd.
H-1027 Budapest Fo u. 68
Tel: +36-1-201-7725
Fax: +36-1-201-2817
e-mail: zsolt.lisziewicz@lmark.hu

Mr. Lennart Lübeck
Chairman
Swedish Technology Foresight
Norr Mälarstrand 38,
11220 Stockholm
Tel: +46705276210
Fax: +4686533850
e-mail: lel@iva.se

Mr. Carlos Magariños
Director General
UNIDO
Vienna International Centre,
P.O. Box 300, A-1400 Vienna
Tel: +43 1 26026 3001
e-mail: C.Magarinos@unido.org

Mr. Bálint Magyar
Minister of Education
Ministry of Education, Republic of
Hungary
H-1055 Budapest, Szalay u. 10-14.
Tel: +36 1 473 7000
Fax: +36 1 473 7001
e-mail: miniszteri.kabinet@om.hu

Mr. István Magyar
State Secretary of Honour
Ministry of Economy and Transport
H-1055 Budapest,
Honvéd u. 13-15.
Tel: +36 1 374 2820
Fax: +36 1 331 5990
e-mail: imagyari@gkm.gov.hu

Mr. Cristian Marende
CRIMM, IRC Romania
e-mail: cmarandei@imm.ro

Mr. Victor Margitich
Medical Director, Phd
Farmak, Pharma Company
63, Frunze Street, Kiev
Tel: 380 67 443 78 79 (mobile)
Fax: 380 44 531 96 59 (tel./fax)
e-mail: vmargit@farmak.kiev.ua

Mr. Miklós Marián
Manager, Consultant
Euromunicipal Partnership
H-1113 Budapest,
Bocskai út 50.
Tel: +36 1 361 0556
Fax: +36 1 361 0556
e-mail: mmiklos@axelero.hu

Ms. Petra Máriás
Business Development Assistant
Solvo Biotechnology and
Hungarian Biotechnology
Association
H-6722 Szeged, Béke u. 5/A
Tel: +36 62 424 729
Fax: +36 62 426 098
e-mail: marias@solvo.hu

Mr. Brandon McMahon
Ambassador
Embassy of Ireland,
Hungary
H-1944 Budapest,
Bank Center, Granit Tower
Tel: +36 1 302 9600
Fax: +36 1 302 9599
e-mail: iremb@hu.inter.net

Mr. Enn Metsar
Executive Officer of
Innovation Policy Division
Ministry of Economic Affairs
and Communications
Harju 11, 15072 Tallinn
Tel: +372 625 6417
Fax: +372 631 3660
e-mail: enn.metsar@mkm.ee

Mr. George Michaeloudes
Senior Industrial Officer
Ministry of Commerce,
Industry and Tourism
CY-1421 Nicosia
Tel: + 357 22 867 241
Fax: + 357 22 375 120
e-mail: mcindust@cytanet.com.cy

Mr. Ales Mihelic
State Undersecretary
Ministry Of Economy
Kotnikova 5, Ljubljana,
Slovenia
Tel: + 386 14785201
Fax: +386 14785240
e-mail: ales.mihelic@gov.sl

Mr. Dezso Miklos
Deputy Director
Alfréd Rényi Institute
of Mathematics
H-1364 Budapest, POB 127
Tel: 36-1-4838321
Fax: 36-1-4838333
e-mail: dezso@renyi.hu

Mrs. Ferencné Mokry J.
Head of Section
Ministry of Education
H-1055 Budapest, Szalay u. 10-14.
Tel: +36 1 484 2533
Fax: +36 1 3184064
e-mail: zsuzsa.mokry@om.hu

Mr. Levente Molnár
Developer
L&Mark Ltd.
H-1029 BP. Fo u. 68
Tel: +36 1 2017725
Fax: +36 1 2017725
e-mail: lmolnar@lmark.hu

Mrs. Beatrix Molnár
Sales Manager
Thales Ltd.

33-34 Bem rkp,
Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail:
beatrix.molnar@thalesnano.com

Mrs. Vesela Mrden
Minister-Counsellor
Embassy of the Republic of Croatia,
Budapest
H-1065 Budapest,
Munkácsy Mihály u. 15.
Tel: +36 1 354 1315, 269 5854
Fax: +36 1 354 1319
e-mail: hrvhu@mail.euroweb.hu

Mr. Endre Müller
Analyst
Hungarian Institute for
Economic Analysis
H-1055 Budapest,
Honved u. 20/a
Tel: +36 1 474 9750
Fax: +36 1 373 0188
e-mail:
muller.endre@gazdasagelemzo.hu

Mr. Gábor Nechay
Senior Counsellor
Ministry of Environment,
Authority for Nature Conservation
H-1121 Budapest, Költö u. 21.
Tel: +36 1 395 7458
Fax: +36 1 395 7458
e-mail: nechay@mail2.ktm.hu

Mr. Stanko Nick
Ambassador
Embassy of the Republic of Croatia,
Budapest
H-1065 Budapest,
Munkácsy Mihály u. 15.
Tel: +36 1 354 1315, 269 5854
Fax: +36 1 354 1319
e-mail: hrvhu@mail.euroweb.hu

Mr. Antal Nikodémus
Head of Department
Ministry of Economy and Transport
H-1055 Budapest, Honvéd u. 13-15.
Tel: +36 1 374 2906
Fax: +36 1 374 2878
e-mail: antal.nikodemus@gmh.gov.hu

Mr. Lajos Nyíri
Executive Manager
Zinnia Group LP
H-1106 Budapest,
Rezvirag u. 5/B
Tel: + 36 1 265 0998
e-mail: zinnia@mail.datanet.hu

Ms. Ewa Okon-Horodynska
Professor, Adviser to the Minister
State Committee for
Scientific Research
1/3 Wspólna Str., Warsaw 53
Tel: +4822 625 41 23
Fax: +4822 625 42 65
e-mail: ehorodyn@kbn.gov.pl

Mr. Gordon Ollivere
Managing Director
RTC North Ltd.
1 Hylton Park, Wessington Way
Sunderland, SR5 3HD
Tel: +44 191 516 44 00
Fax: +44 191 516 44 01
e-mail: gordon.ollivere@rtcnorth.co.uk

Mr. Peter Ondrejka
Director of Department of Strategy,
Analyses and Policy
Ministry of Economy
827 15 Bratislava 212, Mierová 19
Tel: + 421 2 434 41940
Fax: + 421 2 433 30158

Mr. Jaroslaw Osidiacz
Wroclaw Centre for
Technology Transfer
Smoluchowskiego 48,

50372 Wroclaw
Tel: +4871 3202189
Fax: +4871 3203948
e-mail: j.osiadacz@wctt.pl

Mr. Gordon Pace
Senior Researcher
Malta Council for Science
and Technology
MCST, Villa Bighi,
Kalkara CSP12
Tel: +356-23602139
Fax: +356-21660341
e-mail: gpace@mcst.org.mt

Mrs. Mária Pánczél
Head of Department
Ministry of Education
H-1055 Budapest, Szalay u. 10-14.
Tel: +36 1 473 7000
Fax: +36 1 473 7001

Mr. Ioannis Papadopoulos
Director
Agricultural Research Institute,
Ministry of Agriculture, Natural
Resources and Environment
PO Box 22016 1516 Nicosia
Tel: +357 22 403232
e-mail: papado@arinet.ari.gov.cy

Ms. Zsuzsanna Papp
PR Executive
Sygma Creative
H-1061 Budapest, Andrásy út.10.
Tel: +36 1 475 0667
Fax: +36 1 475 0667
e-mail: zspapp@sygma.hu

Mr. Erno Partl
Senior Special Consultant
Ministry of Economy and Transport
H-1055. Budapest Honvéd u. 13-15.
Tel: +36-1-374-28-44
Fax: +36-1-311-41-86
e-mail: partl@gkm.hu

Mr. Markus Pasterk
Deputy Director General
Federal Ministry of Education,
Science and Culture
Directorate VI—Research;
Rosengasse 2-6; A-1014 Vienna
Tel: +43 1 53120/7116
Fax: +43 1 53120/817116
e-mail: markus.pasterk@bmbwk.gv.at

Mr. Karl Pertovsky
Manager—Industry Affairs
Baxter Bioscience AG
A-1221 Vienna, Industriestr. 67.
Tel: +43 120 100 2252
Fax: +43 120 100 735
e-mail: karl_petrovsky@baxter.com

Mr. Gyozo Petrányi
Academician
National Haematology and
Immunology Institute
H-1113 Budapest, Daróczi út 14.
Tel: +36 1 372 4349
Fax: +36 1 372 4352
e-mail: petranyi.home@axelero.hu

Mr. Miroljub Petrovic
Counsellor
Embassy of Serbia and Montenegro,
Budapest
H-1068 Budapest,
Dózsa György út 92/B
Tel: +36 1 322 9838, 342 8512
Fax: +36 1 322 1438
e-mail: ambjubp@mail.datanet.hu

Mr. Jürgen Philipper
Chairman of the Board,
Managing Director
WestLB Hungaria Bank Plc.
H-1075 Budapest,
Madách Trade Center,
Madách Imre út 13-14.
Tel: + 36 1 268 1651
Fax: + 36 1 268 1653

Mr. Tarmo Pihl
National Contact Point for ICT
and E-content
Archimedes Foundation
Tartu 51007, Estonia
Tel: +3727300329
Fax: +3727300336
e-mail: tarmop@archimedes.ee

Mr. Dmitri Piskounov
Director
Europe and NIS Bureau, UNIDO
A-1400, VIC, P.O. Box 300
Tel: +43 1 26026 5578
Fax: +43 1 26026 6822
e-mail: D.Piskounov@unido.org

Ms. María Luisa Poncela
Deputy Director for
Technological Programs
Ministry of Science and Technology
Paseo de la Castellana, 160.,
28071-Madrid
Tel: 34 91 349 43 39
Fax: 34 91 349 42 21
e-mail: isc1@mcyt.es, lpg1@mcyt.es

Mr. Sándor Pongor
Head, Protein Structure
and Bioinformatics
International Centre for Genetic
Engineering and Biotechnology
(ICGEB) Trieste, Italy
34012 Trieste, Padriciano 99
Tel: +390 40 3757300
Fax: +390 40 226555
e-mail: pongor@icgeb.trieste.it

Mrs. Marianna Pongorné Csákvári
Deputy State Secretary
Ministry of Economy And Transport
H-1055 Budapest, Honvéd u. 13-15.
Tel: +36 1 374-2980
Fax: +36 1331-4149
e-mail:
marianna.csakvari@grnh.gov.hu

Mr. Rafael Popper
Research Associate
University of Manchester, PREST
PREST, The University of Manchester,
Oxford Road, Manchester M13 9PL
Tel: +44 (0)161 275 0926
Fax: +44 (0)161 275 0923
e-mail: rafael.popper@man.ac.uk

Mr. Josef Pöschl
Staff Economist
The Vienna Institute
for International Economic
Studies (WIIW)
1010 Vienna,
Oppolzergasse 6
Tel: + 43 1 533 66 1037
Fax: + 43 1 533 66 1050
e-mail: poeschl@wsr.ac.at

Ms. Krisztina Rác
European Sales Coordinator
Comgenex, Inc.
33-34 Bem rkp,
Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: krisztina.racz@comgenex.hu

Mr. Constatntin Radu
Manager
Monsanto CR S.R.O.
110 00 Praha 1,
Krakovska 9/583
Tel: +420 2 2166 4375
Fax: +420 2 2166 4377
e-mail:
constantin.radu@monsanto.com

Mr. Gediminas Rainys
Vice-Minister
Ministry of Economy of
the Republic of Lithuania
Gedimino ave. 38/2,
2600-LT, Vilnius
Tel: (+370 5) 262 84 21

Fax: (+370 5) 262 39 74
e-mail: g.rainys@po.ekm.lt

Mrs. Christof Raluca
Head of Microbiology Program
Biotehnos S.A.
18, Dumbrava Rosie Street,
702542 Bucharest
Tel: 40-21-2102015/153
Fax: 40-21-2109705
e-mail: office@biotehnos.com

Mr. Peter Raspor
Biotechnical Faculty,
University of Ljubljana
Jamnikarjeva 101 SI-1000 Ljubljana
Tel: +386-1-4231161
Fax: +386-1-2574092
e-mail: peter.raspor@bf.uni-lj.si,
peter.raspor@telemach.net

Mr. Jean Frederic Richard
Director
Strategic Research and
Economics Branch,
UNIDO
A-1400, VIC, P.O. Box 300
Tel: + 43 1 26026 3821
e-mail: F.Richard@unido.org

Mr. Zsolt Rieder
Managing Director
Farkas & Rieder Ltd.
H-1026 Budapest Orlo u 21
Tel: +36 20 231 92 05
Fax: + 35 1 200 0808
e-mail: rieder@freemail.hu

Mr. Michael Rinck
Managing Director
MT Promed Consulting
Eisenbahnstrasse 2,
D-66386 St. Ingbert
Tel: +49 6894 581020
Fax: +49 6894 581021
e-mail: info@mt-procons.com

Mr. Decio Ripandelli
Director of Administration and
External Relations
International Centre for Genetic
Engineering and Biotechnology-
ICGEB

Padriciano 99, 34012 Trieste
Tel: +39 040 3757345
Fax: +39 040 3757363
e-mail: decio@icgeb.org

Mrs. Viera Rosova
Senior Researcher-Manager
Slovak Academy of Sciences
Stefanikova 49, 814 38 Bratislava
Tel: +421-2-5249 4213
Fax: +421-2 5249 4172
e-mail: rosova@up.upsav.sk

Mr. Wolfgang Rudischhauser
Deputy Permanent Representative
German UN Mission Vienna
Wagramerstrasse 14., A-1220 Vienna
Tel: +43 12633375
Fax: +43126333756
e-mail: v@wienio.auswaerhges_aut.de

Ms. Hellinga Runa
Correspondent
Technological Weekly Netherlands
Racz Aladar ut 137, H-1121 Budapest
Tel: +36 1-2754206
e-mail: henkruna@pronet.hu

Mr. Włodzimierz Rydzkowski
Chairman
Transport Policy Department,
University of Gdansk
Armii Krajowej 119/121 81-824 Sopot
Tel: + 48 58 551 5645
Fax: + 48 58 551 5645
e-mail: rydz@panda.bg.univ.gda.pl

Mr. Marcelo Salum
Second Secretary
Brazilian Embassy in Hungary

H-1062 Budapest, Délibáb u. 30.
Tel: +36 1 351 00 60-64
Fax: +36 1 351 00 66
e-mail: embassy@brazil.hu

Mr. Robert Saracco
Director
Future Centre, TILAB
Via Reiss Romoli 274 Turin
Tel: +39 041 5213 223
Fax: +39 041 228 8228
e-mail: Roberto.Saracco@TILAB.COM

Mr. Ozcan Saritas
Researcher
University of Manchester, PREST
11 Langdale Road M14 5PQ
Manchester
Tel: +44.161.275.5935
Fax: +44.161.275.0923
e-mail: ozcan.saritas@stud.man.ac.uk

Mr. Péter Scharle
Vice-Rector
Széchenyi István University
H- 9026 Győr, Egyetem tér 1.
Tel: +36 96 503 405
Fax: +36 96 329 263
e-mail: scharle@sze.hu

Mr. Hugo Schepens
Secretary General
EuropaBio
6 Avenue de l' Armés
Tel: 00 32 2 7391175
Fax: 00 32 2 735 49 60
e-mail: h.schepens@europabio.org

Mr. Joachim Schiemann
Institute for Plant Virology,
Microbiology and Biosafety
Messeweg 11/12 D—38104
Braunschweig
Tel: +49-531-2993800
Fax: +49-531-299-3006
e-mail: J.Schiemann@bba.de

Mr. Christos N. Schizas
Professor of Computer Science,
Vice-Rector, University of Cyprus
1678 Nicosia, 75 Kallipoleos Str.,
P.O. Box 20537
Tel: + 357 22 892 045
Fax: + 357 22 750 297
e-mail: schizas@ucy.ac.cy

Mr. Niko Schlamberger
State Undersecretary
Statistical Office of the Republic
of Slovenia
Vozarski pot 12 1000 Ljubljana
Tel: +386 1 2340 838
Fax: +386 1 2340 860
e-mail: Niko.Schlamberger@gov.si

Mrs. Brigita Schmögnerova
Executive Secretary, Under-Secretary-
General, UNECE
1211 Geneva 10, Palais des Nations
Tel: + 41 22 917 44 44
Fax: +41 22 917 05 05

Mr. Hans Schnitzer
Professor for Process Engineering
Institute for Chemical Engineering
Fundamentals and Process
Engineering, Graz University of
Technology
A-8010 Inffeldgasse 25
Tel: +43(0)316-873/7461
Fax: +43(0)316-873/7469
e-mail: HANS.SCHNITZER@tugraz.at,
hans.schnitzer@joanneum.at

Ms. Nina Scholtz
German Embassy, Budapest
H-1014 Budapest, Úri u. 64-66.
Tel: +36 1 4883500
Fax: +36 1 488 3505

Mr. Tamás Schubert
Reader
Budapest Polytechnic

H-1081 Budapest, Népszínház u. 8.
Tel: 36-1 333-4513
Fax: 36-1 333-9183
e-mail: scht@donat.banki.hu

Mr. Claus Seibt
Researcher—Technology Policy
ARC Seibersdorf Research GmbH
A-2444 Seibersdorf
Tel: +43 (0) 50550 3896
Fax: +43 (0) 50550 3888
e-mail: claus.seibt@arcs.ac.at

Mr. Ricardo Seidl Da Fonseca
Programme Manager
UNIDO Industrial Promotion and
Technology Branch
P.O. Box 300, 1400 Vienna
Tel: +43 1 26026 3737
Fax: +43 1 26026 6808
e-mail: R.Seidl-da-Fonseca@unido.org

Mr. András Siegler
Deputy State Secretary
Ministry of Education
H-1055 Budapest, Szalay u. 10-14.
Tel: +36 1 473 7000
Fax: +36 1 473 7001
e-mail: andras.siegler@om.hu

Mr. Peter Šimko
Vice-Director
Food Research Institute
Priemyselná 4, P.O.Box 25 824 75
Bratislava 26
Tel: +421 2 55574622
Fax: +421 2 55571417
e-mail: peter.simko@vup.sk

Mr. Gábor Simon
Trade Officer
Embassy of Israel
H -1026 Budapest, Fullánk u. 8.
Tel: +36 1 2000-781, 2000-782
Fax: +36 12000-787
e-mail: isremb@axelero.hu

Mr. László Simon
National Institute of Psychology and
Neurology, National Stroke Center
H-1021 Budapest
Huvosvolgyi Street 116
Tel: 36-1-391-53-74
Fax: 36-1-391-54-40
e-mail: simla@freemail.hu

Mr. Maciej Sip
Government Affairs Director
Monsanto
Monsanto Polska Sp. z o.o., ul.
Stawki 2, 00190 Warszawa
Tel: +48 602 25 30 70
Fax: + 48 22 530 72 27
e-mail: maciej.sip@monsanto.com

Mr. Domokos Sipos
Managing Director
Hungrana Ltd.
2432 Szabadegyháza, Ipartelep
Tel: + 36 25 578 101
Fax: + 36 25 578 112
e-mail: siposd@hungrana.hu

Mr. Csaba Sisak
Chemical Engineer, University of
Kaposvár, Research Institute of
Chemical and Process Engineering
H-8200 Veszprém, Egyetem u. 2.
Tel: +36-88-421-614
Fax: +36-88-424-424
e-mail: sisak@mukki.richem.hu

Mr. Karel Sklenar
VW-Skoda, Automotive Industry
Association (AIA CR)
110 00 Praha 1, Opletalova 55
Tel: + 420 221 602 983
Fax: + 420 224 239 690
e-mail: autosap@autosap.cz

Mrs. Margita Slimakova
Data Expert
SARC

Stare grunty 52, 842 44 Bratislava 4
Tel: +421 2 654 20 337
Fax: +421 2 654 20 308
e-mail: slimakova@sarc.sk

Mr. Alexander Sokolov
Deputy Director
Centre for Science Research and
Statistics
11, Tverskaya str., Moscow, 125009
Tel: +7-095-2298227
Fax: +7-095-9242828
e-mail: sokolov@csrs.ru

Mrs. Anikó Soltész
Director
SEED Foundation for Small
Enterprise Economic Development
H-1024 Budapest,
Rómer Főris u. 22-24.
Tel: +36 1 212 2179
Fax: +36 1 212 2179
e-mail: asoltesz.seed@hungary.com

Mr. Zoltán Somogyi
Head of Unit, Ministry of Education
H-1052 Budapest Szervita tér 8
Tel: +36 14842527
Fax: +36 13187076
e-mail: zoltan.somogyi@om.hu

Mrs. Natalia Stepanova
Head of the Division of the State
Regulation of Genetic Engineering
Ministry of Industry/ Science and
Technologies of the Russian
Federation
103905 Moscow, Tverskaja st., 11
Tel: +7-095-229-16-74
Fax: +7-095-229-16-74
e-mail: nat-step@yandex.ru

Mr. Jaroslav Štipánek
Counsellor
Permanent Mission of the Czech
Republic in Vienna,

A-1140 Vienna, Penzingerstrasse 11-13.
Tel: +34 1 894 2933
Fax: +43 1 894 5798
e-mail:
mission.vienna@embassy.mzv.cz,
jaroslav_stepanek@mzv.cz

Mr. Tiziano Sudaro
Dr.Rer.Pol
Ministry of Defence
General Staff Planning Staff
Schermenwaldstrasse 13 3063
Ittigen-Bern
Tel: 0041 31 322 87 79
Fax: 0041 31 323 94 17
e-mail: tiziano.sudaro@gst.admin.ch

Mrs. Ilona Szabó
Head of Section
Ministry of Education
H-1055 Budapest, Szalay u. 10-14.
Tel: +36 1 484 2521
Fax: +36 1 318 7213
e-mail: ilona.szabo@om.hu

Mr. Richárd Szántó
Ph.D. Student
BUESPA, Department of Business
Economics
H-1053 Budapest Veres Pálné u. 36.
Tel: +36 1 318 3037
Fax: +36 1 318 3037
e-mail: richard.szanto@bkae.hu

Ms. Zsuzsa Szentgyörgyi
Adviser to the President of the
National Academy of Sciences
H-1124 Budapest, Thoman István u.
14/III.Ih.fsz.1
Tel: +36 1 395 48 71
Fax: +36 1 395 48 71
e-mail: szentzs@helka.iif.hu

Ms. Judit Szilbereky
Project Manager
Innostart National Business and

Innovation Centre
H-1116 Budapest, Fehérvári 130
Tel: +36-1-3821500
Fax: +36-1-382-1510
e-mail: szilbereky@innostart.hu

Mr. Tamás Szüts
Managing Director
Biostatin Ltd.
H-1045 Budapest, Berliini út 47-49
Tel: + 36-1-231-8060
Fax: +36-1-370-8910
e-mail: tamas.szuts@biostatin.hu

Mr. Maciej Szymanowski
Counsellor, Director
Polish Institute in Hungary
H-1065 Budapest, Nagymezo u. 15.
Tel: +36 1 311 5856, 311 1168, 353
0716
Fax: +36 1 331 0341
e-mail: polinst@axelero.hu

Mr. Laszlo Takacs
Head of Genomics and
Bioinformatics
Pfizer Global Research and
Development
3-9 Rue de la Loge Fresnes 94265
Tel: +33-1-40 96 75 64
e-mail: Laszlo.Takacs@pfizer.com

Ms. Eszter Tánczos
Chief Scientific Officer
Biotissue Technologies
Engesser Str. 4a 79104 Germany
Tel: +49 761 7676 102
Fax: + 49 761 76 76 150
e-mail: eszter.tanczos@biotissue-
tec.com

Mrs. Katalin Tánczos
Head
Department of Transport Economics,
Budapest University of Technology
and Economics

H-1111 Budapest, Bertalan L.u. 2.
Tel: +36 1 463 32 65
Fax: +36 1 463 32 67
e-mail: ktanczos@kgazd.bme.hu

Mr. Bogdan Tasnadi
CRIMM Foundation Romania
e-mail: btasnadi@imm.ro

Ms. Adriana Ticau
State Secretary
Ministry of Information Technology
and Telecommunication
Bucharest, Bd. Libertatii No. 14
Sector 5, Cod 70060
Tel: + 40 21 400 1190
Fax: + 40 21 336 5887
e-mail: office@mcti.ro

Ms. Ivana Ticha
Vice-Rector
Czech University of Agriculture
Kamycka 129 Praha 6-Suchdol 165 21
Tel: +420224382260
Fax: +420234381855
e-mail: ticha@pef.czu.cz

Mr. Marek Tiits
Permanent Secretary
Research and Development Council,
State Chancellery
Rahukohtu 3 Tallinn 15161
Tel: +37 2 744 17 22
e-mail: marek@ibs.ee

Mr. József Tóth
Developer, L&Mark Ltd.
H-2151, Fót, Erdoalja ut 3
Tel: +3612017725
Fax: +3612017725
e-mail: jtoth@lmark.mgx.hu

Mr. László Tóth
Institute Director
Bay Zoltán Institute
H-3519 Miskolc Iglói u.2.

Tel: +36 46 560 110
Fax: +36 46 369 438
e-mail: tlaszlo@alpha.bzlogi.hu

Mr. Tibor Tóth
Ambassador of the Republic of
Hungary to the United Nations
Office in Geneva
Permanent Mission of the Republic of
Hungary to the UN Office in Geneva
1206 Geneva, 81, Avenue de Champel
Tel: + 41 22 343 5165, 346 0323, 347
9147
Fax: + 41 22 346 5861
e-mail: mission.hungary@itu.ch

Mr. Rene Tonnisson
Programme Director
Institute of Baltic Studies
Kompanii 2, 51007 Tartu
Tel: +372-5029 873
Fax: +372-7441 722
e-mail: rene@ibs.ee

Mr. Turgut Tumer
Associate Vice-president
Scientific and Technical Research
Council of Turkey (TUBITAK)
Ataturk Blv. 221 06100 Ankara
Tel: +90 312 428 09 29
Fax: +90 312 427 26 72
e-mail: ttumer@tubitak.gov.tr

Mr. Mihály Turcsán
Expert on Technology and Economy
H-1165 Budapest, Budapesti út 121/C
Tel: +36 1 403 7306
Fax: +36 1 403 7306
e-mail: mturcsan_dr@mailbox.hu

Mr. Viktor Türk
Analyst
Hungarian Institute for Economic
Analysis
H-1055 Budapest, Honved u. 20/a
Tel: +36 1 474 9750

Fax: +36 1 373 0188
e-mail:
turk.viktor@gazdasagelemzo.hu

Mr. Tomasz Twardowski
Institute of Bioorganic Chemistry,
Polish Academy of Sciences
Z. Noskowskiego 12/14 61 704 Poznan
Tel: +48-61-8528503
Fax: +48-61-8520532
e-mail: twardows@ibch.poznan.pl

Ms. Zsuzsanna Udvarhelyi
General Director
Ministry of Economy and Transport
H-1055 Budapest, Honvéd u. 13-15.
Tel: +361 374-2805
Fax: +36 1374-2800
e-mail:
zsuzsanna.udvarhelyi@gmv.gov.hu

Ms. Gülhan Ulutekin
Counsellor
Embassy of the Republic of Turkey
H-1062 Budapest, Andrásy út 123.
Tel: +36 1 344 5025
Fax: +34 1 344 5143
e-mail: budapest@turkishembassy.hu

Ms. Laura Ungváry
Project Assistant, SEED Foundation
for Small Enterprise Economic
Development
H-1024 Budapest,
Rómer Főris u. 22-24.
Tel: +36 1 212 2179
Fax: +36 1 212 2179
e-mail: laura@seed.hu

Mr. László Úrge
Chief Executive Officer,
Comgenex, Inc.
POB 73., Budapest 62, H-1388
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: laszlo.urge@comgenex.hu

Mr. Pavel Vacek
Ambassador Extraordinary and
Plenipotentiary
Permanent Mission of the Czech
Republic to UNIDO
1140 Vienna Penzinger Strasse 11-13
Tel: +43 1 894 29 33, 894 2125
Fax: +43 1 894 57 98, 894 1200
e-mail:
mission.vienna@embassy.mzv.cz

Mrs. Daniela Vachova
Project Manager, Technology Centre
AS CR, Bohemian Regional Innovation
Strategy Project for the Prague region
165 Prague 6, Rozvojova 135
Tel: + 420 2 203 90 720
Fax: +420 2 209 22 698
e-mail: vachova@tc.cas.cz

Mr. Tibor Vámos
Academician
Hungarian Academy of Sciences
H-1111 Budapest, Lágymányosi u. 11.
Tel: + 36 1 279 323 6232, 279 6239,
209 5274
Fax: +36 1 209 5274
e-mail: vamos@sztaki.hu

Mr. Marc Van Montagu
Chairman
Department of Molecular Genetics,
Institute Plant Biotechnology for
Developing Countries (IPBO),
Ghent University
9000 Gent, K.L. Ledeganckstraat 35
Tel: +32-9-2648727
Fax: +32-9-2648795
e-mail: mamon@gengenp.rug.ac.be

Mr. Arnold Van Zyl
Research Delegate, EUCAR
211 rue du Noyer, B-1000 Brussels
Tel: 0032 2 738 73 52
Fax: 0032 2 738 73 12
e-mail: az@acea.be

Mr. Pál Venetianer
Research Professor
HAS Biological Research Center
H-6726 Szeged, Temsvári krt 62
Tel: +36 62-432-232
Fax: +6 62-433-506
e-mail:
venetianer@nucleus.szbk.u-szeged.hu

Mrs. Judit Veress
Director
Inda—Investment Development
Agency
V. Babes 12. Sf. Gheorghe, 4000
Tel: +40723522954
Fax: +40267311006
e-mail: judit@investhere.ro

Mr. Roger Vickermann
Director and Jean Monnet Professor
of European Economics
Centre for European, Regional and
Transport Economics, University of
Kent
Keynes College Canterbury, CT2 7NP
Tel: +44 1227 82 34 95
Fax: +44 1227 82 77 84
e-mail: R.W.Vickerman@ukc.ac.uk

Mr. László Vigh
Director
Biological Research Center, Institute
of Biochemistry
H-6701 Szeged, P.O.Box 521
Tel: +36 62 432048
Fax: +36 62 432048
e-mail: vigh@nucleus.szbk.u-
szeged.hu

Mr. Marian Vitkovic
Senior Liaison Officer, Permanent
Secretariat for Cooperation with
the UNIDO
Entrepreneurship Promotion
and Strategy Section, Ministry
of Economy

827 15 Bratislava 212, Mierová 19
Tel: + 421 2 4854 1608
Fax: + 421 2 4333 0109

Mr. Szilveszter Vizi E.
President
Hungarian Academy of Sciences
H-1051 Budapest, Roosevelt tér 9.
Tel: + 36 1 331 9353, 332 7176
Fax: + 36 332 8943
e-mail: elnokseg@office.mta.hu

Mr. Franz Vranitzky
Former Chancellor of Austria
West LB
1010 Vienna, Führichgasse 8/11
Tel: +43 1 512 04 00
Fax: +43 1 512 04 00/20
e-mail: wlb.fv@nextra.at

Mr. Gerhard K. Wagner
Secretary General
Austrian Association for the
Information Industry ViW
1092 Vienna, P.O.Box 273
Tel: + 43 676 369 3610
Fax: +43 1 961 0103
e-mail: gkwagner@via.at

Mr. Artur Wieland
Professional Adviser for
Biotechnology
Ministry of Education
H-1052 Budapest, Szervita tér 8.
Tel: +36 1484-2529
Fax: +36 1318-7076
e-mail: artur.wieland@om.hu

Ms. Eva Wikonkal
Sales & Marketing Director
Comgenex, Inc.
33-34 Bem rkp,
Budapest H-1027
Tel: +36-1-214-2306
Fax: +36-1-214-2310
e-mail: eva.wikonkal@comgenex.hu

Mr. Péter Wolf
Project Office Leader
Hungarian Institute for Economic
Analysis
H-1055 Budapest, Honved u. 20/a
Tel: +36 1 474 9750
Fax: +36 1 373 0188
e-mail:
wolf.peter@gazdasagelemzo.hu

Mr. Costas Yenethlis
Special Scientist/External Consultant
University of Cyprus
10, Prodromou Street,
2063 Strovolos, Nicosia
Tel: +357-99-618777
Fax: +357-22-463161
e-mail: yenethli@ucy.ac.cy

Mr. Spyros Zavros
Industrial Extension Officer Grade 1
Ministry of Commerce,
Industry and Tourism
CY-1421 Nicosia
Tel: + 357 22 867 243
Fax: + 357 22 375 120
e-mail: mcindust@cytanet.com.cy

Mr. Michael Zgurovsky
Rector
National Technical University,
Kyiv Politechnical Institute

37, Peremogy ave. 01001 Kiev
Tel: +38 44 274 69 13
Fax: +38 44 274 0954
e-mail: zgurovsm@hotmail.com

Ms. Eniko Zobor
Programme Coordinator
Technology Foresight Programme
Office
H-1052 Budapest, Szervita tér 8.
Tel: 00-36/1 484-2592
Fax: 00-36/1 317-0249
e-mail: eniko.zobor@om.hu

Mrs. Zita Zoltay Paprika
International Director
Budapest University of Economic
Sciences and Public Administration
H-1093 Budapest, Fovám tér 8.
Tel: +36 1 217 6740
Fax: + 36 1 2176714
e-mail: zita.paprika@bkae.hu

Mr. Attila Zsigmond
Alternate Permanent Representative
Permanent Mission of the Republic
of Hungary to the UN Office
A-1010 Vienna,
Bankgasse 4-6.
Tel: + 43 1 535 3389
Fax: + 43 1 535 6161
e-mail: un-mission@huembvie.at

Annex II. Agenda of the Summit

Hosts of the Summit:

Carlos Magariños
(Director-General, UNIDO)

István Csillag
(Minister of Economy and Transport, Republic of Hungary)

Moderator of the Summit:

Tibor Tóth
(Ambassador of the Republic of Hungary to the United Nations Office in Geneva) Hosts of the Summit

OPENING CEREMONY

Time: 27 March 2003, 14.00-15.00

Room: Star Auditorium

Opening addresses:

Haruko Hirose
(Managing Director, Programme Coordination and Field Operations
Division, UNIDO)

Bàlint Magyar
(Minister of Education, Republic Hungary)

Szilveszter E. Vizi
(President, Hungarian Academy of Sciences)

**TF PLENARY: KNOWLEDGE-BASED SOCIETY, INNOVATION
AND TECHNOLOGY FORESIGHT**

Time: 27 March, 2003, 15.00-16.30

Room: Star Auditorium

- Foresight practice as a tool for enhancing competitiveness and innovation on corporate, sub-, supra- and national levels;
- Main global scientific, technological and social trends, taking into consideration the findings of the various national foresight studies.

Chairperson:

András Siegler (Deputy Secretary of State, Ministry of Education, Hungary)

Speakers:

Luke Georghiou (Executive Director, PREST, University of Manchester, UK)
Topic: "Foresight Concept and Practice as a Tool for Decision-making"

Lajos Nyíri (Executive Manager, ZINNIA Group LP, Hungary)

Topic: "Innovation: A Bridge Between R&D and Industry—a Bottleneck in CEE & NIS countries"

Jean Frederic Richard (Director, Strategic Research and Economics Branch, UNIDO)

Topic: "Foresight and Industrial Strategy"

TF PANEL 1: FORESIGHT AT NATIONAL AND SUB-NATIONAL LEVEL

Time: 28 March 2003, 8.30-10.00

Room: Béla

- Role of Foresight as a tool for strategic decision making and consensus building;
- How to raise the ability of society to shape the future rather than waiting for it to happen;
- The importance of foresight exercises in Central- and Eastern-Europe and in the NIS countries for enhancing innovation and global competitiveness of industry;
- Anticipating issues related to political, economic, social transition;
- Outcome of foresight: the "products" (reports, studies) and the process itself;
- Ways to disseminate the culture of foresight to the society.

Chairperson:

Helen Acheson (Division Manager, Competitiveness and Innovation, Forfas, Ireland)

Speakers:

Lennart Luebeck (Programme Manager, IVA, Sweden)

Topic: "Foresight at National Level: The Experience of Sweden and Its Contribution to the Foresight Process and Culture"

Gordon Ollivere (Managing Director, RTC North Ltd., UK)

Topic: "Foresight Project as a Tool to Enhance Regional Development"

Contributors:

Michael Zgurovsky (Rector, National Technical University, Kiev Politechnical Institute, Ukraine)

Topic: "The Role of Technology Foresight in Economic Transformation in Ukraine"

Turgut Tümer (Associate Vice-president, Scientific and Technical Research Council of Turkey—TUBITAK)

Topic: "The Rationale and Methodology of the Turkish Foresight Programme (Vision 2023)"

Rapporteur:

Attila Havas (Researcher, Institute for new Technologies UNU-INTECH)

**TF PANEL 2: FORESIGHT AT CORPORATE, MULTI-COUNTRY
AND NETWORK LEVEL**

Time: 28 March 2003, 10.30-12.00

Room: Béla

- Integration to the European Union and globalization: new drivers of longer-term thinking.
- New trends in "foresighting": networks of foresight programmes as a first step towards a supra-national or European foresight;
- Recent initiatives to introduce foresight exercise (method and culture) in Central and Eastern-Europe and in the Newly Independent States;
- ERA (European Research Area) as a tool to enhance competitiveness of Europe;
- Experiences of future oriented programmes and strategic thinking at corporate level; what foresight can offer for both small-enterprises and multi-national organizations;

- Trans-border regions in Central and Eastern-Europe and in the Newly Independent States—an opportunity for cooperation;
- The regional dimension on technology foresight process.

Chairperson:

Karel Klusacek (Director, Technology Centre AS, Czech Republic)

Speakers:

Hans Graf (Director, Centre for Futures Research, St. Gallen, Switzerland)
Topic: "Experiences with Foresight Methods at Corporate Level"

Gustavo Fahrenkrog (Head, Technology, Employment, Competitiveness and Society Unit, Institute for Prospective Technological Studies—IPTS, Spain)
Topic: "Networking of Foresight Programmes"

Günther Clar (Principle Officer, European Commission DGRTD K2)
Topic: "Emerging Foresight Programmes in the CEE region"

Ricardo Seidl da Fonseca (Programme Manager, Industrial Promotion and Technology Branch, UNIDO)
Topic: "Regional Initiative on Technology Foresight for CEE & NIS"

Rapporteur:

Attila Havas (Researcher, Institute for new Technologies UNU-INTECH)

TF PANEL 3: EMERGING TECHNOLOGIES FOR TRANSPORTATION AND LOGISTIC

Time: 28 March 2003, 14.00-15.30

Room: Béla

- Response to the need of different groups of CEE countries and NIS for a mid- and long-term development vision on the transportation sector and logistics services;
- Dissemination of the best practices, experience, results and lessons of technology foresight in the field of transportation and logistics;
- Development of more technology-oriented long-term strategies as regards to relevant national and regional transport system development for decision makers of public and private sector, such as NGOs, governments and local authorities, R&D institutions, NGOs and business community;
- Consideration of the main objectives of EU common transport policy and evaluation of regional specialities and circumstances in order to bring together the initiatives which are able to meet the new challenges and can provide assistance for a sustainable mobility;

- Selection of the main priorities to be applied in the transportation and logistics system development in CEE and NIS.

Chairperson:

Katalin Tánczos (Head, Department of Transport Economics, Budapest University of Technology and Economics, Hungary)

Speaker:

Roger Vickermann (Director and Jean Monnet Professor of European Economics, Centre for European, Regional and Transport Economics, University of Kent, UK)

Topic: "Transport, Traffic and Logistics Connecting Countries"

Contributors:

Włodzimierz Rydzkowski (Chairman, Transport Policy Department, University of Gdansk, Poland)

Attila Gönczi (Associate Professor of University Politechnica Timisoara, Faculty of Management in Production and Transportation, Department of Transportation and Logistics, Romania)

Rapporteur:

Katalin Tánczos (Head, Department of Transport Economics, Budapest University of Technology and Economics, Hungary)

**TF PANEL 4: THE FUTURE OF ENVIRONMENT—
THE ENVIRONMENT OF THE FUTURE**

Time: 28 March 2003, 8.30-10.00

Room: Ybl

- Public expectations and reality for cleaner production and healthy environment;
- Environment and quality of life: prospects for improvement and threats;
- International economic relations and environmental management: the need for common visions and agreements.

Chairperson:

István Láng (Science Policy Advisor, Hungarian Academy of Sciences)

Speakers:

Hans Schnitzer (Professor for Process Engineering, Graz University of Technology, Austria)

Topic: "From Cleaner Technologies to Zero Emission Practices"

Adam Budnikowsky (Director, Institute of International Economics,
Warsaw School of Economics)

Topic: "Common Problems and Their Solutions for Environmental
Protection in the CEE & NIS Region"

Contributor:

Tatiana Kluvánková-Oravská (Institute for Forecasting, Slovak Academy
of Sciences)

Topic: "Participatory Multicriteria Decision Aid in Regional Foresight"

Rapporteur:

Sándor Kerekes (Professor, Budapest University of Economic Sciences and
Public Administration, BUESPA)

**TF PANEL 5: INFORMATION AND COMMUNICATION TECHNOLOGIES--
PERVASIVE ELECTRONICS**

Time: 28 March, 2003, 10.30-12.00

Room: Ybl

- Emerging paradigms for electronics and computing technologies (nano-, molecular-, quantum-, bio-technologies);
- Increasing intelligence and connectivity in all kinds of devices;
- The future of communications, perspectives of broadband and mobile technologies, global connectivity;
- Pervasive electronics and computing technologies and development of multi-platform applications;
- Industrial possibilities and challenges with special attention to the CEE/NIS region.

Chairperson:

Laszlo Belady (Technology Futures Inc., Austin, Texas, USA)

Speakers:

István Fodor (Chairman, Ericsson, Hungary)

Topic: "Techniques and Technologies Which Will Change Our Lives:
Ubiquitous Electronics"

Roberto Saracco (Director, Future Centre, TILAB, Italy)

Topic: "Information and Communication Technologies: Disruptions to Look
for and Their Impact on Countries Evolution Strategies"

Contributors:

Christos N. Schizas

(Professor of Computer Science, Vice Rector, University of Cyprus)

Kiril Boyanov

(Head, Central Laboratory for Parallel Processing (CLLP), Bulgarian Academy of Sciences)

Topic: "Trends in Telecommunication and Developments in Bulgaria"

Rapporteur:

Bálint Dömölki (Chairman, IQSOFT Intelligent Software Co. Ltd., Hungary)

**TF PANEL 6: INFORMATION AND COMMUNICATION TECHNOLOGIES—
APPLICATION TRENDS AND SOCIAL ISSUES**

Time: 28 March 2003, 14.00-15.30

Room: Ybl

- Trends in the use of pervasive computing devices (personal networks, mobile applications etc.);
- Enterprise-wide applications in the world of global connectivity;
- The increasing role of community building and citizen participation supporting applications;
- Fighting the "digital divide", both within the countries and between regions;
- Preserving multilingual and multicultural values in the world of global communications;
- Challenges for security and trust in an increasingly ICT-dependent society.

Chairperson:

Tibor Vámos (Chairman of Board, Computer and Automation Research Institute, Hungarian Academy of Sciences)

Speakers:

Zsuzsa Szentgyörgyi (ICT Expert, Adviser to the President of the National Academy of Sciences, Hungary)

Topic: "Application Trends and Social Issues of Information and Communication Technologies"

Vasile Baltac (President, ATIC-IT&C Association of Romania)

Topic: "Information Society and its Challenges to Emerging Economies"

Contributors:

Marek Tiits (Permanent Secretary, Research and Development Council, State Chancellery, Estonia)

Topic: "ICT Foresight as the Tool in Fostering Industrial Development in the CEE"

Niko Schlamberger (State Undersecretary, Statistical Office of the Republic of Slovenia)

Topic: "Measuring the Information Society"

Rapporteur:

Bálint Dömölki (Chairman, IQSOFT Intelligent Software Co. Ltd., Hungary)

TF PANEL 7: PROSPECTS AND NEW TECHNOLOGIES FOR AGRICULTURE AND FOOD INDUSTRY

Time: 29 March 2003, 8.30-10.00

Room: Béla

- Impacts of integration to the European Union on the agriculture and food industry of the Central and Eastern-European Countries and the Newly Independent States;
- Longer-term thinking on possible scenarios dealing with structural changes that will occur as a result of compliance with the "acquis communautaire" in the post accession period;
- Agri-environment: Environmental issues in crop production are mainly related to agro-ecological aspects, plant technologies as pollution sources, sustainability, cultivated areas as wildlife habitat and landscape management;
- Regional (foresight) programmes as potential tools for enhancing rural development and eco-tourism;
- Product development: bio-products, marketing opportunities and difficulties of traditional/regional specialities;
- Food quality and safety;
- New forms of cooperatives in the countries in transition:
 - and storage, joint marketing
 - Small/medium-size enterprises and multinational companies (cooperation or competition?);
- New role of the state:
 - Education and information of small-holders adult education, model farms, consultative networks
 - Introduction of compliance with EU norms in quality assurance
 - EU accepted methods of protecting indigenous small-holders.

Chairperson:

Márton Jolánkai (Szent István University, Budapest)

Speakers:

Ioannis Papadopoulos (Director, Agricultural Research Institute, Cyprus)

Topic: "Challenges of Agriculture in the CEE & NIS in the Next Two Decades"

Péter Biacs (Deputy State Secretary, Ministry of Agriculture and Regional Development, Hungary)

Topic: "Future of Food Industry in the CEE & NIS"

Contributors:

Peter Šimko (Vice-Director, Food Research Institute, Slovakia)

Rapporteur:

Michael Landesmann (Director of Research, Vienna Institute for International Economic Studies, Austria)

TF PANEL 8: AUTOMOTIVE INDUSTRIES AT CROSS-ROADS

Time: 29 March 2003, 8.30-10.00

Room: Ybl

- The weight of Central Europe in the global automotive market: would a fast economic development (catching up) boost this market?
- The importance of accession countries as a production base:
 - Assembling high-volume, low-end models, and/or low-volume, high-end models;
 - Producing high value-added sub-systems for Europe and global production networks and/or low-tech, low value-added components for the local markets;
- The role of endogenous automotive firms in accession countries in the regional, European and global production networks:
 - Low-cost, efficient second- and third tier suppliers ("screw-driving" plants);
 - Mighty first-tier suppliers engaged in R&D and high value-added services (logistics, training, TQM, etc. for other suppliers);
- The impacts of environmental challenges, reactions of global players and endogenous firms;
- The diffusion of new automotive technologies (e.g. fuel cells) in accession countries, and the role of endogenous firms and R&D centres in developing them;
- The marriage of electronics, ICT and automotive technologies;

- New concepts for personalized transport systems and the role of endogenous firms and R&D centres in developing them;
- Alternatives to automotive transport (local, city-to-city) and their impacts on the global and endogenous automotive firms.

Chairperson:

Cedomir Duboka (Faculty of Mechanical Engineering, University of Belgrade, President of Yugoslav Society of Automotive Engineers)

Speaker:

István Lepsényi (President, Association of the Hungarian Automotive Industry, Managing Director, Knorr-Bremse Ltd, Hungary)

Topic: "Automotive Industry—A Driving Force of the Economies of Central and Eastern Europe"

Contributors:

Karel Sklenar (VW-Skoda, Czech Republic)

Jan Lesinsky (Associate Professor, Slovak University of Technology)

Rapporteur:

Erzsébet Czakó (Associate Professor, Appointed Head of Department, Department of Business Economics, BUESPA, Hungary)

BT SESSION 1: BIOTECHNOLOGY AND THE BIOMEDICAL INDUSTRY

Time: 28 March 2003, 8.30-10.00

Room: Star Auditorium

- The post-genomic era and the new paradigm of medical biotechnology;
- Computational and information-driven approaches in the pharmaceutical industry;
- Drug design and pharmaceutical development strategies based on genomic information.

Speakers:

Friedrich Dorner (President, Baxter Bioscience, Austria)

Topic: "Medicine and Man: Can Mankind Cope?"

Jacob de Vlieg (Executive Director, Molecular Design and Informatics, N.V. Organon, Akzo-Nobel, The Netherlands):

Topic: "The Role of "in silico" Biology in Drug Discovery"

László Takács (Head of Genomics and Bioinformatics, Pfizer Global Research and Development, France)

Topic: "Parallel Biology: Current Aspects of Genome Research and its Application in the Pharmaceutical Industry"

Rapporteur:

Pál Venetianer (Research Professor, Biological Research Centre, Hungary)

BT SESSION 2: BIOTECHNOLOGY, FOOD AND AGRICULTURE

Time: 28 March 2003, 10.30-12.00

Room: Star Auditorium

- The challenges and potentials of biotechnology in forming the new agriculture;
- Global and local approaches to agricultural biotechnology, meeting the needs of a growing world population;
- Regulatory aspects of agricultural biotechnology: new challenges to markets and to regulatory agencies.

Speakers:

Marc Van Montagu (Chairman, Department of Molecular Genetics, Institute Plant Biotechnology for Developing Countries, Ghent University, Belgium)
Topic: "Plant Biotechnology for Developing Countries. What Is Needed and What Can Be Done."

Dénes Dudits (Director General, Biological Research Centre, Szeged)
Topic: "The Green Genome Era: Central European Perspective."

Andrzej Aniol (Deputy Director for Research, Plant Breeding and Acclimatization Institute, IHAR, Poland)
Topic: "The Legal and Regulatory System of Biotechnology in Poland and its Relation to EU Regulations."

Rapporteur:

Pál Venetianer (Research Professor, Biological Research Centre, Hungary)

BT SESSION 3: BIOTECHNOLOGY AND THE ENVIRONMENT

Time: 28 March 2003, 14.00-15.30

Room: Star Auditorium

- Biotechnology as a challenge and a help to the environment;
- The effect of biotechnology on the new food standards: regional and global views;
- Public perception of biotechnology: what the public would like to know;
- Biotechnology and society: global and regional views;
- Genetically modified organisms and the environment.

Speakers:

Joachim Schiemann (Institute for Plant Virology, Microbiology and Biosafety, Germany)

Topic: "Environmental and Biosafety Aspects of Commercially used GM Plants"

Peter Raspor (Biotechnical Faculty, University of Ljubljana, Slovenia)

Topic: "Food Standards, Safety and Biotechnology: A Central-European Perspective"

Tomasz Twardowski (Institute of Bioorganic Chemistry, Polish Academy of Sciences)

Topic: "Biotechnology and the Social Environment"

Rapporteur:

Pál Venetianer (Research Professor, Biological Research Centre, Hungary)

BT PLENARY: CROSS-CUTTING ISSUES ON BIOTECHNOLOGY

Time: 28 March 2003, 16.00-17.30

Room: Star Auditorium

- Biotechnology as a new chapter of scientific and cultural evolution;
- Cross-cutting issues of agricultural and industrial biotechnology: common themes of regulation and property rights;
- Biotechnology in a developmental framework: What the developing world needs.

Speakers:

Frank Gannon (Executive Director, European Molecular Biology Organization, EMBO, Germany)

Topic: "The Interaction between Academia and Industry in the Development of European Biotechnology"

Francisco E. Baralle (Director/Trieste Component, International Centre for Genetic Engineering and Biotechnology, ICGEB, Italy)

Topic: "Biotechnology: A Development Perspective"

Maurizio Iaccarino (International Institute of Genetics and Biophysics, IIGB, Italy)

Topic: "Science, Culture and Biotechnology"

Rapporteur:

Sándor Pongor (Head, Protein Structure and Bioinformatics, ICGEB, Italy)

PLENARY: RAPPORT ON THE SUMMIT

Time: 29 March 2003, 10.30-12.00

Room: Star Auditorium

- Strategic Decision-making
- Findings and Recommendations of the Summit
- Issues for the Ministerial Round Table

Chairperson:

Tibor Tóth (Ambassador of the Republic of Hungary to the United Nations Office in Geneva)

Speakers:

Mary Harney (Deputy Prime Minister, Ireland)

Topic: "The Role of Foresight in Policy Making"

Ferenc Kováts (Technology Foresight Programme, TEP, Hungary)

Topic: "Summary Rapport of the Technology Foresight Panels"

Sándor Pongor (Head, Protein Structure and Bioinformatics, ICGEB, Italy)

Topic: "Summary Rapport of the Biotechnology Prospective Forum"

György Bánlaki (Former Hungarian Ambassador to the United States)

Topic: "Proposed Agenda of the Ministerial Round Table"

MINISTERIAL ROUND TABLE

Impact of the European Union Enlargement and Integration Process on the Local Industry

Participating countries:

Austria, Bulgaria, Croatia, Cyprus, Hungary, Lithuania, Poland, Romania, Slovakia, Slovenia, Serbia and Montenegro, Ireland, Turkey

WORKING LUNCH

Time: 29 March, 2003, 12.00-14.00

Room: Platán Restaurant

Speakers:

Carlos Magariños (Director-General, UNIDO)

Patrick Dixon (Trend and Future Expert, Globalchange Ltd., UK)

ROUND TABLE

Time: 29 March 2003, 14.00-16.30

Room: Star Auditorium

Moderator:

Franz Vranitzky (Former Chancellor of Austria)

Ministers:

Nikolay Vassilev (Deputy Prime Minister and Minister of Economy, Bulgaria)

Gvozden Flego (Minister of Science and Technology, Republic of Croatia)

Yiorgos Lillikas (Minister of Commerce, Industry and Tourism, Cyprus)

István Csillag (Minister of Economy and Transport, Republic of Hungary)

Mary Harney (Deputy Prime Minister, Ireland)

Gediminas Rainys (Vice-Minister of Economy, Republic of Lithuania)

Michal Kleiber (Minister of Science, Chairman of the State Committee for Scientific Research, Republic of Poland)

Dan Nica (Minister of Information Technology and Telecommunication, Romania)

Dragan Domažet (Minister of Science, Technology and Development, Serbia and Montenegro)

Tea Petrin (Minister of Economy, Slovenia)

Ali Cotskun (Minister of Industry and Trade, Republic of Turkey)

Deputies to Ministers:

Peter Ondrejka (Director, Department of Strategy, Analyses and Policy, Ministry of Economy, Slovak Republic)

Ales Mihelic (State Undersecretary, Ministry of Economy, Republic of Slovenia)

Adriana Ticau (State Secretary, Ministry of Information Technology and Telecommunication, Romania)

OPENING OF THE FAIR OF THE FUTURE

Time: 27 March, 2003, 13.00-14.00

Room: Jázmin 2

Opening presentations by:

Hugo Schepens (Secretary General, EuropaBio)

Topic: "Biotech in EU: Focus on Entrepreneurship"

Ernô Duda (President and CEO, SOLVO Biotechnology; Director, Hungarian Biotech Association)

Topic: "Biotech in CEE and NIS: Focus on Opportunities and Threats"

PRESENTATIONS

Time: 28 March, 2003, 10.30-11.00

Room: Jázmin 2

Michael Rinck (Managing Director, Medical Technology Promed Consulting)

Topic: "Regulatory Procedures for Biotech Products in Europe"

Time: 28 March, 2003, 11.00-11.30

Room: Jázmin 2

Ann De Beuckelaer (Partner, Biopolis Consultants Ltd.)

Topic: "Governmental Assistance to the Biotechnology Sector in Germany"

Time: 28 March, 2003, 11.30-12.00

Room: Jázmin 2

Decio Ripandelli (Director, Administration and External Relations, International Centre for Genetic Engineering and Biotechnology, ICGEB)
Topic: "The International Centre for Genetic Engineering and Biotechnology: an Example of International Scientific Co-operation"

Time: 28 March, 2003, 12.00-12.30

Room: Jázmin 2

Andy Bailey (Manager Global Pathogen Safety, Baxter BioScience)

Topic: "Biotechnology Applied to a Future Oriented Blood Safety Concept"

Time: 28 March, 2003, 14.00-14.30

Room: Jázmin 2

Arnold Fehér (Director, Business Development, SOLVO Biotechnology)

Topic: "Developing Academic Results into Products Big Pharma Would Buy"

Time: 28 March, 2003, 14.30-15.00

Room: Jázmin 2

Raghib Bains (Life Sciences CEMA Business Development Executive, IBM EMEA Life Sciences Group)

Topic: "IBM and Biotech (IBM's Experiences with Biotech Companies)"

Time: 28 March, 2003, 15.00-15.30

Room: Jázmin 2

Yigal Koltin (Vice President, International R&D, Millenium Pharmaceuticals)
Topic: "Evolution of a Leading Biopharmaceutical—the Millennium-Saga"

Time: 29 March, 2003, 08.30-09.00

Room: Jázmin 2

Zsolt Lisziewicz (CEO, L&MARK Computer and Engineer Ltd.)
Topic: "Knowledge Based Bioinformatics: a Novel Approach in CNS Discovery"

Time: 29 March, 2003, 09.00-09.30

Room: Jázmin 2

Ferenc Darvas (Founder, President and Chairman, ComGenex Inc.)
Topic: "Building an Integrated Biotech Company Via Innovation and Innovation Management: The 10 Years of ComGenex"

Time: 29 March, 2003, 09.30-10.00

Room: Jázmin 2

Rene Tonnisson (Institute of Baltic Studies)
Topic: "Developing Biotechnology in a Small Country—Estonian Case"

Time: 29 March, 2003, 10.30-11.00

Room: Jázmin 2

Zsolt Rieder (Director, CRM and Custody Management, K&H Bank Plc.)
Topic: "Financing Possibilities for Biotechnology"

Time: 29 March, 2003, 11.00-11.30

Room: Jázmin 2

Richard Schwab (CEO, Cooperative Research Centre, Semmelweis University)
Topic: "Cooperative Research Centres: a Novel Approach to University-Industry Relations Targeting Technology-transfer and Education"

Time: 29 March, 2003, 11.30-12.00

Room: Jázmin 2

Eszter Tánczos (Chief Scientific Officer, Biotissue Technologies AG)
Topic: "Tissue Engineering—a Field of Biotechnology for Everyday Clinical Life"

Time: 29 March, 2003, 12.00-12.30

Room: Jázmin 2

Ferenc Berszán (Deputy Managing Director, Hungarian Innovative Technologies Fund)

Topic: "The Role of Venture Capital in Developing Biotechnology Companies in the CEE Region"

EXHIBITORS

Time: 27-29 March 2003

Room: Jázmin 1

PowerPoint Presentations

PowerPoint presentations will be displayed on screens by the following companies and institutions:

- Hungarian Biotechnology Association
- SOLVO Biotechnology
- Institute of Baltic Studies
- IBM
- Baxter Bioscience
- ICGEB
- Millenium Pharmaceutical
- EuropaBio
- Medical Technology Promed Consulting
- Biopolis Consulting
- Biotissue Technologies
- ComGenex
- Semmelweis University of Medical Science, Budapest
- IRC West Poland
- Thales Nanotechnik
- Genodia Molecular Diagnostic Kft.
- Agricultural Biotechnology Research Centre, Gödöllô
- Farkas & Rieder Kft.
- L&Mark Ltd.
- City of Vienna
- Hungarian Innovative Technologies Fund
- Biotechnology Centre, Szeged
- ChemAxon

Exhibition Booths

Exhibition Booths will be presented by the following companies and institutions:

- ComGenex
- ComDrug
- Thales Nanotechnik
- RecomGenex
- Tomtec
- Hungarian Biotechnology Association
- SOLVO Biotechnology
- PREST University of Manchester
- L&Mark Ltd.
- IDG Hungary

Organizing Team

United Nations Industrial Development Organization
Industrial Promotion and Technology Branch
Ricardo Seidl da Fonseca
Claudia Kauffman

Permanent Mission of the Republic of Hungary to UNIDO
Attila Zsigmond

National Coordinator

László Kállay
Péter Kulcsár
Márta Kifer
Péter Wolf
Zsófia Cseke

Technology Foresight Panels Component Manager

Ferenc Kováts (Hungarian Technology Foresight Programme, TEP)

Biotechnology Prospective Forum Component Manager

Sándor Pongor (International Centre for Genetic Engineering and Biotechnology ICGEB)

Ministerial Round Table Component Manager

György Bánlaki (Former Hungarian Ambassador of Hungary to the United States)

Fair of the Future Component Manager

Miklós Devecz (Flextronics International)
Hungarian Biotechnology Association

Public Relations and Marketing

Zsuzsanna Papp (Sygma Creative)

Logistics

Anikó Soltész

Laura Ungváry (SEED Foundation for Small Enterprise
Economic Development)

Multimedia

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, PO Box 300, A 1400 Vienna, Austria
Telephone: +(43) (1) 26026-0, Fax: +(43) (1) 26926-69
E-mail: unido@unido.org, Internet: <http://www.unido.org>