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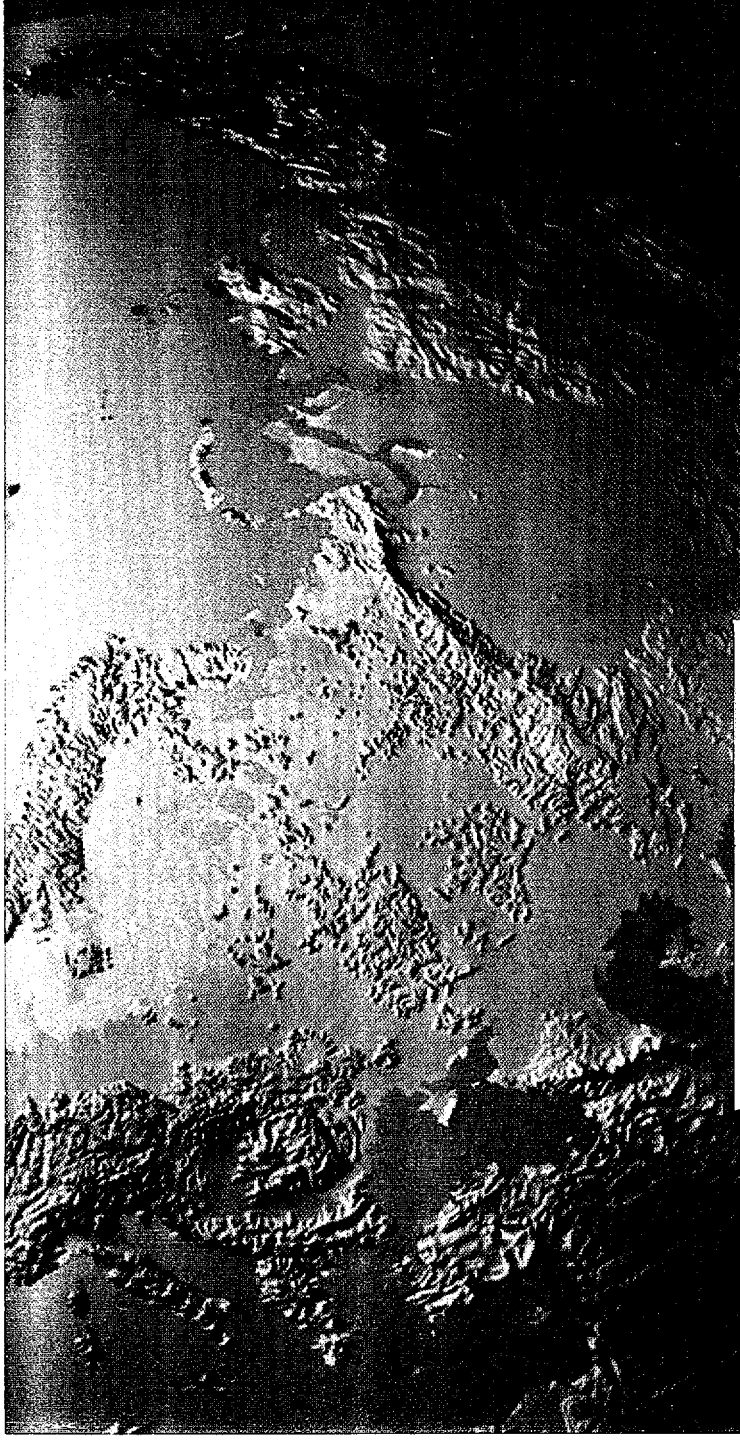

Session I

GLOBALIZATION AND THE INTEGRATION OF INDUSTRY IN THE REGION

Foresight: A Tool for Pre-accession Countries to Face the Challenges of Globalization and Integration

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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by Ferenc Kováts

Session I

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UNITED NATIONS
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Executive summary

The future in the twenty-first century is full of new challenges: revolutionary developments in information/communication technologies and in the field of life science will have dramatic socio-economic effects. In Europe, demographic changes, sustainability concerns and enlargement make the picture even more tangled. The fact that they will occur simultaneously over the next decades (and they may have synergic interactions) makes the future even more uncertain.

To face these challenges a proper strategy is badly needed. A strategy, on the other hand, must be based on an exact forecast, which, due to the above-mentioned complexities, is impossible to prepare.

Governments and non-governmental organizations in some developed countries have realized the problem, and instead of trying to elaborate more or less exact forecasts have called their experts from government, academia and business-life together in an informal way and asked them to draw various possible options (good and bad) for the future and make a set of recommendations for immediate actions to increase the probability of the optimal and avoid (as much as possible) the occurrence of the bad one. Thus the future itself can be modified. This process is called "Foresight".

For countries in Eastern Europe the situation is even more complex. They are in transition towards a market economy, undergoing fundamental economic and social changes. To look into the future and be prepared for good and bad is extremely important for them. The enlargement is raising problems both within the EU and in the accession countries as well.

This paper tries to give a short overview and background information on the methods and experience of the various national Foresight exercises from the point of view of less developed countries (chapter 1) continued by a selected list of challenges facing the Central and Eastern European Countries and the Newly Independent States (chapter 2). In chapter 3 recommendations are made for initiating national, regional and inter-regional foresight programmes and for possible supportive actions of international organizations.

Contents

Preface

Our world is characterized by increasingly rapid change in which global trends cannot be stopped at national borders. At the same time life is becoming more and more competitive, with national competitiveness depending on technological, organizational and social innovation. Similarly, firms cannot survive the ever more fierce, global competition without introducing new products, services. For orientation, or rather, for setting national or company priorities a strategic research is necessary.

This paper tries to give information on an exercise called "Foresight" which has been used in several countries to help decision-makers to select national or company priorities and to identify new research projects. The task is not easy as the (wanted or adverse) social impacts of the technical developments also must be taken into consideration. Finally, but not least the target population (people of the country, or potential consumers) should be able to accept/absorb the new development.

Many governments have realized the importance of foresight activities, and thus this relatively new, and innovative, technology policy tool is spreading across continents.

Australia, Japan, Malaysia, South Africa, the United States, and most EU countries have implemented large programmes in order to set new priorities and find new directions for technology policy. But less-favoured nations and regions also need priority-setting instruments. The foresight process can be a tool for them.

This paper concentrates on why and how a foresight process can be applied especially in Central and Eastern European Countries (CEECs) as well as in the Newly Independent States (NIS).

1 About Foresight

1.1 What is Foresight?

Technology Foresight* is a systematic means of assessing that scientific and technological development which could have a strong impact on industrial competitiveness, wealth creation and quality of life carried out by joining the intellectual force and experience of researchers, business people and government officials. People from academia, business and government participating in the foresight programme, and individual experts, act at a personal capacity, by not representing any organization but by following their own opinion. To put in a more simple way: the principle of "two heads are better than one" is used because the issue is one where exact knowledge is not available (Dalka 1969).

Another, and equally important, attribute is that instead of one particular plan leading to one goal, in the foresight exercise more possibilities, options are identified and a set of recommendations are elaborated for decision-makers to be able to develop strategies to achieve favourable targets and to avoid (or lessen the effect) of the dangers. Thus, by recognizing the good and bad future options, and the necessary actions, foresight seems to be a modest but real tool for shaping the future itself. To act or not to act (and how) will influence the future. So foresight is a learning process of looking into the future and drawing conclusions for the present.

Methods used in different countries are different, corresponding to national characteristics including, among others, tradition, structure of public administration, economic system and last, but not least, financial resources. In most cases a gremium (a steering committee) is set-up by the government, or by the executing organization.

The basic work is done in panels (or working groups) dealing with various sectors of the economy. These panels, consisting of 15-30 members taking into account the present situation, the actual trends and possible future possibilities, prepare different scenarios, which are discussed at well-prepared meetings, workshops. Scenarios can provide long-term visions about the development of a region, an enterprise, or products, or services. Scenarios give decision-makers (both governmental or company managers) the possibility to prepare for the different scenes, the most desirable case as well as the least favourable one. Findings of the panels may be investigated by the so called Delphi survey which was originally developed in the United States. It is an expert survey conducted in two rounds. A questionnaire contains certain events and the participants have to give their opinion on the

*The original name of the British Foresight programme: "Technology Foresight" has been changed [8] to simply "Foresight", in order to involve companies and organizations that lack R&D facilities and to obtain a wider approach to the next programme. This new name is being widely used and spreading in most countries due omitting of to the misleading and frequently misunderstood word: "Technology", but even more because the recognition of the importance of the social and economic factors of the technical developments.

degree of their own expertise, impact on wealth creation, impact on quality of life, economical aspects, feasibility, date of implementation (if ever), necessary inputs, constraints (bottlenecks), etc. anonymously. Participants in the second round are provided with the results of the first, and after considering the information, asked to answer again. The future acceptance of planned decisions may also be checked by the so called "decision Delphi".

The Delphi method may also be used as a tool for anticipatory intelligence, consensus generation, communication and education, all badly needed in the pre-accession countries (PACs).

The results of the foresight programme including the scenarios, recommendations, and results of the Delphi survey (if used) are summarized in the final report(s) of the panels and/or the steering group. With publishing and circulating of the final reports and other documents the most useful phase of the foresight process, the dissemination, is going to begin through dedicated workshops/publications, regional conferences and by the mass media. As time passes, the statements and recommendations may, and surely will, need up-dating and refurbishing, so the process of foresight is repeated in most countries.

In order to avoid misunderstandings it must be emphasized that foresight is not a forecast, but a set of possible future events imagined by independent experts. It is neither a plan nor an action programme, but a set of recommendations for "all whom it may concern" i.e. for decision-makers in government, business, academia, or families.

1.2 Brief summary of successful foresight/ Delphi exercises of some EU countries

Although Japan is not a European country, its pioneer role in foresight exercises must be mentioned, because—using the Delphi technique developed by the RAND Corporation in the United States—the Japanese Science and Technology Agency, STA has carried out Delphi studies regularly since 1971. The number of studies that have been carried out is six, and the last study, completed in 1997, had among its objectives: "to contribute to the formulation of science and technology policies, and provide a basic reference point for technology strategies in the private sector". The success of the Japan foresight proved to be contagious: Australia, Austria, France, Germany, Holland, India, the United Kingdom of Great Britain and Northern Ireland and the United States have carried out some type of foresight and in Hungary, Ireland, New Zealand, South Africa the process is currently ongoing.

The British Technology foresight was initiated by a "White Paper" in 1993 with three main objectives:

- To reach consensus on which generic technologies will have the strongest impact on the future well-being and prosperity of the United Kingdom.
- To overcome traditional barriers between industry and academy; the public and industry; and market and technology.
- To influence the financial support of scientific research in order to guide the scientific community towards fields of industrial excellence.

The British Technology foresight was carried out in 15 fields investigated by a 20 member panel in each. Members of the panels were recruited from companies, universities, government and various research institutions. The panels used several methods, workshops, regional meetings scenarios and Delphi survey. Reports of the panels and the final report of the Steering Group ("Progress Through Partnership") were published in 1995. The reports included 360 proposals. The Steering Group compared the outputs of the several panels and identified 27 generic fields (mainly in the ICT and Life Sciences).

In 1996, a new interesting scheme "Foresight Challenge" was initiated, with the aim of enhancing cooperation between industry and academia. A total amount of 92 million pounds was provided for the projects, 62 of which came from the private sector. In an evaluation of the Parliamentary Office of Science and Technology (POST) it was concluded that the British Technology foresight has been successful in many aspects and has contributed to make science and technology more visible in the society. It has also shown both the strengths and weaknesses of British science and industry. The critics of the programme believed that it has been focused on controlling rather than developing research; and that many barriers between innovators and the financial market remained.

A second Foresight in the United Kingdom has recently started. It is worth mentioning that the number of the permanent staff involved in the foresight exercise in the Office of Science and Technology (OST) is around 40.

Germany cooperated with Japan in carrying out Delphi studies in 1993 and 1995 (Mini-Delphi). The second large survey "Delphi '98" was realized through 12 panels. The questionnaires were sent to 7,000 experts, number of answers for the first round: 2,400, for the second: 1,900.

In the Delphi survey, the opinion of all experts (from the 12 panels) was asked on the probability of occurrence of the 19 "Megatrends"— economic, social, political processes having strong impact on science and technology in the next decades. (For example: "Technical development and the global redistribution of jobs will increase unemployment in the most industrialized countries" [agreed by 74 per cent]; or: "A world-government will successfully hinder war conflicts" [agreed by 16 per cent]) The evaluation of the megatrends has been used to assess the character of the experts involved in the survey (e.g. development-sceptic, or environment-pessimist, etc.).

In the final evaluation the foreseen date of implementation of the most important innovation-areas is as follows:

2000-2005 next Internet generation, new organizatory forms for companies, multimedia in everyday life,

2005-2015 new education systems in workplaces and in everyday life, teleworking and companies connected into network, improving traffic by communication systems, product recycling and sustainable agriculture;

2015-2025 technologies for global environmental-management, new energy sources.

The latest foresight programme approach: FUTURE [12] involves not only experts, but also interested persons from the general public. The platform for the exchange of information, for a discussion about the future and for creating a da-

tabase of persons who can interact in a network is the Internet (http:// www.futur.de). The first fields that have already started are: "Mobility & Communication" and "Health & Quality of Life".

Austria followed the German Delphi '98 programme in many respects: the Delphi survey has been used, with Megatrends. The basic difference was that the main goal of the "Technology Delphi" was not the identification of emerging technologies but the evaluation of their relevance for Austria. Another attribute is that the programme was not a "classic" Delphi, but a so called "Decision Delphi" aiming to build consensus among decision-makers and support of participating experts for the recommendations to enhance the development in strategic fields of the economy. These fields – where supposedly Austria may change from technology receiver to technology developer – were previously selected in the preparatory phase of the programme.

Ten out of the 17 Megatrends were taken from the German exercise. It is worth mentioning that the statement "The principle of the solidarity in the national health-care system will be abandoned" had got only 30 per cent support. (The statement of the majority of the experts of the German Delphi'98 was that the introduction of market economy into the public health-care system would result in a two class medical treatment – a heavy social retrocession.)

Finally the point where the Austrian foresight is differing from others is that beside the "Technology Delphi", they also executed a so-called "Social/Cultural Delphi" as well and the two have been jointly evaluated.

EU: The IPTS Futures project [1] was launched in mid-1998 to examine the individual and combined effects of the technological, economic, political and social drivers. Especially, "Futures" set out to find out what they mean for technology, competitiveness and employment.

The work had been coordinated by the Institute of the Prospective Technological Studies (IPTS), one of the eight institutes of the European Commission's Joint Research Centre. In the process IPTS brought together experts, policy makers, business people and researchers. The result was a major benchmarking and prospective analysis carried out at a full European scale considering also the enlargement process. Thus, the reports of the IPTS Futures Project are of particular interest for PACs. A number of considerations of this paper are also based on, or taken from, its findings, therefore a more detailed introduction is not necessary. All publications (altogether 16 till now) are downloadable from the following web address: http://futures.jrc.es.

1.3 Experiences of the Hungarian Technology Foresight (TEP)

The following section is heavily based on the work of Mr. Attila Havas [13] Programme Director of the Hungarian Technology foresight Programme.

Hungary launched her first foresight programme in 1997. The country, in the transition towards market economy, is undergoing fundamental economic and social changes. The first phase of transition is now over. Most firms and banks have been privatized, the most important new political and economic institutions

have been re-established, e.g. parliamentary democracy based on a multi-party system and the stock exchange. The so-called transition decline had turned into economic growth in the last few years; therefore it was time to think about medium and long-term issues. In other words, it was possible to devise strategies aimed at improving the quality of life and the long-term international competitiveness, the major goals of TEP.

TEP is a holistic foresight programme, based on both panel activities (scenarios, SWOT analyses, final recommendations, policy proposals etc.) and a Delphi survey. At the beginning, a steering group of 20 leading industrialists, academics and government officials was set-up to oversee the programme. The majority of industrialists and academics with close contact to business were thourough and deliberate. In the so-called pre-foresight stage, awareness seminars were held across the country to promote this new concept among experts and professionals in cooperation with regional chambers of trade and industry and other professional organizations.

The Steering Group defined the following topics for panel discussions:

- Human resources (education, employment)
- Health (life sciences, health care, pharmaceuticals, medical instruments)
- Information and Communication Technologies (ICT) and Media
- Environment (natural and built)
- Manufacturing and business processes (new materials, supplier networks, globalization)
- Agrobusiness and food
- Transport
- Energy

In spite of defining broad fields as panel topics to be analysed, strong emphasis was put on the so-called cross-cutting (cross-panel) issues. This issue proved to be one of the most difficult to implement, but resulted in the most useful findings.

The panels have formulated statements for the two-round Delphi survey. 1400 questionnaires have been returned, each consisting of 60-80 statements and a set of questions, namely: respondents' degree of expertise; economic, social and economic impact; time of occurrence (including: never), Hungary's current position vs. advanced European countries (S&T capabilities, innovation, quality of production, service and regulation); constrains (social/ethical/ technical, commercial, economic, regulatory, education/skill base); promotion of development, (domestic R&D, purchase of licence, or ready-made products.)

Panels have relied on the expertise of their members, but also commissioned studies, reports by "outsider" experts. All panels have prepared scenarios for different future options.

Whithin the frame of the programme three so-called macro scenarios were elaborated. They can be depicted as cells of a 2 x 2 matrix, where the columns represent *(a)* whether Hungary is actively pursuing a well designed strategy, or *(b)* on the contrary it is drifting with no strategy; *(c)* the rows distinguish two possible global situations (scales of value), one: no change, or *(d)* fundamental changes in

the global scales of value. Out of the theoretically four possibilities three proved to be worth further elaboration:

Macro Vision I: *(a,c)* Hungary implements an active strategy characterized by strong integration and high-level knowledge intensity,

Macro Vision II: *(a,d)* Hungary is integrated into a new "green" world by an active strategy along a knowledge-intensive way, and finally,

Macro Vision III: *(b,c)* Hungary is grabbed into the current system of the international division of labour by multinationals along a low-skills, low-wages path.

All the above materials have been discussed at workshops across the country jointly with the local chambers of commerce and professional societies. All the background reports, scenarios and the Delphi statements are available on the Internet. Dissemination propagation, PR activities are essential but very time consuming. A full-time PR expert is badly needed.

The whole project from the very beginning was supported, and organized by the TEP Office with, a rather modest, five full-time staff. Draft reports of the panels are under final editing, the final report of the Steering Group is going to be compiled. So final conclusions are not yet available, however, some preliminary experiences and observations for PACs are available and summarized among the recommendations in chapter 3 of this paper.

2 Selected list of the challenges of globalization and integration to Europe

The following list is far from complete, because some basic problems such as knowledgeable society, legislation/role of government, social protection/cohesion, innovation and R&D, are beyond the scope of this publication. Some other issues are discussed in other presentations.

The findings in this chapter were taken from, or based on, IPTS Futures Project Reports [1]; statements of national foresight Reports were also used.

2.1 Information and Communication Technologies (ICT)

The Information Technology Revolution began after the end of the Second World War with the invention of the computer. Recently it has gathered new momentum and wide public use by the take-off of the Internet. The emergence of micro systems and the embedded-computing industries will create the possibility of ubiquitous computing in our professional and everyday life.

The exponential trend of miniaturization is expected to continue until the size limits to photolithography have been reached. Chips are already embedded into many everyday devices (automobiles, locks, alarms, payment machines, handtools, identification cards, electronic mail and financing). Mobile phones and personal organizers are the fastest growing areas for semiconductors.

Proliferation of embedded equipment (sensors, information processing and communication systems) may transform not only industrial technologies, but also household equipment (remote control of abandoned homes, medicare for lonely, elderly persons), clothing (garments of police, sportswear, or clothing for people with chronic medical conditions, etc.).

These brand new applications will need new skills, perhaps both in production of basic equipment and in the adaptation of traditional, perhaps existing, systems. Industrial firms and R&D companies in CEECs surely can find niches to develop new products and/or services. In the framwork of cooperation with EU partners the flexibility and skills of SMEs may be useful.

Europe is regarded as strong in mobile telephony, neurochips, industrial and home-sensors/actuators/networks, embedded systems, consumer electronics, digital TV, transport telematics. The appearance of a functional European-commerce is foreseen for 2002-2003, with high frequency chips for 2004-2006, full voice machine interaction for 2004-2007, industrial and homesensor/actuator networks for 2003-2008, personal mobile >10 Mbps for 2005-2008, urban broadband cable >34 Mbits, molecular computing for 2010-2011, 1 Mega neurochip for 2010-2012,

and integrated biocomputers after 2015. Where Europe is weak, but where it could catch up, are: imaging and 3D representation technologies, natural languages text translation, high-performance batteries, VLSI chips 256 Gb.

Electronic commerce, or more widely, European-business has already started. Governmental (tax paying, land register etc.) and company administration and business transactions will be carried out electronically and on-line. Robotic systems of sensors and actuators in networks of machine to machine communications raise the importance of information processing and software design: the so called Knowledge Management Tools i.e. to find, sift, store and retrieve information.

Europe has market leaders in this domain, but the current leadership will be converted into a future strength by new techniques such as software agents (programmed to reflect user preference). In addition, context sensitive knowledge tools are expected enabling machines to learn about user behaviour and adapt their responses accordingly. Consequently, a convergence between informatics and cognitive sciences will take place. Strong traditions in cognitive sciences and software development in certain CEECs and NIS countries may help these countries to be among the leaders of this area.

Among Europe's strengths and foreseen applications in information processing and knowledge management the following may be mentioned: supply chain management for 2000-2003, sensors and microsensors for 2001-2004, reliable authentication of ID for contracts for 2003-2006, network-based authentication of contracts for 2003-2007. However, in the fields of software engineering, data mining and warehousing, artificial intelligence (including natural language processing and continuous speech and pattern recognition), imaging visual-aural interfaces, groupware and decision support tools, the present position of Europe is medium or weak. Cooperation with new partners may help to catch up on global competitors.

A well-balanced technology policy for the ICT and related domains seems to be crucial both for EU member States, and CEECs. The software industry is the main actor in this drama but success, however, is limited by the absorption capacity of the end-users. For this reason, policy for technology and innovation should not be limited to the selection of winning solutions, but concentrate on creating platforms and frameworks for innovation.

Policy frameworks, on the other hand, must also take into account the possible unwanted side effects of ICT. For example, if less waste in production leads to lower prices, will this stimulate demand, so that overall, the level of consumption of natural resources actually escalates? Likewise, does videoconferencing reduce travel or simply stimulate the demand for more face-to-face meetings. When those secondary costs outweigh the first order gains we face what might be called the "rebound" or "boomerang" effect.

The most direct risk is that electronic and digital signatures will be stolen in order to commit crimes. People could find that criminals have hijacked their face, their body or their whole identity. The assessment of protective measures against the abuse of information and protection of privacy are, however, beyond the scope of this publication.

2.2 Health-care

Forecasts and public opinion agree on the dramatic impact of life sciences on health, food, sustainability of industry, protection of environment, basic and applied research; and is strongly connected with intellectual property and patenting, handling of data, globalization. This chapter focuses on the health aspects.

The development of life sciences has been accelerated dramatically by the discovery of DNA. The fact that a single molecule, no matter how sophisticatedly structured, may contain all genetic information of individuals, moreover, of all living organizms has triggered debates on moral, ethical and socio-economic issues. The sharpness of these debates have not weakened during the last decades, on the contrary, the "menace" of the fully mapping of the entire human genome has started strong discrepancy between the directives of the European Parliament and certain member countries (e.g. Holland, Germany, the United Kingdom of Great Britain and Northern Ireland).

The harmonization of Health Care System (HCS) of EU member States and that of the PACs seems to be difficult not only because of the differences in respective GDPs, but also of the large variability due to different traditions, socio-economic frameworks, history. In EU member States health systems are generally a combination of both a public and private system. They are, however, far from uniform.

Prevention, which is a basic component of any national HCS programme, seems to be rather difficult to be realized. In most cases it is used as a slogan. The reason is obvious: high expenses (vaccination, screening systems etc.) for a long-term, without clearly visual quick returns on investment. "Lifestyle" is the first priority in prevention. The healthy way of living may help avoiding obesity, stress, smoking, and alcohol in excess, thus decreasing the occurrence of cardiovascular disorders, cancer etc.

The question for PACs is: is the healthy lifestyle bound to high GDP? Experience (morbidity, mortality, life expectancy) from less-developed regions of the world indicate that certain elements of a healthy lifestyle may be realized without high-tech and costly investment. For example fruits and vegetables have protective effects against cancer in the gastro-intestinal tract [2].

The possibility to produce and eat healthy food (i.e. less fat, more vegetables, etc.) is available in all Central and East European countries, all having traditionally good agricultural products. The dietetic habits, unfortunately, are far from acceptable.

Health-care again may be realized (or even maintained) in the old but not obsolete family models where the elderly may have socially acceptable caring without being a burden on the society. Tomorrow's elderly population will increase the importance of home-care and nursing services.

There will also be a market opportunity for new (perhaps small and medium size) companies. In Austria [3], for example, experts turned down the idea of fundamental structural changes in the health-care system. They supported a policy of better cooperation between medical treatment and social-medical care. Home-care seems to be a cross cutting discipline between medical, technical and social needs. The necessary apparatus and instruments for self-monitoring of health and fitness again yields a new development area for industry.

· Disease management is going to be more and more "fashionable" in Europe. The United States-style health management schemes are interesting, some details are really convincing [4]. Health insurance companies and the pharmaceutical industry may help in elaborating practice-guidelines. The vertical integration of pharmaceutical industry and care service might be a solution to cost reduction and a profitable field for the pharmaceutical companies [5]. Curing and therapy are really expensive. High-tech vs. social solidarity is perhaps the most difficult problem, even for EU member countries, to face in the future.

2.3 Life services

The Human Genome Project will have an unprecedented effect on all the above-mentioned aspects: the understanding of the molecular basis of human diseases will produce new diagnostics and—which may be really revolutionary—prognostics together with new treatments. Genetic screening for various diseases is an application which has already started. The deciphering of genomes will be extremely important for the pharmaceutical industry. Small and big firms are competing in evaluating this data in order to design new products adapted to the molecular mechanisms of disease.

Gene therapy is an expression that is frequently misused or misunderstood. The so called "somatic" gene therapy is only curing a genetic defect in a cell, which is not involved in procreation. The therapeutic effect will last as long as the cell is alive, consequently it will have to be repeated. The "germ line" gene therapy, a favourite issue in sci-fi literature, is not being considered at this time. (Certain experiments are reported, animal tests have been done, but a moratorium is in place).

Genetic testing and counselling raises the most heated debates on using or misusing of scientific results. If genetic tests become widely available, people who know they are at high risk may take out insurance. Insurance companies argue that those people who know that they are at high risk will take out high life insurance cover, which will drive up the prices of premiums. Successful test for Alzheimer's diseases, for example [6], could create an "uninsurable underclass". The confidentiality of genetic data is a most sophisticated issue with genetic testing.

Industrial aspects of genetic information may be also worth consideration. The possibility of patenting genetic information combined with advances in bioinformatics and high throughput screening, has caused a "gold rush" for DNA-sequences deriving from all kinds of organisms. These efforts may result in the development of new drugs. It is well known, that the R&D costs of new pharmaceutical products are extremely high (US$200-600 million for a single item), so the protection of intellectual property is of paramount importance for the pharmaceutical industry. However, strong debates on this subject are still on-going.

The main objections against patenting of genetic information is that it restricts innovation and "patenting of life" is immoral. Due to the many ethical, moral, religious, economical, and political problems "The Legal Protection of Biotechnological Inventions (98/44/EEC)", a directive with guidelines for debate all over the EU and legally binding ethical safeguards, has not yet come into force and has been criticized by several member States (most strongly by the Germany, the Netherlands and the United Kingdom of Great Britain and Northern Ireland).

It is worth mentioning that in spite of the above problems, the recent emergence of small, flexible enterprises have taken over research services in the drug research field, such as high-throughput screening or testing of drugs.

However, the risks are high. In the United States, for example, 21 out of around 1,500 bio-companies can be regarded as profitable. The old fashion venture capital system is not able to take the increased risks (and costs). An "empathically" or "investor friendly" policy is badly needed. Attractive tax system, special stock option may decrease the growing gap in expectation between investors/finance/starting companies.

As a summary it can be stated that scientific progress is clearly ahead of the political and ethical discussions. A lack of clarity on legal issues related to biotechnology often proves to be a hindrance to business developments. A reliable and transparent instrument that mediates and narrows the gap between science, industry, public interest and policy-making would thus be helpful.

2.4 Joint effects of the synergy between ICT and life sciences and other new challenges facing Europe [1]

The synergetic effect of the above outlined developments of the ICT and life sciences together with certain other challenges facing the EU, such as the single currency, the enlargement of the EU, demographic changes, sustainability concerns and the wider context of globalization will have dramatic effect on the economy of the EU. Each of these "trend breaks" is in itself a challenge.

The fact that they will occur simultaneously over the next ten years, and strongly react with each other, is even more challenging for most policy areas and in particular policies relating to technology, competitiveness and employment. Many new opportunities for growth and for satisfying human needs will derive from the breakthroughs that will transform the technological frontier, especially in the areas of the ICT and biotechnologies. But the key technological drivers also bring challenges. First these technologies are carriers of globalization. They raise global governance issues (for example over privacy and security in European-commerce, and on food policy regarding genetically modified organisms). Second, the leading companies are multinationals. Their technologies and the global orientation of their actions are transforming the rules of the game on competitiveness: new markets are opening up, strategic acquisitions are being made and alliances formed. The pace of change brings increasing uncertainty. Third, people and firms will need new skills and competences to use and to work with these new technologies effectively.

2.5 Economy (industry, agriculture, services): where, what and how to produce in CEE, especially in CEECs?

The question represents the basic problem of all pre-accession Countries. The introduction of a market economy means to open the borders for competition between imported and domestic products. Sophisticated PR background, higher quality, more attractive outfit are the weapons which the local producers have to learn and be accustomed to.

Standard quality is the first lesson to be learned. Not only quality control of the finished products but also the manufacturing process itself (including the quality of the raw materials) must be kept permanently on the required niveau. These are the main elements of the so-called "quality management", which is essential both to keep the consumer, but also, or even more, for the "partner" who may be a multinational company with a worldwide network for purchasing raw materials or semi-finished products together with a global sales force.

The implementation of quality management costs money, but the main problem is not financial, but changing the attitude of the whole company, introduction of laborious procedures. It is hard but it can be learned. The assistance of UNIDO in the efforts to introduce total quality management into certain sectors of industry in Hungary proved to be very useful.

So the ambivalence of globalization means not only a menace to the local producers but opens a door for the whole world, for those who are able to use it.

A country-by-country assessment of local industry and agriculture with sectoral SWOT analysis prepared with the assistance of relevant international organization seems to be helpful to respective countries. The competitiveness of low wages in less developed countries seems to be attractive, but dangerous in the long-term because it conserves low level technology. In order to utilize existing production capabilities in most cases transfer of technology is needed.

Receiving firms and countries must have a skilled labour-force (in addition to financial and investment resources) to be able to absorb the new, in some cases high-tech technology. That raises serious educational and social problems which are outside of the scope of this paper. (The problems of small and medium enterprises and the role of foreign direct investment are discussed in other presentations of the Regional Forum).

Otherwise, the fashionable expression "high-tech" can be misleading. Namely, the production of a high-tech electronic product (computer or TV for example) may be executed manually by low-skilled, low-wage labour force.

R&D may be very helpful in product and process development of industrial and agricultural enterprises. The problem is that local R&D facilities in most CEECs are in bad shape. Industrial and agricultural research organizations lost their customers, who also have lost theirs, due to the collapse of their former traditional Soviet market. However, a survey of existing R&D capability in CEECs may be worth the effort, and an integration to European R&D life may have practical results.

For small countries the most essential task is to find comparative advantages, niches in the world market. In some cases, especially among the agricultural products, the traditional goods are of better quality (taste, flavour), yet they are regarded as inferior due to shape, size, colour or some other "quality parameter" which does not meet internationally accepted norms. The best examples for this are the wonderful fruits and vegetables grown traditionally in most CEECs. To introduce these products into the global market is very difficult but a challenge to the region.

2.6 Sustainable environment

"Environment" in the last decades has become the star of headlines and slogans all around the world. The notion of sustainability has been introduced more recently due to the recognition that concern for the global environment is also concern for the economy and social well-being. As such, it can be regarded as one of the positive effects of globalization. The problem is that regardless of what has to be done the uncomfortable question remains, namely, who should pay for it? The costs are immediate while the benefits may be far away in the future.

The following issues do not cover the broad field of sustainable environment, but concentrate on some items that have been selected for special interest to representatives of PACs.

Industry, in EU countries, has become cleaner. Environmental management measures and cleaner processes have been introduced. Less cleaner processes are being out-sourced to less developed countries. Industry in some CEECs are using a lot of obsolete processes with rather poor environmental protection facilities.

Agriculture, in EU countries, continues to create problems given its over-use of chemical products (herbicides, pesticides and fertilizers) as well as of water in dry areas. In this respect, there seems to be no major difference in EU countries and PACs.

Energy consumption in both parts of Europe is now rising more slowly than economic growth, but it is more or less based on fossil fuels and, therefore, threatens to cause changes in climate with potentially serious short and long-term consequences. Despite efforts to increase the use of renewable energy technologies, their feasibility is a debated question among experts. Their application in industrial size will be introduced gradually in the next decades. Agricultural products in CEE may be a source for new fuels, such as alcohol or vegetable oil for diesel engines (bio-diesel); and bio-gas for heating.

Climate change is regarded as probably the most challenging single environmental issue facing Europe in the coming years. In 1997, in Kyoto, the EU agreed to reduce its average gas emissions between 2008 and 2012 by 8 per cent compared with the baseline year of 1990. Together with the forecasted 6 per cent rise of emissions over the same period it means that the needed effective reduction will be 14 per cent. The targets of the Kyoto Protocol will mean high energy costs. To decrease the costs several measures may be used, e.g. recycling tax revenues.

Costs can be reduced also by utilizing the "Kyoto (Flexible) Mechanisms"* i.e. emission trading. If Europe can produce a coherent strategy to implement "Joint Implementation" (JI) and "Clean Development Mechanism" (CDM), integrated with its export programmes, this is a major opportunity for the private sector to extend its growing export markets in clean technologies and related services. For each of these instruments it will be necessary to independently monitor and verify the

*Kyoto (Flexible) Mechanisms. The Kyoto Protocol proposed three new instruments: emissions permit trading, "Joint Implementation" (JI) and the "Clean Development Mechanism" (CDM). The idea behind each of them is that the cost-efficiency of emissions abatement is greatly improved if countries with high abatement costs are allowed to share the burden with low abatement cost countries. CDM offers the industrialized countries with emissions quotas, the opportunity to claim credits for reducing emissions in developing countries on a project-by-project basis. JI provides the same mechanism whereby the industrialized countries can claim credits for assisting one another.

emissions reductions claimed. To elaborate, new clean or cleaner technologies and their export possibilities may be a challenge for joint projects of industry and R&D in CEECs.

Last but not least, let us not forget to mention some special problems for sustainable environment in the region which are already on the agenda of the respective countries: industrial and military soil and water pollution, safety of nuclear reactors and the managing of radioactive wastes.

3 Conclusions and recommendations

3.1 Usefulness of foresight exercises both at national and regional level

CEECs and NIS countries are currently changing their political, economic, and what seems to be the most painful, social systems. They have to face the challenge of integration into the EU which is also changing at a ferocious space given the rapid development of ICT, together with life sciences and the single currency, demographic changes and sustainability. All this is going on in the context of globalization. To look into the future and to prepare the proper strategy is of crucial importance. It is obvious from the aforesaid that if foresight exercises proved to be useful and widespread in developed countries, it may be more useful for those who wish to get closer to them.

Some specific issues for CEECs based on the experience of the Hungarian Technology foresight Programme is as follows:

- The process itself of a foresight programme is the most valuable item, because it brings together people: who do not know each other, or have not the opportunity to meet, or which is sometimes the most useful, who are on opposite sides of the political spectrum.
- Foresight helps create consensus.
- Foresight helps initiate regional programmes.
- Foresight is a tool to inform experts, influence public opinion, thus initiates to educate citizens in order to be prepared to face the good and bad effects of integration (to Europe) and globalization.
- Foresight is informing government officials not only on what but how and when it is to be done.
- Foresight gives inputs to strategic decisions for enterprises—for those who need it.
- Foresight gives really a foresight for young people for long term decisions.

The future of all countries of Europe, whether members of the EU or not, is dependent on the future role of Europe in global competition. With enlargement, Europe will be by far the largest common market in the world, in purchasing power terms, with a population of over 550 million. However, the continuity of the EU cohesion and the competitiveness of the continent depends upon the stability of the new members, so that the support for their economic development is incumbent on all of Europe.

The process of enlargement will have major political and strategic implications for Eastern Europe, which must become a safe, stable and prosperous region. Thus, it will also then change the socio-economic landscape of the whole continent. In any account, as a peacetime process of voluntary agreement between autonomous governments, it is of historic dimensions.

A Regional foresight Programme for Central and Eastern Europe (similar to IPTS's Futures Programme) may be a useful tool for the respective countries to collect inputs for long-term national development strategies for accession.

Such a regional foresight programme may, among others:

- represent a harmonized way of thinking of experts and representatives from all countries from the region,
- initiate to harmonize the development programmes of the individual countries,
- strengthen the solidarity and cooperation between nations in the EE,
- help increase awareness and preparedness for integration and globalization, yield input data for national development programmes.

3.2 Possible assistance of UNIDO and other international organizations for PACs and the CEE region

From the afore-mentioned it is obvious that looking into the future it is necessary for all countries in this region, but especially for less-developed countries, to formulate a long-term vision and to answer the basic question, namely, whether they wish to integrate into the global economy and European economic system specifically. It is also clear, that starting and conducting a foresight exercise is not a simple procedure, and there is no ready-made model to copy. It varies from country to country due to their peculiarities. However, the experience of former foresight programmes, particularly the lessons learned, and the professional knowledge of some international organizations may be helpful.

First of all the IPTS Futures Project [1] has an abundant store of challenges facing enlarged Europe within the next decades: competitiveness of Europe with the United States and the Far East; what and where to produce, competition within the continent, cleaner production, environmental protection issues; the present and future weight of agriculture in the GDP, changing role of tourism and recreation; the importance of innovation including but not limited to research and development, etc. Thus, it is of outstanding value for pre-accession countries to prepare themselves for integration within the EU.

The need of certain methodological and professional assistance for pre-accession countries has been recognized by the Institute of Prospective Technological Studies of the Joint Research Centre of the European Commission. A Thematic Network on foresight [16] activities on science and technology interrelated to socio-economic issues in the pre-accession countries has been established.

In order to assist pre-accession countries, three levels of foresight studies seem to be recommendable:

- National foresight exercises,
- Regional foresight study for Central and Eastern Europe, and
- EU + PACs Futures Project (Foresight of an Enlarged Europe)

Thus the vision of an enlarged Europe can be drawn-up in various versions and scenarios with a set of recommendations for immediate actions for member countries. The beauty and value of such a process is that it is based on a certain

degree of agreement of experts from participating countries. The project should follow the above-mentioned hierarchy. Based on the national foresight studies a regional survey for Central and Eastern Europe should be prepared followed by the final synthesis.

UNIDO, through its mandate, can participate in the framework of an institutional cooperation with other organizations, especially with IPTS in all three levels of foresight processes, including the above-mentioned thematic network, in assisting to cope with issues still not/or insufficiently and/or elaborated. Specific description of possible UNIDO intervention included in the so called UNIDO Service Modules [17] can form a useful tool for the consideration of UNIDO's role by the respective panels of the national foresight programmes.

As an example, in December 1999, UNIDO launched the Technology foresight Initiative for Latin America. The initiative aimed at building awareness of the benefits of Technology foresight and at spreading the techniques and know-how needed by foresight practitioners and decision-makers as widely as possible. It responded to a perceived demand for support required in the Latin America region to help governments and other authorities promote, prepare and mount Technology foresight programmes and to link them with the sources of technology. A regional Knowledge Network on Technology foresight is being established to provide and disseminate information on technology trends, innovation break-throughs, high-tech know-how and operation methodologies among all regional players.

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