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Ukrainian STI 2025

Foresight Brief No. 074

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Sponsors: Ministry for Education and Science
Type: National foresight exercise
Organizer: Ministry for Education and Science, National Academy of Sciences
Duration: 2004 - 2006 **Budget:** €85,000 **Time Horizon:** 2020-2025

Purpose

The key objective of the Ukrainian national 'foresight-type' program is to form priorities in STI – Science, Technology and Innovation with long-term (15-20 years) and medium-term (3-5 years) perspectives and to determine the most promising areas for R+D, which could receive state financial support. The second main goal of the program is to create a background for a permanent system of state-sponsored foresight studies in the country.

Brief Historical Overview of Foresight Studies in Ukraine

'Foresight of S+T and innovation development' is a national program and was been approved by the Cabinet of Ministers of Ukraine in August 2004 but it started only in 2005, after the government provided financial resources.

Ukraine has a long history of foresight-type studies. The very first attempts to prepare normative forecasts of S+T and economic development in Ukraine could be associated with the establishment of the central-planning system. Since the late 1970s, the so-called Complex Programs of S+T Progress over the next 20 Years Period was started, along with the 'usual' five-year plans. These programs were oriented towards strategic issues and possible effects of S+T development, and not on short-term economic goals. At least 1500 key specialists from different research institutes took part in preparing the programs. The method of commission was used to reach consensus on different issues. In contrast with the five-year plans, it was possible to generate different scenarios within the program. This helped to understand better various outcomes and problems of the future. But 'the future' assumed the existence of the status quo in political and social spheres: the communist regime could not be changed and large-scale market reforms

could not be introduced. These programs were parts of the similar All-Union program that had to co-ordinate development within the Soviet Union. At the end of the Soviet period, another 15-year forecast with special attention to the territorial deployment of productive forces and the distribution of R+D in different regions was introduced.

In the 1980s and early 1990s various ministries, the Academy of Sciences of Ukraine and even large companies in the military-industrial complex started to prepare their own long-term technological forecasts to define their technological policies. Some of them used Delphi-type procedures. The Cybernetics Institute of the Ukrainian Academy of Sciences developed methodologies of forecasting, and graph and computer software for these forecasts. Due to fundamental social and economic changes in the second half of the 1980s, almost all of these forecasts had no serious impact on development in Ukraine.

Between 1998 and 1999 the Cabinet of Ministries of Ukraine started to prepare the so-called 'Indicative Plan of S+T and Economic development until 2005'. The Ministry of S+T co-ordinated the preparation of this plan. The method of commission - with creation of several sub-commissions on different S+T spheres - was used. About 300 specialists were involved in the preparation of the Plan. Two joint sessions were organ-



ized at the end of the one-year project. After changes in the government, though, the draft of the plan was forgotten - de-

spite being published and disseminated between different state ministries and agencies.

More Routine Required for Setting S+T Priorities

Every five years, the Ukrainian parliament establishes several main S+T priorities and the government starts dozens of technologically oriented programs. It is widely recognized that priorities are formulated in a very broad sense and the programs are not well designed and they have insufficient financial resources to be undertaken. Time horizons of the specific programs and projects are usually short (1-3 years) and it is often unclear who the addressee of the results is and what the economic parameters of innovative products will be. That is why the government has decided to supplement existing mechanisms by the new foresight-type program.

In fact the program has four main tasks:

- To elaborate the basic and alternative variants of S+T and innovation development of the country,
- To form a list of the most prospective technologies and innovations, which will create opportunities for opening new external markets,
- To form a list of so-called critical technologies, which will have exceptional importance for the stable development of the national economy and for national security,
- To prepare recommendations for the Ukrainian government on how to use effectively R+D results, financed by the state, and to create the background for the permanent system of foresight-type studies in the country.

Experts Discussing New Technologies and Innovation

The Ministry for Education and Science (MES) of Ukraine is responsible for the distribution of money between participants of the program and its general logistics. The National Academy of Sciences of Ukraine is responsible for the content of the foresight studies.

Elements of the Delphi technique and commission method have been used in the program. In the first stage, the Scientific Council of the program was formed. It includes around 30 prominent Ukrainian scientists and top state officials. Two research institutes - one from the Academy and the second from the MES - were nominated representing the basic organizations, which were responsible for the technical side of the program's realization.

After broad consultations, fifteen thematic groups of scientists and other specialists were formed to discuss the following issues:

- Actual problems of state support of basic sciences and its infrastructure,
- Biotechnologies,
- Means and technologies for medical treatment of common diseases,
- Telecommunication, information technologies and resources; optical electronics and new computing technologies,
- Energy saving, non-traditional and renewable energy sources, problems of hydrogen energy utilization,
- Advanced technologies of agricultural production and the food industry,
- Technologies of metal welding and treatment of metals and alloys, new composite materials,

- Lasers and ionization technologies; nanotechnologies, functional and instrumental materials,
- Perspective chemical materials and technologies,
- Protection of environment and sustainable development,
- Macroeconomic drivers, demography and human potential,
- Applied aspects of earth sciences,
- Innovation in construction and architecture,
- Innovation in transportation systems,
- Space technologies and 'dual-use' technologies in the national economy.

Every group of experts consisted of 25-40 specialists from different research institutes, universities or leading industrial companies, usually from different cities of Ukraine. Special questionnaires were prepared and distributed among these experts in a two-stage Delphi procedure.

In the second stage, about 20% of experts were substituted by other specialists as a result of the analysis of the initial responses. The third round of survey is under way at the time of writing, and is planned to be finished between September and October 2006. The third round has to provide recommendations on how to improve the situation with S+T and innovation in Ukraine.

Every previous stage / round of Delphi was ended with special conferences and roundtables of experts and invited 'external' specialists, who discussed the key results of the program. Publications on the results of the studies were prepared and widely distributed among specialists within the country. In fact, everyone could express his or her opinion on the key findings of the program. It is worth mentioning that with the assistance of the British Council, British specialists with experience in Foresight programs took part in methodological seminars and

conferences, which were organized within the program in

2005-2006.

Reduction of R+D Funding – Lack of Human Resources

The years of transition have demonstrated that the state had no sufficient material resources to preserve science in such conditions that it did over the years of the Soviet regime. Substantial reductions in R+D funding occurred during the period of market transformation, including cutting back on funds for financing new purchases of research equipment, while science was deprived of prestige and the status of scientists eroded.

These changes resulted in a gradual reduction in the number of researchers and a collapse of many branch – industrial - research institutes. Many scientists of middle age left their academic establishments and industry institutes and swapped their activities for more profitable ones, while others emigrated.

This has caused a deepening age gap between different groups of scientists, which was accompanied by the considerable shortage of 30-40 years old specialists - the most active part in terms of creative capacities. This age crisis in science will be hanging over Ukraine in the years to come. Alongside senior generations leaving active involvement in science, the shortage of skilled specialists will be more evident. By implementing urgent measures, the processes of age unbalance of personnel structure can be halted. However, the problem is complicated by the circumstance that it is very difficult to resume research activities after a break of several years because of the very specificity of this activity. In particular, measures undertaken by the government to increase payments to research fellows are inadequate for changing the situation radically, although they might make the crisis less acute.

Slackening of the Ukrainian Innovation System

The current low level of relative expenditure on S+T in Ukraine is incapable of supporting efficient research processes since funds barely suffice for paying relatively low wages and utility bills. Ukraine spends much less per researcher per year than EU countries, including new member-states, and even less than India or South Africa. Specialists who are involved in the foresight program suggest that the government as well as private sector could increase financial support for S+T, but any increases are unlikely to be enough to reach levels comparable to those of neighbouring Eastern European countries.

The national innovation system is weak, as the authorities do not pay serious attention to the stimulation of development of high-tech sectors. Creation of conditions for growth of high-

tech enterprises is the key for the future of the national economy. If the government would establish any system, in which traditional sectors of the economy would not have artificial privileges, it would be possible to shift resources to innovations and R+D.

Strengthening the Traditional Research Areas

As to particular research areas, traditionally, Ukrainian scientists have relatively strong positions in material sciences, physics, and some technical disciplines. Here, Ukrainian experts look forward with restrained optimism. It seems that in some scientific fields S+T development will preserve dynamism and it is possible to expect interesting applied results, as, for example, in welding technologies. It is worth noting that problems of energy saving, utilization of alternative sources of energy and upgrading of the energy generating system have received the highest ratings for their importance. Bearing in mind existing potential and experience, there is a high chance that these problems will be studied and (partially) solved successfully.

The High-tech Divide

On the other hand, the gap between Ukraine and the developed countries in such areas as biotechnology, genetics, electronics, nanotechnologies, and health care methods will grow, despite these research areas having received high ratings for their importance from experts as well as Ukrainian scientists having promising results in some narrow sub-fields of these disciplines.

Interdisciplinary research, such as physical and chemical biology, sensors and environmental studies were mentioned as important directions of development.

Traditionally, Ukrainian experts have put much effort into research and technologies. But now and in the foreseeable future the country cannot conduct this research without engaging in intense international co-operation. The focus is being shifted towards practical aspects of the research, including observation of agriculture, telecommunications, and weather forecasts.

The development of the aviation industry, including the introduction of several new planes such as the AN-70 and modernisation of the AN-225, is under serious threat after worsening relations with Russia. At least several important joint projects have been halted and the prospects of other projects are not clear.

Need for Restructuring R+D Organisations

The Ukrainian foresight-type program shows that the country still has scientific potential in a number of areas. At the very least, Ukrainian specialists could provide qualified expertise of the importance of different research results and determine perspectives of S+T and innovation in key research areas. At the same time, it is evident that the country's research system continues to lag behind international standards of research, despite its world-class results in some research fields. S+T policy has to be better connected with the implementation of economic reforms. It is becoming critical for Ukraine under present conditions.

The most urgent objectives at the present stage of economic development are as follows:

- Development of better R+D organisation and enhancing R+D management, in particular, development of new organisational and economic forms of integration of science and production,
- Mastering of advanced management expertise by Ukrainian experts and their further dissemination nationwide,
- Improvement of industrial structure and acceleration of socio-economic development of the regions,

- Active implementation of R+D results and advanced technologies into different sectors of the national economy; and
- Further development of S+T co-operation with other countries, especially with the EU and neighbouring states.

There is no guarantee that the country could solve successfully a number of problems it faces at the moment, but the clear orientation on integration into the EU opens the way for effective modernization of the national S+T system and its utilization in the interests of Ukrainian society and the European Community.

Given today's economic conditions in Ukraine, the role of scientific and innovation activities are of growing importance. In particular, it is necessary to augment the role of scientific foresight in all areas of science, social growth and national economic development. Although foresight is an important 'scientific' instrument to make better-informed selections in the service of social and economic growth, it has been neglected for years. Now the urgent need for foresight studies is evident for a number of scientists, industrialists and officials. In particular, outlines and priorities of scientific research and economic policy, aimed at long-term economic growth, are to be identified by means of foresight. There are widely supported plans to conduct nation-wide foresight studies in Ukraine on a regular basis.

Sources and References

Foresight of S+T and Innovation Development of Ukraine (Preliminary variant).- Kiev, 2006, STEPS Centre, National

Academy of Sciences of Ukraine, 160 p. (in Ukrainian, ISBN 966-651-307-2).

About the EFMN: Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.