

## SCIENCE FOR SUSTAINABLE DEVELOPMENT

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### Summary

In the period of radical reforms in Russia, science entered a state of crisis. Nevertheless, the powerful R&D potential available in the country enables Russian scientists to make a decisive contribution to the transition to sustainable development. Primary attention is attributable to the problems of the role of science in economic stabilization. At the same time, science is devoted to contribute to strengthening national security, which can be analyze in brief with the use of the personality–society–State triad. One of Russia’s national goals at the present moment is the informatization of the country, which cannot be achieved without the assistance by the scientific community. A scientific base is required also for the formation of a strategy of sustainable international links in different fields. To play an adequate role in the transition to sustainable development, Russian science itself should develop on a sustainable path. These purposes require an essential transformation of the R&D sector and radical improvement of State S&T and innovation policy.

### 1. Russian Science during the Transition to a Market Economy

The period of radical reconstruction of the Russian society during the 1990s involved science in a very difficult situation. Although the collapse of the totalitarian regime sufficiently increased scientists’ freedom, in particular, ideological prohibitions and restrictions on contacts with foreign colleagues were lifted; on the whole the rating of research activities among social priorities has declined to a critically low level.

As a result of financial collisions, the government funding of R&D has reduced practically tenfold. The industrial R&D sector, earlier maintained due to funds of

ministries and government agencies, has found itself on starvation rations because of the low activity of newly emerged business entities. Currently, the average salary rate in the R&D sector is insufficient even for a minimum consumption level necessary for creative activities. The stock of research instruments and equipment is practically not recreating. Many R&D institutions survive due to leasing their premises. The publication of scientific papers has decreased several times and the import of scientific literature reduced more than tenfold. Because of the lack of funds a majority of researchers and R&D institutions have no possibility to use modern information and communication systems.

In a relatively good state the matters remain only in particular R&D institutions funded by rich business entities trading in fuel and natural resources or working to orders from abroad. A new blow to the Russian R&D sector was struck by the most acute economic crisis in August 1998.

A result of these destructive trends is the more than twofold reduction in R&D personnel. Most remaining specialists are forced to search for secondary earnings in other fields. Several thousands of researchers have emigrated. Research in many fields is being performed only due to scientists' enthusiasm. At the same time, the average age of researchers is coming close to 50 years and only few of talented graduates choose the scientific career.

Nevertheless, Russian science seems to have preserved a sufficient potential in order to take a decisive part in the transition of the country to a path of sustainable development. What is the basis for this belief?

First, the foundation of powerful Soviet science that had been created during decades and was oriented to the advanced positions worldwide practically on the whole range of research areas has been kept. The unique scientific reserves and material base are accumulated in R&D. Many specialists possessing unique knowledge and traditions continue working in science. New unprecedented results are obtained periodically.

Second, the educational and professional level of the country's population is on the whole sufficient for the acceptance of scientific achievements embodied in advanced technologies.

Third, Russian science is traditionally characterized by many features necessary for the development and accomplishment of a conception of sustainable development. In particular, these are an interdisciplinary and comprehensive approach to objects under examination, and endeavor to search for new scientific paradigms. (In fact, sustainable development is essentially a new paradigm of the civilization's existence).

Fourth, Russian scientists are historically distinguished for a high feeling of social duty, responsibility before society for results of their investigations. As far as the transition to sustainable development is essentially the only possible way to survive for mankind as a whole and every country in particular, it is natural to expect that for Russian science it will become not merely a scientific problem but a moral imperative as well.

Fifth, many Russian scientific schools have become an inalienable unique component of the world science. So, Russian scientists make a significant contribution to reorientation towards sustainable development as an integrated part of the international scientific community.

Sixth, in spite of the crisis, measures are being undertaken in Russia to reform the national R&D potential and adapt it to conditions of the market economy. Thus, a system of goal-oriented (grant) funding of research projects through various funds is introduced, the *Doctrine of the Development of Russian Science* and the Federal Law *On Science and State Science and Technology Policy* were passed, a list of priority research areas and critical technologies has been compiled, etc.

Environment-oriented research activities go on in Russia. E.g., large-scale studies on the problems of transition to sustainable development were launched at the Social Ecology Chair of the Russian Academy of Public Service under the President of the Russian Federation. Works on mathematical modeling of interaction between society and environment are continued. A number of funds, in particular the V. Vernadsky Ecological Foundation, are financing environmental research projects on the competitive basis. Moscow is hosting one of the, pioneering in the world, international universities of environmental and political science, where the training of specialists with a universal and holistic understanding of societal problems is combined with research activities going beyond the limits of a narrow specialization. With the participation of specialists in various sciences, a number of large-scale environmental projects were developed, such as the goal-oriented program *The Volga's Revival*. Scientists take an active part in the activities of various environmental associations and movements, although the possibilities of their real impact on the behavior of government authorities are as yet minimal. Since 1993, the Russian Ecological Academy has been operating, having 10 sections and branches in 39 Russian towns. It is symbolical that the *Conception of the Russian Federation's Transition to Sustainable Development* applies to science the utmost importance in the preparation of methodological and technological base of the planned transformations.

## **2. The Economic Significance of Science**

The problems of transition to sustainable development is certainly not confined to environmental issues only but involves many military, political, economic, social, and other aspects. For Russia in the present situation of crisis, the significance of science for the transition to sustainable development is to be analyzed, in our opinion, primarily as a role of the R&D sector in ensuring national security and neutralizing numerous dangers to the existence and integrity of the country. At the same time, the first and foremost importance is due to the requirements of economic safety.

Stabilization of the Russian economy, revival of its real sector, and involvement of large-scale investment are impossible without new technologies generated by science and ensuring production of new products and services. Noteworthy, the concern is not only the traditional, commercial, sense but environmental relevance as well, i.e., accordance with the tasks of social and natural co-evolution. Therefore, it is especially important that R&D institutions should develop resource-saving, waste-free and low-

waste, and recyclable technologies. It is necessary to emphasize that a scientific base is required not only for the creation of domestic-made technologies but also for the adaptation of imported ones. The decisive factor of distribution of advanced technologies is the degree of innovative activity of business entities. For Russia, the transition to sustainable development will in the forthcoming period be in many respects identical with the economy's transition to an innovative type of operation. Wide innovative opportunities, including environmental issues, lie in conversion of R&D output of the Russian defense sector.

It is only an economy based on achievements of science and technology progress that can provide a minimum quality standard of living to every member of society, which includes the environmental component as well as a stable increase in the number of highly-paid workplaces. However, it is precisely the factor of poverty that often primarily forces to use environmentally dangerous technologies. An increase in the employment of highly qualified specialists in Russia could be, in particular, stimulated by the development of small and middle-size R&D-intensive business.

The problem of food safety is for Russia urgent enough because almost half of demand for food is already covered due to imports. Science is destined not only for contribution to solving the problem of self-provision with food but as well to initiate an agrospheric revolution, i.e. contributing to the creation of a practically new agriculture based on the principles of careful management of soil and other natural resources, oriented to not technogenic and chemical but breeding technologies.

In the near future it will be necessary in Russia to significantly increase the role of science in elaborating and making governmental decisions at different levels up to the development of economic policy of the State. The growing interdependence of different economic aspects requires knowledge not only in economics but in other sciences as well. On the one hand, without a scientific base it is already impossible to imagine a comprehensive analysis of the situation and formulation of alternatives; on the other hand, the same is true for forecasting the consequences of a choice through coupling mechanisms determining sustainability of a considerable number of objects, including ecosystems. In Russia it will not be easy to clear the path for scientific approach to decision-making though the traditions of subjectivism standing for long years. In this case it can be useful to launch studies in non-conventional fields, such as pathoeconomics: the science studying the operation of economic systems under conditions of crisis.

Science must take the principal part in expertise of large-scale economic programs and projects. The tasks of sustainable development require an analysis of economic expediency combined with other criteria of efficiency as well as with a holistic evaluation of impact on the system Humankind/Nature and ensuring the interests of future generations. The actual laws of the Russian Federation *On the Protection of Natural Environment* and *On Ecological Expertise* provide the necessary legal base for participation of scientists in corresponding procedures.

Unfortunately, the chaotic formation of the market economy as well as the swift and sometimes not well-grounded privatization of Russian enterprises have moved

environmental issues to the background. However, the anticipated transition to a more rational economic policy poses before science such tasks as the elaboration of economic mechanisms of rational nature management and creation of new organizational forms of production, favorable for people and environment. It is important also to elaborate criteria for the efficiency of economic activities, meeting the requirements of minimizing the anthropogenic burden on the biosphere. It is necessary to formulate a scientifically grounded environmental and economic governmental strategy stipulating the formation, through direct and indirect means, of an environmentally favorable sectoral structure of the economy.

An illustration for a problem urgent for Russia and requiring combined efforts of researchers is the formation of natural reserves and national parks on enormous and practically unaffected by economic activities territories, with subsequent commercially profitable use of these environmentally unspoiled territories.

Of course, Russian science in the future will contribute to rationalizing the structure of consumption, including replacement of tangible goods by intangible of less “biosphere-intensive” ones. It is possible both through differentiation of goods and promotion of a healthy and environment-friendly way of life. In Russia the relatively low level of material consumption will perhaps facilitate this task in the majority of population and the historically formed meaningful place of spiritual values in public consciousness.

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