# TECHNOLOGICAL PROGRESS FOR SUSTAINABLE DEVELOPMENT IN RUSSIA

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**Keywords:** technological progress, government policy in technology and innovation, priorities of scientific and technological development, critical technologies, program and purpose oriented management methods, promotion of high technologies in the real sector of economy.

## Contents



## Summary

At every stage of economic development, technological progress reflects the human capacity for wise use of knowledge of our surrounding world, accumulated over the centuries, for sustainable development of civilization. Modern scientific and technological achievements, which transform not only the way of life but also the very way of human thinking, are the most tangible implementation of human intellectual development.

Nations which generate new knowledge at a rapid rate have always been more successful, and demonstrate a higher level of technological development. Today the problem of safe technological development transcends national borders and has become global. In the new millennium the opportunity to preserve human civilization depends to a great extent on the character of technological systems, and their correspondence with the general principles of Nature.

With Russian examples and materials, this article deals with various problems of technological progress as an important resource and as a tool for ensuring sustainable development. The rich experience of Russia in this area is, in our opinion, useful and informative for the world community. It describes the place and role of the Russian scientific and technological sector in solving global and national problems of sustainable development, and evaluates, both objectively and subjectively, and the level of the country's technological development at different stages.

In the concluding part, regarding the state-of-the-art in the Russian technological sector, problems and perspectives for its future development are described. It includes a

number of suggestions concerning its restructuring in the interests of sustainable development in Russia and the world community as a whole.

## 1. Russia's technological sector: structure and management

In the historical perspective, the scientific and technological sector of Russia has developed in a specific way basically different from that of the West.

Science and technology in Western Europe and later in USA developed mainly through universities, wherefrom knowledge penetrated various branches of production and other areas of life. Academic organizations in those countries were established as corporate associations of scholars independent of the State.

In Russia, on the other hand, the Academy of Sciences was set up in 1724 on the initiative of the State. Unlike its analogues abroad, the Academy not only united outstanding scholars, but also became an important State institution determining in many respects the level of development of Russia's national economy and culture. From the outset science and technology were developing on the initiative and with the support of the State, which assumed the burden of costs connected both with supporting scientific activity and applying its results. At all times the technological potential of Russia invariably predetermined its status as a great world power. Today the names of M. Lomonosov, N. Lobachevsky, I. Mechnikov, P. Lebedev, D. Mendeleyev, A. Stoletov, I. Pavlov, S. Vavilov, M. Keldysh, S. Korolev and many others are known throughout the world.

In this way the Russian Academy of Sciences (RAS) became the major national center of scientific and technological activity. During a short historical period, achievements of Russian science and technology won world recognition. Today the Academy has its branches and a wide network of research organizations all over the country with unique research installations to conduct experiments and fundamental research. Many leading scientists are working in these organizations. Apart from research they are engaged in training young researchers, often acting in close cooperation with the higher educational establishments, within the framework of postgraduate and doctoral courses. Research carried out in RAS, has largely predetermined the trends of Russia's technological development.

The RAS is also a self-governing association of outstanding scientists working in different fields of knowledge. Being formed as a democratic body, the Academy is worthily recognized as a center for integrating science, education and production. Along with famous scholars in the field of fundamental research, there are many outstanding designers, engineers and professors among its members. Recommendations given by this most authoritative and representative academic community in Russia have a decisive influence on elaborating national policy in science and technology.

Being the sole investor in science and technology for many decades the government also established the science budget. Moreover, it determined, in many cases, the directions and themes of R&D, the size of allocations, as well as the spheres and scale of applying the achievements to production. In conformity with this principle, a special

structure of management of the technological sector was formed, fully adequate to the system of centralized planning and administration in science and technology.

All scientific achievements are put into practices through a network of branch research institutes operating in basic sectors of production and in the social sphere. It is in these sectors that new technologies, industrial samples, pilot series of science-intensive products, and long-term models of social and economic advancement are developed.

The higher educational establishments have their special place in science and technology. Its professors and teachers have high academic qualification just as elsewhere in the world. Institutions of higher education carry out large amount of fundamental and applied research. The results of their research, as well as other achievements of domestic and world science, are widely used, primarily to raise the level of education, but not only that. Scientists of higher educational establishments make their contribution to the development of production, culture and social sphere, as a rule, in cooperation with sect oral and academic scientific organizations.

Thus, three sub-sectors of science and technology, which are rather conventionally referred to as fundamental, branch and academic, have been formed and are operating as organizationally independent, although they are actually closely interconnected.

Such a structure of scientific and technological sector has naturally required establishment of an adequate system for its management. It is not fortuitous that methods of program and purpose-oriented planning and administration have been developed and applied in Russia.

Since GOELRO Plan (1920) fulfillment of which laid the technological basis for industrialization, the program and purpose-oriented approach has become the key method of solving major development problems on the basis of technological progress.

One of the most striking examples to illustrate successful application of this method is the achievement of parity with USA in the sphere of nuclear armaments and rocketry, just two years after the Second World War. High technologies developed during that period made it possible to implement the programs of space exploration and later to develop nuclear power engineering. The launch of "Sputnik" in 1957, the first manned space flight in 1961, and construction of atomic power stations, have demonstrated the outstanding scientific achievements and great technological and industrial capacity of Russia.

From the 1950s to the 1970s a number of target programs for creating highly efficient life supporting systems, and establishing conditions for the country's sustainable development, were implemented. The most important of them are:

- development and production of powerful earth-moving and transport machinery (walking excavators, 25-ton dump trucks, etc.) providing conditions for substantial progress in the mining industry, land reclamation and hydrotechnical and industrial construction;
- fundamentally new methods of welding technique developed in Russia led to a

real revolution in shipbuilding and construction of a reliable system of pipelines to transport oil and gas over long distances;

- development of high voltage electrotechnical equipment and power operated drive systems made it possible to convert railway transport to electric power, transfer electric power over super-long distances, and to establish the Unified Energy System on Russia's vast territory, a globally unique achievement.

The program and purpose-oriented approach has been in full conformity with the practise of overall centralized planning and administration of the economy. Such an approach ensured a comprehensive (science, technology, personnel and production) solution of existing problems, and mobilization of all intellectual and material resources. It enabled the realization of objectives, and development and mastery of structural technologies ensuring a real advance in the basic sectors of economy, so as to create life-supporting systems in the shortest possible time. Its high efficiency has proved especially valuable in critical situations when the country's survival and independence were at stake.

Today the program and purpose-oriented planning has received theoretical development and practical application all over the world. This is widely used in most industrialized countries for developing large-scale scientific and technological projects of national importance.

With the rapid growth of economic, scientific and technological activities, the principles of overall planning and strict state administration began to rapidly lose their efficiency. The first signs of stagnation in science and technology appeared as far back as the mid-1970s. Unfortunately the rich experience of western countries in using market mechanisms to boost technological advance was not applied in Russia. For several objective and subjective reasons, high technology achievements were "localized" in the defense sector, and civil branches of the Russian economy were doomed to satisfy themselves with outdated technologies.

There was a paradoxical situation: on the one hand there were scientific achievements of global significance and high technologies, not infrequently unique, without analogues elsewhere in the world, and on the other hand, production of essential consumer goods lagged ever behind world standards. Deep transformation of the S&T sector had become an urgent necessity. The disintegration of the USSR, and subsequent radical restructuring of Russian society, have greatly changed the situation, and aggravated the process of reforming the scientific and technological sector.

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## Biographical Sketch

**V.N. Alympiev** was born in 1945 in Saratov, Russia. He graduated from Physical Faculty of Saratov State University, with a Ph.D. in Physics. He was a teacher in Saratov and Samara State Universities. Lately, he worked in the Department of Science in the Central Committee of CPSU, and was a head of department and Deputy of Minister in the Ministry of Science and Technologies. He is a specialist in economics and management of science.

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