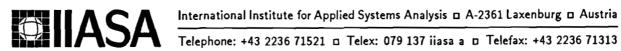# Working Paper

STATISTICS OF BASIC RESEARCH IN RUSSIA

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(Russia)

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Foreword

The major goal of the project "Research and Development Management in Russia's Transition to a Market Economy". is to advance the understanding of R&D management and to translate this understanding into practical advice to Russian policy-makers. The project is organized as a series of case studies and seminars and is aimed at bringing together Russian policy-makers and scholars with Western experts to exchange their views and research results in the field, and to promote further contacts and research collaboration among them.

Until now, five workshops on various aspects of R&D management have been held, and the first volume of papers presented at these meetings has been published (Serguei Glaziev and Christoph Schneider (eds.), *Research and Development Management in the Transition to a Market Economy*, IIASA collaborative paper CP-93-1, March 1993). Preparations for the second volume are currently underway and participants of the project have their studies in various stages of completion. This study by Dr. Natalia Gorodnikova is circulated as an IIASA working paper to enable the author to broadly discuss her results with other project participants.

Contents

STATISTICS OF BASIC
RESEARCH IN RUSSIA

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1 Introduction

Statistics of research and development (R&D) is one of the youngest branches of economic statistics in Russia and was developed under the influence of the centralized planning system and financing.

Under the conditions of the transition to a market economy, R&D policy cannot be re-organized without a comprehensive evaluation of input and output of the national R&D system. This is why a radical revision of statistics becomes a crucial component for the transformation of the R&D system and the background for the development and implementation of a new R&D policy aimed at maintaining basic research potential.

This paper is devoted to the problems of R&D statistics in Russia, its applicability for estimating basic research and comparability of data. The perspectives of Russian R&D statistics, for example, in connection with implementing international statistical standards, is also the focus of this paper.

The author is grateful to the ETI Project at IIASA for providing technical support.

2 R&D Statistics in Russia: General Background and Key Players

The current status of basic research data should be examined in the context of general problems of R&D statistics.

It should be taken into account, that the official role of statistics in the former USSR has been limited to the information support of governmental bodies. Statistics was based on gross indicators and badly suited for analytical studies. The interest in methodological investigations has been reduced and sufficient achievements of domestic and foreign statistics has been under-estimated. Soviet R&D statistical data was, as a rule, incompatible with international standards because of the differences in the objects of surveying, definitions and classifications, methods of accounting, and data collection and processing.

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In the past, R&D statistics was concentrated mainly in the former USSR State Committee for Statistics. The Committee was an agency of general economic profile, and the system of R&D data collection was organized as in other branches of the national economy (industry, agriculture, construction, etc.). It presupposed universal surveying of all the enterprises' activities and resulted in a lack of flexible statistics.

In order to clarify the current status of R&D statistics in Russia it is necessary to consider some significant factors hampering the transformation of the statistical system based on international standards. The major ones are:

1. The absence of national S&T policy (in the commonly used sense) under the centralized economy. On the whole the policy has come to control the fulfillment of state plans on S&T. As a result, the statistical agency oriented toward the information demand of the central government has not been interested in deepening and detailing R&D statistics beyond such utilitarian tasks.

   Because of the strong monopolization of statistical services the former USSR State Committee on S&T, in turn, was not engaged in statistics and was only the user of the data provided by the Committee for Statistics.

2. Autarchy policy in the S&T sphere which had been conducted by the former USSR for decades served as an additional reason for the state statistical services being uninterested in the international standards implementation.

3. Until now there are still differences between the general principles of accounting and statistics in Russia and those used internationally. This makes it difficult and sometimes impossible to introduce internationally recognized concepts, classifications and definitions in R&D statistics in isolation from the overall revision of economic and social statistics.

4. The order of statistical data collection and processing which existed in the former USSR did not promote the dissemination of ideas for the international standardization of R&D statistics. Only the central statistical agency was responsible for the All-Union data generalization and completing the questionnaires of international organizations. The republican statistical bodies, e.g., the Russian one, have been delivered from the necessity of being acquainted with international statistical standards.

The disintegration of the USSR has affected the statistical framework of R&D data collection. The USSR State Committee for Statistics which was in charge of statistical methodology and of R&D surveying has been abolished. The new statistical agency which was established—the Statistical Committee of the Commonwealth of Independent States (CIS)—has not any legal rights for primary data collection. Its authority includes only methodological recommendations for the CIS countries (excluding the Baltic states) and receiving data from their statistical agencies. This Committee has very limited resources

and a large part of the methodological work on R&D statistics for this body is being performed by the CSRS.

The role of the State Committee on Statistics of the Russian Federation the past has been to only collect data in Russia and to pass this on to the former USSR central statistical agency for further processing. This body has not been involved in the studies on the methodology of R&D statistics and has insufficient experience and resources for the development of new methodologies which are compatible with international standards.

The transition to the market economy has caused the complication of economic and social processes and the formation of a new state regulation mechanism. This situation obviously has required demonopolization of the national statistical services. Concrete executive bodies—ministries and governmental agencies—are entitled to keep statistical data collection concerning areas of their responsibility.

Unfortunately, the official statistics do not react to modern realities in S&T and, as a result, do not meet the modern requirements of S&T policy-making. Methodological and organizational alienation of governmental statistics on R&D from the system of forming and implementing S&T and innovation policies has become a crucial factor hampering the further improvement of S&T statistics in Russia.

In this connection in 1992 the Ministry of Science and Technological Policy (MSTP) of the Russian Federation approved the Conception of Science and Technology Statistics Formation. It was proposed that the Ministry would take the authority for the development of general R&D statistics in addition to those related to government R&D funding. The positive experience, for example, of the ministries of science and technology in Germany, France, and in other developed countries, confirms the advisability of direct leadership of R&D statistics by those governmental bodies.

The Statute of the Ministry of Science and Technological Policy, approved by the Government of the Russian Federation on July 12, 1993, proclaims that the Ministry is generally responsible for developing the methodology of R&D statistics, implementing the respective surveys, and introducing international standards.

In this connection the MSTP and the State Committee for Statistics of the Russian Federation issued a common statement at the end of 1993. This statement is aimed at implementing joint efforts to raise the efficiency of R&D statistics. In accordance with the statement, the Centre for Science Research and Statistics (CSRS) established in early 1991 and subordinated both to the MSTP and the Russian Academy of Sciences, is officially responsible for the methodology of R&D statistics, including the implementation of international statistical standards. The CSRS has also been authorized to represent the Ministry in relations with interested international organizations in the field of statistics.

Along with a wide range of methodological activities, the CSRS has also an ambitious program of statistical publications. These include reports, yearbooks, analytical reviews, thematic essays, as well as methodological editions (see Bibliography). Most of these are published in Russian and English.

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3 Current Surveying Practice

Until 1989, the predominant concept of R&D data collection was the coverage of quite definite types of institutions (depending on the objectives of concrete surveys) versus the activity-based concept recommended by international statistics. The primary data on R&D mostly concerned the sector "Science and Scientific Services" in accordance with the so-called All-Union Classification of Branches of the National Economy.

The given sector traditionally incorporates R&D institutes, design organizations, experimental enterprises (without serial production), as well as some non-R&D units (for instance, on the prospecting stocks of fish and marine products, weather monitoring, geological exploration, etc.). But this sector does not cover R&D units of industrial enterprises and higher education institutes directly performing research and development. So, on the one hand, the data on the sector "Science and Scientific Services" do not reflect the total scale of the national R&D activity, and, on the other hand, this classification does not correspond to ISIC. The existence of such an eclectic sector within the national industrial classification is an attribute of artificial statistics which was oriented to the centralized planning system.

Current statistics on S&T in Russia traditionally covers several major groups of indicators:

1. R&D Input.

   (a) Personnel,
   (b) S&T education,
   (c) Fixed assets,
   (d) Funding.

2. R&D Output.

   (a) Inventions, patents, licences,
   (b) Prototypes of new machines and equipment.

3. Innovations.

   (a) Utilization of inventions and new prototypes of machines and equipment,
   (b) Production of new products,
   (c) Expenditures on innovation.

Most of the data on R&D and innovations are usually obtained from mandatory reports of R&D institutions and industrial enterprises.

The concept of basic research was introduced in Russian statistics only in 1989, when the new national survey was launched. That was the first step in forming statistics of basic research.

Basic research in the Russian R&D statistics is implied to be experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. This definition is identical with that of the Frascati Manual–1992.

The survey covers all establishments performing R&D and S&T services. Data is grouped by ministries and other bodies according to the subordination of R&D units, regions, and types of institutions.

This survey includes data on several groups of indicators:

(i) Indicators of R&D financing measured in terms of the total value of projects (including profit obtained during the year) and actual expenditure, both extramural and intramural (i.e., performed within the unit).

Data is available for R&D by type of activity including basic and applied research, development (design, projects, creation of prototypes, etc.) and, in addition, for S&T services (S&T information, services on patents and licences, consultancy, and so on). The definitions used are close to those of the Frascati Manual.

The total values of S&T activity and of all projects performed by R&D units are also collected.

(ii) R&D personnel (by gender, qualification, occupation, field of S&T, region, type of institution), including researchers, technicians and supporting staff.

The peculiarities of personnel recruitment and R&D labor organization in Russia are taken into account in the definitions used. Thus, researchers should be graduates of higher education institutes, as a rule, with 4–5 year training (equal at least to ISCED level 6). R&D specialists with special secondary education, i.e. graduates of specialized secondary education establishments (technical colleges) with 3–4 year training (equal to ISCED levels 3 and 5), usually work as technicians. The national survey also provides a separate estimation of higher education teaching staff working as part-time researchers.

The classification of R&D personnel by formal qualification is based on categories mentioned above and connected with the Russian educational system. It proposes a subdivision of personnel into groups of staff with scientific degrees (doctors and candidates of science) and higher or special secondary education diplomas.

The classification of researchers by field of S&T corresponds to the Nomenclature of Occupations of Scientific Workers, adopted by the former USSR State Committee on S&T in 1988. This includes 21 fields of S&T which incorporate more than 600 detailed specialities. On the whole they can be grouped into major fields of S&T stipulated by the Frascati Manual.

The indicator of R&D personnel is much closer to international standards (see Figure 1) but, certainly, covers only a portion of S&T personnel. The significant distinction here is that R&D personnel is expressed as head counts and not full-time equivalent.

EMPLOYMENT IN R&D INSTITUTIONS

R&D Specialists		Supporting Staff	Other
Personnel directly engaged in R&D		Personnel providing direct services to R&D (planning, financing, S&T information patent services; workers of experimental plants, etc.)	Personnel of staff services, supplying units, etc.
With higher education (ISCED Level 6)	With special secondary education (ISCED Level 3, 5)		

EQUAL TO OECD CATEGORIES

Researchers	Technicians	Other Supporting Staff

Figure 1: Correspondence Between Concepts of R&D Personnel in Russia and OECD.

A survey of this kind was intended to be an intermediate stage moving away from the old statistics on R&D to the modern, internationally comparable one. Unfortunately, further progress has been stopped by official statistical bodies, and a half-and-half methodology is still in use. Besides, the absence of a business register appropriate for surveying purposes together with the legal limitations on the data caused a lack of information on the R&D activity of small enterprises.

The fact that the annual national survey appeared was very significant from the viewpoint of providing the opportunity to develop the R&D data series. These rows are the basis for comparing data for different years and for producing future forecasts. At the same time, the options of international comparisons were very limited. This can be illustrated using concrete examples.

Firstly, it is impossible to compare data on R&D personnel in Russia with similar data from other countries where OECD statistical standards are used. The absence of full-time equivalent estimations in official R&D statistics makes it impossible to assess the distribution of R&D personnel by type of activity, including basic research.

Secondly, it is extremely difficult to compare data on basic research expenditure in Russia and abroad because of the following reasons:

1. The coverage of expenditure are different: as it used to be in Russia, current R&D expenditure includes the depreciation of fixed assets, whereas according to the Fras-

cati Manual it should be excluded from R&D expenditure. At the same time, the Russian national R&D survey does not cover capital expenditure which are surveyed in the framework of investment statistics.

2. Sectoral classification accepted in Russian R&D statistics is not compatible with the Frascati Manual sectoring recommendations (except the higher education sector).

The peculiarities of its contents and utilization could be explained by the essential reasons determining the principles of R&D organization and statistics.

(i) There is strong administrative subordination of R&D units to respective ministries and other governmental bodies under the centrally planned economy. Ministries have only been interested in data on affiliated R&D units and the official statistics had to satisfy such requirements. The procedure of data collection, e.g., on R&D, has been organized in accordance with this principle and the sectoral classification has not been introduced in the data collection system.

(ii) The existence of the Academy of Sciences and branch academies (on agriculture, medical sciences, education) as the bodies administering a network of R&D institutes separated from industry and higher education. The academies represent a significant part of the national R&D potential, especially in basic research.

(iii) The institutional structure of the R&D system traditional for the former USSR. Until now a large number of R&D institutions, independent from industry and higher education, has played a dominating role in national R&D efforts.

(iv) The specialization of different parts of the national R&D system on different types of activity. Thus, academy institutes are oriented mostly to basic research whereas the activity of R&D units of industrial enterprises is devoted to development.

As a result, the national sectoral classification is based on a combination of such criteria as administrative subordination, type of institution, and function of R&D units.

For analytical purposes the following sectors are identified:

(i) The academy sector consists of the Russian Academy of Sciences (RAS), the Russian Academy of Agricultural Sciences, the Russian Academy of Medical Sciences, and the Russian Academy of Education.

(ii) The higher education sector comprises R&D units of universities and equal higher education institutes.

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(iii) The industrial R&D sector covers all research institutes, design bureaus, construction projects and experimental organizations working independently of industrial enterprises. This sector traditionally also includes R&D units serving the government and the military industry.

(iv) The enterprise sector consists of R&D units of industrial enterprises.

3. Data on R&D expenditure by field of science are not provided for Russia by the national R&D survey.

The attempt to collect data on the distribution of R&D expenditure by field of science was made only once in Russia, in the 1989 ad hoc survey devoted to R&D fixed assets.[1]

In 1992 the questionnaire of the national R&D survey was revised. The last version included a new group of indicators, which described the sources of R&D funding, e.g., of basic research. Among those sources budget, non-budget (funds of technology development, economic stabilization, regional development, etc.) and own funds, as well as customer funds were considered. Along with this, data on the distribution of R&D personnel of the academy sector by position, academic status, age and nationality were also collected for the first time. This is especially important in order to analyze the structure of human resources extensively engaged in basic research.

Unfortunately, recent methodological developments of international statistics were not introduced even in the revised version of the national R&D survey. Thus, for an indepth analysis of basic research from the viewpoint of its practical applicability, it is recommended to distinguish pure and oriented (or strategic) basic research. This concept is not in use in Russia.

All of the above influences the quality of statistical information which is unsuitable for reflecting the real condition of national R&D potential.

In order to estimate R&D indicators in Russia in accordance with the Frascati Manual recommendations, the CSRS will perform a series of experimental calculations using its own data bases which include information on some 98% of R&D-performing institutions of the Russian Federation. The project is aimed at obtaining data comparable with OECD statistics by coverage, classifications, and composition. Special emphasis will be put on assessing expenditure on basic research and its distribution by sector of performance.

The main methodological findings of this project will include the following steps:

- redistribution of institutions by sector of performance in accordance with the Frascati sectoring;

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[1]The survey covered fixed assets intended for R&D in research institutes and higher education establishments and has no analogues in international statistics.

- revising the coverage of R&D expenditure;

- re-estimation by sectors of performance will be made for a set of indicators, including numbers of R&D institutions, R&D personnel, expenditure and fixed assets.

Thus, for example, official statistics on R&D expenditure in the former USSR has been based on estimating the so-called "gross national expenditure on S&T". This indicator was created by the centralized planning system to demonstrate the overall value of R&D institutions' activities and is not comparable with the one used in the OECD area ("GERD" which is limited to R&D expenditure).

The gross national expenditure on S&T is calculated as the total value of work performed by R&D institutions (including both expenditures, other than capital, and profits received during the year), and R&D capital expenditure (excluding investment by R&D institutions in housing, personal services' facilities and other installations not connected with R&D). Expenditures on the implementation of innovations are excluded.

Tables 1 and 2 demonstrate the principle differences in R&D expenditure, when calculated on the basis of national methodology or in line with OECD standards.

These estimations show that R&D expenditure in Russia calculated traditionally is over-estimated by some 45%, due to the inclusion of profits and depreciation, compared to that adjusted according to Frascati standards.

Table 1: Gross National Expenditure on S&T in the USSR and Russia (billion rubles; CSRS est.)

	1986	1987	1988	1989	1990	1991
USSR	21.2	23.3	26.7	31.6	34.6	39.4
Russia	—	—	—	22.8	22.2	29.0

At current prices.

Table 2: R&D Expenditure in Russia (CSRS est.)

	1990	1991	1992
Total R&D expenditure, billion rubles	13.08	19.99	14.06
As a per cent of:			
gross domestic product	2.03	1.54	0.78
net material product	2.94	1.90	0.96

At current prices. Calculated in line with OECD standards.

The same concerns the estimations of R&D personnel which, being measured on the internationally comparable basis, is 41% less than that reported officially for the sector "Science and Scientific Services" (Table 3).

Table 3: Indicators of R&D Personnel in Russia (in thousands)

	1989	1990	1991	1992
Employment in the "Science and Scientific Services" sector	2215.6	1943.4	1677.8	1532.6
R&D personnel	3203.6	3130.3	3075.0	2600.0

This work will play a "methodological bridge" role between the data for the period 1989–1994 and those collected after implementing a new national annual survey based on international standards.

The CSRS implemented a number of surveys oriented to analyzing the resources of basic research and factors influencing its trends. The survey of R&D personnel in the Russian Academy of Sciences was organized. The goal of this survey was to provide information on the flows of R&D personnel in the institutes which were administered by the Russian Academy of Sciences and produced the major part of basic research. It covered demographic trends and qualification of entrants and discharged staff; reasons for discharge; data on emigrated researchers, and those working abroad on contracts. This survey will be repeated in 1994.

For the first time in Russian statistics, the CSRS performed a special sample survey concerning the values and sources of money income of R&D personnel in the Russian Academy of Sciences in order to evaluate the welfare standards of scientists and engineers under worsening social conditions. This survey included wages and salaries for both R&D and secondary jobs (other payments). Housing conditions and the availability of expensive utensils were also a focus of the survey.

4 Recent Changes and Future Perspectives

The goals of S&T policy directly determine the objectives of revising R&D and innovation statistics. From this point of view several main principles will be highlighted in the background of the projected R&D statistical system:

1. The provision of a realistic picture of R&D input and output. Statistics have to react to the priorities of R&D policy, not only reflecting existing trends, but also foreseeing some future changes.

2. The coverage of all relevant elements and determining factors of R&D.

3. The introduction of international standards into Russian R&D statistics. This should be comparable with international statistics in order to include information on R&D in Russia into the international data series.

4. The concordance between R&D statistics and others (labor, education, industrial, foreign trade, etc.).

5. A flexible system of data collection based on its different forms adequate for concrete statistical tasks. This requires high-quality planning and coordination of censuses, regular reports, sample surveys, sociological interrogations.

6. Public relations in R&D statistics which is to be made available for the general public. This includes the implementation of a program of various statistical and analytical publications on R&D indicators.

The new stage of transforming R&D statistics in Russia is connected with the program of the new national R&D survey being developed by the CSRS. The development of a specially tailored questionnaire for eventual use in collecting key R&D input and output data takes a significant place in the current CSRS methodological activity. This is being designed in accordance with OECD standards and its contents are determined by the necessity to meet, at least, the following main demands:

- to have a unified form appropriate for different types of institutions;

- to provide information on the structure of the OECD questionnaires on R&D;

- to have a form familiar for the enterprises and statistical services in Russia.

The questionnaire includes a number of indicators which can be subdivided into three groups:

(i) Traditional issues for OECD statistics as well as for Russian (R&D personnel and expenditure).

(ii) Issues which have not been developed earlier in the former Soviet statistics, e.g., distribution of R&D expenditure by socio-economic objective.

(iii) Issues which are traditional for statistical studies in Russia, but not in the OECD area (R&D fixed assets).

The draft R&D questionnaire contains the following sections:

(i) Employment in R&D. This proposes a head-count estimation of R&D personnel (full-time and part-time) by qualification, occupation, and field of S&T.

(ii) Expenditure on R&D. This is considered by type of expenditure, type of activity (basic and applied research, development, S&T services, other), source of funds (own funds of R&D units and external funds—government, business enterprises, higher education, foreign), and field of S&T. The classification of intramural R&D expenditure by socio-economic objective is also foreseen.

(iii) R&D fixed assets. This section is devoted to the measurement of the stock of R&D fixed assets, e.g., of equipment.

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Essential definitions and classifications (including sectoral) used are based mostly on the Frascati Manual. Besides, some additional classifications reflecting important features of the Russian economy in transition are used, for example, classification of institutions by type of property.

Pilot surveys are planned for 1994. The overall survey is expected to be implemented in 1995, along with the traditional one to obtain information for the re-estimation of the retrospective data series. It is important that the surveys are launched along with the introduction of the new ISIC-based Russian Classification of Economic Activities. This survey is considered to be the basis for the further development of internationally comparable R&D statistics.

Government R&D funding, being the major source of maintaining the national R&D potential, will be another focal subject for statistical surveying. In order to obtain detailed data, in 1992 the CSRS developed the questionnaire for the survey of government R&D funding conducted by the MSTP. This was aimed at collecting data on budget R&D expenditure in 1991 and appropriations (ex-ante), both actual (for 1992) and expected (for 1993), from departments, government agencies and other bodies (associations, academies, independent research centres, etc.). The questionnaire included indicators reflecting the distribution of current budget expenditure by type of costs (labor, equipment, others). R&D financed from own funds of R&D units and through contracts were also estimated.

Following the needs of policy-makers in relevant statistical data, the CSRS has recently developed a new questionnaire on the outlays for R&D from the republican budget.[2] Several principal requirements were taken into consideration:

1. To meet the current practice of R&D budget planning and analysis. The annual procedure of R&D budget planning includes accounting actual expenditures of the previous year, development of a preliminary plan and its final adjustment, as well as estimating the outlays required for the next year. Besides, capital R&D investment are planned in the framework of republican (federal) budget separately from current outlays.

2. To provide information for detailed comprehensive analysis of budget R&D funding. This supposes obtaining data on budget R&D expenditure by type of costs, type of activity, field of science and technology and socio-economic objective.

3. To be in line with the general revision of concepts, definitions and classifications of R&D statistics in Russia in accordance with international standards. Concordance is vital between statistics of budget R&D funding and the new national R&D survey being developed by the CSRS on the basis of the Frascati Manual.

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[2]Improvement of the budget R&D funding statistics is being developed in the framework of the Project on R&D and Innovation Indicators in the Russian Federation being performed by Eurostat and the CSRS under the TACIS Program.

4. To reflect national peculiarities of R&D management, accounting and statistics in Russia. It is important to combine both compatibility with the Eurostat NABS and Frascati recommendations, and specific elements of national classifications, e.g., of socio-economic objectives and types of costs. These classifications should allow internationally comparable data items to be obtained by detailed regrouping.

The questionnaire includes four sections:

1. Outlays for R&D by type of costs (both actual and planned for the current and following years). Breakdown of expenditure by type of costs meets usual articles of expenditure accepted in the R&D budget planning in Russia namely expenditures on personnel, social fees, purchasing of equipment, energy, depreciation of fixed assets, rental fees, others. They can also be grouped in larger elements recommended by the Frascati Manual.

2. Actual current R&D expenditure by priority government programs. Special attention here is paid to the appropriations on basic research from the Russian Fund for Fundamental Research. This Fund, established in 1992, takes 3–4% of the total budget R&D appropriations and is devoted specially to support basic research.

3. Actual current expenditure on R&D by type of activity, including basic and applied research, development, and field of S&T. Fields of S&T cover: natural sciences, engineering, medical, agricultural, social sciences and humanities. The definitions used are in line with international standards.

4. Current expenditure on R&D by socio-economic objective and field of S&T. The classification of socio-economic objectives is based on NABS, and at the same time, reflects national traditions. It influences the grouping of objectives in major groups and their disaggregation into detailed ones. This approach gives an opportunity to define actual priorities in R&D. In the case when it is impossible to refer particular basic research to a concrete objective, one should be concerned within the objective "General advancement of research". This covers basic research projects intended for the general development of natural and social sciences, and humanities. Research in economics, policy and management of science should also be included in this group.

Table 4 illustrates the correspondence between the Russian, OECD and Eurostat NABS classifications of socio-economic objectives.

In May 1994, pilot surveys were supposed to begin; an overall survey will also be implemented this year.

The adaptation of international standards to the peculiarities of the Russian R&D system has a significant impact on all elements of statistics.

As far as **R&D personnel indicators** are concerned, further progress is connected with the development and implementation of an appropriate concept of human resources

Table 4: Key Between Russian, OECD, and Eurostat NABS (1993) Socio-economic objectives*

Russia	OECD	NABS (1993)
1. Economic development	1+2+3+4	2+5+6+7
1.1 Agriculture, forestry, and fishery	1	6
1.2 Production, distribution, and rational utilization of energy	3	5
1.3 Industry	2	7
1.3.1 Increasing economic efficiency and technological development		7.0+7.1+7.2
1.3.2 Extraction and processing of non-energy minerals		7.3
1.3.3 Chemical industry		7.4
1.3.4 Manufacture of motor vehicles and other means of transport		7.5
1.3.5 Electronic industry, manufacture of radio, television and communications equipment		7.6.1+7.6.2
1.3.6 Software development		7.6.3
1.3.7 Manufacture of electrical machinery and apparatus		7.7
1.3.8 Manufacture of instruments		7.9
1.3.9 Manufacture of non-electronic and non-electrical machinery		7.8
1.3.10 Manufacture of textiles, clothing, and leather goods		7.11
1.3.11 Manufacture of food products and beverages		7.10
1.3.12 Other manufacturing products		7.12+7.13
1.4 Construction		2.2
1.5 Transport	4	2.4
1.6 Communications	4	2.5
1.7 Infrastructure, urban and rural planning	4	2.0+2.1+2.3+2.6+2.9
1.8 Services	2	
2. Social objectives	5+6+7+9.1	3+4+8+11
2.1 Environment protection	5	3
2.2 Protection of human health	6	4
2.3 Social development and structures	7	8
2.4 General advancement of research	9.1	11
3. Exploration and exploitation of the earth and atmosphere	8	1
4. Civil exploitation of space	10	9
5. Defense	11	13

* For details see the Frascati Manual–1992 and the Nomenclature for the Analysis of Science Budgets, Rev. 1993, Eurostat.

in S&T. Finally, this group of indicators will reflect labor market trends and cover S&T personnel stock and flows (including professional mobility), demographic trends, employment, education and standards of living.

In order to obtain information on modern trends of S&T personnel the CSRS has performed a set of statistical studies. These concern some vital issues so as to meet the needs of analysts and policy makers. Among them are:

1. **The survey of R&D employment and salaries in the CIS countries.** The survey produced by the CSRS in cooperation with the CIS Statistical Committee, serves for collecting data on stock, gender, age, inflow and outflow (including staff reduction) of researchers in the CIS member countries.

   The renewed version of the questionnaire includes indicators on international mobility of personnel.

2. **The survey of unemployed scientists and engineers.** The survey covered scientists and engineers registered at the Moscow Labor Service in 1991–1992. It was dedicated to evaluating demographic trends, qualification, and occupation of unemployed scientists and engineers, reasons for unemployment and ways for job placement.

3. **The sample survey of post-graduate students at universities and engineering higher education institutes.** The survey was intended to study post-graduate student population, activity and intentions. Special attention was given to the succession of occupation and research experience received at high school, research activity and secondary employment during post-graduate training, and further career intentions. Social origin of post-graduate students, qualification and the occupation of parents were also taken into account.

4. **The study of emigration of researchers** devoted to estimate the stock of emigrants engaged in R&D, their distribution by qualification and country of destination.

The systematic approach to the analysis of S&T input envisages broadening a set of **indicators of R&D fixed assets.** In addition to those of their value, composition, age structure and quality, experimental base of R&D units, it is useful to pay particular attention to the production and trade in scientific instruments, their competitiveness, construction of buildings and installations intended for R&D.

Among the recent methodological developments of the CSRS the following should be mentioned:

1. **The survey of R&D fixed assets** performed together with the CIS Statistical Committee. The stock, composition, and quality of R&D units' fixed assets were analyzed with an emphasis on flows of equipment and privatization of R&D institutions.

2. **The survey of experimental base of R&D units.** Availability of experimental bases, their affiliation, intentions to privatize, and personnel are to be analyzed. Equipment (both own and leased), its age and technical level, and the premises intended for experimental production are also the objects for investigation.

3. **The survey of the production of research instruments.** It is supposed that the survey will cover all of the enterprises producing research instruments. It will be helpful to obtain data on the volume of production by type of instruments, their quality (in comparison with foreign analogues) and prices.

The implementation of all the planned works, connected with introducing new statistical methodology and surveys, will give an instrument for analyzing the situation in R&D as a whole and in basic research particularly.

5 Bibliography of the Major CSRS Publications on S&T Statistics

1. Science and Technology in Russia: 1993, 240 pp., (in Russian and being translated into English).

2. Research and Development in Russia Outlook, 468 pp., (in Russian and being translated into English).

3. Science and Technology Indicators in the CIS, 408 pp., (in Russian and being published in English).

4. Science and Technology in Russia: 1991, 166 pp., (in Russian and in English).

5. Research and Development in the USSR, Data Book: 1990, 60 pp., (in Russian and English).

6. Science and Technology in the Former USSR: Analysis and Statistics, 296 pp., (in Russian and being translated into English).

7. Directory of R&D Institutions of Russia, 287 pp., (in Russian and being translated into English).

Forthcoming:

1. Russian Science and Technology at a Glance, Pocket Data Book.
2. Science and Technology Indicators in the Regions of Russia.
3. Higher Education in Russia.