# SCIENCE AND RESEARCH

**1. Please describe the national policy for research and technological development (RTD). Please refer to the priorities, priority sectors, targets, target groups, instruments, performance monitoring and evaluation.**

In accordance with Article 47 of the Constitution of the Republic of Macedonia, the state is committed to fostering and supporting scientific research, as well as technological development. In accordance with Article 23 of the Law on Organisation and Operation of the State Administrative Bodies ("Official Gazette of the Republic of Macedonia" No. 58/00), the Ministry of Education and Science is responsible for the organisation, finance, development and promotion of science and technological development, state-of-the-art communication technologies, information science and technology, as well as international cooperation regarding these issues.

Pursuant to Article 6 of the Law on the Scientific Research Activity ("Official Gazette of the Republic of Macedonia" Nos.13/96 and 29/02), the fundamental principles of the scientific research activities are inviolability and protection of human dignity. They, in turn, are based on the following criteria: freedom of scientific and scholarly creative work, autonomy and implementation of the findings, diversity of scientific views and methods, as well as international cooperation.

Article 7 of the Law on the Scientific Research Activity ("Official Gazette of the Republic of Macedonia" Nos. 13/96 and 29/02) contains a clear definition of the public interest related to the scientific research in the domain of the national and cultural identity of the Macedonian people and other ethnic communities within the Republic of Macedonia. Furthermore, research is underlined as a basic prerequisite for the overall development of the state. The research activities carried out in order to raise the level of research excellence and creativity and the transfer of world-class knowledge, including the domain of defence and security, are also determined by this Law.The promotion of human resources and research infrastructure are also issues of public interest.

The objectives of the Law on Stimulation and Facilitation of the Technological Development ("Official Gazette of the Republic of Macedonia" No. 98/00) are to foster and support the technological development at a national level, and to programme and fund these activities. The technological development as defined by this Law comprises:

- development of national technologies;
- substantial progress of the country based on an independent economic basis;
- deployment of new technologies within the production facilities;
- establishment of innovation and technology centres;
- development of the necessary technological infrastructure, transfer of knowledge through a continuous upgrading of adequate skills.

In accordance with the structure of economy and the institutional infrastructure in the domain of science, the Ministry of Education and Science has set the following priorities regarding the science and technology development of the Republic of Macedonia:

- sustainable growth,
- biotechnology,
- high-quality food production,
- water resources management,
- energy sector,
- new materials,
- environmental protection,
- information and communication technologies,
- healthcare, and
- geological science and engineering.

In the forthcoming period, the infrastructure support to scientific research will focus on the following:

- further development of the academic research network;
- renovation of the research equipment;
- stimulation of promoting new research and development units within the economy;
- systematic and continuous supply of foreign reference literature;
- upgrading the library information system;
- strengthening the present technology development capacities;
- founding new technology transfer centres in view of a more efficient integration of the research and business entities;
- providing favourable working conditions for those research entities that operate in unacceptable conditions.

The imperatives of the research and development policy of the Republic of Macedonia in the near future will be:

- enhancement of the application and transfer of knowledge relevant for the economic, social, cultural and environmental development of the Republic of Macedonia;
- stimulation and promotion of international cooperation and the transfer of knowledge and technology from abroad;
- introduction of the performance monitoring and evaluation system regarding the quality of results achieved by the science and technology research teams through the implementation of international standards and criteria;
- increased investments in science and development activities;
- facilitating the access to the international funds and providing technical assistance ;
- Defining and introducing of interdisciplinary programmes for target research activities;
- establishing internationally standardised measures for the evaluation and assessment of the economic relevance of the research results as defining criteria for further development policy;
- providing incentives for the enterprises in establishing effective knowledge and technology transfer units;
- reducing the technology gap with the aim to reach the level of development of the developed countries;
- creating the conditions for raising the quality of knowledge and innovations;
- establishing a technology information system as part of the information system that is commensurate with the criteria of the corresponding data bases, services and networks;
- setting a model of a single infrastructure for the support and the development of science and technology;
- consolidation and promotion of the national industry and companies, especially the support to small and medium enterprises, in order to ensure the quality and competitiveness of their products on the global market;
- setting a system of priorities, supported by economic policy measures.

The science policy focuses on the following target entities:

- institutions of higher education;
- the Macedonian Academy of Sciences and Arts;
- public scientific and research institutions;
- technology transfer entities; and
- Research and development entities of the industry.

The Ministry of Education and Science has at its disposal the following financial instruments for the support of scientific research:

- financing the national research and technology development projects;
- awarding scholarships for post-graduate and doctoral studies at local and foreign universities;
- financial support for research workers participating at international conferences;
- financial support in organising international scientific conferences;
- contribution for publishing scientific and research publications;

- development of the research and technology development infrastructure.

Due to the unfavourable situation in the industry, the resources for the research and technology development activities are mainly allocated from the Budget of the Republic of Macedonia. Thus, there is an urgent need to impose a more active role upon the business sector that, in turn, will be encouraged to invest in its own development via innovations, new products and new technology lines.

The Macedonian science will strengthen its competitiveness at an international level only if the scientific research entities are adequately supported in terms of personnel and technical equipment. Due to its limited capacities, the Ministry of Education and Science is about to organise an international donation conference on science and technology development. The funds raised by this conference will be allocated for the reconstruction of the science infrastructure.

With reference to the revision and evaluation process of the scientific research activity, it should be noted that the existing system has to be improved. Namely, the selection of projects is carried out institutionally on the basis of a public competition followed by an anonymous review. After the completion of projects, their findings are presented to the competent scientific public. The main goal of this system is to achieve desetatisation of the process of expert evaluation of the science and research activity.

The traditional evaluation system has to be upgraded with the solutions laid down in the new Law on Scientific Research and Technological Development. For that purpose, the Law has foreseen the establishment of a network of national coordinators for different domains and disciplines in order to achieve objective evaluation procedures. Moreover, for projects of a broader public interest, international expertise has been provided for, so as to avoid the conflict of interests among the scientists and scholars.

**2. Please describe the legislative framework. Refer to the general legislation and to intellectual property rights, regulatory and ethical aspects and the existence of a committee charged with the monitoring of the latter. Discuss your legislation regarding taxation and import duties concerning EC funds for RTD.**

The legislative framework in the domain of research and technological development consists of the following laws and bylaws:

- the Law on Scientific Research (“Official Gazette of the Republic of Macedonia” Nos. 13/96 and 29/02), which regulates the system, the principles, the public interest, the forms of organization and management of scientific research, the ways of fostering and facilitating science and research development, the research scientists, and other issues regarding the research activity;
- the Law on the Macedonian Academy of Sciences and Arts (“Official Gazette of the Republic of Macedonia” No. 13/96), which defines the Academy as the highest autonomous scientific and artistic institution in the Republic of Macedonia, at the same time being the institution of utmost importance on the national level;
- the Law on Stimulation and Facilitation of the Technological Development (“Official Gazette of the Republic of Macedonia” No. 98/00), which regulates the stimulation and facilitation of the technological development of the Republic of Macedonia, programming and financing its activities, such as: development of self-reliant technologies, enhancement of an independent economic base, modernisation of the existent production capacities, establishment of innovation centres and technology nuclei, providing the necessary technology infrastructure and knowledge transfer by raising the level of research excellence and creativity;
- the Law on Enhancement and Facilitation of Technical Culture (“Official Gazette of the Republic of Macedonia” No. 53/00), which regulates the training aimed at the acquisition of skills and knowledge in the domain of technology and computer science, innovation and creativity, dissemination of scientific and technological research results, stimulation of the research excellence and creativity, technical and vocational education and training, especially in relation to young people;

- the Rulebook on Determining the Conditions and Criteria Regarding the Allocation of Resources for the Stimulation and Facilitation of Scientific Research (“Official Gazette of the Republic of Macedonia” No. 3/05 );
- the Rulebook on Determining the Conditions and Criteria Regarding the Allocation of Resources for the Implementation of the Annual Programmes for Operation and Development of the Public Research Institutions (“Official Gazette of the Republic of Macedonia” No 3/05);
- the Rulebook on Determining the Conditions and Criteria for the Allocation of Resources for the Training of Research Scientists (“Official Gazette of the Republic of Macedonia” No. 33/04);
- the Rulebook on the Conditions, Criteria and Management of the Resources Allocated for the Stimulation and Facilitation of the Technological Development (“Official Gazette of the Republic of Macedonia” No. 49/01); and
- the Rulebook on the Criteria for the Allocation of Resources for the Implementation of the Programme Regarding the Projects in the Domain of Technical Culture (“Official Gazette of the Republic of Macedonia” No. 31/01).

The guiding principles of scientific research are:
- freedom of scientific creative work;
- autonomy of the scientists in conducting their research;
- the scientists’ ethics in performing their research and in applying their findings;
- diversity of scientific views and methods;
- joint and open international cooperation.

The new Law on Scientific Research and Technological Development that is being drafted will determine the principles, the objectives, the public interest, as well as the implementation of the scientific research policy and the stimulation and facilitation of the technological development that are financed by budgetary resources and by other international programmes and funds, including the local self-government units and business entities. This policy aims at accomplishing the objectives of the economic and social development of the Republic of Macedonia.

This law will also regulate the forms of the organisation and management of scientific research and the technological development, the conditions for conducting research, as well as the advanced training and specialisation of the scientists, thereby setting research and technological development as the main priorities in the overall development.

The new law anticipates the establishment of an Ethical Committee, the preparation of an ethical codex, as well as the formation of ethical departments within the institutions. The Committee will be charged with the monitoring and assessment of the implementation of ethical principles and values in research and technological development, in business relations and in public affairs, as well as in the deployment of new technologies for the environment protection.

The legislation in the domain of industry and intellectual property is based on the following laws: the Law on Industrial Property (“Official Gazette of the Republic of Macedonia Nos. 47/02, 42/03 and 9/04), the Law on Copyright and Other Related Rights (“Official Gazette of the Republic of Macedonia Nos. 47/96, 3/98, 98/02 and 04/05). The latter determines the relations regarding the enforcement and protection of copyright to the original work of authorship, including research studies. The authorship of research studies enjoys the same regime of copyright enforcement and protection as all other related creative works. Hence, the answers regarding section III_ B. Intellectual property rights apply respectively to all types of creative works in the field of science and research. With reference to the protection of industrial property, there are several bylaws: Patent Rulebook, Rulebook on Industrial Design, Rulebook on Trademark, Rulebook on the Product Mark of Origin and Geographic Marking, Rulebook on Professional Examination of Agents for Industrial Property Rights Protection (“Official Gazette of the Republic of Macedonia No. 18/04).

The legislative framework for taxation and customs duties is the Customs Law (“Official Gazette of the Republic of Macedonia Nos. 21/98; 26/98; 86/99; 25/00; 55/02); in accordance with Article 55 of the Law on Organisation and Operation of the State Administrative Bodies, an Instruction on

Procedures for Imposing Import Duties, Excise and VAT Exclusion and on Providing Resources for Excise Duty and VAT Payment for the Exchange of Goods and Services in the Country Used for the Implementation of Projects Financed by Non-Refundable Monetary Assets from Foreign Donators has been adopted.

With reference to the import of donated equipment intended for research projects, the Ministry of Education and Science issues documents to the institutions of higher education and to other public research institutions, whereby they are exempt from paying customs duty and VAT, more exactly, the allocated funds are being returned in accordance with the "Rulebook on Procedures on Imposing Import Duties, Excise and VAT Exclusion and on Providing Resources for Excise Duty and VAT Payment for the Exchange of Goods and Services in the Country used for the Implementation of Projects Financed by Non-Refundable Monetary Assets from Foreign Donators" ("Official Gazette of the Republic of Macedonia No. 54/03).

**3. Please describe the institutional framework, with reference to the role and competence of ministries, national committees, parliamentary committees, regional authorities and representative organisations of private industry.**

The scientific research and technological development are under the competence of the Ministry of Education and Science. In accordance with the Law on Organisation and Operation of the State Administrative Bodies ("Official Gazette of the Republic of Macedonia" Nos. 58/02 and 44/02), the Law on Scientific Research ("Official Gazette of the Republic of Macedonia" Nos. 13/96 and 48/02) and the Law on Stimulation and Facilitation of Technological Development ("Official Gazette of the Republic of Macedonia No. 98/00), the Ministry of Education and Science performs administrative and other functions in relation to:

- the organisation, the financing, the development and the promotion of science;
- monitoring the organisation and the system of the public research institutions network (scientific institutes) and proposing measures for further development;
- establishing public scientific institutions (scientific institutes);
- monitoring the system of other forms of conducting research and their entry in the Register of Scientific Institutions (independent research and other scientific institutions – private scientific institutions);
- proposing measures for promoting scientific research and developing standards and norms regarding the research potential;
- monitoring the development of the public scientific institutions infrastructure (the facilities where research is being conducted, the adequate equipment, library and referential activities, and the like);
- development of science and the application of scientific findings;
- financing scientific research projects of special interest;
- stimulation and support of the technological development of the Republic of Macedonia
- international scientific and technical cooperation;
- supervision, documentation and implementation of scientific, technical and technological cooperation with foreign countries and international organisations in accordance with the international treaties;
- providing opportunities for national experts to specialise abroad and engaging foreign experts in the Republic of Macedonia;
- awarding scholarships, mobility grants for practical training to foreign and national experts by means of international and bilateral treaties and other agreements;
- providing support for the functioning of information systems of the state administrative bodies;
- planning, coordination and implementation of the information technology development within the overall information system of the Republic of Macedonia;
- providing information technology equipment for the state administrative bodies;
- drafting laws and bylaws (rulebooks, instructions, decrees, etc.) in the field of science, international cooperation, technological development, technical culture and information science;
- supervising the legality of the operations and rulebooks of the public scientific institutions;

- supervising the beneficiaries of the funds allocated by the Ministry of Education and Science;
- drafting proposals and delivering opinions to the Government of the Republic of Macedonia regarding the election of council members of the public scientific institutions that are appointed by the Government of the Republic of Macedonia;
- drafting proposals and delivering opinions to the Government of the Republic of Macedonia regarding the appointment of directors of the public scientific institutions;
- delivering opinions to the Government of the Republic of Macedonia regarding the adoption of statutes of the public scientific institutions;
- issuing decisions on the compliance with the relevant requirements on entry of other scientific institutions and independent researchers in the Register of Scientific Institutions;
- keeping evidence of the deadlines for promotion of research fellows and research assistants.

Within the framework of the Ministry of Education and Science and in accordance with the Rulebook on Organisation and Operation of the Ministry of Education and Science, a Science and Technological Development Sector has been established, which comprises the following units: the Unit of Financing the Research and Technological Development, Unit of Normative and Legal Procedures in the Research and Technological Development, Unit of Technological Development and Technical Culture, Projects Unit, and the Unit of International Scientific and Technical Cooperation.

In accordance with Article 6 of the Law on Amendments to the Law on Scientific Research ("Official Gazette of the Republic of Macedonia" Nos. 13/96 and 29/02), the Scientific Research Council is the strategic body for the promotion and development of science and research.

The Council performs the following duties:

- proposes measures for the promotion and development of science and research in the Republic of Macedonia;
- delivers recommendations, opinions and proposals regarding the annual programmes for the implementation of the Scientific Research Programme;
- participates in the drafting of the rulebooks on conditions and criteria for allocation of the resources for the implementation of the Scientific Research Programme; and
- performs other duties assigned by the Minister of Education and Science.

The Assembly of the Republic of Macedonia, in accordance with the Rules of Procedure of the Assembly of the Republic of Macedonia, appoints the Commission for Education, Science and Sports, the competence of which is to deliver opinions on the draft-laws in the domain of science and technological development, as well as to deliver opinions regarding the financing of science and technological development by the Budget of the Republic of Macedonia, and on other issues which fall into the competence of the Ministry of Education and Science.

With the adoption of the new Law on Scientific Research and Technological Development, a National Council on Science and Technological Development will be established and chaired by the President of the Government of the Republic of Macedonia. The main objectives of this Council will be to set priorities for different domains, to establish an inter-institutional coordination regarding the scientific research, and to supervise the implementation of the science and technological development policy.

In accordance with the Law on Scientific Research ("Official Gazette of the Republic of Macedonia" Nos. 13/96 and 48/02), the institutional forms of conducting research in the Republic of Macedonia are the following:

- the Macedonian Academy of Sciences and Arts,
- the institutions of higher education,
- the public scientific institutes (scientific institutions), and
- independent researchers.

In accordance with the Law on Stimulation and Facilitation of Technological Development ("Official Gazette of the Republic of Macedonia No. 98/00), the technological development in the Republic of Macedonia is achieved through:

- research and development organisations within private companies;
- public scientific institutions (scientific institutes)
- innovation centres and technological nuclei;
- civil associations in the domain of innovation and technical promotion; and
- other legal entities and natural persons involved in the technological development.

Within the 1995-2003 period, 77 private companies were successfully engaged in the implementation of technological projects financed by the Ministry of Education and Science. Thus, they had an indirect impact on the technological development policy in the Republic of Macedonia. Moreover, the representatives of the most successful companies in the area of technology transfer are expected to contribute as members in the National Council on Science and Technological Development.

**4. How is research and technological development organised? Please refer to:**
**a) types and numbers of research institutions (higher education institutions, governmental research centres, military research centres, academies, private foundations, research centres of state or private industry);**
**b) centres of excellence;**
**c) nature of research activities (public or private, civil or military, institutional or contractual, applied or basic).**

**a)**
Types and numbers of research institutions (higher education institutions, governmental research centres, military research centres, academies, private foundations, research centres of state or of private industry)

The Macedonian institutional infrastructure for research and technological development is comprised of:

- the Macedonian Academy of Sciences and Arts,
- the universities,
- research and development units, and
- regional research associations.

The Macedonian Academy of Sciences and Arts has 41 full members (academicians), one honorary member and 33 foreign members. The Academy is comprised of 5 departments and 5 research centres.

There are three state universities and one private university and one private faculty in the Republic of Macedonia. Within these universities there are 37 faculties, 2 high vocational schools and an interdisciplinary studies programme. The two state universities in Skopje and in Bitola are composed of 13 public scientific institutions, whereby 10 of them are within the Ss. Cyril and Methodius University of Skopje, while 3 are within the St. Climent of Ohrid, University of Bitola.

The research and development centres operate within the framework of private companies in the industry sector, and according to the records of the Ministry of Education and Science their total number is 30.

In addition, there are 6 regional research centres within the non-governmental sector that are also included in the establishment of the institutional network in the domain of science.

**b)**
Centres of excellence

At present, the acknowledgment of the scientific and scholarly institutions in the Republic of Macedonia is determined by the number of studies published and cited in international impact factor

periodicals, the participation in international projects, cooperation with the industry sector, as well as by adequate technical facilities and qualified academic staff. On the basis of these criteria, several institutions in the Republic of Macedonia have been identified as future centres of excellence:

- The Research Centre for Genetic Engineering and Biotechnology – Macedonian Academy of Sciences and Arts;
- Institute of Earthquake Engineering and Engineering Seismology – Skopje;
- Institute of Chemistry, Faculty of Natural Sciences and Mathematics – Skopje; and
- Nephrology Clinic, Faculty of Medicine – Skopje.

The new Law on Scientific Research and Technological Development will provide for procedures for proclaiming centres of excellence on the basis of established criteria.

**c)**
Nature of research activities (public or private, civil or military, institutional or contractual, applied or basic)

The Ministry of Education and Science finances projects of public interest. The project selection procedure is carried out in an open competition. The competition is announced in accordance with the decision on approving projects in different fields of science and research (that can be financed within the current year) brought by the Minister of Education and Science, excluding international projects. The team of researchers involved in a project is composed of the principal researcher, a holder of a scientific or of a teaching and scientific title, employed in the project holder institution, and at least one researcher, a holder of a teaching or of a teaching and scientific title or a research assistant, from the Register of the Ministry of Education and Science. The assessment of the project proposals is carried out through an anonymous evaluation by at least two experts assigned by the Ministry of Education and Science.

The holders of the research projects are the scientific and higher education institutions that, on approving the project, sign a contract for the project implementation with the Ministry of Education and Science.

The research projects from the military domain are under the competence of the Ministry of Defence that has a special fund for that purpose.

In the course of the 1995-2003 period, the Ministry of Education and Science financed a total of 932 projects, the structure of which is displayed in the following table:

| Field of Science | Number of projects | % per field of science | Resources (in Euros) | % per field of science |
|---|---|---|---|---|
| Natural Sciences and Mathematics | 142 | 15,23 | 1 455 703,9 | 17,95 |
| Technical | 302 | 32,40 | 2 448 525,5 | 30,19 |
| Medical | 130 | 13,95 | 1 203 616,6 | 14,84 |
| Biotechnical | 137 | 14,70 | 1 366 517,1 | 16,85 |
| Social | 94 | 10,09 | 520 059,32 | 6,41 |
| The Humanities | 127 | 13,63 | 1 115 675,4 | 13,76 |
| TOTAL | 932 | 100,00 | 8 110 097,8 | 100,00 |
| Source: Ministry of Education and Science | | | | |

The above-mentioned projects were of basic or applied nature.

Besides research projects, the Ministry of Education and Science also co-finances the so-called development projects. Within the period from 1995 to 2003, a total of 77 development projects of a solely applied nature were financed (for more details see 17_7). The structure of these projects is shown in the following table:

| Field of Science | Number of projects | % per field of science | Resources (in Euros) | % per field of science |
|---|---|---|---|---|
| Natural Sciences and Mathematics | 2 | 3 | 42 622.95 | 6 |
| Technical | 64 | 83 | 549 098.36 | 80 |
| Medical | 1 | 1 | 11 475.41 | 2 |
| Biotechnical | 10 | 13 | 86 491.80 | 12 |
| TOTAL | 77 | 100 | 689 098.36 | 100 |
| *Source: Ministry of Education and Science* | | | | |

In the course of the 1995-2003 period, the Macedonian Academy of Sciences and Arts completed 146 projects (financed by the Budget of the Republic of Macedonia), the structure of which is shown in the following table:

| Field of Science | Number of projects | % per field of science | Resources (in Euros) | % per field of science |
|---|---|---|---|---|
| Natural Sciences and Mathematics | 16 | 10,96 | 207 426,22 | 12,42 |
| Technical | 24 | 16,44 | 208 213,11 | 12,47 |
| Medical | 26 | 17,81 | 384 016,39 | 22,99 |
| Biotechnical | 4 | 2,74 | 45 409,83 | 2,72 |
| Social | 15 | 10,27 | 82 1312,15 | 4,92 |
| The Humanities | 61 | 41,78 | 742 983,6 | 44,48 |
| TOTAL | 146 | 100.00 | 1 670 180,3 | 100,00 |
| Source: Macedonian Academy of Sciences and Arts | | | | |

**5. What are the main research results in priority areas? Are there indicators of scientific production? Please refer to the number of scientific publications (in ISC or other bibliometric database), number of patents or licences, number of research contracts or any other pertinent indicator to quantify scientific production.**

On the basis of the structure of the economy and the institutional infrastructure in the domain of science in the Republic of Macedonia, the technical and the natural sciences are identified as priority research areas. Hence, the largest number of approved projects financed by the Ministry of Education and Science fall into these areas. After a certain period of time (when the comparatively larger part of resources will have been allocated for research activities), the research results are expected to lead to an enhanced development of the country. In the latest Memorandum on the Economy of the Republic of Macedonia, the World Bank experts have decomposed the GDP growth rates of the Macedonian economy in the period from 1991 to 2000, i.e. they have established the contribution of the relevant production factors (capital stock, human capital and total factor productivity) to the GDP growth, in accordance with the standard methodology of accounting for economic growth. In the period from 1997 to 2000, the Macedonian economy achieved an average GDP growth rate of 2.4 %. In this context, the total factor productivity, i.e. the science and technology progress in its broadest sense, essentially contributed to the dynamisation of the economic growth of the country.

In order to quantify the scientific production of the Republic of Macedonia and its contribution to the global treasury of scientific information, the Ministry of Education and Science has established a database of the studies of our scientists published in the impact factor scientific publications, as well as of the citations thereof. The information source for the above-mentioned database was the International database ISI Web of Knowledge. According to the data from this source, between 1981 and 2003, Macedonian scientists have published 1652 studies in these publications.

Regarding the copyright protection in the field of research and technological development in the Republic of Macedonia, licences for 879 patents, 389 models and 9736 brands were issued by August 2004.

In the period from 1996 to 2993, the Ministry of Education and Science co-financed funds for 77 development projects, the results of which being:

- new products (34%),
- new materials (4%),
- deployment of individual technologies – new technological procedures (18%),
- establishment of new technology lines (2%),
- optimisation (enhancement) of the existing technology processes (26%),
- rationalisation of the production (5%),
- improvement of the quality of life (11%).

**6. How are the institutions promoting RTD innovation in industry organised? Please refer to technology centres, Community Innovation Relay Centres, science and research parks, technology transfer agencies.**

In accordance with Article 47, Paragraph 5, of the Constitution of the Republic of Macedonia, the state has an obligation to stimulate and facilitate the technological development. This constitutional provision is subsequently regulated by the Law on Stimulation and Facilitation of Technological Development ("Official Gazette of the Republic of Macedonia No. 98/00).

The institutions promoting research and technological development are organised as:

- Research and development units in the industry;
- Innovation centres;
- Higher education institutions;
- Research centres of the Macedonian Academy of Sciences and Arts;
- Public research institutes;
- Associations of Citizens (SPATU – Association of Inventors and Promoters of Technical Progress, Associations of Sciences and Arts, Polytechnic Association and others); and
- Knowledge transfer organisations (technological nuclei, technology parks, technology transfer centres and others).

According to the updated records of the Ministry of Education and Science, presently there are 30 research and development units within the Macedonian economy.

The most prominent from the above-mentioned institutions and organisations involved in promoting research and technological development in the Republic of Macedonia, are the knowledge transfer organisations.

In the year 2002, the Ministry of Education and Science allocated funds for the establishment of technological nuclei at the following institutions:

- The Faculty of Natural Sciences and Mathematics – Skopje;
- The Faculty of Mechanical Engineering – Skopje;
- The Faculty of Electrical Engineering – Skopje; and
- The Faculty of Medicine – Skopje.

With the financial support of the TEMPUS Programme, as well as of the German Programme for Technical Cooperation (GTZ), besides the 4 above-mentioned technological nuclei, 5 other technology transfer centres were established:

- Centre for Research, Development and Continuing Education at the Faculty of Mechanical Engineering – Skopje;
- Technology Transfer Centre at the Faculty of Electrical Engineering – Skopje;
- Centre for Applied Research and Continuing Education in the Field of Agriculture at the Faculty of Agriculture – Skopje;
- Euro-Regional Technological Centre at the Faculty of Technical Studies – Bitola; and
- Technology Transfer Centre for Chemical and Textile Engineering at the Faculty of Technology and Metallurgy – Skopje.

Both the Faculty of Biotechnical Sciences in Bitola and the Faculty of Agriculture and Food in Skopje participate in the work of the Regional Centre for Technology Transfer in the Field of Biotechnology and Applied Sciences for the Countries of Central and Eastern Europe, established at the University of Zagreb, Croatia.

The Regional Innovation Centre, established in Shtip in 1992, aims at promoting and presenting innovations, introducing the business entities to the innovations as a means to boost the competitiveness of the market, assisting in the completion of technical documentation of draft designs of innovations and patents, creating conditions for assisting the young and talented innovators in the practical realisation of their ideas, and at organising national and international exhibitions of innovations. Moreover, this centre plays a significant role in popularising this activity among the young people for their professional orientation towards technical and technological creativity.

**7. How are RTD services to industry organised? Please refer to RTD-related management and counselling, venture capital provision, intellectual property protection, patenting, public policies to support RTD services.**

The research and technological development support policy is outlined in the Technological Development Programme for the period 2002-2006, brought by the Ministry of Education and Science, which encompasses the objectives and the activities of the Ministry of Education and Science for the stimulation and facilitation of technological development, as well as the criteria for setting the priority areas of technological development.

The primary goal of this Programme is to establish close cooperation between the science and the economy aimed at developing the model of market economy. A special emphasis is placed on the need for: developing new technologies, products and services competitive to the domestic and international market; improving the existent products and production processes, and providing a continuing support for establishing a technological infrastructure.

In accordance with the Law on Stimulation and Facilitation of Technological Development (“Official Gazette of the Republic of Macedonia” No. 98/00) and the Law on Stimulation and Assistance of the Technical Culture (“Official Gazette of the Republic of Macedonia” No. 53/00), the activities are directed towards organising and providing research services for industry.

Following this objective, the Ministry of Education and Science supports and facilitates, in accordance with the Annual Scientific Research Programme, the implementation of research and innovation projects of mutual interest for both science and economy. These projects are approved by means of an open competition and the established procedure for an expert evaluation, in accordance with the Rulebook on the Conditions and the Criteria Regarding the Allocation of Resources for the Stimulation and Facilitation of Technological Development (“Official Gazette of the Republic of Macedonia” No. 49/01). In the period from 1996 to 2003, the Ministry of Education and Science financed 932 projects (for more details see table in 17 4).

Moreover, the Ministry of Education and Science, in accordance with the Annual Programme on the Stimulation of Technological Development, co-financed research and development innovation projects, the holders of which are the technological development entities. The financial support granted to such projects is conditioned by a financial participation of 70% of the value of the project to be provided by the user of such services. The primary objectives of such projects are: developing new technologies, introducing new projects and services, supporting the development of a new technological infrastructure, and improving the existent one, and the like. These projects are also approved through a system of an anonymous selection, thus ensuring the necessary competitiveness. Between 1995 and 2003, 77 development projects were financed in this way in the Republic of Macedonia (for more details see table in 17 4)

In the course of the period 1995-2003, 146 academic projects within the framework of the Macedonian Academy of Sciences and Arts were implemented by the financial support of the Budget of the Republic of Macedonia (for more details see table in 17_4).

The Sector for Science and Technological Development at the Ministry of Education and Science has the main role in the research and technological development management. Besides its role in creating the scientific research and technological development policy, the Ministry of Education and Science also has an advisory function regarding the industry sector, i.e. in assisting increase its awareness of how to use the research findings for its own development. In this context, the Ministry of Education and Science uses the publications “Model of Internments”, published by the Faculty of Electrical Engineering with the financial support of the TEMPUS Programme.

In the last three decades, the Faculty of Agriculture and Food has been organising traditional meetings regarding cooperation between the Faculty and the business entities. The aim of these meetings is to present the most significant achievements in the scientific research conducted in the country in the field of agriculture for the potential beneficiaries in the business sector.

The protection of intellectual property is regulated by the Law on Copyright and Related Rights (“Official Gazette of the Republic of Macedonia” Nos. 47/96, 3/98, 98/02 and 04/05), according to which the original work of authorship is defined as an individual and intellectual, as well as a scientific and scholarly creative work (Article 3 of the Law). Thus, these original works of authorship enjoy the same copyright protection regime, as applies to all other types of original works.

The industrial property and patent rights protection is in the competence of the State Bureau of Industrial Property.

The industrial property is regulated by the Law on Industrial Property (“Official Gazette of the Republic of Macedonia” Nos. 47/02, 42/03 and 9/04), as well as by the following bylaws: Patent Rulebook, Rulebook on Industrial Design, Rulebook on Trademark, Rulebook on the Mark of Origin and on Geographical Marking of the Product, Rulebook on Professional Exams for Authorised Agents for Industrial Property Rights Protection (“Official Gazette of the Republic of Macedonia” No. 18/04). The adoption of a new Rulebook on Supplementary Protection Certificates is in progress, at the same time taking into account the requirement to harmonise it with the European Parliament Regulation 1610/96/EC and with the Council on Creating Supplementary Protection Certificates for Plant Protection Products.

The procedure for the authorisation of industrial property rights is partly automated (the overall automation is planned for the end of 2005) through the application of special software and licences for the ORACLE base that were obtained as technical aid by the World Intellectual Property Organisation – WIPO and by the CARDS Programme for 2002.

More details and data regarding the number of registered patents, models and trademarks see 17_5.

**8. How are continuing training schemes organised (e.g. implementing organisations, target groups, existing programmes)?**

The advanced training of the junior research staff is realised by organising postgraduate studies, or writing doctoral theses within the higher education institutions and the public research institutes. A detailed presentation of the organisation of these studies is given in 18_I_A_1. Apart from this type of formal education of the junior research and the academic staff, numerous seminars, conferences and congresses are organised in the Republic of Macedonia, aimed at a continuing exchange of information and experience in the domain of science. The organisers of such scientific and scholarly gatherings are the professional associations.

The target groups of the continuing training schemes are: junior researchers, candidates undergoing specialist training, postgraduate students, candidates for a doctoral degree, as well as others

interested in broadening their knowledge and skills. With the impending amendments to the Law on Higher Education, the doctoral degree will be awarded after the completion of doctoral studies. Thus, the structure of the higher education will consist of three stages of university level studies: undergraduate, postgraduate and doctoral studies. Moreover, a further stage leading to a higher doctorate (postdoctoral studies) is also envisaged.

The Ministry of Education and Science awards scholarships for postgraduate studies at home and abroad, by means of an open competition and in accordance with the Rulebook on Determining the Conditions and Criteria Regarding the Resource Allocation for the Academic and Research Staff ("Official Gazette of the Republic of Macedonia No. 33/04). The beneficiaries of these resources, the scholarship holders, are bound to complete their postgraduate studies in three years, or to obtain a doctoral degree in five years. In addition, the Ministry of Education and Science awards scholarships obtained in the framework of bilateral treaties for cooperation and international organisations.

The state scholarships for studying abroad are awarded if there are no postgraduate studies for a specific field of research organised in the Republic of Macedonia.

At the university level, more exactly, at the faculties, different training schemes are offered in the form of specialist studies, seminars or courses that lead to a diploma or a special certificate. For example: the Faculty of Technology and Metallurgy offers Specialist Studies in Quality Management; the Faculty of Economics offers Specialist Studies in Investment Projects Planning and Management, on the Restructuring of the Economy via the Establishment of Small and Medium Enterprises, in Organisation and Management, in Foreign Trade, and in Marketing; the Faculty of Philosophy offers Specialist Studies in Peace and Development; the Faculty of Agriculture offers Specialist Studies in Plants Protection, in Seed Production and Seed Control, in Seed and Planting Stock Production of Horticultural Plants, in Mechanization, and in Tobacco. The Institute of Earthquake Engineering and Engineering Seismology awards scholarships for postgraduate and doctoral studies for the countries in the region, and it offers three-month courses for participants from developing countries. The Research Centre for Genetic Engineering and Biotechnology organises Interdisciplinary Postgraduate Studies in Molecular Biology and Genetic Engineering.

Furthermore, the informal continuing education in the field of science implements the training schemes of international organisations, the Chamber of Commerce, and other organisations, aimed at the dissemination of specialised knowledge and skills.

**9. Please provide quantitative information for your country, if possible for the period 1997-2003, including at least the following aspects:**
**a) personnel (public/private RTD);**
**b) gross domestic expenditure on RTD – ratio to gross domestic product (GDP);**
**c) gross government expenditure on RTD – ratio to GDP;**
**d) gross higher education expenditure on RTD – ratio to GDP;**
**e) gross business enterprise expenditure on RTD – ratio to GDP, ratio to gross government expenditure;**
**f) gross foreign investment in RTD;**
**g) tertiary education related to RTD: number of graduates, field, undergraduate/ post-graduate.**

**a)**
The data on changes in the number of employed research personnel in the period 1997-2002 according to the sector (business or government) are displayed in the following table:

| Employees within the research and development activity according to the sector of performance | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| Total | 2936 | 3275 | 3168 | 3094 | 2909 | 2869 |
| Business Sector | 370 | 361 | 306 | 241 | 203 | 100 |
| Government Sector | 916 | 957 | 1022 | 1044 | 809 | 820 |
| Higher Education | 1650 | 1957 | 1840 | 1809 | 1897 | 1949 |
| Source: State Statistical Office, Statistical Survey: Scientific Research and Development in the Republic of Macedonia | | | | | | |

The following table presents the same data, expressed according to Full-time equivalent (FTE) and FTE per 1000 employees.

| Employees within the research and development activity, according to Full-time equivalent (FTE) and FTE per 1000 employees | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
| Total | 2936 | 3275 | 3168 | 3094 | 2909 | 2869 |
| FTE | 1685 | 1892 | 1838 | 1786 | 1630 | 1519 |
| FTE per 1000 employees | 2,1 | 2,3 | 2,3 | 2,2 | 1,9 | 1,8 |
| Source: State Statistical Office, Statistical Survey: Scientific Research and Development in the Republic of Macedonia | | | | | | |

The data in the above tables show a trend of continuing outflow of academic personnel from the Republic of Macedonia as a result of the intensifying process of brain-drain and job restrictions. Therefore, the state is taking precautions to put an end to this trend.

Moreover, the data show that the largest number of the junior research and the academic personnel is concentrated in the higher education institutions, which impedes the efficient collaboration between the academic and the industry sector.

**b)**

Gross domestic expenditure on research and technological development (RTD) – ratio to gross domestic product (GDP)

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|
| Gross domestic expenditure on RTD / GDP | 0,38 | 0,43 | 0,34 | 0,45 | 0,31 | 0,27 |
| Source: State Statistical Office | | | | | | |

**c)**

Gross government expenditure on RTD – ratio to GDP

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|
| Internal expenditure on RTD in the government sector / GDP | 0,18 | 0,15 | 0,16 | 0,15 | 0,16 | 0,15 |
| Source: State Statistical Office | | | | | | |

**d)**

Gross higher education expenditure on RTD – ratio to GDP

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|
| Higher education expenditure on RTD / GDP | 0,15 | 0,23 | 0,14 | 0,27 | 0,13 | 0,11 |
| Source: State Statistical Office | | | | | | |

**e)**

Gross business enterprise expenditure on RTD – ratio to GDP, ratio to gross government expenditure

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|
| Gross business enterprise expenditure on RTD / GDP | 0.05 | 0.05 | 0.04 | 0.03 | 0.02 | 0.01 |
| Gross business enterprise expenditure on RTD / gross government expenditure | 30.00 | 32.65 | 27.31 | 16.72 | 11.96 | 4.60 |
| Source: State Statistical Office | | | | | | |

The data presented in tables b), c), d) and e) show the reduction of expenditures on research and technological development. Taking into consideration the input of science in the overall development of the country, this trend is expected to stop, as science will become one of the most important factors in the development of the Republic of Macedonia.

**f)**
Gross foreign investment in RTD

The State Statistical Office and the Ministry of Education and Science do not have at their disposal available data on the foreign investments in research and technological development in the Republic of Macedonia.

In the period 1995-2003, the Macedonian Academy of Sciences and Arts received MKD 27.607,000 from foreign donations for research.

**g)**
Tertiary education related to research and technological development: number of graduates, field, undergraduate/ post-graduate

| Tertiary education | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
| Total | 3049 | 2956 | 3687 | 3706 | 3446 | 3603 | 4382 |
| Natural sciences and mathematics | 165 | 243 | 203 | 245 | 235 | 246 | 272 |
| Technical and technological sciences | 939 | 844 | 881 | 840 | 693 | 642 | 690 |
| Medical sciences | 369 | 357 | 344 | 388 | 360 | 396 | 384 |
| Biotechnical sciences | 229 | 201 | 233 | 206 | 192 | 200 | 246 |
| Social sciences | 1241 | 1231 | 1898 | 1881 | 1851 | 1992 | 2191 |
| The Humanities | 106 | 80 | 128 | 146 | 115 | 127 | 599 |
| Source: State Statistical Office | | | | | | | |

| Masters of Sciences and Specialists | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
| Total | 77 | 71 | 104 | 83 | 155 | 95 | 61 |
| Natural sciences and mathematics | 22 | 21 | 11 | 12 | 22 | 19 | 2 |
| Technical and technological sciences | 22 | 17 | 37 | 24 | 43 | 30 | 20 |
| Medical sciences | 1 | 0 | 20 | 3 | 10 | 4 | 0 |
| Biotechnical sciences | 4 | 4 | 20 | 16 | 6 | 11 | 2 |
| Social sciences | 11 | 12 | 5 | 24 | 31 | 17 | 17 |
| The Humanities | 17 | 17 | 11 | 4 | 43 | 14 | 20 |
| Source: State Statistical Office | | | | | | | |

| Doctors of Sciences | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
| Total | 53 | 50 | 33 | 46 | 66 | 50 | 59 |
| Natural sciences and mathematics | 6 | 0 | 8 | 5 | 8 | 25 | 12 |
| Technical and technological sciences | 17 | 12 | 9 | 11 | 21 | 8 | 12 |
| Medical sciences | 3 | 2 | 0 | 8 | 4 | 2 | 21 |
| Biotechnical sciences | 5 | 3 | 3 | 3 | 2 | 2 | 1 |
| Social sciences | 12 | 22 | 12 | 8 | 18 | 8 | 10 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| The Humanities | 10 | 11 | 1 | 11 | 13 | 5 | 3 |
| Source: State Statistical Office | | | | | | | |

**10. Financing**

**a) How are state funds allocated? Please refer to the method and criteria used for the division of funds, sector priorities, regional priorities, private vs. public research, performance indicators and the role of possible advisory committees.**

**b) What are the financial or other incentives for RTD investment by state and private industry? What is the effectiveness of these incentives?**

The scientific research in the Republic of Macedonia is conducted in accordance with the Law on Scientific Research ("Official Gazette of the Republic of Macedonia No. 13/96) and the following bylaws: the Rulebook on Determining the Conditions and Criteria Regarding the Allocation of Resources for the Implementation of the Annual Programmes for Operation and Development of the Public Scientific Institutions ("Official Gazette of the Republic of Macedonia No. 3/05) and the Rulebook on Determining the Conditions and Criteria Regarding the Allocation of Resources for Scientific Research in the Republic of Macedonia ("Official Gazette of the Republic of Macedonia No. 3/05), and with the annual programmes for the implementation of scientific research in the Republic of Macedonia.

**a)**

The funds earmarked in the Budget of the Republic of Macedonia for research and technological development are allocated by the Ministry of Education and Science for the following purposes:

1. Research projects (national and international);
2. Publications;
3. Awarding scholarships for students who attend postgraduate studies at home and abroad;
4. Organising science conferences or congresses in the country;
5. Enabling the academic and research personnel to participate at science conferences or congresses abroad;
6. Study stays of domestic experts in foreign countries, as well of foreign experts in the Republic of Macedonia;
7. Programmes for operation and development of public research institutes;
8. Procurement of research equipment;
9. Procurement of scientific literature.

The funds are used in accordance with the annual programmes for research and stimulation of technological development. The research projects are financed on the basis of an open competition and an anonymous evaluation of the submitted project proposals. Since 2004, the criteria on financing projects have been changed with the introduction of new rulebooks (for more details see 17_3). These amendments are directed towards ensuring greater competitiveness, concentration of resources, and multidisciplinary research projects. In 2003, the sum for financing 294 projects amounted to 29.800.000, 00 MKD, whereas in 2004, the sum for 186 projects amounted to 20.620.000,00 MKD. Part of the resources allocated for research projects are used for financing bilateral and international projects, under the conditions determined by the international cooperation treaties.

The research findings in the Republic of Macedonia are being published in 45 scientific periodicals, 25 miscellanea, and about 200 books on scientific research annually. These publications are also co-financed by the Ministry of Education and Science.

Every year the Ministry of Education and Science awards 150 scholarships for postgraduate and doctoral studies for the unemployed. The selection of scholarship candidates is carried out on the basis of the results of the undergraduate studies and the field of specialisation. At the same time, one-time financial supports can be provided for the completion and the defence of master's and doctoral theses.

In accordance with the Programme on Scientific Research, the Ministry of Education and Science also supports the organisation of both national and international science conferences and congresses. The average number of such scientific gatherings in the Republic of Macedonia is 50 per year.

The Ministry of Education and Science provides financial support for the participation of the academic personnel at international conferences, seminars, congresses and symposia that take place abroad. About 550 applications are submitted annually by the academic staff to the Ministry regarding their participation at international conferences. The selection concerning these applications is based on the nature of the conference and the applicant's participation.

Each year the Ministry of Education and Science provides financial assistance for 125 study stays abroad.

The public research institutes; are financed according to the submitted annual programmes, the allocated funds being used for salaries and remunerations, as well as for the following activities: research projects, publications, science conferences, study missions, procurement of research equipment and of foreign scientific literature, adaptation and renovation of facilities, etc. Moreover, the public research institutes; have their own revenues from services and they manage those finances autonomously.

The research conducted in the fields of natural, biotechnical, medical and technical sciences is related, to a great extent, to the usage of modern equipment. In the last few years, the Ministry of Education and Science could only allocate symbolic resources for the procurement of research equipment.

The funds that are allocated by the Ministry of Education and Science in accordance with the Programme on Scientific Research for the information system maintenance, as well as for the procurement of scientific literature, barely meet the needs.

**b)**
The state co-finances research and technological development in the following ways:

- Budgetary resources as a current transfer for technological development;
- Budgetary resources as a current transfer for technical culture;
- Budgetary resources for the activities of associations of citizens and foundations;
- Sponsorships and donations;
- Foreign investments.

In accordance with its competences, the Ministry of Education and Science stimulates and facilitates the technological development and the technical culture by allocating resources from the Budget of the Republic of Macedonia for these purposes, in order to co-finance research and innovation projects investments, develop the technological infrastructure, and to foster the qualification of the junior research staff.

The Ministry of Education and Science provides financial support for the research and development and innovation projects which are selected on the basis of an expert evaluation, to the amount of 30% of the project total value. The rest is provided by the project holders or from other sources.

**11. What is the current experience of your country with international RTD cooperation other than EU programmes?**

After its constitution as an independent and sovereign state in 1991, the Republic of Macedonia embarked on the process of institutionalization of its international cooperation in the domain of research and technological development. Hence, international cooperation has been effected through bilateral and multilateral agreements on scientific and cultural cooperation.

So far, the Republic of Macedonia has signed bilateral agreements on RTD cooperation with 15 countries: Slovenia, Croatia, Serbia and Montenegro, Bulgaria, Albania, the Russian Federation, Ukraine, Belarus, Germany, France, United Kingdom, Italy, Turkey, Egypt and China. Cooperation has been accomplished, on the basis of reciprocity, through joint research projects, scholarships for advanced academic training, study stays.

The RTD cooperation with Slovenia can be singled out as a highly efficient one, since it has resulted in 150 research projects and 200 individual trainings. In the 2005-2006 period, eighteen projects are due to be completed. Cooperation with Turkey has resulted in twelve projects, and six more are about to be completed. Cooperation with Germany has included nineteen projects and 155 individual trainings, while three research projects have been carried out in cooperation with France. The projects are mainly in the fields of the natural, technical, social sciences and the humanities.

Moreover, preparations are under way for establishing cooperation with: Romania, Greece, Israel, Hungary, Bosnia and Herzegovina, Spain, Kazakhstan, Uzbekistan and Kyrgyzstan.

The Republic of Macedonia is granted scholarships for academic training from the Czech Republic, Slovakia and Poland, although the bilateral agreements have not been signed yet. In addition, candidates from the Republic of Macedonia underwent advanced academic training in Egypt (60), Israel (40), India (15), and China (12).

Within the framework of overall bilateral cooperation, cooperation with the Japan International Cooperation Agency (JICA) is of special importance. The Ministry of Education and Science has effectuated the technical aid from the JICA, covering the conduct of RTD studies, professional training of our experts in Japan, as well as providing expert services. There have been two RTD studies carried out so far. Moreover, 150 candidates from the Republic of Macedonia underwent academic training in different fields, within the JICA Training Programme. The Republic of Macedonia also took the initiative in establishing project cooperation with Japan, the objective being an increase in the efficiency and productivity of the knowledge and technology transfer via applicative projects.

Within the framework of multilateral cooperation, the Republic of Macedonia has accomplished fruitful cooperation with the International Atomic Energy Agency (IAEA), NATO Research Programme, as well as with other specialised agencies of the UN (UNESCO, UNDP and others).

Cooperation with the IAEA is carried out in accordance with the Agreement on Technical Cooperation and the National Framework Programme. So far, twelve applicative projects have been carried out for the implementation of nuclear technology in human and veterinary medicine, agriculture, environment protection and industry. Within the framework of the IAEA Regional Programme, the Republic of Macedonia is engaged in conducting eleven projects in the field of radiation protection.

Furthermore, within the framework of cooperation with NATO, seven projects have been carried out, three of them within the programme “Science for Peace” (two of them are in the final phase of evaluation) and the other four as collaborative projects.

Within the framework of the UNESCO Participation Programme, the Republic of Macedonia has carried out twenty-one projects in the field of education and science: four of them are in progress, while five are in the final phase of evaluation and are expected to be approved. Moreover, the Republic of Macedonia has been included in the Basic Sciences Programme since 2004.

**12. What are the policies, programmes and budgets in the field of the conversion of military RTD?**

In accordance with the Law on the Production and Trade of Arms and Military Equipment (“Official Gazette of the Republic of Macedonia” No. 54/02), the research and development of new armament is carried out on the basis of the Programme on Research and Development that is adopted by the Government of the Republic of Macedonia upon the proposal of the Ministry of Economy, in

cooperation with the Ministry of Defence and the Ministry of Interior. The research and development of new armament is also conducted by public scientific institutions, enterprises that produce arms and military equipment, as well as by other scientific institutions engaged in research, in accordance with the existing laws. This Programme is being funded by the Budget of the Republic of Macedonia.

The Ministry of Defence does not have its own research and production capacities, so it provides products and services for its own needs on the basis of contracts concluded with qualified and licensed companies from the business sector of the Republic of Macedonia. The basis of the defence industry of the Republic of Macedonia are companies with specific military technologies and capacities: “Suvenir”, with 97% state-owned capital (for the manufacture of small ammunition and repair of small arms), “Eurokompozit”, with 100% state-owned capital (for the manufacture of personal protection equipment: military helmets, bullet-proof vests and plates) and “MZT – Specijalni vozila" ( Special Vehicles), with 52% state-owned capital (for repair of artillery weapons and light military vehicles). The universal technologies and capacities of these companies are in compliance with the military ones, and at the same time, their production programmes are aimed at the civilian market.

In order to comply with the needs of the army and the police, the military capacities of the first two companies mentioned above are utilised up to 30% annually, and taking the civilian programmes into consideration, up to 50%, therefore, they are unprofitable. From the constitution of the Republic of Macedonia as an independent state to the present time, there have been neither initiatives for capital programmes nor allocation of budgetary funds for capital military RTD, being regarded as economically unjustified due to the small procurement requirements by the army and the police. Therefore, the conversion of financial resources for the implementation of adequate civilian production programmes, production restructuring and orientation towards the civilian market is not viable.

Within the framework of the financial plan of the Ministry of Defence, a financial leverage of EUR 50.000 per year has been allocated to research and technological development, as well as to the procurement of the necessary equipment for the infantry, artillery, engineering, and quartermaster corps if they have been considered as economically justified. All of the above-mentioned companies, with prevailing state-owned capital, will be offered for sale through an international public tender. After the status of companies is changed, the foreign investments will be used for the innovation of military and universal technologies, increasing the occupancy rate and re-orientation towards the global market.

**13. If there exists a problem in regard to brain-drain of RTD personnel from your country, what are the possible government policies to address this matter?**

In the course of its transition period, the Republic of Macedonia has been faced with the problem of increased emigration of its academic personnel, including the experts on research and technological development. This emigration has manifested in two segments. First, the emigration of academic personnel that remained abroad after the completion of their academic training or their research stay. Second, the emigration of graduate students who had excellent grades and represented potential teaching and research assistants at the faculties and research institutes.

Considering the current situation, the career prospects and the migration rate of the academic personnel and the students (especially from the faculties of technical and natural sciences), as well as the causes of brain-drain, the government policies to address this matter are directed towards the two above-mentioned categories.

Regarding the reduction of emigration of the research and technological development experts, the government policy will focus on creating the conditions for a substantial change of the position of science and the status of the academic personnel. Hence, the policy measures will be directed not only towards increasing the investments in science and research, but also towards comprehensive implementation of the research findings regarding the development of the country. The latest analysis on the detection of the causes of brain-drain has pointed to the necessity of directing the investments

primarily towards improving the conditions for conducting research and the accessibility of scientific and technical information, as well as towards improving the living standard of the academic personnel. Moreover, it is also important to establish higher evaluation criteria of the research results and the overall activity of the researchers, as a prerequisite for raising the level of research excellence and creativity and its adequate valorisation.

With reference to the emigration of the potential junior research personnel, the labour market policy should pay special attention to this segment of the unemployed. The government policy will be directed towards changing the existing restrictive policy regarding the employment of junior researchers. To this end, in the course of the 2003/2004 academic year, 132 associates were employed at the higher education and scientific institutions in the Republic of Macedonia, 117 of which were junior research assistants and 15 research assistants. This trend will continue in 2005. In addition to employing junior research personnel at the public higher education institutions, 70 academic workers have also been employed in the last 2 years. These have been the first employments in the field of science and higher education since 2001. Moreover, in 2004, 197 new employments took place at the newly founded State University of Tetovo.

In 2004, the President of the Republic of Macedonia introduced new awards (“Professional Engineering Ring”) for the best graduate students in the domain of engineering. These students have also been offered jobs in the public administration.

If the best students are employed immediately after their graduation, they will not be forced to leave and work abroad, so that the unfavourable situation regarding the lack of junior research personnel at the faculties and research institutes can be surpassed. Moreover, this will contribute to the affirmation of the international grants for the re-integration of the research personnel.

In accordance with the latest amendments to the Rulebook on the Conditions and Criteria Regarding the Resource Allocation for the Academic Personnel (“Official Gazette of the Republic of Macedonia” No. 33/04), the holders of scholarships for postgraduate or doctoral studies have the obligation to be engaged in research at private or state RTD institutions within the period covered by their research grants.

In future, the Republic of Macedonia will support regional initiatives regarding the development of cooperation in the field of research and technological development, which will result in mobility of the research personnel. This will prevent further brain-drain of the RTD personnel that is inadequately employed. In this context, the Republic of Macedonia supports the EU policy on uniform development of the EU Candidate Countries, which creates a virtual barrier to prevent the further brain-drain of the academic personnel from the Republic of Macedonia.

**14. What are the prospects for re-orientation of your country’s science and technology towards integration into Research and Development of the EU?**

With reference to scientific research, the Republic of Macedonia is endeavouring to definitely integrate into the international research mainstreams, especially to actively participate in the establishment of the European Research Area (ERA). Therefore, the Republic of Macedonia attentively follows all events pertaining to the effectuation of ERA and is committed to harmonising its research policy with the EU policy on research and development.

Even though the Republic of Macedonia is still unable to comply with the European requirement to allocate 3% of the GDP for financing research and technological development, out of which 2% should be coming from the business sector and 1% from the public sector, it makes strenuous efforts to promote science as the crucial factor for the development of the country. Moreover, the strategic goal of the EU to become the most powerful “knowledge-based society” by 2010 represents a challenge of utmost importance for the Republic of Macedonia as well.

Accordingly, the Republic of Macedonia takes an active part in the programmes funded by the EU. In 2002, the Republic of Macedonia became a full member of COST (Cooperation in Science and

Technology), which is a flexible instrument of inter-governmental cooperation in the field of science and technology, based on an established network of more than 20,000 researchers from all over Europe. In addition to the participation of Macedonian researchers in 12 COST activities, the Republic of Macedonia organised the 158th Session of COST high officials, which took place in Skopje in February 2004, thus confirming its serious commitment to becoming an equal partner in European research cooperation.

Even more significant is the inclusion of the Republic of Macedonia in the EU Framework Programmes, which are the main instruments of the European partnership in the field of research and technological development. The enhanced interest of the Macedonian scientific institutions and scientists in these programmes is also evident. More and more institutions are encouraged not only to join the networks of excellence, but also to become engaged in strategic target projects and in integrated projects.

For example, within the last year, even upon the first call, the number of submitted project proposals for the Sixth Framework Programme was more than doubled in comparison to the Fifth Framework Programme. The Sector for Science and Research at the Ministry of Education and Science has submitted proposals for the Sixth Framework Programme; consequently, it has been engaged in two major multilateral projects (SEE-ERA-NET and ERA WEST BALKANS). Thus, the Republic of Macedonia has been offered broader opportunities for its participation in the European RTD activities.

Bilateral cooperation is a crucial factor of the integration of the Republic of Macedonia into the European Research Network. Within the framework of bilateral cooperation with the EU Member States, 33 international projects are financed: 28 with Slovenia, 3 with France, and 2 with Germany.

Moreover, the Macedonian Academy of Sciences and Arts is currently engaged in four international projects with the EU Member States.

In the period from 1996 to 2004, the TEMPUS Programme has made a substantial impact on the development of the Macedonian capacities for participation in the EU research and development programmes. From its budget of 20,7 million EUR, the European Commission has supported: 68 joint European projects, 10 compact measures, 5 structural and complementary measures and 312 individual mobility grants (by 31.10.2004).

Three TEMPUS projects resulted in the establishment of technology transfer structures at the Faculty of Electrical Engineering, the Faculty of Technology and Metallurgy and at the Faculty of Agriculture, within the Ss. Cyril and Methodius University of Skopje.

The objectives of the TEMPUS projects were aimed at upgrading knowledge and skills, as well as at procuring modern laboratories for education and training and for research and development projects. These projects encompassed: the complex modelling in the industrial engineering and collaboration with the small and medium enterprises (the Faculty of Mechanical Engineering at the Ss. Cyril and Methodius University of Skopje); geomagnetic measuring and quality standards (the Faculty of Mining and Geology – Shtip, within the Ss. Cyril and Methodius University of Skopje).

Within the framework of the TEMPUS project on institutional infrastructure, a Centre for the Law on the EU Industrial Property was established at the Faculty of Law of the Ss. Cyril and Methodius University of Skopje.

Furthermore, the Macedonian higher education institutions, acting as partner institutions in the project consortia and as coordinators of more than 50% of the TEMPUS projects, have gained precious experience in managing complex international projects. The resultant knowledge is a valuable contribution to international cooperation on the RTD projects.

Of special importance for the Republic of Macedonia was the European Ministerial Conference on Science and Technology, held in Thessalonica in June 2003, on the occasion of which a special

Action Plan on the RTD Cooperation between the EU and the South East European Countries was adopted. It brought new opportunities for regional and European cooperation in the domain of research and development.

Taking these facts into consideration, the full integration of the Republic of Macedonia into the European Research Network can lead to:

- securing financial assistance for the renewal of the existing equipment, as a prerequisite for increasing competitiveness in the field of research;
- implementation of the “bottom up” initiation principle and “a la carte” inclusion in the COST ongoing projects;
- foreign support for the evaluation of projects of national interest;
- enhancing the mobility of research personnel by simplifying the procedure of obtaining visas for European countries;
- exchange of good practice between Macedonia and European countries in conducting the research policy with the aim to establish a knowledge-based society;
- interconnecting the research entities at a regional and European level into the powerful pan-European multi-gigabyte data communication network (GEANT), reserved specifically for research and educational use;
- facilitating the access of Macedonian research institutions to the research data bases;
- granting a special fee for Macedonia so as to be able to participate in the European programmes, considering the present economic situation in the country.