

R&D National Policy in the Republic of Macedonia according to the security related and generally R&D scene – Current status and shortfalls

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Abstract

Wiling to use a more general, comprehensive, methodical and thorough approach based on a deductive analyze as well, striving to contribute on a pragmatic way in the area of interest - Security and military R&D policy in Republic of Macedonia, below is offered (by the authors) a *problem-available means-possible solutions model* based on the analyzing the current status, comparative examples, national and international environment, problems and shortfalls and consequently optimal possible solutions, future steps needed to be done.

1. Policy Framework

1.1. Governmental Bodies

According to the Constitution, the state has an obligation to encourage and support the technological development of the world. The governmental body in charge of R&D policy in the Republic of Macedonia is the Ministry of Education and Science, which is organised and executed by the Department of Science and Technology and advised by the Council for Science and Research. The Ministry of Education and Science is responsible for organisation, financing, developing and promotion of scientific research, technological development, technical culture, information technology and information systems as well as the international cooperation related to these issues. The responsibilities of the Ministry also include issues related to level of education.

Scientific activities in the Republic of Macedonia are performed and organised by a network of scientific institution comprising 6 universities (3 public and 3 private), several research institutes active in various fields units in industry. An important scientific organisation is the Macedonian Academy of Science and Arts, the goal of which is to stimulate development of the science and arts.

Within the governmental sector, we should also mention the activities of other ministries: the Ministry of Agriculture, Forestry and Water Supply; the Ministry of Economy, Health and Ecology; and especially the Sector of European Integration of the Government. According to their strategies, all these bodies act as important subjects related to the research achievement of the scientific community.

1.2. Legal Framework of the R&D Sector

Issues related to R&D are regulated by the following laws:

- Law on the Macedonian Academy of Science and Arts;
- Law on Science and Research Activities;
 - **Internal documents for:**
 - **Supporting of young scientists**
 - **Financing of scientific projects**
 - **Supporting of publishing**
- Law on Encouraging and Supporting Technology Development;

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- Law on Higher Education;
- Law on Industrial and Intellectual Property Protection;
- Several regulations and instructions.

The Laws related to research arrange the system, principles, public interest, forms of organizations and management of these kind of activities as well as the ways of stimulating and supporting their development, scientific personnel and other issues related to them. The system of scientific activities involves scientific research, qualification and training of personnel for research work and research infrastructure.

The basic principles of performing scientific activities are inviolability and protection of human personality and dignity, and they are also based on the following: freedom of scientific creativity; autonomy and ethics of researchers during their scientific work and use and application of the results; diversity of scientific ideas and methods; and international cooperation.

These laws also define the public interest in scientific research in the field of national and cultural identity of the Macedonian people and others living in the Republic of Macedonia. It also determines research as a general condition for the economic, social, cultural and environmental development of the country. Research that serves the function of increasing the scientific level and transfer of knowledge as well as that in the field of defence and security is also defined in this law. Improvement in the human resources and research infrastructure are also in the public interest. A five-year programme for development of these activities is being prepared.

The law related to technology development stimulates and supports this kind of development in the country as well as the programming of this activity and its financing. This law defines technology development as:

- Development of own technologies;
- Progress of the country upon independent economic base;
- Modernization of existing production capacities;
- Building of necessary technological infrastructure and transfer of knowledge thorough a continuous superstructure of skills.

1.3. Role of the industrial sector in R&D

Considering overall political, social and economic conditions the country has faced during the past years, while additionally burdened by instability, the role and position of industry has significantly decreased in the domain of research and development.

As a result of restructuring and privatisation processes, many R&D units within enterprises have vanished. Present inconvenient financial circumstances do not allow larger investments in research and development.

1.4. Macedonian Research Infrastructure

Macedonian institutional infrastructure is as follows:

- Macedonian Academy of Science and Arts, comprising five departments and five research centers;
- Six universities (three public and three private);
- Thirty-four faculties;
- Thirteen public scientific institutes;
- Twenty R&D units within industry;
- Six scientific regional associations;
- Consulting agencies and offices.

In the following table can be seen scientific human resources in Macedonia until 2004.

Table 1. Scientific Human Resources in Macedonia

YEAR	1998	1999	2000	2001	2002	2003	2004
Total	3275	3168	3094	2909	2869	2589	2552
FTE	1892	1838	1786	1630	1519	1464	1447
FTE per 1000 LF	2.4	2.3	2.2	1.9	1.8	1.7	1.7

1.5. Financial aspects of science and technology in R. Macedonia

Considering the overall political, social, and economic conditions the country has faced during the past years, the funding of scientific research has been very limited. This has also been followed by a continuous decrease in the number of active researchers in the country. However, the Ministry has promoted and stimulated activities aimed at an integrated approach in research activities and especially for regional and international cooperation.

In 2002, the gross HE (Higher Education) expenditure on R&D - ratio of the GDP was 0.11. Out of 100% gross expenditure for R&D, 40.9% goes to research conducted in the HE sector. Support from the National Budget: national and international research projects, grants for postgraduate and doctoral studies in the country and abroad, R&D meetings, participation of academics in the international meetings, study visits abroad, programs of the public research institutes, equipment, R&D literature etc

The Higher Education Development and Financing Council (HEDFC) was established by the Government in October 2003. The Council is responsible for development and implementation of measures and criteria for financing of HE (institutions, investments in HE, student grants and loans etc.). It prepares programs for development of HE to be submitted to the Government for adoption.

In accordance with sources for financing, R&D can be financed through:

- own resources of institutions,
- companies resources,
- state budget,
- international financed projects.

Budget contribution to R&D is limited (scarce resources) and in 2002 it was 0,44% from governmental budget. In accordance with EU suggestion and directives from Barcelona it has to be from GDP, and in case of the Republic of Macedonia it actually means only 0,11 % from GDP. On the other side funds coming from business community are 0,02%, while EU directives are 2%. It means that in the Republic of Macedonia *business sector provides 100 times less than countries from EU*. We can conclude that if continues in that way, we could not expect faster development of R&D in Macedonia. *Having not enough established R&D innovation system in the private sector and low interest in the private sector for R&D it couldn't be possible to provide faster development of science.*

The number of researchers in 2002 was 1519. For their activities in last five years were spent 0.2% of GDP per year. Considering the fact that level of budget expenditures for R&D is still not sufficient, we can identify the need for changes and searching new sources as urgent.

Public-Private partnership should be seriously considered as a additional element of R&D Concept and Policy, that can provide funding and development of necessary capacities and support of R&D Projects in the Republic of Macedonia.

Government still shows low level of trust to private companies' capacities for R&D in security sector as well as their bigger involvement and functions in security area. Full implementation of the Concept of Logistic Support for the Republic of Macedonia and ARM can provide progress in that way. It will help not only to improve the situation in security sector, but also will bring additional influence to economic development of the country.

2. The goals of R&D Policy in the Republic of Macedonia

Republic of Macedonia has managed to achieve significant results in certain scientific areas. There are several distinguished high-level institutes and centers recognized throughout the international scientific community. There are also other research units moving rapidly toward achieving international standards and criteria, which can be competitive and desirable partners in research activities.

The goals of R&TD policy are to:

- Increase the use and transfer of knowledge for economic, social, cultural and environmental development of Republic of Macedonia;
- Encourage and promote international cooperation and transfer of knowledge and technology from abroad;
- Introduce a monitoring and evaluation system of scientific and technological quality and output of research groups using internationally accepted standards and criteria;
- Increase investments in S&R activities;
- Increase the use of internationally funds, technical assistance, etc;
- Define and establish interdisciplinary programmes for target research;
- Set internationally recognized measures for evaluation and assessment of the economic value of research results as criteria for future policy definition;
- Support enterprises in establishing R&D units for effective transfer and use of new technologies;
- Reduce the technological gap in order to reach the level of development of more highly developed countries;
- Create conditions to raise the quality of knowledge and innovation;
- Create a system of technology information as part of a community information system according to the criteria of relevant databases, services and networks;
- Establish a unique infrastructure model to support and develop science and technology;
- Heal and improve domestic industry and companies, and especially support SMEs in order to achieve better performance of their products and make them competitive worldwide;
- Establish a system of priorities that will be supported by economic policy tools.

3. Measures Taken by the Government to Develop the R&D Sector and Encourage R&D

The ministry of Education and Science strives toward the successful transformation of higher education with regard to better transfer of knowledge within the scientific and business sectors.

The Governmental measures for improvement of the R&D sector are defined in several programmes, which encompass programmes for improvement of R&D and programmes for enhanced technological development. The Ministry of Education and Science has seriously considered the problem of the technological development of the country, and in that regard, measures have been taken in order to stimulate and support cooperation between the universities and industry, improve and intensify the use of scientific research results in industry, and promote the technological development of enterprises aimed at stimulating their competitiveness.

➔ Programs for improvement of R&D

- for encouraging and supporting national R&D projects,
- for granting fellowships for post-graduate and doctoral studies both in the country and abroad,
- for supporting researchers for participation at international meetings,
- target research program for coordination of the R&D activities within the governmental bodies,
- for encouraging and supporting technological development for the period 2006-2010,
- for development of R&D infrastructure

➔ For enhanced technological development, measures are taken in order to:

- stimulate and support the cooperation between the universities and the industry;
- improve and intensify the use of the scientific research results in the industry;
- promote the technological development of the enterprises aimed at stimulation of their competitiveness.

During 2004 and 2005, for the first time, a complete database with publications in scientific journals with impact factors (journals referred to in SCI and citations of institutions and researchers) was created in the country. A database of all patent activities was compiled as well.

In 2005, the new Council for Scientific research was introduced. Furthermore, a completely new system of project evaluation was established with assigned national coordinators for each scientific discipline who manage the evaluation process of scientific projects in the respective fields.

In 2006, the Ministry of Education and Science signed an agreement for national access to the electronic scientific database Scopus, which is available for all faculties and institutes at the state universities in the country. Also in 2006, the Government accepted a "Programme for development of scientific research activities in the Republic of Macedonia for the period of 2006-2010". The Programme was prepared in one year by experts and officials from all fields of science and future activities are set out in the Action Plan of this Programme. The new strategy for improvement of R&D defined in this document suggests an integrated approach to research activities characterized by necessity and quality. Increasing funding for R&D projects and for fellowships for young researchers is one of the priorities together with increased regional and international cooperation. Additionally, a definition of the national priorities in the R&D sector as well as an improved intergovernmental coordination between the ministries is emphasized as main concerns for the future development of the country. This strategy for the future science policy also includes a definition of criteria for supporting R&D, establishing a new peer evaluation procedure.

As one of the strategic objectives, five potential centers of excellence have been identified in the country based on their scientific results: Institute of Chemistry at the Faculty of Natural Sciences and Mathematics; Research Centre for Genetic Engineering and Biotechnology at the Macedonian Academy of Sciences and Arts; Nephrology Clinic at the Faculty of Medicine; Research Centre for Energy, Informatics and Material Science at the Macedonian Academy of Sciences and Arts and the Institute for Earthquake Engineering and Engineering Seismology. They are recognized not only in the country, but also internationally due to their publications, citations and international cooperation.

During the 2006, the Ministry has promoted and stimulated international cooperation in all fields of scientific research and technological development. This strategy has produced a substantial increase in international scientific cooperation with many countries, especially with the European Union Member States. The scientific cooperation has been realized through the Framework Programmes for RTD, COST, NATO, UNESCO, IAEA and JICA. The increased participation of the Macedonian scientists in the 6th Framework Programme should be especially highlighted. According to our data, more than 50 projects with our scientists have been approved, which is 4 times more than in the 5th Framework Programme. The Macedonian Government officially stated the willingness and readiness for improvement of science and research in the country and a full participation in the 7th Framework Programme. The Department of Science at the Ministry of Education and Science is an active participant in two large and important multilateral projects in the 6th Framework Programme (SEE-ERA.NET and ERA-WEST-BALKAN+), which enables a wider incorporation of Macedonia in European S&T activities. The participation of our scientists in the COST Program also significantly increased from 5 Actions in 2003 to 25 Actions in 2006.

The Department of Science creates European oriented science policy and, in every way, promotes, stimulates and assists in establishing international cooperation. Three years ago, there was bilateral project cooperation with Slovenia and Germany only. Then, this kind of cooperation was for the first time established with Bulgaria, Serbia, Croatia, France, Albania, the Russian Federation, Japan and China with more than a hundred bilateral projects. In the near future, cooperation with the USA, Israel, Austria and Spain will begin as well. Furthermore, there is an open call for joint project proposals with institutions from countries with which Macedonia has not signed agreements for scientific cooperation yet.

All these activities are intended to facilitate the incorporation of Macedonia in the European activities in the scientific research area, which has been recognized in the opinion of the European Commission for the status of this sector in the country, stating that in the fields of Science and Research the country should not have major difficulties in applying the acquis in the medium term.

Finally, the necessity of full understanding, coordination and support between the science policy makers and other decision makers should be emphasized because it is the only way for efficient and productive improvement of the scientific research and technological development of the country.

3.1. National Research Priorities

The Ministry of Education and Science has defined and set the following R&D priorities:

- Sustainable development;
- Water resources and management;
- Energy;
- New materials;
- Environment;
- Information and communication technologies;
- Health;
- Biotechnology;
- Nanotechnology
- High-quality food production;
- Earth science and engineering.

Special attention will be paid to overcoming problems concerning modernization of the existing R&D infrastructure as well as building a new one.

3.2. Development of the strategy for industrial policy in the Republic of Macedonia

Key drivers of Macedonian industry development are the following:

- Future of Macedonian industry will depend on enhanced collaboration between business and academia/research for knowledge creation and innovation.
- Macedonian industry will need better technology and will have to adopt high-quality standards in order to create high-value added products and services. Strategic industries will have to be defined.
- SME development and entrepreneurship will depend upon concrete governmental measures for elimination of administrative barriers.
- Relevance of education and importance of knowledge for industry development should be intensively promoted.
- Macedonia should strive for regulation compatible with EU (especially in the area of technology imports, quality, prices and other terms of trade).
- Exploitation and financing of new technologies should be stimulated (also by establishment of coordinative body for new technologies support).
- Public-Private Partnership (PPP) should be enhanced (learning PPP from experiences in other countries).
- Renewable energy production will have to be stimulated by supportive regulation and proactive policy measures.
- Better financing for SMEs (loans, venture capital etc.) is a pre-requisite for SME development.
- Innovation support institutions will have to be developed and they will have an important role for innovation development.

Investment enhancement will have to be based on equal treatment between domestic and foreign investors. The Inter-ministerial working group, business sector representatives and academia members have created a **shared vision** of industry development. It has been jointly agreed that the **vision of Macedonian industry will be based on high value added products and the development of new capacities in research and production of sustainable, organic and specialized high-tech products and services** (i.e. organic wine and foods, eco-steel, specialized electronic parts, renewable energy production, construction, medical equipment, authentic tourism etc.).

The pro-active industrial policy as a set of governmental measures will support Macedonian industry in such way that it will be able to **grow traditional (niche oriented) as well as new high tech sustainable industries around the renewable energy field, and combining information technology and other advanced services – building on knowledge networks established through the world.**

Macedonian industrial policy will strive to enhance new, applicable research and innovation methods in education and industry. Business and research will be stimulated for interaction and collaboration (clustering). Knowledge for development will be possible due to the **increased public and private investment in research and development and engagement of talented people** (approaching towards Lisbon Strategy goals).

The Macedonian new industry potential will be possible due to the ability of key development stakeholders (political, business and research/academia leaders) to reach consensus and decide for value-added, internationally oriented

industry based on dynamic mix of sustainable and authentic industries, “clean-tech” manufacturing, and innovative service industries that create jobs and a rising standard of living for all its people.

4 Republic of Macedonian security related R&D scene

Macedonia’s accession to the North Atlantic Treaty Organization (NATO) requires restructuring as well as modernization of the Macedonian Armed Forces in compliance with the NATO standards. Along with the outlined plan for the modernization of the Armed Forces within a timeframe that spans from 2004-2013 there is also a separate Strategic Defense Review (SDR). Its main task is to perform a thorough reassessment of the state of the armed forces and to outline the guidelines for their long-term development in conformity with the new security environment and the available defense resources.

The *upgrading of the communication/information systems will be one of the main focuses* of the campaign, as well as *strengthening the operative capabilities of the deployable forces*. The modernization of the armament/equipment of the Army, and Aviation WING, Development of Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance Systems (C4ISR) is another priority.

For the sake of development of the structure and capabilities, defense assumptions should be adopted most urgently, which relate to operational capability, readiness, scale of effort and concurrency for operations. The development of the structure of forces and capabilities should be in accordance with the requirements and structure of forces and capabilities established in this political framework, especially the priorities, missions of defense and tasks of Macedonian army.

The *Strategy is adopted* for the management of defense at all levels of decision making, as well as in the areas that relate to personnel (including also education of civilian experts), its professionalisation, qualifications, career with equal opportunities for all, as well as adequate ethnic representation in the Macedonian army, training and education, including the civilian personnel in the ministry of defense, interoperability, modernization and procurement, logistics, standardization, as well as development of strategies for improvement and interoperability of the intelligence capabilities and crisis management.

The current Strategic Defense Review works on the basis not of a nonexistent conventional threat, but of a *considerable internal terrorist and insurgent threat*. Cross-border criminal activity should figure prominently in these calculations, as should plans to stop trafficking and *organized crime* networks from further eroding the authority of the Macedonian state. The lingering *ethnic tension* signals to NATO that Republic of Macedonia still requires significant external assistance, from both Europe and the United States, in order to embrace its original reform policies and goals and that continued international engagement and the bi-ethnic composition of the ruling coalition in Republic of Macedonia will help to reduce the threat of a return to the open conflict experienced in 2001. However, the acknowledgment of the achieved results accomplishing all NATO membership criteria (including political stability and contribution to regional and worldwide stability) given to Republic of Macedonia during NATO Summit in Bucharest 2008 presents Republic of Macedonia in an another light - as more contributing country than an user of foreign assistance.

Achieving NATO interoperability and contributing to the organization’s future operations are priority goals for Republic of Macedonia, even though currently the ARM’s capability is limited in both of these areas. Still, Republic of Macedonia now contribute a motorized infantry company, a medical squad, an aviation detachment with two utility helicopters, and an engineering platoon for Multinational Peace Force South-East Europe (MPFSEE)/Southeast European Brigade (SEEBRIG).

The Republic of Macedonia is not “giant” manufacturer of armament and military equipment and therefore the Republic of Macedonia is not a big exporter of defense technologies. There are only two factories producing some military equipment and armament (“Suvenir” – producing munitions and repair of small weapons and “Eurocomposit”- producing equipment for personal protection as helmets and bulletproof personal equipment) and one factory for repairing and maintenance of the military equipment and armament factory - “MZT Specijalni vozila” (factory that repairs the artillery armament and light combat vehicles). At the beginning of 2005 the factory “Suvenir” was bought by “Olympicos Industry”. The restarting of the production is expected followed by extending of the small ammunition production program- appropriate to NATO standards. In the next period the factory “Eurocomposit” should be sold and its privatization is to be expected in the near future. According the factual situation there is no strict and designed concept for defense industry transformation.

According to the Production and Turnover of Armament and Military Equipment Law (published on 15 July, 2002), articles 9 and 10, D & R of new armament and military equipment technologies is committed under the base of a D & R program which is adopted by the Government of the R Macedonia on the proposal by the Ministry of Economy in cooperation with the Ministries of Defense and Interior. The D & R of the new armament and military equipment

can be committed by public science institutions, enterprises producing armament and military equipment and other science institutions that are dealing with science – research activities, in accordance to the existing laws. The program is financed from the budget of the Republic of Macedonia. The Ministry of Defense doesn't possess science – research and producing capacities. Therefore the Ministry of Defense for its own needs is contracting products and services with the factories that are part of the Economy system, eligible and verified for this purpose. Within the Ministry of Economy exists a Sector for Special Production that is the pillar body for coordination of R & D activities. In the budget of MoD/Sector for Logistic – Section for R & D of the weapons and military equipment is planned an amount of 50 000 euros per year for R & D. The R & D issue is only generally considered within the 5th part of the SDR – Equipment and Modernization Plan.

5. Actors and coordination of security related R&D

Ministry of Defence R&D capacities- The function of the Section for R&D (3 persons manned only) of the production of weapons and military equipment in the frame of the Sector for Logistic in the MoD is: informative support to the leading authorities in the MoD in the creating of the policy for equipping of the MoD by weapon and military equipment from the domestic industrial resources, cooperation with the Sector for Special Production in the Ministry of Economy by overseeing the situation of the domestic industrial capacities and preparation of the relevant legal documents, preparing the regular analyses for technical – technological capacities and regular analyses for the personal management capacities of the production subjects that are dealing with R&D of the production of weapons and military equipment.

The Commission for Special Production oversees the situation and the development of the production of weapons and military equipment in peace; development and preparation of the basic and additional capacities intended for production of weapons and military equipment, as well as production of medical materials and other products, equipment and services for the needs of the defense.

Within the Ministry of Economy - Sector for Special Production is the focal point dealing with special production and plays the coordination role for other institutions and agencies (Ministries).

The main own innovation potential of military science development and R&D policy of the MoD and General Staff are the Military academy, the Military Hospital and other institutions in the Army. Material and financial support is from the MoD budget funds. Responsible institution in MoD (Department for training and education and R&D policy) should make plans and programs and should hold A Law for R&D policy within the Army.

The Military Academy of the Republic of Macedonia was established by Law which is in accordance with the Law on Higher Education and the Law on Research Work in the Republic of Macedonia.

The Military Academy was verified by the Ministry of Education and Science as tertiary level educational and research institution, which gives it the same status as other faculties and makes it part of the educational system of the Republic of Macedonia. The degrees issued by the Military Academy are valid in the country and they give officers an equal education status as other graduates from civilian universities. The Military Academy is the only tertiary-level military educational institution in the Republic of Macedonia. Its main task is to educate, train and provide further development for officer personnel for ARM, and to engage them in research in the field of defence in accordance with the law.

Section for R&D of the production of weapons and military equipment, in the frame of the Sector for Logistic in the MoD, provides: informative support to the leading authorities in the MoD in the creating of the policy for equipping of the MoD by weapon and military equipment from the domestic industrial resources, cooperation with the Sector for Special Production in the Ministry of Economy by overseeing the situation of the domestic industrial capacities and preparation of the relevant legal documents, preparing the regular analyses for technical – technological capacities and regular analyses for the personal management capacities of the production subjects that are dealing with R&D of the production of weapons and military equipment.

On the 1st of July 2003 the Law on ***the Police Academy*** came into effect. This law provides the Police Academy with a leading role concerning research and education in the field of policing and other areas of security.

Police academy (now is transformed as faculty of security from St. Klement Ohridski University - Bitola) want to enhance its educational role by delivering basic and further education of national and international acknowledged quality and by the evaluation, dissemination, production and application of scientific knowledge in the field of policing and other areas of security. Police academy want to become a ***centre of excellence*** in our part of the world as well as belonging to the top five Police Academies in Europe. It considers itself responsible for remaining up-to-date in the field of research and education. Its police education is recognized on national and international level. This means that it will meet national and international quality standards. Its diplomas will be recognized all over Europe

and they will facilitate participation in studies abroad. Being a centre of excellence will provide the Macedonian police and the other agencies in the field of security with state-of-the-art expertise. In this way we can serve the police and the other agencies in our field of security of our country in the best way.

6. Future steps – by priorities

6.1 Investments against possible security threats

Having in mind the national and international defense missions, tasks, strategic goals and functions, the asymmetric character of most possible security threats (facing with terrorist groups attacks) especially viewed through the light of casualties analyzed from the conflict 2001 in Macedonia, where more than 80% were spawned by anti-transport vehicles mine attacks, it is obvious that first priority of the security and military R&D should be obtaining ***highest level of combat/transport vehicles mine attacks protection***. Other priorities in this area should be T72 tanks modernization and supplying of transport aircrafts.

6.1.1 In pursuit of mission 1.1.1 subtask B.4- defense and protection of the territorial integrity and independence of the Republic of Macedonia versus Control of the Macedonia Airspace, creating the ***optimal development anti-aircraft protection programs*** would be second priority. In this regard a suitable regional ASOC system development program will be much appreciated.

6.1.2. Concerning the counterterrorism the development ***upgrading programs for the communication/information systems should be one of the main focuses***, especially in correlation to the Development of Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance Systems (C4ISR) is another priority. Taking into consideration that the current Strategic Defense Review works on the basis of a ***considerable internal terrorist and insurgent threat*** and that cross-border criminal activity should figure prominently in these calculations, development of appropriate ***engineer equipment and special vehicles upgrading programs*** are welcomed as well as programs for soldier personal higher protection (for example within a cooperation with EUROINVEST company)

6.1.3. Having in mind that in the long term we are not expecting any conventional one, in addition to the above said, the visions, plans, force structures and manner of their functioning should incorporate elements and contents of what is today called crises management and early warning on potential threats. To that end, we particularly have to improve the intelligence capabilities and possibilities of compatible and efficient information sharing and coordination of the activities with the all other subsystems of the R. Macedonia, as well as with our neighbours, countries in the region, NATO and the international community.

The Republic of Macedonia continues the development of the national capabilities for the fight against terrorism and capacities for support of and participation in the joint activities of NATO and its Partners, as well as with the other international organizations. The security agencies in the country (the Directorate for Security and Counterintelligence at the Ministry of the Interior, the Military Service for Security and Intelligence at the Ministry of the Defence and the Intelligence Agency) maintain mutual coordination and cooperation at an exceptionally high level. Prime minister and the president of Republic of Macedonia are regularly informed on the security situation in the country and in the region through joint intelligence information from the security services.

Security agencies of the Republic of Macedonia maintain continuous and good cooperation with NOS (NATO Office for Security), ILU (Intelligence Liaison Units) and TTIU (Terrorist Threat Intelligence Unit). On several occasions in course of 2007 direct communications have been established and Joint meetings have been held.

Aiming at creating a single and integrated national security system, upon the initiative of the Ministry of the Interior, and an inter-department Working Group, composed of representatives of the competent ministries, agencies and services for intelligence and counterintelligence, for reform of the security system was established.

In capability category of intelligence collection and reconnaissance, procurement of the Long range Surveillance Vehicles, High performance Radar Equipments, Unmanned Aerial Vehicles and specific Warfare Equipment will be made and they are to be organically combined in the mixed ISR Units of the Army intelligence branch.

6.2. Cooperation with EU and NATO R&D institutions

Having in mind the Macedonian aspiration to be full-fledged member of NATO and EU and to promote collective approach to the security and stability as comparatively considered superior and more appropriate versus clear national approach, especially seen in the light of coping with asymmetric threats - such as international terrorism, for Republic of Macedonia would be very beneficial to continue with following and incorporating its own R&D

capacities within NATO and EU R&D structure, programs and organization (NATO Program for Security Through Science, NATO Research and Technology Organization, EDA and EU R&D area with EU Framework Programs)

6.3. Education system improving

Concerning the threats coming from structural violence especially potential internal *ethnic tension* and low level of R&D oriented education it is more than needed to strengthen the governmental coordination with relevant IO's (OSCE, EU, NATO, US resident missions) through development of common (governmental and IO supported) confidence building focused programs⁵.

6.3.1. Development of programs for better and more qualitative R&D oriented *education* comprising as much as possible of the school population.

6.3.1.1. Increasing the awareness and relevance of education and importance of knowledge for industry development should be intensively promoted.

6.3.1.2. Improving the education and science system in order to tackle shortage in the supply of qualified labor, to improve the firms' access to high qualified personnel, including vocational and on-the-job training and to provide a public research base as a partner in innovation projects.

6.3.2. The lack of enough traditional produced energy is more and more obvious and in the future this lack can spawn instability and security threats. In order timely to take relevant and appropriate measures it is necessary a development of renewable and alternative energy production programs - to be stimulated by supportive regulation and proactive policy measures.

6.4. Government (state) institutions versus privates companies

- Improving framework conditions for innovation, notably through simplifying the tax system and reducing the tax burden for firms, and by diminishing bureaucratic procedures that may inhibit innovation and the start-up of new enterprises.
- Promoting innovation activities in firms through financial aid. Subsidies can be delivered via four channels: R&D grants for research in high-tech areas, R&D grants for co-operative research, financial support for innovation projects in technology-oriented R&D provided either through loans or venture capital and technology consulting services and the provision of a techno-scientific and informational infrastructure for innovative enterprises.
 - Establishment of Inter-ministerial and private companies working groups,
 - Establishment of new technology transfer centers in a view of more efficient integration of research and business entities,
 - Providing favorable working conditions for the research entities with unacceptable conditions.
 - Stimulation of the promoting new research and development units within the economy,
 - Recommendations for increasing knowledge transfer between universities and industries,
 - In pursuit of aspects of security and industrial policy - the preservation of core capabilities, the problems relating to military equipment and dual us equipment, the preservation of technology and jobs must hereby all be taken into account

6.4.1. The *research work conducted by government-funded institutes* is of particular importance. In addition to the available civilian research and its results that are to be used for defense technology these institutes have to accomplish the following central tasks:

- to provide the scientific and technological know-how for intelligent and economical equipment decisions;
- to offer new technological solutions and to realize the relevance of new technologies for the armed forces' capabilities;
- to develop new generic (sub-)system concepts;
- to work out contributions for a national- relevant international NATO/EU research and technology basis and for the ability for cooperation;
- to participate in maintaining a defense-related competence;

⁵ For example OSCE Spill-over mission (in Skopje) budget for 2007 was around 10 Mil EURO. One of five sections within structure of this mission is focused on confidence building.

- to research in the area of the *Catalisators and electrode structure for ecological clean electromechanical energy sources with hard polymery electrolite*, bilateral project funded by the Ministry of Science of the RM and The institute for electrochemistry at the Bulgarian Academy of Science, continuing with work during 2008;
- to research in the area of the *Unstability and nature law at the rising up of the morfology forms at the electrochemical systems which are far from stability*, bilateral project funded by the Ministry of Science of the RM and The institute for phisical chemistry at the Bulgarian Academy of Science, continuing with work during 2008;
- to study *the morphology of the metal deposits with electrorafining in modified conditions*, project funded by the Ministry of Science of the RM, 2003-2006
- to provide the system for researching and following the chemical stability of pressured explosive materia – fusses, project funded by the Ministry of Defence of the RM, from 2006 and during 2008.

6.5. Funds

As it is elaborated above, concerned by the growing capabilities gap between Europe and the United States, the 2002 Barcelona European Council set the goal of raising overall research investment in the *EU* from 1.9% of GDP to **around 3%** by 2010. Nearly all Member States have set targets, which – if met – would bring research investment in the EU to 2.6% by 2010. The same trend exist in *NATO* frame where many European leaders have already taken steps to increase their defense budgets. France, Norway, Portugal, and the United Kingdom have submitted budgets with **a boost in defense spending**, ranging from 1.2 percent in the United Kingdom to 8.2 percent in France (here especially increasing the level of funds dedicated to R&D - **near to 2%**)

From the another side a short overview given above within item 1.5 depicts the low level of financial support (**0.44%** from the GDP) as well as even low level of consideration of using developed R&D capacities advantages within the industrial process (military/civilian) in Macedonia. A proper way ahead could be increasing of national (governmental) funds dedicated on R&D capacities, especially in the industrial process, based on the priorities mentioned in this item or a consolidated version of these main priorities appropriate to national industry (state or private sector), but not limited only on the relying on these funds. It will be grate advantage to use also the IO, NGO, multilateral cooperation projects and bilateral cooperation programs funds for this purpose i.e. supporting the industrial R&D projects as it is case with some agricultural projects, electrical power and water supply projects, clean environment (ecological) and communities confidence building projects. etc. It is to convince the projects allocation funds decision makers on the benefit of some industrial R&D and technological development projects.

7. Perspectives and ideas for change of the R&D National policies for the Republic Macedonia

In the field of R&D in the Republic of Macedonia, the *main priorities* are as follows:

- Further development of the academic research network,
- Renovation of the research equipment,
- Stimulation of the promoting new research and development units within the economy,
- Systematic and continuous supply of foreign reference literature and providing access to electronic scientific data bases,
- Upgrading the library information system,
- Strengthening the present technology development capacities,
- Establishment of new technology transfer centers in a view of more efficient integration of research and business entities,
- Providing favorable working conditions for the research entities with unacceptable conditions.
 - Improving framework conditions for innovation, notably through simplifying the tax system and reducing the tax burden for firms, and by diminishing bureaucratic procedures that may inhibit innovation and the start-up of new enterprises.
 - Improving the education and science system in order to tackle shortage in the supply of qualified labor, to improve the firms' access to high qualified personnel, including vocational and on-the-job training and to provide a public research base as a partner in innovation projects.

- Promoting innovation activities in firms through financial aid. Subsidies are delivered via four channels: i. R&D grants for research in high-tech areas (esp. through the thematic programs of the Science institutions in the Republic of Macedonia); ii. R&D grants for co-operative research by SMEs; iii. financial support for innovation projects in technology-oriented SMEs provided either through loans or venture capital; iv. technology consulting services and the provision of a techno-scientific and informational infrastructure for innovative enterprises.
- Aspects of security and industrial policy, the preservation of core Macedonian capabilities, the problems relating to SMEs and dual use, the preservation of technology and jobs in Macedonia must hereby all be taken into account

Macedonia aims at the participation of the institutes, where it is possible and useful, for they can act as competent and integrative links between the civilian and military levels of security research, even more so as this subject will become increasingly important in the Commission's future framework programs for research.

A short overview given above within item 4.3 depicts the low level of financial support as well as even low level of consideration of using developed R&D capacities advantages within the industrial process (military/civilian). A proper way ahead could be increasing of national (governmental) funds dedicated on R&D capacities, especially in the industrial process, based on the priorities mentioned in item 8 or a consolidated version of these main priorities appropriate to national industry (state or private sector), but not limited only on the relying on these funds. It will be grate advantage to use also the IO, NGO, multilateral cooperation projects and bilateral cooperation programs funds for this purpose i.e. supporting the industrial R&D projects as it is case with some agricultural projects, electrical power and water supply projects, clean environment (ecological) and communities confidence building projects. etc. It is to convince the projects allocation funds decision makers on the benefit of some industrial R&D and technological development projects.

7.1. Perspectives

The DG will continue to manage the Framework Programmes, which will remain a central policy tool. But while these programmes have to date mainly sought to bring about synergies in European science by sponsoring trans-national collaboration and mobility, we will need to add new activities. We envisage competition-based European funding for fundamental research, European decision-making about the development of major facilities, and large-scale technological research projects undertaken through public-private partnership.

The overall results of the consultation reveal a strong stakeholder support for the ERA vision, and the six specific ERA dimensions. Knowledge sharing is coming out on top and it is the area in which actions is most required at regional level. It appeared that forthcoming action at EU level will have to aim at the realisation of a single labour market for researchers. Correspondingly, five key communications have been planned (in the following chronological order):

1. Joint Programming of Research for more strategic and *better-structured joint programmes* and common calls for projects as of **2010**.
2. A communication on measures *to increase researcher mobility*, e.g. by a 'European Researchers' passport';
3. A legal framework for pan-European research (based on *art. 171 EU Treaty*) to facilitate the construction and operation of new consortia;
4. A European strategy for enhanced and coherent international science and technology cooperation;
5. *Recommendations for increasing knowledge transfer between universities and industries*.