

**THE PRIMARY ISSUES WITH OF FINANCING AND MANAGEMENT  
OF SCIENTIFIC AND SCIENTIFIC-TECHNICAL ACTIVITIES IN THE  
REPUBLIC OF ARMENIA**

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### **Abstract**

The governments of the Republic of Armenia have assigned both substantive and formal approaches to scientific and scientific-technical activities. Here, a scientific and educational system is currently in place, with both numerous issues and potential for growth. The state system perspective on scientific and scientific-technical operations in Armenia has dramatically evolved, particularly over the previous three to four years. The state budget now includes a large increase in funding for scientific and scientific-technological activities. However, the existing issues that require solutions in the management system of the sector do not provide an opportunity to ensure progress in the development of more important directions of applied relevance.

The challenges of funding creative research in the scientific and scientific-technical fields were studied in this paper along with recommendations for their resolution. It was advised to make sure that independent and nominated programs were well-balanced and that the choice of scientific themes was transparent.

**Keywords:** science, scientific-technical activity, knowledge-based economy competition, transparency.

### **Introduction**

The socioeconomic and geographical conditions that have developed as a result of economic integration and the global economy fundamentally change the challenges associated with the production and distribution of goods by national economies as well as the provision and sale of services until it is contrasted with the prices of a comparable product or service indication in other nations, it cannot be deemed sufficient. This idea can be applied to any good or service offered on the world market. To put it another way, when offering a service or exporting a good to a foreign market, the type should not be assessed and discussed solely from the perspective of the national economy because this may not give a true idea about the circulation of the given good and the results expected from it.

It is still incorrect to use only the absolute or relative advantages of the national producer in any country, in any sector of economic activity, when expenses implemented in any sector of the national economy have increased by a certain percentage, which may be several times higher than the previous year. Instead, the given good or service should also be evaluated by global market standards [1].

This is especially crucial for open, small-economy nations since they face unique challenges when trying to reach the global market, which makes it more challenging to make the desired product or service a reality. Another crucial element is the magnitude of the country's balance of payments. In this sense, the small size of the national economy, the low purchasing power of the population, the long distance from the sales markets, the lack of access to the sea, etc. can act as negative factors for Armenia. The structure of the national economy and ensuring competitiveness are also of great importance. Therefore, it is necessary to show a unique approach to those sectors of the economy that can have a significant impact on increasing the GDP growth rate and increasing the well-being of the population.

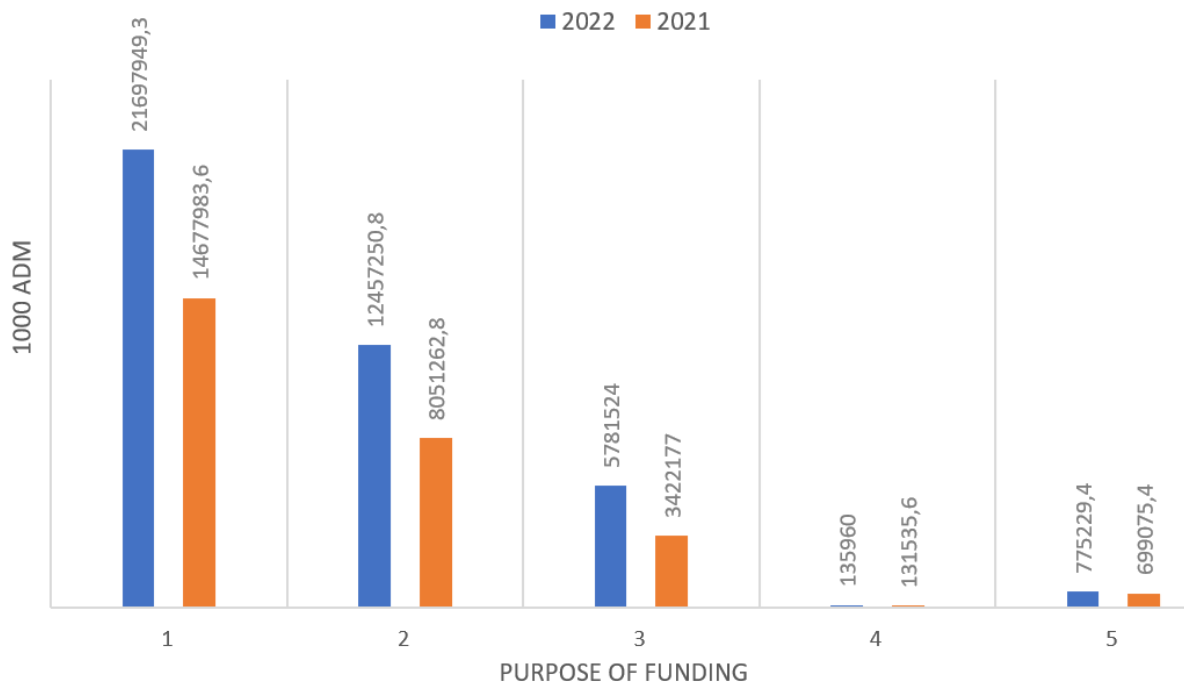
Scientific and scientific-technical activities can fall under this category for the Armenian economy. The quality of high-tech exports, the quantity of innovations and their acceptance in the global market, as well as a number of other indicators that describe the state

A.Kh. Markosyan, V.G. Khachaturyan, H.V. Tokmajyan, A.K. Harutyunyan, M.A. Markosyan of development and effectiveness of scientific and scientific-technical activities in the global context, will all have a significant impact on the export and import of goods and services of the national economy.

The coordination of scientific and scientific-technical activities by different governments in Armenia has been carried out with variable success. Currently, there is a scientific and educational system in the country, which has certain opportunities for development, as well as multiple problems [2].

The created system was formed over decades, for its operation many laws and other legal acts were developed and adopted, which regulate the sphere in one way or another [3]. The full critical analysis of the mentioned legal acts and the development of a full vision of their reforms (both in terms of legislative-legal and organizational structural changes) is beyond the scope of this study, the authors will address them in a separate study.

The state system's perspective on scientific and scientific-technical activity has greatly evolved in recent years. The state budget's actual allocations to scientific and technical activity have increased significantly (Fig. 1).



**Fig. 1 Expenditures from the RA State Budget for scientific and scientific-technical research programs (thousand drams) in 2021-2022.**

1 - Scientific and technical research program (total), including: 2 - Modernization of the scientific infrastructure, 3 - Scientific and scientific and technical contractual (thematic) research, 4 - Scientific and scientific-technical target-program research, 5 - Supplements given to researchers for scientific degrees

It should be noted that after the official publication of statistical data, the indicators given in Fig. 1 may undergo some changes, which cannot affect the qualitative results of the research presented in this article. It is also necessary to keep in mind that the presented data may differ from the planned indicators of the state budget due to the changes occurring in the reporting year.

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**Conflict Setting**

The task is to analyze the problems of financing the innovative works carried out in Armenia and to propose solutions in order to increase the efficiency of the system that carries out scientific and scientific and technical research.

**Research Results**

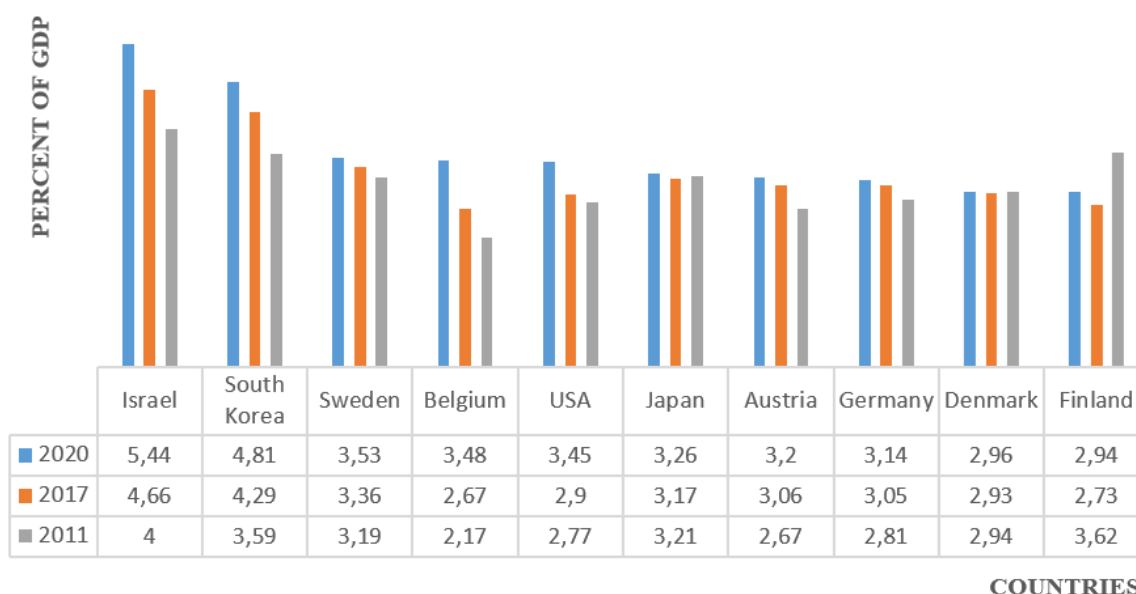
The cost of scientific and scientific- technological activities increased by around 1.5 times in 2022 compared to 2021, which significantly aided the sector's growth. But it raises the question of whether it has significantly improved the sector's efficiency (Fig. 1).

Additionally, the Government of the Republic of Armenia adopted a decision for the calculation of the minimum official rate for scientific personnel participating in state programs for the implementation of fundamental and most significant applied research in research organizations funded by the state budget, the maintenance and development of the infrastructure of scientific and scientific and technical activities, and the preservation of scientific objects of national value. as the base salary is calculated by the product of the coefficient and the base salary for the given year [4].

However, the same question arises again. will the improvements made will ensure the development of the Armenian scientific and scientific-technical thought to reach the best international indicators?

The draft of the RA government's decision "On approving the concept of the economic policy of the Republic of Armenia" (submitted for public discussion in 2023) states: "Technological progress is the basis of economic policy, the realization of which depends on the development of human capital and the creation of a knowledge-based economy." One of the main goals of the state is the development of human capital in Armenia and the formation of prerequisites for the manifestation of human talent.

**RESEARCH AND DEVELOPMENT EXPENSES**



**Fig. 2 List of the world's top 10 countries (among 67 countries) by percentage of research and development expenditures to GDP, 2011-2020 for [6]**

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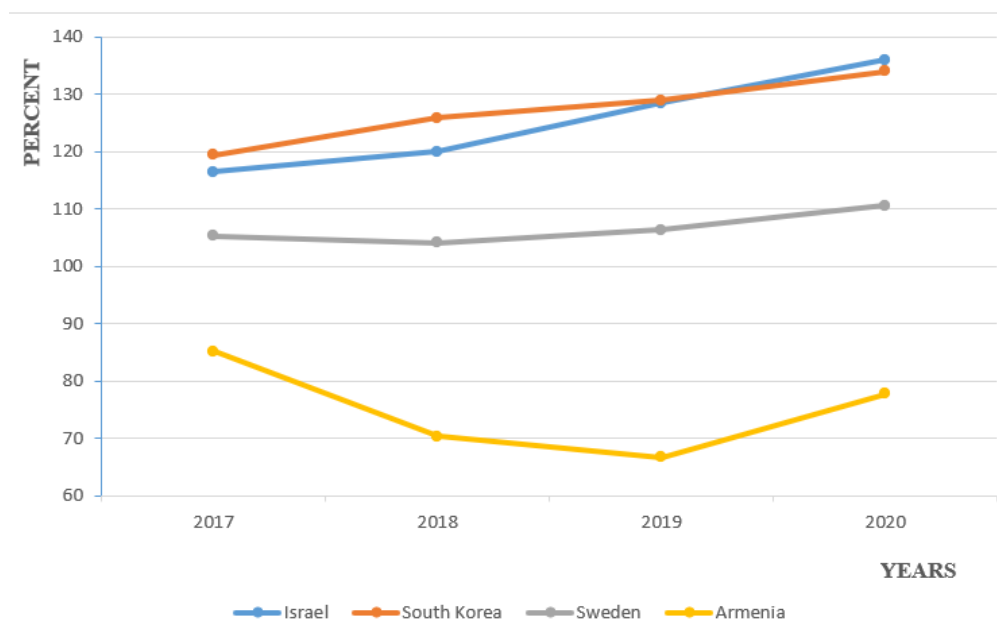
In the context of the indicated priorities, the sectoral concepts and strategies developed for the current and following years should be adopted, re-edited or rewritten" [5]. Meanwhile, the definition of the priorities of the economic development policy of the Republic of Armenia was considered as the goal of the adoption of the Concept.

Let us present the comparison of the main indicators related to the scientific and scientific-technical activities of Armenia with the best international and relevant indicators of the countries of the former Soviet Union.

Fig. 2 shows the percentages of research and development expenditures to GDP for the top 10 countries in the world for 2011-2020.

Research and development expenditures as a proportion of GDP have been steadily rising over time in the nations shown in Figure 2. Finland and Denmark are exceptions. Israel leads the world in this statistic, with the most consistent growth in R&D spending as a percentage of GDP starting in 2011 and continuing through 2020.

Fig.3 shows the change in research and development expenditures in relation to GDP in Israel, South Korea, Sweden, and Armenia in 2017-2020. compared to 2011 with indicators (in percentages) [6].



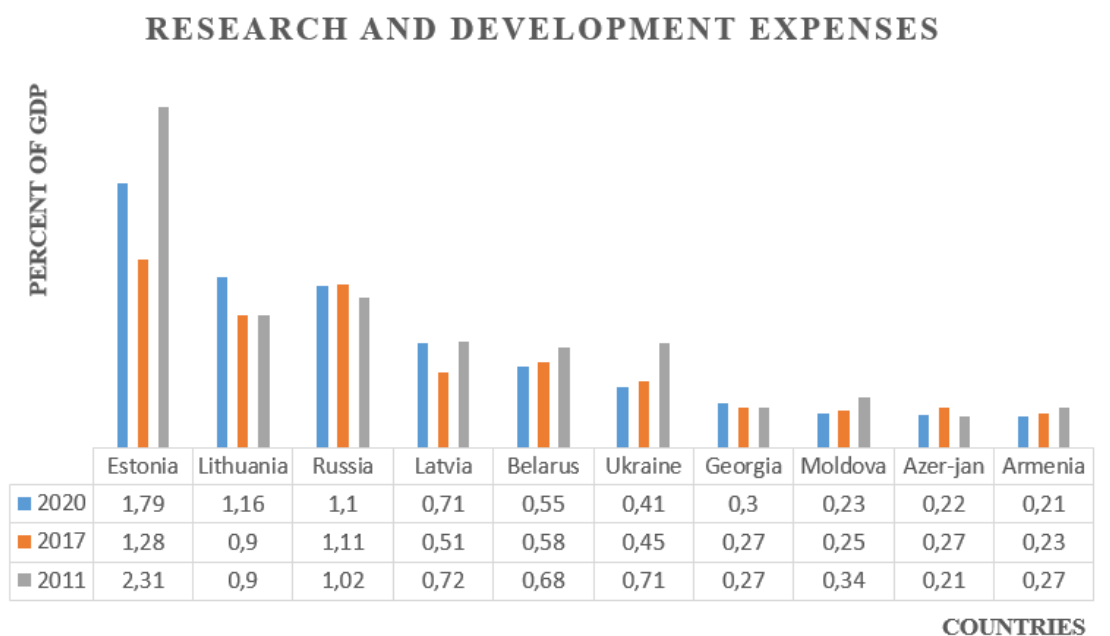
**Fig. 3 The change in R&D expenditure relative to GDP in Israel, South Korea, Sweden and Armenia in 2011 compared to 2017-2020 (in percent) [6]**

Although the expenditures on research and development in the Republic of Armenia are increasing year by year [7], the expenditures on research and development in relation to the GDP in 2011 decreased by about 20%, reaching the minimum in 2019. (- 9%).

Regardless of the GDP, this indicator displays trends in the amount of money spent on research and development in a specific nation. It is a crucial qualitative factor that describes the place of the target nation in respect to inventive processes. In our view, developing nations should devote a larger portion of their budgets to research and development in order to produce significant breakthroughs in the field of science-intensive technologies and, first and foremost, to assure a high level of human potential. This is similar to the problem of ensuring the implementation of programs in small communities, in the presence of limited funds. Just

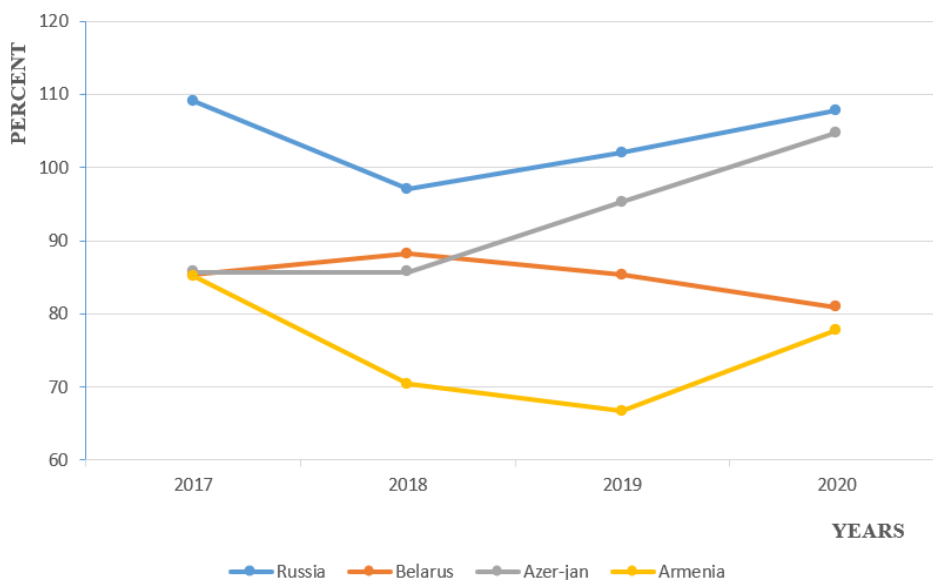
A.Kh. Markosyan, V.G. Khachaturyan, H.V. Tokmajyan, A.K. Harutyunyan, M.A. Markosyan as this problem is solved by uniting small communities, countries with small GDP should try to integrate into international programs of common interest in order to determine their benchmarks for future development. And here again we are dealing with the importance of the existence of quality human potential, which is possible only by ensuring the sustainable development of the scientific and educational system.

Fig. 4 lists the 10 countries in the Eurasian region of the former Soviet Union by percentage of research and development expenditures to GDP, 2011-2020 for [6]



**Fig. 4 List of 10 Eurasian countries of the former Soviet Union (2011-2020 percentage of R&D expenses to GDP)**

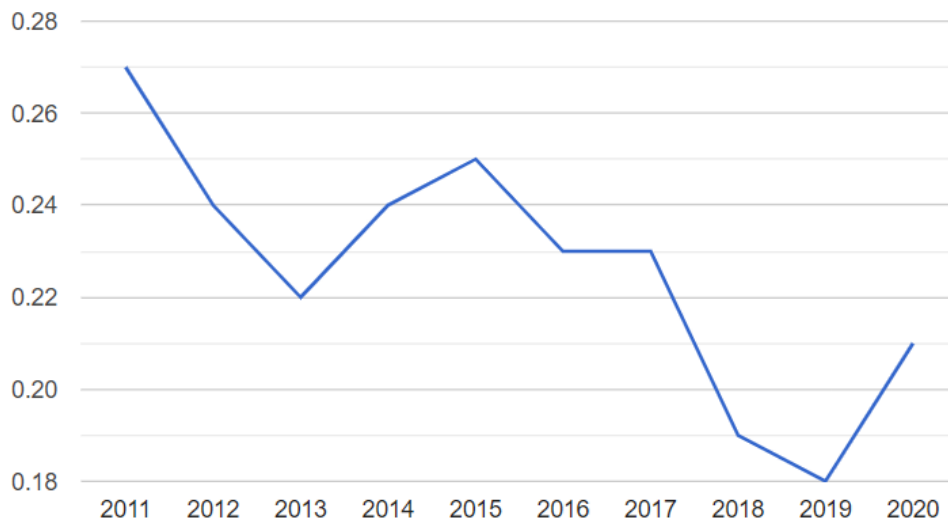
Fig. 5 shows the change in R&D expenditures in relation to GDP in Russia, Belarus, Azerbaijan, and Armenia in 2017-2020. compared to 2011 with the index (in percent). Here too, Armenia's indicators are the lowest.



**Fig. 5 In Russia, Belarus, Azerbaijan and Armenia in 2011 compared to 2017-2020 the change in R&D expenditure relative to GDP (in percent) [6]**

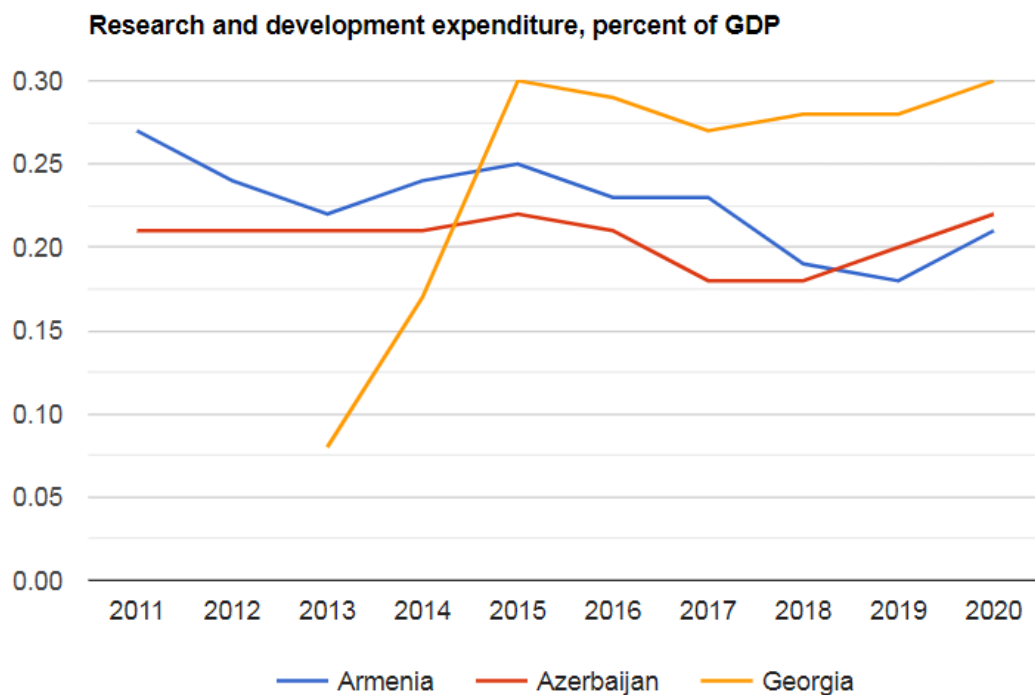
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The analysis shows that the change of research and development expenses in relation to the GDP in Armenia by years, starting from 2011, continuously decreased (Fig. 6) [6]. An exception is 2020, where a certain (not significant) increase was recorded.



**Fig. 6 2011-2020 Changes in research and development expenditures in relation to GDP in Armenia (percentage by year) [6]**

The analysis also shows that in Transcaucasia by year (starting from 2011) in terms of R&D expenses in relation to GDP, the indicator of Armenia is the lowest (Fig. 7) [6].

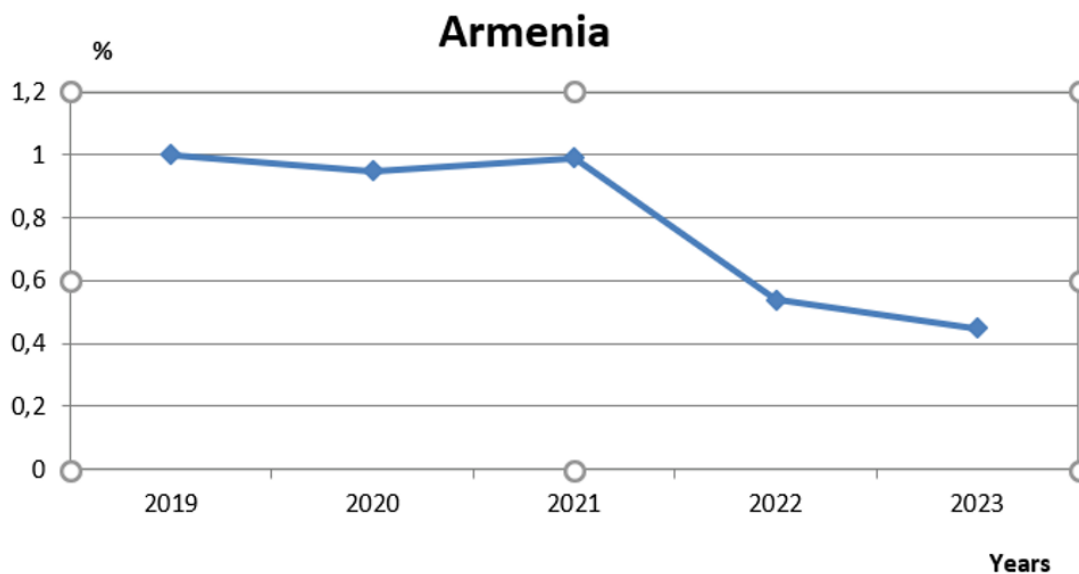


**Fig. 7 2011-2020 Changes in research and development expenditures relative to GDP in the Transcaucasian countries (percentages by year) [6]**

"The RA government will promote the creation and development of connections between science and technology (in production chains), which is important both in terms of the commercialization of innovations and, as a result, the formation of the country's

A.Kh. Markosyan, V.G. Khachaturyan, H.V. Tokmajyan, A.K. Harutyunyan, M.A. Markosyan competitiveness," according to the draft of the RA government's decision "On approving the concept of the economic policy of the Republic of Armenia" [5].

According to the diagram in Figure 8, target-programmatic investigations make up a very small portion of the scientific and scientific- technological research programs funded by the RA budget.



**Fig. 8 The share of target-programmatic researches in scientific and scientific and technical research programs financed from the RA budget (in percentages) for 2019-2023**

This is a result of the fact that in the state budget of the RA, in the conditions of the continuous increase of the funds allocated to scientific and scientific and technical research programs, the amount of funding for targeted-programmatic research remains the same: 135.9 million AMD. Such an approach cannot be considered justified. It is worrisome when the share of research aimed at solving state problems is less than one percent of the funds allocated to scientific and scientific and technical research.

In this direction, it is necessary to develop and implement a complex program of radical reforms.

As the main directions of project development, it is suggested:

1. To change the structure of the selection of topics proposed for target-programmatic researches, in particular:
  - 1.1. To determine the list of state bodies and departments, which have the right to nominate the topics of target-program research and approve their technical tasks.
  - 1.2. Define the order of making estimates of topics.
  - 1.3. Define the procedure and schedule for the publication of topics and the acceptance of applications.
  - 1.4. Establish a procedure for organizing and guaranteeing financing of topic contests.
  - 1.5. In the process of choosing topics, give preference to works aimed at the introduction of scientific results.
  - 1.6. Establish a simplified financing guarantee procedure for the works that implementing organizations propose to carry out with a guarantee for the quality of research.



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1.7. Define the procedure for establishing control over the performance of subjects and accepting the results of the research.

2. To set the minimum amount of funding for targeted-programmatic researches in the RA state budget of not less than 10 percent of the funds allocated to scientific and scientific and technical research programs.

The proportion of funds allotted to scientific projects aiming to produce applied results in scientific and scientific-technical research programs financed from the RA budget is also very low within the framework of contractual (thematic) funding of scientific and scientific and technical activities.

In particular, only six of all themes presented in the 2022 were guaranteed money for 2023, five of which are biological and biochemical in nature [8]. This index is extremely low for a nation with constrained natural resources and a challenging geopolitical environment. After clarifying the fields and professions of scientific and scientific and technical activities, according to the direction of research [7] and setting the minimum funding allocation threshold for them, we propose to increase the funds directed to applied research to the extent that every year it is possible to finance at least 5-6 new topics in each direction. Taking into account the "abundance" of various programs currently being implemented by the RA Science Committee and still requiring an evaluation of their effectiveness, this opportunity exists in Armenia.

Additionally, the process for coordinating the evaluation of bid selection needs to be fundamentally changed. In 2023, the significance of finding a solution to this issue will be obvious based on the screening procedures the RA Science Committee used to choose scientific projects with the goal of producing an applied outcome (offered under the label "Experimental Developments").

According to the requirements of the invitation to the tender for the selection of applications for experimental development projects within the contractual (thematic) financing of scientific and scientific and technical activities, a Council is established for the evaluation of the applications submitted to the competition, which together with the Committee develops and approves the evaluation sheets for the scientific examination of the applications. During the scientific examination, they are evaluated [9].

- the scientific and scientific-technical innovation and modernity of the project,
- the level of preparation of the developed technology,
- applicability of the expected end result,
- commercialization perspective,
- being aimed at meeting the needs of the economy,
- the achievements of the group leader and performers in the given field of scientific and scientific-technical activity, their professional qualifications and the ability to properly perform the given scientific project,
- the prerequisites, stages and deadlines for the implementation of the scientific project,
- justification of the estimate,
- co-financing,
- other issues arising from the specifics of the tender (in our opinion, there should be no ambiguity in the evaluation process and the authority of the board should be clearly regulated).

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The application is subjected to scientific examination by at least two experts. The members of the Council can act as experts. If necessary, the Council can involve independent experts. For each Application, the expert fills out the scientific expertise evaluation sheet. The final assessment of the scientific examination of the application is the arithmetic mean of the assessments of two experts. If the evaluations of two experts differ by 30% or more of the expert's maximum evaluation, the Application is given to the third expert. In that case, the final assessment of scientific expertise is the arithmetic average of two close assessments of three experts. In case of equal differences in the evaluations of three experts, the final evaluation of the scientific examination is the arithmetic mean of the two maximum evaluations. The provision of information about the content of the Application, the process and the result of the scientific examination by the Committee, the Council and experts to other persons is prohibited, in accordance with the provisions of the Law of the Republic of Armenia "On Scientific and Scientific-Technical Examination" [8, 9]. In the version under discussion, as a result of the joint discussion between the Council and the Committee, the following sheet for the evaluation of scientific expertise of applications consisting of 15 questions was used.

1. Analysis of the current situation. How comprehensively is the current state of the field analyzed?
2. The project. How clearly formulated are the scientific project, the problems to be solved and the goals?
3. Modernity. How modern and prospective is the proposed project?
4. The methods. To what extent do the proposed methods fit the project?
5. Project planning. To what extent are the phases of the project's implementation consistent with the achievement of the research objectives and how realistic are they?
6. Project risks. How clearly are the risks and ways and means of overcoming them described?
7. Clarity and interpretation of the estimate. To what extent does the required amount of funding and its distribution according to the articles correspond to the achievement of the research objectives and how justified is the estimate?
8. The influence. To what extent will the successful implementation of the project have an impact on the development of this direction of the RA economy?
9. Commercialization. To what extent is the commercialization perspective and innovative potential of the expected result clearly formulated?
10. Management of results. To what extent is the management of research results clearly defined, and to what extent do the expected results correspond to the scope of funding (publication of results, application of innovative capacity: introduction of technologies, demonstration, pilot sample, prototype and management of intellectual property: patent, copyright, etc.)
11. Current situation. How realistic is the current level of technology readiness assessed?
12. Expected result. How realistic is the level of technology readiness expected by the end of the project?

Each question is evaluated with an interval of 0.5 from 0 in a 5-point system.

The preliminary analysis of the questions posed in the assessment sheet of the scientific examination shows their imperfection, which can contribute to the creation of opportunities for the use of corruption structures. In order to carry out a thorough analysis of

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the organization of the conducted competition, it is necessary to study the entire chain of the evaluation process of scientific expertise. For this purpose, the RA Science Committee should provide necessary information regarding the previous competitions. As a result of research, at least for the last 10 years, it is necessary to get answers to the following main questions:

1. Analyze the process of formation of the Council of Experts, in particular, by whose order and by what standards is the council created, what qualifications and professionals with professional orientation were included in the council?
2. Analyze the process of formation of the list of experts. What qualifications and professional orientation have professionals examined both guaranteed and non-guaranteed funding topics?
3. In what areas are topics guaranteed funding? According to the completed topics, evaluate the state of commercialization of scientific results.
4. Analyze the validity of the reasons for rejecting non-guaranteed topics.
5. By what mechanism does the Council jointly with the Committee develop and approve the evaluation sheets for the scientific examination of the applications, what qualitative changes have they undergone over the years? Demand and analyze the evaluation standards of the questions.

However, until the proposed comprehensive research is carried out, it can now be recorded.

Foundations for sustainable development cannot be created if trust in the impartiality of the selection of topics is not ensured, one of the main factors of which is the transparency of their implementation. It is problematic when the list of rejected themes is not published.

We recommend that the following edition be used to draft section 3 of Article 7 of the RA Law "On Scientific and Scientific-Technical Expertise" [10]. "The principal obligations of the client of the examination are: 3) until the conclusion of the topic selection, ensuring the confidentiality of the examination's planning and the experts' anonymity. "Even if the current legal protocols are followed, the impartiality of the topic selection cannot be guaranteed, and the expert and the committee chairman's judgment and decisions will have a significant impact on the competition's outcome. Depending on the individuals, it can also create corruption risks. In order to solve this problem, it is necessary to develop and apply a procedure for selection of topics based on objective indicators. During the evaluation of the applications, there are valid questions regarding the evaluation sheets of the scientific examination consisting of a large number of questions used by the experts. In particular, in 2023, 15 questions were used in a 5-point system with an interval of 0.5. Thus, a large number of options arise, which is a favorable condition for dodging. The number of questions should be drastically reduced, only two options should be set for answers: yes, no, and responsibility should be set for unjustified assessment. It is necessary to ensure the transparency of scientific and scientific-technical program tenders and the availability of the decisions made. In the process of organizing tenders, reduce the limit of the influence of the human factor to a maximum of seven percent [7]. It is necessary to create a bank of experts with a large list, from which the computer will select the experts.

We believe that the whole maximum financing amount intended for each proposal should be made public prior to the tender. Otherwise, funding for 13 topics, for instance, might be provided once, and then it might be cut to six the next, which also fosters mistrust. It

A.Kh. Markosyan, V.G. Khachatryan, H.V. Tokmajyan, A.K. Harutyunyan, M.A. Markosyan is unacceptable to ask "The co-financing organization must be interested in the application of the project's final result." This is a fabricated, fake need. Financial support for the commercialization of scientific results should be encouraged, regardless of the fact that the co-funder is interested in the application of the final result of the project. Furthermore, the applicant organization itself must also have the right to act as a co-funder.

The group's leader must independently decide whether it is necessary to replace the group's executor in an adequate manner. The leader also has the authority to implement rotation based on the duration of the topic's implementation and the requirement that the executors' professional qualifications be updated. The mechanism of drawing up estimates for applied works should be fundamentally changed. Within the scope of financing the topic, it should be the result of an agreement between the group and the head of the presenting organization.

For the solution of the presented problems, it is important to introduce an effective reporting system, which is currently incomplete and formal.

### **Conclusion**

In the Republic of Armenia, such a scientific and scientific- educational system has been formed, which has many issues and potential for growth. Although the state system's attitude toward scientific and scientific-technical activities has changed dramatically and the state budget's allocations for these activities have expanded greatly, yet the sector's management system now faces issues that must be resolved and does not offer a way to guarantee considerable advancement in the creation of critical scientific directions and efficient commercialization of scientific findings.

The following suggestions can be made based on the findings of the research that has been done:

1. To designate the minimum amount of funding for focused, programmatic research as being no less than 10 percent of the money allotted to scientific and technological research programs in the RA state budget.
2. To transform the mechanisms of selection and accountability of topics proposed for purpose-programmatic research.
3. To transform the mechanisms of selection and accountability of topics proposed for the purposes of applied research. Organize applied research competitions every year. In order to ensure confidence in the impartiality of the selection of topics of practical significance, implement changes in legal acts, where one of the main factors should be the transparency of the implementation of tenders. In the process of organizing competitions it is necessary to reduce the relative weight of the influence of the human factor.
4. To assess the success of the choice of practical topics and the commercialization of research outcomes, undertake research going back at least ten years.

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Մարկոսյան Ա.Խ.<sup>1,2</sup>, Խաչատրյան Վ.Գ.<sup>1</sup>, Թոքմաջյան Հ.Վ.<sup>2</sup>, Հարությունյան Ա.Կ.<sup>2</sup>,  
Մարկոսյան Մ.Ա.<sup>1</sup>

<sup>1</sup>Քաղաքագիտական, իրավագիտական, տնտեսագիտական հետազոտությունների և կանխատեսումների ՀԿ  
<sup>2</sup>Շուշիի տեխնոլոգիական համալսարան

Հայաստանի Հանրապետության կառավարությունների կողմից գիտական և գիտատեխնիկական գործունեությանը հատկացվել է ինչպես էական այնպես էլ ձևական մոտեցումներ: Ներկայումս այստեղ գործում է գիտական և գիտակրթական այնպիսի համակարգ, որը ունի զարգացման որոշակի հնարավորություններ և բազմակի խնդիրներ: Հատկապես վերջին 3-4 տարիների ընթացքում Հայաստանում էականորեն փոփոխվել է գիտական և գիտատեխնիկական գործունեության նկատմամբ պետական համակարգի վերաբերմունքը: Զգալիորեն ավելացել են պետական բյուջեից գիտական և գիտատեխնիկական գործունեության համար հատկացումները: Միևնույն ժամանակ ոլորտի կառավարման համակարգում լուծումներ պահանջող առկա խնդիրները հնարավորություն չեն տալիս առաջընթաց ապահովել կիրառական կարևորություն ունեցող գիտական ուղղությունների զարգացման համար: Աշխատանքում վերլուծվել և առաջարկներ են ներկայացվել գիտական և գիտատեխնիկական ուղղություններով նորարարական (ինովացիոն) հետազոտությունների ֆինանսավորման հիմնախնդիրների բացահայտման և դրանց լուծումների վերաբերյալ: Որպես կարևոր գործոն, առաջարկվել է ապահովել գիտական թեմաների ընտրության թափանցիկությունը և առաջադրվող ծրագրերի ուղղությունների արդյունավետ բալանսավորումը:

**Բանալի բառեր.** գիտություն, գիտատեխնիկական գործունեություն, գիտելիքահենք տնտեսություն, մրցակցություն, թափանցիկություն:

## ПРОБЛЕМЫ ФИНАНСИРОВАНИЯ И УПРАВЛЕНИЯ НАУЧНОЙ И НАУЧНО-ТЕХНИЧЕСКОЙ ДЕЯТЕЛЬНОСТЬЮ В РЕСПУБЛИКЕ АРМЕНИЯ

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В настоящее время в Республике Армения действует такая научно-техническая система, которая имеет как определенные возможности для развития, так и множество проблем. Особенно за последние 3-4 года в Армении существенно изменилось

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отношение государства к научной и научно-технической деятельности, значительно увеличились ассигнования из государственного бюджета. В то же время существующие проблемы не дают возможности обеспечить устойчивое развитие прикладных научных направлений. В работе проанализированы и представлены предложения по выявлению проблем финансирования инновационных исследований и определены пути их решения. В качестве важного фактора решения проблем, предлагается обеспечить прозрачность выбора тем научных исследований и эффективное балансирование направлений предлагаемых программ.

**Ключевые слова:** наука, научно-техническая деятельность, наукоемкая экономика, конкуренция, прозрачность.

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