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THE INNOVATION ECOSYSTEM OF MOLDOVA

REPORT PREPARED UNDER UNIDO COUNTRY
PROGRAMME FOR MOLDOVA 2019-2023

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EXECUTIVE SUMMARY

This report presents a preliminary analysis of the research and innovation ecosystem of Moldova. The study aims to inform and fine tune the foreseen actions related to innovation and industrial competitiveness under the Country Programming Framework (CPF) signed between the Republic of Moldova and UNIDO in December 2018 and whose goal is to advance Inclusive and Sustainable Industrial Development (ISID) in the country. The report is based on an examination of relevant studies and regulatory frameworks in Moldova and semi-structured interviews conducted to representatives of national institutions.

The study reviews key indicators to provide a comprehensive overview of the composition, operation and legal framework of the research and innovation system in Moldova. The report stresses that the research and innovation system in Moldova needs significant restructuring. The number of researchers in 2019 showed a downward trend while the average age of research staff continues to grow.

The report notes that, despite the recent policy reforms enacted, the country's innovation system is still in an incipient stage of development and argues that constant monitoring and evaluation of the policy frameworks are required to enhance the impact of the research and innovation on the industrialization and economic development of the country.

The analysis presented in this report allows identifying crucial national, regional and sectoral stakeholders in the innovation ecosystem as well as the functioning and orientation of the main support mechanisms and instruments in place for promoting industrialization and business development in Moldova such as Free Economic Zones, Industrial Parks, Clusters, Scientific and Technological Parks and business incubators.

Based on the key findings from the interviews process and a SWOT analysis conducted in Chisinau, Balti and Cahul, this report discusses regional and national challenges and opportunities for promoting an innovation-driven economy. It determines that there are inadequate communication and information sharing between key actors of the system; insufficient skills among the workforce for meeting the international labour market demands; and that there are still limited institutional capacities for promoting research and innovation.

An examination of the statistics and current trends in the adoption of digital technologies in Moldova shows that the country still has a low transition level towards the Fourth Industrial Revolution (4IR). However, the study also reveals that Moldova has good adoption readiness spearheaded by infrastructure developments such as the extensive fibre optic and mobile networks coverage. The report concludes with a series of recommendations to maximize the country's innovation potential.

LIST OF ABBREVIATIONS

| | |
|--|-------|
| ● FOURTH INDUSTRIAL REVOLUTION..... | 4IR |
| ● ADVANCED PRODUCTION TECHNOLOGIES..... | ADP |
| ● ASSOCIATION OF INFORMATION AND COMMUNICATION TECHNOLOGY COMPANIES..... | ATIC |
| ● ARTIFICIAL INTELLIGENCE..... | AI |
| ● COUNTRY PROGRAMMING FRAMEWORK..... | CPF |
| ● FREE ECONOMIC ZONE..... | FEZ |
| ● INFORMATION AND COMMUNICATION TECHNOLOGIES..... | ICT |
| ● INTERNET OF THINGS..... | IoT |
| ● MINISTRY OF AGRICULTURE, REGIONAL DEVELOPMENT AND ENVIRONMENT..... | MARDE |
| ● MOLDOVA COMPETITIVENESS PROJECT..... | MCP |
| ● MINISTRY OF EDUCATION CULTURE AND RESEARCH..... | MECR |
| ● MINISTRY OF ECONOMY AND INFRASTRUCTURE..... | MEI |
| ● NATIONAL AGENCY FOR RESEARCH AND DEVELOPMENT..... | NARD |
| ● ORGANIZATION FOR DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES..... | ODIMM |
| ● SMALL AND MEDIUM-SIZED ENTERPRISE..... | SME |
| ● SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS..... | STEM |
| ● SCIENCE AND TECHNOLOGY PARKS..... | STP |
| ● STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS..... | SWOT |
| ● RESEARCH AND DEVELOPMENT..... | R&D |
| ● VALUE ADDED TAX..... | VAT |
| ● VIRTUAL REALITY..... | VR |

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1. INTRODUCTION

“UNIDO is determined to make the CPF for Moldova a success, building on past achievements in the country”

LI Yong, Director General of UNIDO

On December 21st 2018, the Republic of Moldova signed with UNIDO the first Country Programming Framework (CPF) for inclusive and sustainable industrial development covering the period 2019-2023. The CP had been developed to contribute to the achievement of the inclusive and sustainable industrial development agenda of Moldova through dedicated development activities, addressing three components:

- I Enhanced industrial competitiveness, market access, innovation and investment promotion;
- II Productive employment for rural communities and entrepreneurship development;
- III Sustainable energy and environmental management.

The CPF is fully aligned with the priorities set out in Moldova's National Development Strategy and builds on the achievements of previous projects and programmes. As industrialization is a long-term endeavour involving many stakeholders, the focus is set to be on strengthening synergies by collaborating with development cooperation partners, state and non-state actors, including the private sector.

With the CPF for Moldova, UNIDO aims to provide support for the Government's efforts towards improving the overall competitiveness of the economy, increasing industrial productivity, stimulating entrepreneurship, and encouraging knowledge and innovation through capacity development and the adoption of international standards as well as the use of best practices. The overarching goal is full integration of Moldova into the European Union's market and global value chains.

The CPF aims to enhance industrial competitiveness, market access, innovation and investment promotion. Through this component, it is expected that priority industry subsectors be well integrated into the European and global value chains.

In November and December 2019, a UNIDO mission to Moldova was organized that saw extended consultations with representatives of the Ministry of Economy and Infrastructure (MEI) and other stakeholders regarding the launch of CPF. During the discussions, the development of a project proposal aiming to strengthen the linkages between research and industry has been identified as a priority for the country.

Therefore, a project concept note has been prepared by UNIDO with the overall objective of increasing industrial competitiveness, creating jobs and promoting innovation-driven economic development in Moldova, by strengthening linkages between science and research institutions, and the industrial sector, fostering knowledge sharing, technology transfer and entrepreneurship development. The proposed project-specific objectives are:

- Improving the regulatory framework and policies for strengthening the regional and sectoral innovation ecosystem.
- Promoting the adoption of regional innovation cluster model.
- Supporting the development of Innovation, Entrepreneurship and Technology Transfer platforms.
- Supporting the internationalization of Moldovan SMEs by increasing competitiveness, digital transformation and market access.

As a result of the UNIDO technical mission to Chisinau, conducted on 24-27 February 2020, which discussed the proposal approach with the main stakeholders, including donors, it found support from the Government

side and interest from donors. To ensure synergies and programmatic coherence, and to maximize impact and strengthen the innovation ecosystem in Moldova, UNIDO is analysing existing innovation initiatives and programmes in the country, to enrich the UNIDO actions under the CPF and to smoothly integrate the CPF into the country's priorities and running initiatives. The present study is part of the innovation ecosystem evaluation.

1.1. OBJECTIVES OF THE STUDY

The study aims to conduct a preliminary assessment of the innovation ecosystem in the Republic of Moldova to enhance the Country Programme and project proposals. The findings are foreseen to enable a better alignment of the project proposals with the country's priorities and to facilitate their integration with ongoing initiatives. Thus, helping to improve existing structures and networks in Moldova and contributing to strengthen the innovation ecosystem and advance the digital transformation of value-adding activities. The study includes mapping of the existing initiatives, programmes, policies and institutions operating in the area of innovation.

Thus, the study contains:

- 1 Mapping of existing initiatives/programmes related to the establishment and operation of Science and Technology Parks (STP), Innovation Centres, Industrial Parks, Start-ups Incubators and similar multi-functional platforms with an emphasis on the Chişinău, Bălţi and Cahul regions.
- 2 Evaluation of the policy framework governing innovation in the R&D and academia sector, to include existing innovation support, programs, mechanisms and incentives.
- 3 SWOT analysis of the local industrial sector, R&D and educational competitive advantages in the Chisinau, Balti and Cahul regions.
- 4 Conclusions and recommendations for the enhancement of the innovation sector in the Republic of Moldova.

1.2. METHODOLOGY AND APPROACH

The methodology applied combines desk research of existing reports, information and regulatory frameworks in Moldova with semi-structured interviews, based on defined dimensions, variables and constructs for benchmarking and comparability with the main stakeholders of the innovation ecosystem: state institutions, academic institutions, donor communities and business associations. The methodology combines qualitative and quantitative analysis of data made available by national institutions and international organizations, benchmarking tools based on international indexes, evaluation of reports and programmes of institutions involved in the applicable area of research.

Regarding the interview process, representatives of 25 institutions were consulted during the period of May 6th – July 2nd 2020. The list of the institutions is presented below grouped by categories:

STATE INSTITUTIONS:

1. Ministry of Economy and Infrastructure (MEI);
2. Ministry of Education, Culture and Research (MECR);
3. Ministry of Agriculture, Regional Development and Environment (MARDE);

4. National Agency for Research and Development (NARD);
5. Organization for Development of Small and Medium Enterprises (ODIMM);
6. Moldova IT Park;
7. Free Economic Zone Balti.

INTERNATIONAL PARTNERS AND DONOR COMMUNITY:

8. EU Delegation in Moldova;
9. World Bank Moldova;
10. Moldova Competitiveness Project (MCP) (USAID project);
11. Economic policy advice to the Moldovan Government (GIZ project);
12. Opportunities through technologies and innovation in Moldova (Swiss Agency for Development and Cooperation project).

ACADEMIC INSTITUTIONS:

13. Technical University of Moldova;
14. State University of Agriculture of Moldova;
15. State University of Medicine and Pharmacology Nicolae Testemițeanu;
16. State University Cahul;
17. State University “Alecu Russo”, Bălți.

BUSINESS COMMUNITY:

18. European Business Association;
19. American Chamber of Commerce;
20. Chamber of Commerce and Industry of Moldova;
21. Moldovan Association of Information and Communications Technology Companies;
22. AROBS Moldova Ltd (developing embedded software and programming microprocessors for the automotive industry).

INNOVATION PLATFORMS:

23. FabLab;
24. Tekwill;
25. Horizon 2020 Moldova focal point.

Interviews were organized based on an interview guide (for further details, please see Annex 1). However, the discussions were conducted in a dialogue format, with priority being given to the experience and knowledge of the representatives, exploring the practices and activities linked to the innovations they were involved in, ensuring more ground-based assessment.

2. OVERVIEW OF THE RESEARCH AND INNOVATION SYSTEM IN MOLDOVA

In 2019 Moldova's Research and Development sector included 4058 employees, of which 2767 are researchers. The numbers of both employees and researchers have declined dramatically compared to 2018, -8.8% and -9.4% respectively. This indicator alone shows that the R&D sector is in crisis and needs a deep restructuring. For further confirmation of this situation, see the table below:

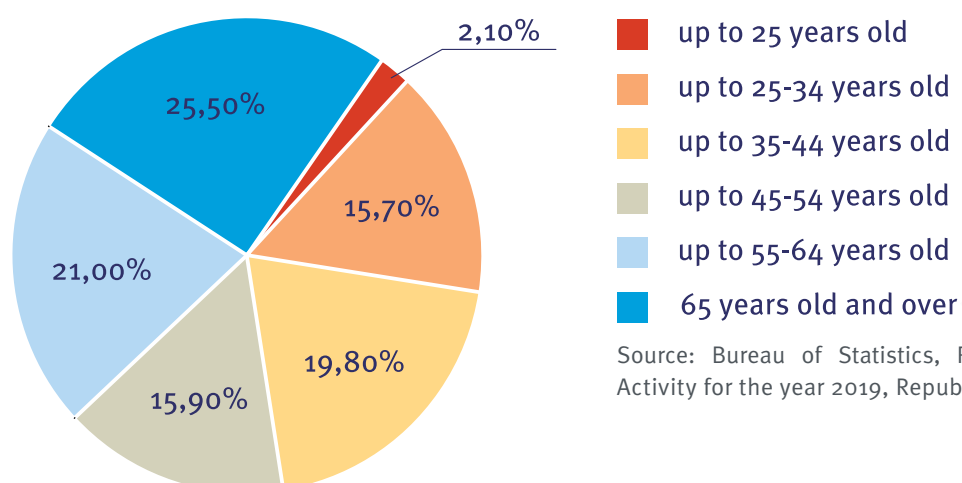
TABLE 1. EMPLOYEES IN THE RESEARCH AND DEVELOPMENT SECTOR BY TYPE OF OCCUPATION, IN 2018-2019.

| | EMPLOYEES | | STRUCTURE, % | |
|----------------------------|--------------|--------------|--------------|--------------|
| | 2018 | 2019 | 2018 | 2019 |
| TOTAL | 4 451 | 4 058 | 100,0 | 100,0 |
| RESEARCHERS | 3 054 | 2 767 | 68,6 | 68,2 |
| TECHNICIANS | 257 | 275 | 5,8 | 6,8 |
| AUXILIARY PERSONNEL | 576 | 510 | 12,9 | 12,6 |
| OTHER PERSONNEL CATEGORIES | 564 | 506 | 12,7 | 12,4 |

Source: Bureau of Statistics, Research and development activity for the year 2019, Republic of Moldova.¹

The structure per age of the researchers shows a decline in the sector as well. The 25-34 year old group is the smallest category compared to any other age group, showing a low level of interest amongst young people in stepping into the R&D sector.

FIGURE 1. THE STRUCTURE OF RESEARCHERS PER AGE CATEGORIES IN 2019.



Source: Bureau of Statistics, Research and Development Activity for the year 2019, Republic of Moldova.²

In 2019, almost 37% of the researchers were in natural sciences, followed by engineering and technological sciences, accounting for 14.6% of total researchers.

¹ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

² <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

TABLE 2. RESEARCHERS' DISTRIBUTION PER SCIENTIFIC AREA, IN 2018-2019.

| | RESEARCHERS | | STRUCTURE, % | |
|--|--------------|--------------|--------------|--------------|
| | 2018 | 2019 | 2018 | 2019 |
| RESEARCHERS - TOTAL | 3 054 | 2 767 | 100,0 | 100,0 |
| Natural sciences | 1 083 | 1 018 | 35,5 | 36,8 |
| Engineering and technological sciences | 445 | 403 | 14,6 | 14,6 |
| MEDICAL SCIENCES | 369 | 339 | 12,1 | 12,2 |
| AGRICULTURE SCIENCES | 392 | 352 | 12,8 | 12,7 |
| SOCIAL SCIENCES | 464 | 393 | 15,2 | 14,2 |
| HUMANISTIC SCIENCES | 301 | 262 | 9,8 | 9,5 |

Source: Bureau of Statistics, Research and development activity for the year 2019, Republic of Moldova.³

In 2019, the expenditure on R&D amounted 498,0 million lei (approx. 25.5 million EUR), representing 0,24% of the GDP of Moldova. 97.3% of this amount represents operational costs, and capital investments are only 2.7%. 88.5% of total expenditure occurs in state-owned organizations. Comparing to the year 2018, R&D expenditure have grown in both sectors: state-owned organizations (+7.6 million MDL or +1.8%) and private companies (+5.9 million MDL or +11.5%).

TABLE 3. EXPENDITURES ON R&D, IN 2018-2019, MILLION MDL.

| | 2018 | | | 2019 | | |
|---------------------------|--------------|-------------------------|----------------------|--------------|-------------------------|----------------------|
| | TOTAL | IN STATE-OWNED ENTITIES | IN PRIVATE COMPANIES | TOTAL | IN STATE-OWNED ENTITIES | IN PRIVATE COMPANIES |
| TOTAL EXPENDITURES | 484,5 | 433,1 | 51,4 | 498,0 | 440,7 | 57,3 |
| OPERATIONAL EXPENDITURES | 469,5 | 419,4 | 50,1 | 484,5 | 428,7 | 55,8 |
| CAPITAL EXPENDITURES | 15,0 | 13,7 | 1,3 | 13,5 | 12,0 | 1,5 |

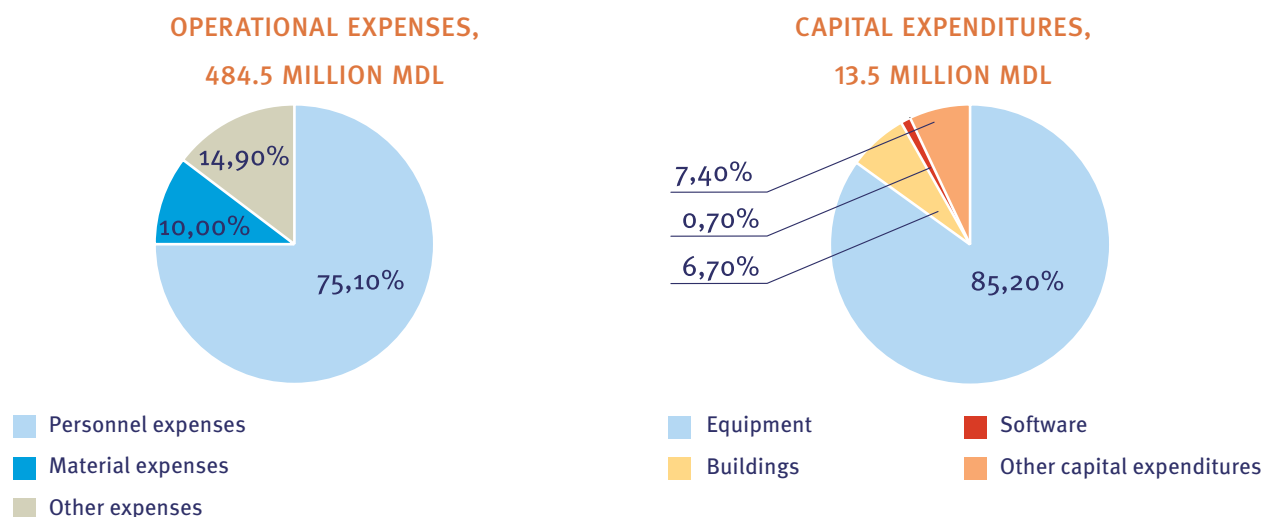
Source: Bureau of Statistics, Research and development activity for the year 2019, Republic of Moldova.⁴

75% of operational expenditure is represented by personnel costs, and 85% of the small capital investments are spent on equipment.

³ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

⁴ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

FIGURE 2. EXPENDITURE STRUCTURE BY COMPONENTS, IN 2019.



Source: Bureau of Statistics, Research and Development Activity for the year 2019, Republic of Moldova.⁵

In spite of the fact that applied research is financed to a proportion of 56.4% and technology development has a rate of 15%, there is still little connection between the academic environment and business environment.

TABLE 4. OPERATIONAL EXPENDITURES DISTRIBUTED PER SCIENTIFIC DOMAINS, IN 2019, MILLION MDL.

| | TOTAL, INCLUDING: | NATURAL SCIENCES | ENGINEERING AND TECHNOLOGY | MEDICAL SCIENCES | AGRICULTURE SCIENCES | SOCIAL SCIENCES | HUMANISTIC SCIENCES |
|--|-------------------|------------------|----------------------------|------------------|----------------------|-----------------|---------------------|
| TOTAL OPERATIONAL EXPENDITURES, INCLUDING: | 484,5 | 178,8 | 90,0 | 57,5 | 81,2 | 39,2 | 37,8 |
| FUNDAMENTAL RESEARCH | 138,5 | 73,1 | 9,0 | 8,0 | 2,5 | 16,5 | 29,4 |
| APPLIED RESEARCH | 273,4 | 97,0 | 24,1 | 42,5 | 78,7 | 22,7 | 8,4 |
| TECHNOLOGY DEVELOPMENT | 72,6 | 8,7 | 56,9 | 7,0 | - | - | - |

Source: Bureau of Statistics, Research and development activity for the year 2019, Republic of Moldova.⁶

The main source for R&D research personnel is doctoral students. The number of postgraduate students increased in 2019 with 4.5% and the number of students supported by state with 8.2%.

TABLE 5. NUMBER OF DOCTORAL STUDENTS.

| | 2018 | 2019 |
|-------------------|------|------|
| TOTAL | 1569 | 1641 |
| STATE FINANCED | 996 | 1078 |
| PRIVATE FINANCING | 573 | 563 |

Source: Bureau of Statistics, Doctoral and postdoctoral activity for year 2019, Republic of Moldova.⁷

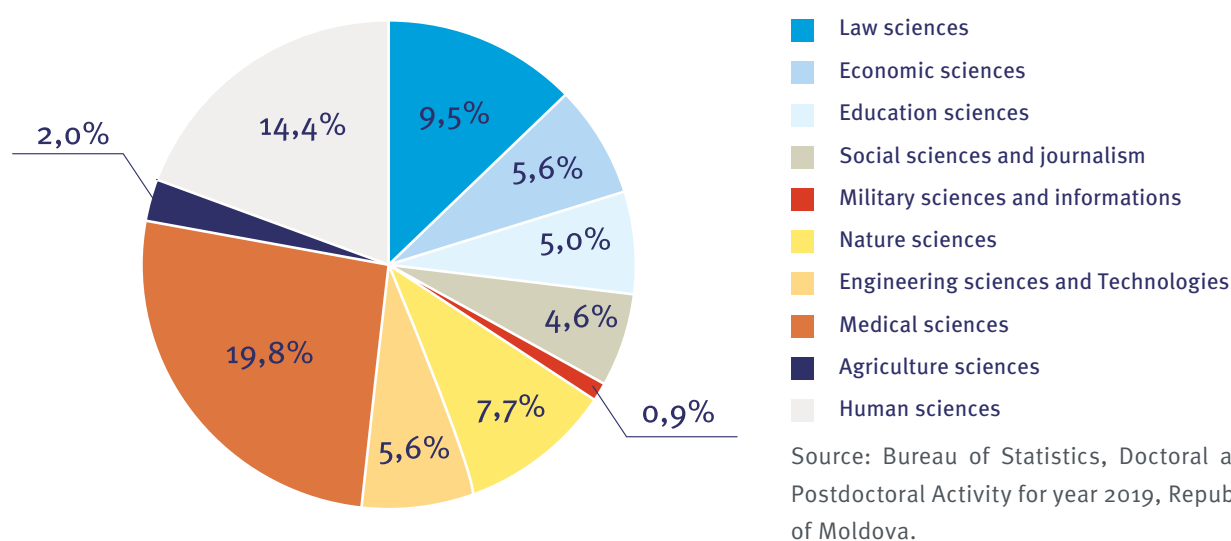
⁵ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

⁶ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6628>

⁷ <https://statistica.gov.md/newsview.php?l=ro&idc=168&id=6633>

The bulk of doctoral studies are concentrated in social, economic and human sciences, accounting altogether for 65% of the total students. Engineering and technology, nature and agriculture sciences account for only 15.3%.

FIGURE 3. STRUCTURE OF DOCTORAL STUDENTS BY SCIENCE AREA, IN 2019.



2.1. POLICY FRAMEWORK RELATED TO R&D

The Government has realized the need for reform in the science and innovation sector. Thus in 2018 the National Agency for Research and Development was created and the distribution of funds among research institutions is now conducted on a competitive basis. 2019 became the first year that the new mechanism of funds distribution became functional.

The key normative act in this area is the Code regarding science and innovation in the Republic of Moldova (no. 259-XV of 15.07.2004⁸), with the final modifications published on 23.02.2018. The law defines the authorities responsible for the evaluation of scientific and research activities, stakeholder roles, intellectual property protection, logistics and financial aspects of the research and innovation area, as well as legal matters pertaining to the scientific researchers.

Based on this law, governmental decision to constitute the National Agency for Research and Development nr. 196 of 28.02.2018⁹ was elaborated, describing the responsibilities and the roles of the agency in the supervision and administration of funds for R&D and innovation activities. In 2019 the Government approved the methodology for financing of projects in the area of research and innovation by the decision nr.382 from 01.08.2019.¹⁰

⁸ Codul cu privire la știință și inovare al Republicii Moldova, Legea nr. 259-XV din 15.07.2004 (Romanian version)

⁹ Hotărârea Guvernului nr.196 din 28.02.2018 cu privire la organizarea și funcționarea Agenției Naționale pentru Cercetare și Dezvoltare (Romanian version)

¹⁰ Hotărârea Guvernului Nr. 382 din 01-08-2019 cu privire la aprobarea Metodologiei de finanțare a proiectelor din domeniile cercetării și inovării (Romanian version)

In April 2018, the Government of Moldova approved the priorities for sectorial policies for medium term (2019-2021) via decision nr.350 of 18.04.2018.¹¹ The innovation is one of the 22 priorities established with 2 policy focuses:

- 1) Connecting research and innovation to the needs of socio-economic development of the country;
- 2) Supporting the participation of young researchers in the thematic programs of the European Union.

In the same year, the Government approved the National Roadmap for Integration of the Republic of Moldova into the European Research space during 2019-2021 and the Action Plan for its Implementation via decision no.1081 of 08.11.2018.¹² In 2019, the Government approved the National Program for the research and innovation sector for the years 2020-2023 and the Action Plan for its implementation via decision nr. 381 from 01.08.2019.¹³ The National Programme in Research and Innovation and the Action Plan for its Implementation are the main policy documents through which the Government sets out priorities and strategic directions for development in research and innovation for the upcoming period of 4 years and ensures synchronization with the country's strategic development agenda, sectoral strategies and EU framework programmes for research and innovation. The National Programme was discussed with EU high-level advisers and represents a coordinated roadmap that serves as guideline for planning EU assistance to Moldova in the area of research and innovation, being in line with the EU aspirations established in the Guidelines for the next European Commission 2019-2024.¹⁴

For the digital area, the Moldovan Government has developed a dedicated strategy for the IT sector and digital innovation ecosystem for the period 2018-2023, adopted by governmental decision nr. 904 of 24.09.2018.¹⁵ The Government aims to facilitate the emergence of dynamic ecosystems through close collaboration with entrepreneurs, investors, corporations and other stakeholders, as well as multiplying IT solutions horizontally through this new digital strategy, focused on developing the ecosystem for digital innovation and supporting start-ups. The new document was discussed with EU experts and aligned to the European Digital Strategy¹⁶ and EU Foreign Policy¹⁷ for digital transformation.

The Moldova 2030 Strategic Priorities Project law is currently undergoing approval in Parliament and a review of the strategic planning framework will also occur. However, it should not change the development vectors and main objectives significantly. A new governmental decision is in process of discussion to approve the new Regulation of the digital innovation and technology start-ups support Fund¹⁸ aiming to facilitate access to finance for start-ups in digital innovation and technology development, enhancement of the competitiveness of residents of the Moldova IT Park.

11 Hotărârea Guvernului nr.350 din 18.04.2018 cu privire la aprobarea priorităților de politici sectoriale pe termen mediu (2019-2021) (Romanian version)

12 Hotărârea Guvernului nr. 1081 din 08.11.2018 cu privire la aprobarea Foii naționale de parcurs pentru integrarea Republicii Moldova în Spațiul european de cercetare pe anii 2019-2021 și a Planului de acțiuni privind implementarea acestuia (Romanian version)

13 Hotărârea Guvernului Nr. 381 din 01-08-2019 cu privire la aprobarea Programului național în domeniile cercetării și inovării pentru anii 2020-2023 și a Planului de acțiuni privind implementarea acestuia (Romanian version)

14 https://ec.europa.eu/commission/sites/beta-political/files/political-guidelines-next-commission_en.pdf

15 Hotărârea Guvernului nr.904 din 24 septembrie 2018 cu privire la aprobarea Strategiei de dezvoltare a industriei tehnologiei informației și a ecosistemului pentru inovare digitală pe anii 2018-2023 și a Planului de acțiuni privind implementare acestuia (Romanian version)

16 <https://ec.europa.eu/digital-single-market/en/content/european-digital-strategy>

17 <https://ec.europa.eu/digital-single-market/en/policies/foreign-policy>

18 Regulamentul Fondului de susținere a inovațiilor digitale și startup-urilor tehnologice (draft regulation, Romanian version)

The national policy framework has a series of normative acts establishing various innovation, industrial and sectorial platforms. The most important are:

1. Law nr. 226 of 01.11.2018 regarding scientific and technological parks and innovation incubators.¹⁹
2. The Law nr. 77 of 21.04.2016 regarding information technology parks²⁰ that establishes significant fiscal facilitations, including a unified tax of 7%, calculated based on sales that substituted a series of taxes, as well as VAT and labour taxes. Based on this law the Government, by decision nr.1144 of 20.12.2017,²¹ has established the “Moldova IT Park” that started to administrate and register residents benefiting from the facilities.
3. Law nr.440 of 27.07.2001 regarding free economic zones²² has established a framework and fiscal facilitations for investors aiming to import raw materials and export production. These zones became important industrial hubs.
4. Law nr. 182 of 15.07.2010 regarding industrial parks.²³

Research activity is guided by the Ministry of Education, Culture and Research. Thus, the educational aspects of the research area are governed by Education Code nr. 152 of 17.07.2014²⁴, especially the aspects linked to scientific researchers and doctoral and post-doctoral studies.

A series of agreements and protocols were signed regarding cooperation in the area of research and science. The most important are listed below:

1. The Collaboration Agreement between the Executive Unit for financing university education, research and innovation in Romania and National Agency for Research and Development from the Republic of Moldova.²⁵
2. Memorandum of Understanding between Republic of Moldova and European Union regarding the association of the Republic of Moldova with the 7th Framework Programme of the European Community for research and technological development and demonstration activities (2007-2013), as ratified by law nr.279 of 27.12.2011.²⁶ Based on the Memorandum the Government have decided upon the establishment of the Office of the Republic of Moldova for Science and Technology at the European Union by decision nr. 790 of 22.10.2012.²⁷ The Regulation regarding the functioning of the Office of the Republic of Moldova for Science and Technology at the European Union was issued by NARD in 19.12.2018 by Order nr.70.²⁸
3. Protocol on Co-operation in Science and Technology between the Scientific and Technological Research Council of Turkey and the National Agency for Research and Development of the Republic of Moldova.²⁹

19 Legea nr. 226 din 01.11.2018 cu privire la parcurile științifico-tehnologice și incubatoarele de inovare (Romanian version)

20 Lege nr. 77 din 21.04.2016 cu privire la parcurile pentru tehnologia informației (Romanian version)

21 Hotărârea Guvernului Nr. 1144 din 20-12-2017 cu privire la crearea parcului pentru tehnologia informației „Moldova IT park” (Romanian version)

22 LEGE Nr. 440 din 27.07.2001 cu privire la zonele economice libere (Romanian version)

23 LEGE Nr. 182 din 15.07.2010 cu privire la parcurile industriale (Romanian version)

24 CODUL Nr. 152 din 17.07.2014 (Romanian version)

25 Acord de colaborare dintre UEFISCDI și ANCD (Romanian version)

26 LEGE Nr. 279 din 27.12.2011 pentru ratificarea Memorandumului de înțelegere între RM și UE privind asocierea RM la Cel de-al Șaptelea Program-cadru al Comunității Europene pentru cercetare, dezvoltare tehnologică și activități demonstrative (2007–2013) (Romanian version)

27 Hotărârea Guvernului Nr. 790 din 22.10.2012 cu privire la instituirea Oficiului Republicii Moldova pentru Știință și Tehnologie pe lângă Uniunea Europeană (Romanian version)

28 Ordinul Agenției Naționale pentru Cercetare și Dezvoltare nr. 70 din 19. 12.2018 (Romanian version)

29 Protocol on Co-operation in Science and Technology between The Scientific and Technological Research Council of Turkey and the National Agency for Research and Development of the Republic of Moldova

4. Agreement on Scientific and Technical Cooperation between the State Committee for Science and Technology of the Republic of Belarus and the National Agency for Research and Development.³⁰

2.2. KEY NATIONAL, REGIONAL, AND SECTORAL STAKEHOLDERS

As was specified in chapter "3.1. Policy framework related to R&D", research activities are guided by the Ministry of Education, Culture and Research. In addition to the activities of MECR, there are also research centres under the supervision of the Ministry of Agriculture, Regional Development and Environment and the Ministry of Health, Labour and Social Protection. The full list of research institutions is presented in Table 6 below. The Ministry of Economy and Infrastructure supervises various platforms for technology and business development. These 4 ministries are key policymakers in the areas of R&D and industrialization.

The recently (2018) created National Agency for Research and Development is a key player for the implementation of governmental policies in the area of R&D and plays the role of fund allocation for research projects on a competitive basis.

TABLE 6. LIST OF PUBLIC RESEARCH INSTITUTIONS.

| MINISTRY OF EDUCATION, CULTURE AND RESEARCH | | |
|---|--|---|
| 1. | STATE UNIVERSITY OF MOLDOVA | http://usm.md/ |
| 2. | STATE PEDAGOGICAL UNIVERSITY OF MOLDOVA "ION CREANGĂ" | https://www.upsc.md/ro/ |
| 3. | STATE PEDAGOGICAL UNIVERSITY "ALECU RUSSO", BĂLȚI | http://usarb.md/ |
| 4. | STATE UNIVERSITY OF PHYSICAL EDUCATION AND SPORTS | http://www.usefs.md/ |
| 5. | STATE UNIVERSITY "DIMITRIE CANTEMIR" | http://edu.asm.md/md |
| 6. | STATE UNIVERSITY FROM TIRASPOL | https://ust.md/ |
| 7. | COMMERCIAL COOPERATIVE UNIVERSITY OF MOLDOVA | http://www.uccm.md/ro/ |
| 8. | TECHNICAL UNIVERSITY FROM MOLDOVA | https://utm.md/ |
| 9. | ACADEMY OF ECONOMIC STUDIES FROM MOLDOVA | http://www.ase.md/ro/ |
| 10. | ACADEMY OF MUSIC, THEATER AND FINE ARTS | http://amtap.md/ |
| 11. | INSTITUTE OF EDUCATIONAL SCIENCES | http://www.ise.md/ |
| 12. | INSTITUTE OF CHEMISTRY | http://chem.asm.md/ |
| 13. | INSTITUTE OF MATHEMATICS AND INFORMATICS "VLADIMIR ANDRUNACHEVICI" | http://www.math.md/ |
| 14. | INSTITUTE OF APPLIED PHYSICS | https://www.phys.asm.md/ |
| 15. | INSTITUTE OF GEOLOGY AND SEISMOLOGY | http://igs.asm.md |
| 16. | INSTITUTE OF ZOOLOGY | http://www.zoology.asm.md/ |
| 17. | INSTITUTE OF ECOLOGY AND GEOGRAPHY | http://www.ieg.asm.md/ |

³⁰ Agreement on scientific and technical cooperation between the State Committee for Science and Technology of the Republic of Belarus and the National Agency for Research and Development (Romanian version)

| | | |
|--|---|---|
| 18. | INSTITUTE OF ELECTRONIC ENGINEERING AND NANOTECHNOLOGIES "DUMITRU GHIȚU" | http://nano.asm.md |
| 19. | INSTITUTE OF ENERGY | http://www.ie.asm.md |
| 20. | INSTITUTE OF PHYSIOLOGY AND SANOCREATOLOGY | http://www.ifs.asm.md/ |
| 21. | INSTITUTE OF MICROBIOLOGY AND BIOTECHNOLOGY | http://www.imb.asm.md/ |
| 22. | INSTITUTE OF GENETICS, PHYSIOLOGY AND PLANT PROTECTION | http://igfpp.asm.md/ |
| 23. | INSTITUTE OF CULTURAL HERITAGE | http://patrimoniul.asm.md/ |
| 24. | INSTITUTE OF ROMANIAN PHILOLOGY "BOGDAN PETRICEICU HAȘDEU" | http://www.if.asm.md/ |
| 25. | INSTITUTE OF LEGAL, POLITICAL AND SOCIOLOGICAL RESEARCH | http://icjp.asm.md/ |
| 26. | INSTITUTE OF HISTORY | http://www.history.asm.md/ |
| 27. | NATIONAL INSTITUTE FOR ECONOMIC RESEARCH | https://www.ince.md/ |
| 28. | INFORMATION SOCIETY DEVELOPMENT INSTITUTE | https://idsi.md/ |
| 29. | NATIONAL BOTANICAL GARDEN (INSTITUTE) "ALEXANDRU CIUBOTARU" | http://www.gradinabotanica.asm.md/ |
| 30. | "ANDREI LUPAN" SCIENTIFIC LIBRARY (INSTITUTE) | http://bsclupan.asm.md/ |
| 31. | NATIONAL MUSEUM OF ETHNOGRAPHY AND NATURAL HISTORY | http://www.muzeu.md/ |
| 32. | NATIONAL MUSEUM OF HISTORY OF MOLDOVA | https://www.nationalmuseum.md/ro/ |
| MINISTRY OF HEALTH, LABOUR AND SOCIAL PROTECTION | | |
| 1. | ONCOLOGICAL INSTITUTE | http://onco.md/ |
| 2. | MOTHER AND CHILD INSTITUTE | https://www.mama-copilul.md/ |
| 3. | INSTITUTE OF NEUROLOGY AND NEUROSURGERY | http://inn.md/ |
| 4. | INSTITUTE OF CARDIOLOGY | http://icardiologie.md/ |
| 5. | "CHIRIL DRAGANIUC" INSTITUTE OF PHTHISIOPULMONOLOGY | http://ftiziopneumologie.asm.md/ |
| 6. | INSTITUTE OF EMERGENCY MEDICINE | http://www.urgenta.md/ |
| 7. | REPUBLICAN CLINICAL HOSPITAL | http://www.scr.md/ |
| 8. | NATIONAL PUBLIC HEALTH AGENCY | http://ansp.md/ |
| 9. | "NICOLAE TESTEMITANU" STATE UNIVERSITY OF MEDICINE | http://usmf.md/en/ |
| MINISTRY OF AGRICULTURE, REGIONAL DEVELOPMENT AND ENVIRONMENT | | |
| 1. | STATE AGRARIAN UNIVERSITY OF MOLDOVA | http://www.uasm.md/ |
| 2. | CENTER FOR RESEARCH ON AQUATIC GENETIC RESOURCES "ACVAGENRESURS" | |
| 3. | "MECAGRO" INSTITUTE OF AGRICULTURAL TECHNOLOGY | http://mecagro.md/ro/credit-tehnic |
| 4. | FIELD CROPS RESEARCH INSTITUTE (SELECTION) | http://agriculture.cia.md/fito/index.html |
| 5. | "PORUMBENI" INSTITUTE OF PHYTO TECHNICS | http://porumbeni.md/ |
| 6. | SCIENTIFIC-PRACTICAL INSTITUTE OF HORTICULTURE AND FOOD TECHNOLOGIES | http://agriculture.cia.md/ISPHA/index.html |
| 7. | "NICOLAE DIMO" INSTITUTE OF PEDOLOGY, AGROCHEMISTRY AND SOIL PROTECTION | http://www.ipaps.md/home/ |
| 8. | SCIENTIFIC-PRACTICAL INSTITUTE OF BIOTECHNOLOGIES IN ANIMAL HUSBANDRY AND VETERINARY MEDICINE | http://agriculture.cia.md/tevit/ |
| STATE CHANCELLERY | | |
| 1. | ACADEMY OF PUBLIC ADMINISTRATION | http://aap.gov.md/ |

Source: National Agency for Research and Development, Republic of Moldova.

The main platforms for industrialization and business development are represented by:

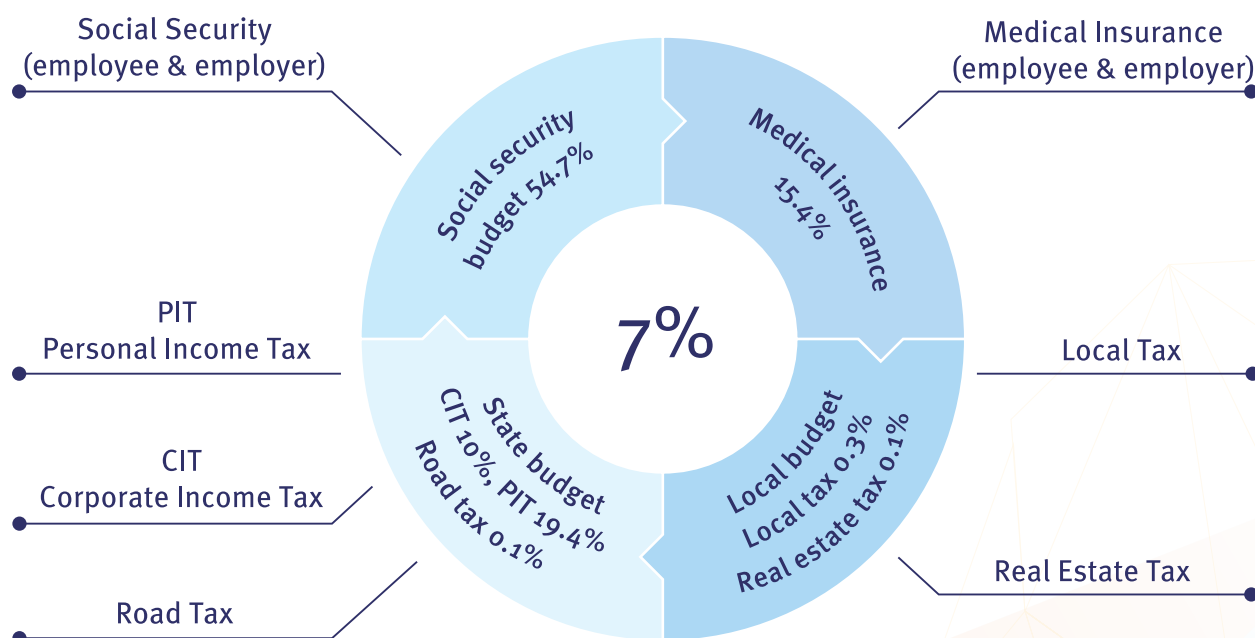
1. An IT Virtual Park.
2. Free Economic Zones (9 zones and 16 subzones).
3. Industrial Parks (10).
4. The Organization for Development of SMEs (ODIMM) and 11 business incubators.
5. Scientific-technological park, "Academica", and 7 innovation incubators, mostly created by universities.
6. Clusters: 4 agro-tourism clusters, 1 automotive industry cluster, 1 energy and biomass cluster, 1 educational cluster, 1 trans-border organic agriculture promotion cluster (covering Romania, Moldova, Ukraine).

The most successful platforms are the Free Economic Zones and IT Virtual Park that offer very concrete fiscal and operational facilities and ODIMM for providing grant schemes, knowledge and educational support for SMEs.

2.2.1. IT VIRTUAL PARK

The main facility of the IT Virtual Park is the substitution of most taxes for one single tax of 7% applied to the company's turnover. The list of taxes is presented in Figure 4 below:

FIGURE 4. LIST OF TAXES THAT ARE SUBSTITUTED BY ONE SINGLE TAX OF 7% ON TURNOVER.










Source: Agency for investment, Moldova.

According to the IT Park Moldova annual report for 2019, the platform has 525 active residents, which employs 9716 specialists (87% of the personnel are involved directly in IT activities). Residents of the IT Park have realized a revenue of 2.9 billion MDL (approx. 150 million EUR), an increase of 30% compared to 2018. The IT Park ensured a single tax collection amounting to 258.2 million MDL (approx. 13.2 million EUR). During the interview with a resident of the IT Park the feedback was very positive.

2.2.2. FREE ECONOMIC ZONES

INCENTIVES IN FREE ECONOMIC ZONE (FEZ)

| | |
|---|--|
| 0% CIT | for a period 3(5) years when investing at least 1(5) million USD |
| 0% VIT | no Excise and Customs duties |
| 10 YEARS | State guarantee on legislation changes |
| 24/7 | Customs office on site |
|  | Road and utilities infrastructure |
|  | EU border green lane (AEO) |
|  | Dual vocation system |
|  | Ongoing professional support by FEZ Administration |
|  | 0.15-3.5 euro/m% land sales price |
|  | EUR/USD payments among FEZ residents |
|  | Minimal state inspection and control regime |

Free economic zones (FEZs) are excellent platforms for export- oriented businesses that benefit from a preferential customs and tax regime.

Activities in the FEZ are limited to industrial production, packaging, trade, transportation, logistics and utilities, with priority given to manufacturing.

The total level of investments attracted in FEZs amounts to 432.7 million USD since the foundation of FEZs until December 31st 2019. The total number of employees recorded at the end of 2019 amounts to 18180 persons, an increase of 14.5% compared to 2018. Most successful in operations are FEZ Bălți that attracted approx. half of the investments in all FEZs and most of the subzones across Moldova, including the Cahul subzone. The total volume of production represents 11.7 billion MDL (approx. 600 million EUR) in 2019, recording an increase of 7.9% compared to the previous year.

2.2.3. INDUSTRIAL PARKS

INCENTIVES IN INDUSTRIAL PARKS

| | |
|---|---|
|  | Free re-zoning of agricultural into industrial land; |
|  | Normative (below market) prices for the purchased land; |
|  | Reduced rental price for state land; |
|  | Free connection to existing infrastructure in the park; |
|  | Minimal state inspection and control regime. |

Industrial Parks have less tax incentives, however these platforms are functional, and they enable industrial production with simplified access to infrastructural facilities.

The last report published on Ministry of Economy Infrastructure is for the year 2017. The total number of employees working in industrial parks increased to 2866. The volume of sales recorded by residents amounts to 2.2 billion MDL (approx. 130 million EUR).

Since the foundation of the industrial parks (2011) most investments are made in "Tracom" industrial park (Chisinau), at 498 million MDL; followed by "Triveneta Cavi Development" (Straseni) – circa 317 million MDL; and Edinet industrial park (Edinet) at approximately 229 million MDL. All other industrial parks have either no investments or very limited investments as of the end of 2017.

2.2.4. ODIMM AND BUSINESS INCUBATORS (RIAM)

ODIMM and its network of business incubators (totalling 11 offices) throughout Moldova offer training and support for start-ups and SMEs aiming to grow. The network of incubators houses 195 residents, out of which 94 are start-ups. The number of employees total 998 for the end of 2018. Residents of business incubators registered in 2018 a revenue of 117 million MDL (approx. 6 million EUR). There are 350 companies that have "graduated" to business incubation out of which 262 are active, registering a 75% of survival rate.

The incubated companies are housed in an incubator for a period of 3 years. During this time companies benefit from services that can be grouped as follows:

- Providing office and production space for rent at a lower price than the commercial one;
- Administrative and technical services (reception, secretariat, security, communication services);
- Business consultancy and guidance;
- Access to finance.

According to a RIAM report³¹ most of consultancy service requests are focused on following domains:

- Business start-up consultancy;
- Consultancy and assistance in the elaboration of business and marketing plans;
- Consultancy in the field of legislation;
- Business management consultancy and training;
- Assistance for the development of national and international partnerships;
- Human resources management;
- Dissemination of information on national and international programs managed by ODIMM;
- Dissemination of information on the opportunities offered by other programs / projects operational.

31 <https://riam.md/wp-content/uploads/2017/05/Raport-Activitatea-RIAM-2019.pdf>

Most of incubators inhabit 2-4 floor buildings with an area of between 1000 and 2100 m2. The space is still underused and 23% of office spaces and 18% of the production facilities are available. The mapping of all FEZ, industrial parks and incubators are presented in Figure 5 below.

FIGURE 5. MAPPING OF BUSINESS PLATFORMS IN MOLDOVA.



| Industrial Parks | | Business Incubators | |
|---------------------------------------|------------------------|---------------------|-------------|
| Tracom (Chișinău) | | ODIMM (Chișinău) | Leova |
| Răut (Bălți) | Cahul | Cahul | Nisporeni |
| Cimișlia | Bioenergagro (Drochia) | Călărași | Rezina |
| Edineț | FAIP (Durlășeni) | Ceadăr Lunga | Soroca |
| Comrat | CAAN (Strășeni) | Cimișlia | Sângerei |
| Triveneta Cavi Development (Strășeni) | | Dubăsari | Ștefan Vodă |

Source: Investment Agency, Ministry of Economy and Infrastructure with additions and actualizations by author.

The Scientific-technological parks and research incubators have rather limited activity and need policy improvements to stimulate their activity.

In addition to the state owned and public platforms there are private platforms for business development. These are represented mainly by **start-up accelerators** that offer excellent opportunities for communication, testing of business ideas, partnering, training and housing for small start-up teams.

TABLE 7. LIST OF PRIVATE START-UP ACCELERATORS.

| INSTITUTION | MAIN OBJECTIVE | SECTOR | STAKEHOLDERS | INITIATIVE |
|---------------------------------------|---|---------------------------|---|----------------------------|
| FABLAB (FABRICATION LABORATORY) | An ultra-modern platform for digital manufacturing, industrial design and engineering, equipped with state-of-the-art equipment and equipment assisted by computers, divided into 5 work areas: Co-working, 3D Printing, Electronics and IoT, Woodworking and Metalworking. https://utm.md/blog/2018/05/05/start-fablab-chisinau/ | Manufacturing | Government of the Republic of Moldova, USAID-Moldova, Government of Sweden, National Association of ICT Companies, Technical University of Moldova "Nanu Market" company. | Government institution |
| BUSINESS ANGELS MOLDOVA | A group of experienced businesspeople and top managers ready to invest in start-ups at their early stage of development, providing mentorship, funding and networking opportunities. https://www.businessangels.md/ | Finance | USAID, Moldovan Association of ICT Companies (ATIC), Sweden, Tekwill | Private |
| START-UP ACADEMY | A learning centre for start-up development programs, mentoring and workshops. https://www.startupacademy.md/ | Education | USAID, Sweden Sverige, Tekwill | Private |
| GENERATOR HUB | A project with the purpose of growth in the IT domain in Moldova creating an easy to access coworking space, where start-ups can obtain experience, advice and mentorship, thus creating a community that operates by constantly exchanging experience, ideas and knowledge. In addition, the residents of Generator Hub will also benefit from various development programs like events, seminars, workshops, business trainings and other. https://hub.md/en | ICT services | YOPESO; Spooky House; Fusion works; Starnet; Gramatic; IMAGO, ITLAB; FEST,md; GEEKO clouding housing; Memora; S&T; D-Link | NGO |
| IHUB | A central co-working space for developing an ecosystem of innovative start-ups that provides education , access to investors, professional orientation for start-ups and IT specialists at affordable rates. https://www.ihub.md/ | ICT and Learning platform | Technical University of Moldova, Tekwill | Public-private partnership |

| | | | | |
|----------------------------|---|-------------------|--|-----------------------------|
| TEKWILL | A technology focused community for great ideas, resources, science and industry to enhance excellence in information technology. https://www.tekwill.md/ | ICT and Education | USAID, Sida/Swedish International, Moldovan Association of ICT Companies (ATIC), Technical University of Moldova. | Public -private partnership |
| ZIPHOUSE | Stimulates the creative potential and entrepreneurial spirit in the field of design, contributing to the development of a professional community integrated into the vibrant world of fashion. https://www.ziphouse.md/ | Textiles | USAID, Technical University of Moldova, Proiectului Creșterea Competitivității și Dezvoltarea Întreprinderilor II (CEED II), Asociația Patronală a Industriei Ușoare din Moldova (APIUS) | Public-private partnership |
| DIGITAL PARK | Ecosystem for professional growth in IT, designed to become a central meeting space for companies active in the IT industry, connecting technology companies with old history or start-up businesses, IT developers, national and international companies, oriented towards innovation and progress. https://digitalpark.md/en/ | ICT services | Government | Government institution |
| DREAMUPS INNOVATION CAMPUS | A centre for development of a community where young entrepreneurs learn, exchange ideas and launch global companies. https://dreamups.com/ | Education | Individual Entrepreneurs | Private |

Business associations and Chambers of Commerce have experience of organizing training sessions, connecting different stakeholders and are excellent platforms for disseminating information and organizing meetings with relevant organizations and businesses.

2.3. BRIEF SUMMARY OF EXISTENT INNOVATION SUPPORT AND PROMOTION POLICIES, PROGRAMMES, MECHANISMS, TOOLS AND INCENTIVES

A series of programmes and reforms in research and innovation has been prompted by governmental objectives of attracting further investment and increasing competences domestically.

2.3.1. NATIONAL AGENCY FOR RESEARCH AND DEVELOPMENT

The recently formed National Agency for Research and Development has significantly changed the rules for accessing of funds by research institutions and organizations, by distributing them on a competitive basis.

STATE PROGRAMME 2020-2023

Following the adoption of Government decision 381/2019 on the approval of the National Program in the fields of research and innovation and Government Decision 382/2019 on the Methodology of funding for research and innovation projects, the National Agency for Research and Development organized the contest "State Programme" (2020-2023). In late 2019 the selection of research programmes was organized for the "State Programme". 249 teams of researchers have applied, involving 4496 persons. The projects amounted to 425.6 million MDL (approx. 21.7 million EUR) but available finance was only 224.7 million MDL (approx. 11.5 million EUR). As result 101 projects can be financed from available resources, however the Council recommended adding 66 additional projects for financing. As a result, 3006 persons will be involved in 166 projects during 2020.

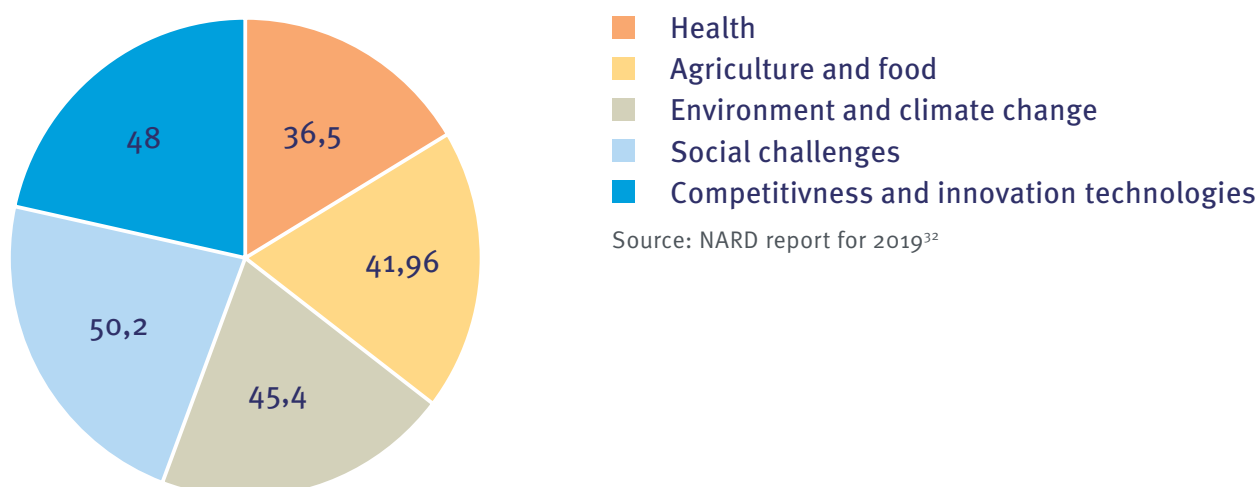
THE TOP 10 ORGANIZATIONS THAT HAVE RECEIVED FINANCE ARE:

| INSTITUTION | | FINANCING, THOUSAND MDL |
|-------------|--|-------------------------|
| 1 | State University of Medicine and Pharmacy "N. Testemiteanu " | 20 078.9 |
| 2 | Institute of Genetics, Physiology and Plant Protection | 15 477.7 |
| 3 | Institute of Applied Physics | 14 294.1 |
| 4 | Technical University of Moldova | 14 138.2 |
| 5 | State University of Moldova | 12 579.5 |
| 6 | Scientific-practical Institute of Horticulture and Food Technology | 10 561.6 |
| 7 | Institute of Chemistry | 9 510.6 |
| 8 | The Botanical Garden "A. Ciubotaru " | 8 424.7 |
| 9 | Institute of Zoology | 8 338.1 |
| 10 | Institute of Microbiology and Biotechnology | 5 870.4 |

Source: NARD report

The distribution of financing approved per domain is depicted in the diagram below.

FIGURE 6. DISTRIBUTION OF FINANCE OF "STATE PROGRAMME" PER DOMAINS, MILLION MDL.



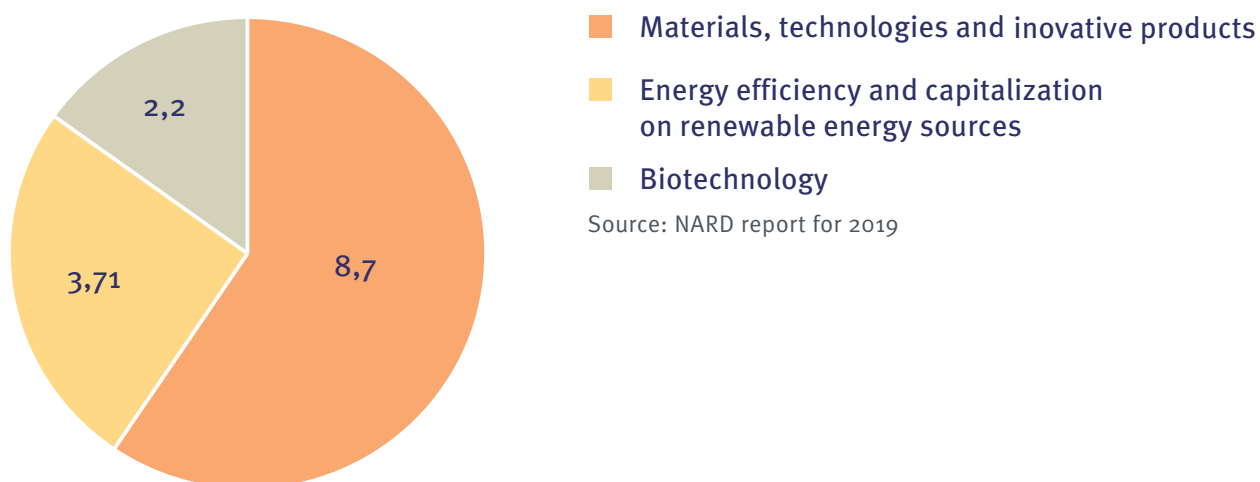
32 https://ancd.gov.md/sites/default/files/document/attachments/Raport%20proiect%202019%20ANCD_o.pdf

INNOVATION AND TECHNOLOGY TRANSFER PROGRAM

Of particular interest is the Innovation and Technology Transfer Programme. In spite of a small budget allocation, the programme is significant as it stimulates cooperation between business and academic institutions and it leverages the state contribution of at least a 1:1 ratio. In 2019, the state budget contributed 6.1 million MDL (approx. 310 thousand EUR) and attracted an additional 8.5 million MDL (approx. 434 thousand EUR). A total of 12 projects were financed, the distribution of finances by strategic directions is shown in Figure 7 below.

FIGURE 7. DISTRIBUTION OF FUNDS (STATE OWNED AND PRIVATE)

BY STRATEGIC PRIORITIES, MILLION MDL



This programme is a good starting point to increase cooperation between the business environment and academic research institutions, as well as to stimulate the operations of scientific parks and innovation incubators.

There are a series of bilateral and multilateral projects being implemented as present. Most of them are focused mainly on academic research, linkages, exchange programmes, conferences, learning programmes, publications etc. Among these are Horizon 2020, Erasmus+, COSME, the Moldo-Italian bilateral programme, the Moldo-Belarusian bilateral programme, the multilateral programme of the Scientific-Technological Centre of Ukraine, ERA.Net.RUS Plus etc.

2.3.2. ORGANIZATION FOR SMALL AND MEDIUM ENTERPRISE DEVELOPMENT (ODIMM)

ODIMM is among many programmes supporting SMEs through a dedicated digitalization programme³³. It has two financing instruments: business vouchers and the Grant for SME Digitalization. These initiatives were launched this year in the context of Covid-19 pandemic, to address the increased need for digitalization, eSales and distance working.

³³ <https://www.odimm.md/ro/digitalizarea>

BUSINESS VOUCHER

This is a 100% grant that does not require mandatory private contribution, focused mainly on consultations and support to create a road map for the beneficiary to set up online sales, develop a website or improve the existing one, or to set up digital media campaigns. The maximum amount of the grant is 20 thousand MDL (1000 EUR).

SME DIGITALIZATION GRANT

This programme represents a grant of 200 thousand MDL (10,000 EUR) with a mandatory contribution of at least 10%. The grant's objective is to digitalize a company's operations. It can be used for procurement of necessary equipment, specialized and customized software to digitalize and modernize the operational process of the company.

ECO SME GRANT

This programme offers financial support to SMEs in the form of grants for the implementation of greening actions on resource efficiency, application of sustainable production and consumption models, introduction of eco-innovations in technological processes, waste reduction and management, pollution prevention and water resources management.

The maximum grant amount is 500 000 MDL (25,600 EUR), up to 50% of the total investment cost, or for small investments 200,000 MDL (10,200 EUR) is offered, covering up to 70% of the investment cost.

2.3.3. MOLDOVA COMPETITIVENESS PROJECT (MCP)³⁴

This project is implemented by Chemonics International financed by USAID. It started in September 2015 and ends in September 2020. The project is not focused specifically on R&D, however it is focused on supporting private companies in Moldova to improve competitiveness, improve quality of products and adapt them for external markets. In most of the cases this cannot be done without adoption of new technologies, improvement of organizational and productions processes. During the 5 years of project implementation so far they have gathered good practical knowledge of industrialization processes, innovation and technology adoption challenges in the Moldovan environment.

2.4. BENCHMARKING OF THE MOLDOVAN INNOVATION SYSTEM

In spite of the reduced focus of the Government on R&D and innovation until recently, compounded by obsolete facilities and organizational principles, Moldova still has a platform to build on and with the right policy changes and support it can register significant improvements in international rankings pertaining to innovation.

The Global Innovation Index 2019 positions Moldova in 58th place out of 129 countries, with a score of 35.52

³⁴ <https://www.chemonics.com/projects/boosting-business-moldova/>

out of 100 (the maximum score was recorded by Switzerland – 67.24). For the Innovation Input Sub-Index³⁵ (measuring elements enabling innovation activities) ranks Moldova much worse, placing it 81 with a score of 40.77. The Innovation Output Sub-Index³⁶ (measuring actual evidence of innovation outputs) positions Moldova in 45th place, with a score of 30.26 (Switzerland ranked number one with a score of 63.45), showing that in spite of poor conditions and policy environment, Moldova's innovation sector can bring results. Improvements in input innovation elements (policies, education, and business environment) can bring substantial results in outputs. This discrepancy between input and output probably suggests a relatively high existing capacity and indicates an opportunity to improve the situation by relevant and timely policy decisions and programs. This is confirmed by the quite high Innovation Index score, outperforming Romania, Serbia and Georgia on this indicator, being closer to Estonia and Ukraine. (See Table 8 below).

TABLE 8. GLOBAL INNOVATION INDEX 2019, MOLDOVA POSITIONING VERSUS NEIGHBOURS AND PEERS.

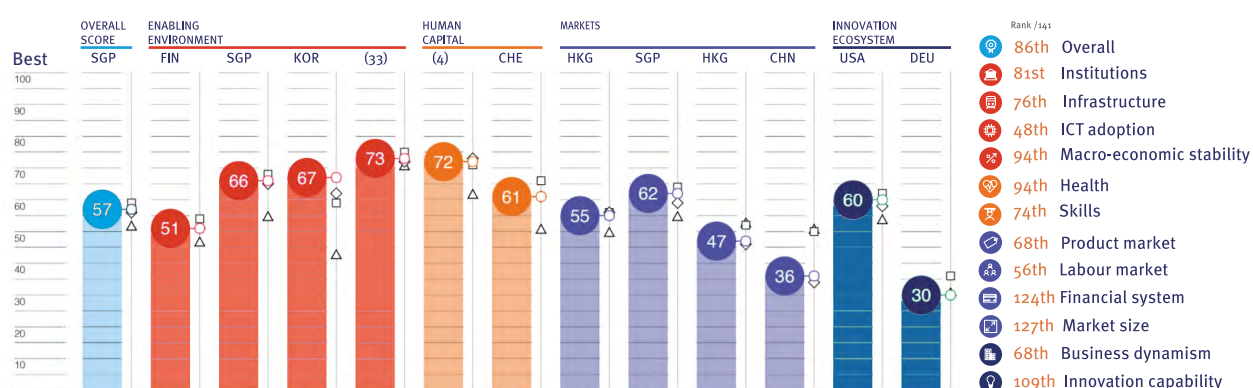
| | INNOVATION | INDEX | INNOVATION | INPUT | INNOVATION | OUTPUT | Innovation |
|---------|------------|-------|------------|-------|------------|--------|------------------|
| | Rank | Score | Sub-Index | Score | Sub-Index | Score | Efficiency Index |
| | Rank | Score | Rank | Score | Rank | Score | (output/input) |
| Estonia | 24 | 49.97 | 27 | 56.10 | 19 | 43.83 | 0.78 |
| Ukraine | 47 | 37.40 | 82 | 40.73 | 36 | 34.07 | 0.84 |
| Georgia | 48 | 36.98 | 44 | 48.19 | 60 | 25.76 | 0.53 |
| Romania | 50 | 36.76 | 54 | 45.51 | 53 | 28.02 | 0.62 |
| Serbia | 57 | 35.71 | 62 | 44.50 | 57 | 26.93 | 0.61 |
| Moldova | 58 | 35.52 | 81 | 40.77 | 48 | 30.26 | 0.74 |
| Albania | 83 | 30.34 | 70 | 42.42 | 93 | 18.26 | 0.43 |

Source: Global Innovation Index Report 2019

 Highest rank/score

In the Global Competitiveness Index, Moldova is ranked 88th out of 141 countries and gained 2 positions compared to 2018. The general overview is presented below.

FIGURE 8. GLOBAL COMPETITIVENESS INDEX 2019, MOLDOVA OVERVIEW.



Source: Global Competitiveness Index (WEF 2019)

- 35 **Innovation Input Sub-Index:** Five input pillars capture elements of the national economy that enable innovative activities : Institutions (3 sub-pillars : Political environment, Regulatory environment, Business environment), Human capital and research (3 sub-pillars : Education, Tertiary education, Research and development) Infrastructure (3 sub-pillars : ICT, Energy, General infrastructure) Market sophistication (3 sub-pillars : Credit, Investment, Trade and competition), Business sophistication (3 sub-pillars : Knowledge workers, Innovation linkages, Knowledge absorption)
- 36 **Innovation Output Sub-Index:** Two output pillars capture actual evidence of innovation outputs: Scientific outputs (3 sub-pillars : Knowledge creation, Knowledge impact, Knowledge diffusion), Creative outputs (2 sub-pillars : Creative intangibles, Creative goods and services outputs)

The component analysis of the Competitiveness Index shows that ICT adoption (3rd pillar) is relatively good, with Moldova being ranked 48th. E-participation of the public sector in Moldova is ranked 36th. However, the general administration of the Government is poor: for burden of government regulation, Moldova ranks 76th; government responsiveness to change is ranked 104, policy stability and government long-term vision is ranked 116th. In spite of the fact that Moldova is ranked 35th for the mean years of schooling, the quality of workforce and graduates is ranked at 100 or below. The discrepancy of these indicators shows that the education system is of poor quality and unaligned to economic needs. Unlike other skills, digital skills among active population is ranked 50th, showing a good level of readiness for digitalization processes. A list of relevant component indicators vs neighbours and peers is presented below.

TABLE 9. GLOBAL COMPETITIVENESS INDEX 2019, SELECTED INDEX COMPONENT OF MOLDOVA VERSUS NEIGHBOURS AND PEERS

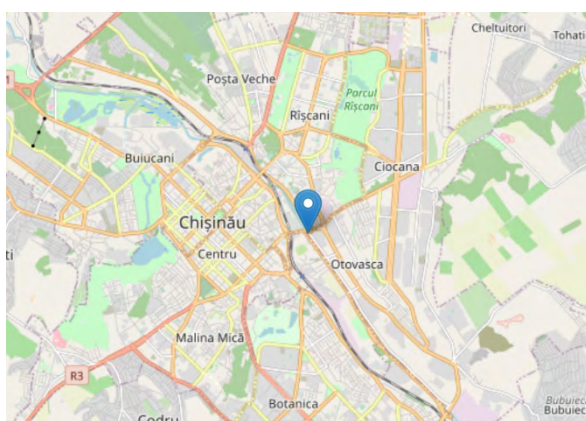
| No | INDEX COMPONENT | MOLDOVA | | ROMANIA | | UKRAINE | | ESTONIA | | GEORGIA | |
|-----------|---|------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|------------|-------------|
| | | RANK | SCORE | RANK | SCORE | RANK | SCORE | RANK | SCORE | RANK | SCORE |
| | Global Competitiveness Index | 81 | | 51 | | 85 | | 31 | | 74 | |
| 1.12 | E-participation in public sector | 36 | 86.0 | 66 | 70.8 | 72 | 68.5 | 27 | 91.0 | 84 | 62.4 |
| 1.15 | Intellectual property protection | 91 | 47.1 | 43 | 61.5 | 118 | 39.4 | 26 | 71.9 | 94 | 46.5 |
| 1.22 | Legal framework's adaptability to digital business models | 98 | 37.4 | 40 | 51.4 | 89 | 39.0 | 6 | 69.3 | 38 | 51.6 |
| 3 | ICT adoption (3rd pillar) | 48 | 66.8 | 31 | 72.0 | 78 | 51.9 | 16 | 78.8 | 55 | 63.7 |
| 3.01 | Mobile-cellular telephone subscription | 118 | 73.3 | 71 | 96.9 | 60 | 100.0 | 17 | 100.0 | 33 | 100.0 |
| 3.02 | Mobile-broadband subscriptions | 75 | 72.8 | 48 | 88.0 | 109 | 45.2 | 5 | 100.0 | 107 | 45.3 |
| 3.03 | Fixed-broadband Internet subscriptions | 60 | 15.4 | 42 | 52.1 | 68 | 24.6 | 21 | 66.7 | 49 | 42.0 |
| 3.04 | Fiber internet subscriptions | 30 | 8.6 | 21 | 13.2 | 46 | 3.7 | 24 | 11.4 | 20 | 13.4 |
| 3.05 | Internet users | 51 | 76.1 | 65 | 70.7 | 84 | 58.9 | 21 | 89.4 | 79 | 64.0 |
| 6 | Skills (6th pillar) | 74 | 61.5 | 72 | 62.5 | 44 | 69.9 | 15 | 79.4 | 46 | 69.8 |
| 6.01 | Mean years of schooling | 35 | 77.2 | 46 | 73.2 | 51 | 69.3 | 4 | 91.1 | 13 | 85.4 |
| 6.03 | Quality of vocational training | 114 | 41.6 | 111 | 42.2 | 65 | 53.4 | 31 | 61.7 | 135 | 34.9 |
| 6.04 | Skillset of graduates | 106 | 43.5 | 113 | 41.9 | 54 | 54.5 | 28 | 62.5 | 125 | 39.8 |
| 6.05 | Digital skills among active population | 55 | 57.6 | 53 | 58.2 | 56 | 57.3 | 8 | 73.7 | 107 | 44.3 |
| 6.06 | Ease of finding skilled employees | 136 | 36.7 | 133 | 37.5 | 53 | 56.7 | 122 | 42.2 | 120 | 42.7 |
| 11.07 | Growth of innovative companies | 129 | 38.7 | 62 | 52.6 | 109 | 42.8 | 15 | 66.1 | 108 | 43.0 |
| 11.08 | Companies embracing disruptive ideas | 104 | 39.3 | 64 | 45.0 | 102 | 39.4 | 31 | 51.9 | 75 | 43.3 |
| 12 | Innovation capability (12th pillar) | 109 | 29.9 | 55 | 42.3 | 60 | 40.1 | 34 | 52.1 | 91 | 32.7 |
| | Interaction and diversity | 130 | 29.0 | 56 | 42.7 | 70 | 40.3 | 39 | 47.0 | 117 | 31.4 |
| 12.01 | Diversity of workforce | 114 | 49.9 | 18 | 70.9 | 59 | 60.4 | 136 | 36.9 | 121 | 47.7 |

| No | INDEX COMPONENT | MOLDOVA | | ROMANIA | | UKRAINE | | ESTONIA | | GEORGIA | |
|-------|----------------------------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| | | RANK | SCORE | RANK | SCORE | RANK | SCORE | RANK | SCORE | RANK | SCORE |
| 12.02 | State of cluster development | 136 | 26.1 | 109 | 38.2 | 96 | 40.9 | 85 | 43.9 | 120 | 34.8 |
| 12.03 | International co-inventions | 79 | 4.0 | 48 | 21.1 | 55 | 13.0 | 26 | 54.5 | 78 | 4.1 |
| 12.04 | Multi-stakeholder collaboration | 120 | 36.2 | 98 | 40.4 | 58 | 47.0 | 37 | 52.9 | 102 | 39.0 |
| | Research and development | 95 | 21.0 | 53 | 34.8 | 59 | 31.1 | 36 | 46.9 | 75 | 23.8 |
| 12.05 | Scientific publications | 98 | 68.0 | 51 | 80.5 | 50 | 80.6 | 48 | 80.9 | 74 | 74.7 |
| 12.06 | Patent applications | 80 | 5.2 | 49 | 27.9 | 62 | 17.3 | 29 | 61.0 | 75 | 8.5 |
| 12.07 | R&D expenditures | 81 | 10.1 | 65 | 16.1 | 67 | 15.0 | 26 | 42.7 | 82 | 10.0 |
| 12.08 | Research institutions prominence | 92 | 0.7 | 36 | 14.9 | 44 | 11.8 | 67 | 2.9 | 75 | 1.9 |
| | Commercialization | 94 | 49.4 | 66 | 56.7 | 60 | 57.6 | 21 | 72.7 | 79 | 53.1 |
| 12.09 | Buyer sophistication | 118 | 30.9 | 108 | 34.5 | 65 | 44.0 | 54 | 46.5 | 95 | 37.2 |
| 12.10 | Trademark applications | 68 | 68.0 | 47 | 78.8 | 59 | 71.2 | 9 | 98.8 | 67 | 69.0 |

Source: The Global Competitiveness Index Report 2019

2.5. REGIONAL SWOT ANALYSIS

This chapter will emphasize key SWOT elements for each of regions of interest for the project and key relevant data for comparison. Chisinau and Balti are by far the most developed cities in Moldova and 2 key economic, industrial and research centres that are easy to rank at first glance when reviewing statistical data. For an equilibrium in regional distribution the 3rd target location should be selected from the southern region of Moldova. Cahul is one of the few smaller cities in Moldova that has a university-level institution and is the biggest city in the southern region by population. Cahul also has the advantage of being close to Romanian border and Giurgiulesti port, with access to the Black Sea.

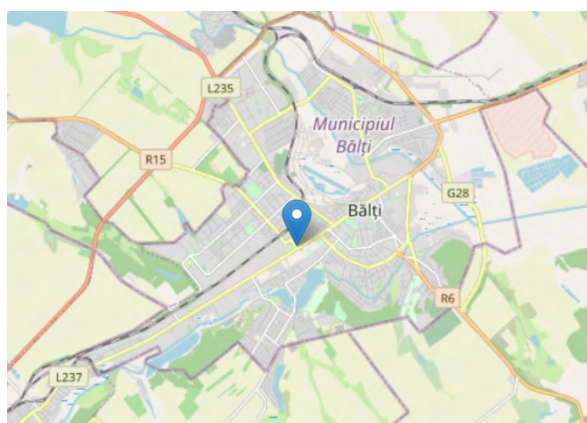


CHISINAU MUNICIPALITY

- POPULATION: 832,900 (municipality), 695,400 (Chisinau city)
- 26 HIGHER EDUCATION INSTITUTIONS
- VOLUME OF INDUSTRIAL PRODUCT (2019): 30,095 million MDL, 50.7% of the country total
- NUMBER OF EMPLOYEES (AS OF END OF 2019): 359,138
- AVERAGE SALARY (2019): 8645 MDL

SWOT

| STRENGTHS | WEAKNESSES |
|--|---|
| <ol style="list-style-type: none"> 1. Political administrative centre. Capital city of the country. 2. Economic centre of the country. In Chisinau accounts for 60% of the national economy. 3. Educational and research centre of the country. All universities and research centres except a few are located in Chisinau. 4. 1/3 of the country's population lives in the Chisinau municipality. 5. All sectors of the economy are present. 6. Robust infrastructure. 7. Most easy to find expertise. 8. Multilingual environment. 9. The IT sector is concentrated mainly in Chisinau. 10. It has an International Airport. | <ol style="list-style-type: none"> 1. Most expensive space facilities. 2. Most expensive workforce. |
| OPPORTUNITIES | THREATS |
| <ol style="list-style-type: none"> 1. Further growth based on migration from rural areas to Chisinau. 2. Growth of the local market. 3. New competitively based R&D policies may trigger growth of interest in Research and Innovation. 4. Growth of the interest to digitalization as consequence of Covid-19. | <ol style="list-style-type: none"> 1. Migration of qualified specialists out of the country. 2. Migration of businesses out of the country. |



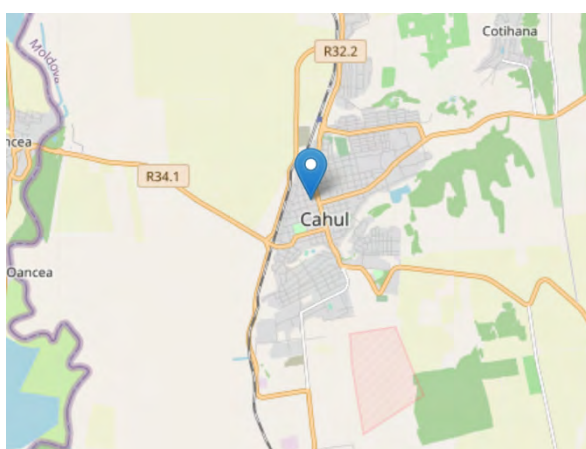
BALTİ MUNICIPALITY

- POPULATION: 151,800 (municipality), 146,900 (Balti city)
- 2 HIGHER EDUCATION INSTITUTIONS
- VOLUME OF INDUSTRIAL PRODUCT (2019): 7,728 million MDL, 13.0% of the country
- NUMBER OF EMPLOYEES (AS OF END OF 2019): 48,606
- AVERAGE SALARY (2019): 7188 MDL

SWOT

| STRENGTHS | WEAKNESSES |
|--|---|
| <ol style="list-style-type: none"> 1. Second city by population size and economic strength. 2. Second economical centre of the country. Approx. 20% of the country's economy is located in Balti. 3. Most successful Free Economic Zone in the country. It is number one by investment attraction and job creation. It has multiple subzones, including in Cahul. | <ol style="list-style-type: none"> 1. Limited workforce resources, mostly absorbed by the new labour intensive investing projects. The northern region of Moldova faces the most difficulties in employing people. 2. Most of new investors open labour- intensive factories. |

| STRENGTHS | WEAKNESSES |
|--|---|
| 4. Second educational and research centre of the country. 5. Good infrastructure. | |
| OPPORTUNITIES | THREATS |
| 1. Further growth based on FEZ developments Possibilities to start attraction of investors for vertical integration as the Balti automotive cluster is the biggest. 2. Transformation of Marculesti airport into international cargo airport. 3. Growth of interest in digitalization as consequence of Covid-19. | 1. Migration of qualified specialists to Chisinau and out of the country. 2. Migration of businesses out of the country. 3. Growth of salaries may trigger relocation of labour-intensive factories by international investors. These factories are mostly concentrated in Balti. |



CAHUL

- POPULATION: 39,400 (Cahul city), 124,100 (Cahul region)
- 1 HIGHER EDUCATION INSTITUTION
- VOLUME OF INDUSTRIAL PRODUCT (2019): 563 million MDL, 1% of the country
- NUMBER OF EMPLOYEES (AS OF END OF 2019, REGION): 19,607
- AVERAGE SALARY (2019): 5,880 MDL

SWOT

| STRENGTHS | WEAKNESSES |
|---|---|
| 1. Proximity to the Romanian border and Galați (Romanian port and industrial centre). 2. Proximity to Giurgiulesti port (with access to the Black Sea). 3. One of the few regional centres that have a university. 4. Recognized as the main regional centre of the southern region in Moldova. | 1. Small size of the industry and of the economy of the region. 2. Narrow range of industries, mainly agriculture and food processing. 3. Reduced scalability capacities. |
| OPPORTUNITIES | THREATS |
| 1. Cahul free economic subzone (subordinated to Balti FEZ) was opened on greenfield land. Authorities are ensuring the necessary infrastructure (electricity, water, road access). 2. Growth of cooperation with Romania. 3. Cahul is one of two EU pilot projects to multidimensional development of a town. | 1. Migration of qualified specialists to Chisinau or out of the country. 2. Migration of businesses out of the country. |

3. RESULTS AND KEY FINDINGS

This assessment has confirmed that Moldova's innovation system is still in the incipient stage of development. Significant policy reforms have been enacted, including a change in the model of funding distribution from centralized control to a competitive basis mechanism, and the creation of an independent National Agency for Research and Development. These changes represent fundamental steps and reform of the old Soviet-style paradigm. 2019 was the first year when the new policies were put fully in practice. However, still, close monitoring of the actual effects and progress is required, and based on the feedback, openness from state bodies is needed to fine-tune and adjust policies to minimize the adverse effects of the transition. Academic stakeholders need additional support to adapt to the new conditions and to increase the connection of the academic community to business environment. It is important to emphasize that while the regional context is an important constituent of the innovation ecosystem of Moldova, this report centres on the national context almost exclusively. In the sub-sections below are explained the challenges and opportunities that were identified during this conduction of the study.

3.1. CHALLENGES AND OPPORTUNITIES

Moldova's Government has paid limited attention to innovation up until recent times. There are significant challenges to be addressed, but as well as many opportunities to be uncovered. A big challenge identified is the insufficient or lack of communication and sharing of information among different groups of stakeholders. In particular, there is almost no exchange of information between academic research institutions and the business sector. There is no culture of communication and viable models of cooperation that can lead to sustainable partnerships and generation of benefits for both parties. Government bodies perceive research institutions as counterparties which consume finance. There are many insipient and incomplete initiatives from the governmental side that poorly involve academic and research knowledge for the development of the country.

3.1.1. ECONOMIC SUB-SECTORS WITH GREATER POTENTIAL TO BENEFIT FROM INNOVATION

Most of the traditional sectors of Moldova suffer from reduced levels of efficiency and productivity per person. There is a need for major technology improvements to increase performance of these sectors and for adoption of high value-adding processing capabilities. Each sector needs thorough analysis of productivity, value chains and international demand to identify areas where feasible improvements with market effects can be made. Most interviewees agreed that there is lack of competence and expertise in several important areas:

- Elaboration and implementation of tailored, efficient technological solutions for entrepreneurs;
- Individual production process optimization;

- Technology adoption mechanisms;
- Efficient adaptation and integration of new technologies into individual existing business processes, with the right evaluation of technology absorption capacities.

This represents a significant issue but also a great opportunity for both developing practical, applied research capabilities, and for significantly increasing the efficiency of selected sectors and the economy as a whole.

The communication mechanisms and information flow between the academic/research community and business environment is another issue emphasized by most of the respondents. This relationship is very superficial, the information flows are very generic and sporadic, and they lack models of efficient cooperation. Solving these issues can trigger a transformation of research capabilities in the academic sector into performance and value added for the economy.

AREAS THAT NEEDS INNOVATION AND TECHNOLOGY TRANSFER IN MOLDOVA:

1. Agriculture;
2. Processing of agricultural products, storage, packaging, logistics;
3. Food processing;
4. Textiles;
5. Chemistry, pharmaceuticals and beauty industries;
6. Metal processing and machine building;
7. Energy production and transportation, renewable energy;
8. Infrastructure (road engineering, water supply and wastewater evacuation systems, solid waste evacuation);
9. Public transport and logistics;
10. Private business, modern management and logistic processes and tools, digitalization;
11. State institutions management and process organization tools and digitalization. Data processing, sound processes organization and digitalization.

AREAS WITH OPPORTUNITIES FOR DEVELOPMENT OF HIGH VALUE ADDING SERVICES AND PRODUCTS, BASED ON HISTORICAL SPECIALIZATIONS AND / OR EDUCATIONAL CAPABILITIES:

1. Embedded software, including for automotive industry;
2. Metal processing, machine building;
3. Software development, IT services;
4. Pump engineering for aggressive environments;
5. Creative industries (design, sound, imagery, modelling);
6. Fashion.

The Government has developed a thorough national programme for the research and innovation domain for the years 2020-2023, according to Government Decision nr.381/2019. The document defines the 5 strategic priorities of the research and innovation domain as:

- Health;
- Sustainable agriculture and food security;
- Environment and climate change;
- Social challenges;
- Economic competitiveness and innovative technologies.

These 5 strategic priorities are divided into 19 strategic directions. For each direction the document specifies expected results. The programme cover all economic and social aspects of the country. By analysing and selecting the directions and results outlined that fall under the categories of innovation in business environment and technology development, the following priority directions will be the focus of the study:

| NR | STRATEGIC PRIORITY | NR1 | STRATEGIC PRIORITY | EXPECTED RESULTS1 |
|----|---|-----|--|--|
| I | Health | 3 | Pharmaceutical and nutraceutical preparations | <ul style="list-style-type: none"> a) elaboration of pharmaceutical and nutraceutical preparations from local raw materials; b) the use of existing natural sources and local pharmaceutical products in medical practices; c) capitalizing on the potential of local pharmaceutical preparations, vitamins and antioxidants; d) the elaboration of food additives of natural origin as a means of preventive treatment. |
| II | Sustainable agriculture and food security | 5 | Varieties and hybrids of high - performance agricultural, technical and fodder crops | <ul style="list-style-type: none"> a) advancement in the use of genetic methods and modern biotechnologies for the purpose mitigating the impact of environmental changes; b) creation and implementation, of crops and agricultural products with high productivity and increased resistance to drought, disease and damage through the production of competitive varieties and hybrids; c) increasing the productivity and adaptation of agricultural crops to climate change; d) more efficient use of water and nutrients (for plants) and food (for animals); e) more efficient agricultural production systems with a reduced impact on the environment. |
| | | 6 | Sustainable management of agricultural ecosystems | <ul style="list-style-type: none"> b) identification and / or promotion of varieties and breeds with high productive and adaptive potential; c) forecasting and monitoring of dangerous phytosanitary hazards and elaboration measures to control and quarantine harmful organisms; d) elaboration of alternative methods of plant protection and promotion of agriculture; e) elaboration and modernization of sustainable and ecological technologies in fruit growing, viticulture and vegetable growing. |
| | | 7 | New technologies for processing agricultural raw materials. | <ul style="list-style-type: none"> a) increasing technological performance in the transformation of agricultural raw materials, reducing the gaps between the processing of local agricultural raw materials and sales market requirements; b) ensuring a more efficient circuit of nutrients and antioxidants, avoiding losses of agricultural raw materials and food; c) ensuring the nutritional value and amplifying the biological effects of food through biotechnology and food engineering; d) ensuring the circulating bioeconomy, developing digital networks for realization, traceability of agricultural raw materials and food; e) innovative technologies for storage and processing of agricultural production. |

| NR | STRATEGIC PRIORITY | NR1 | STRATEGIC PRIORITY | EXPECTED RESULTS1 |
|-----|--|-----|--|---|
| III | Environment and climate change | 9 | Safe, clean and efficient energy | <p>d) identification of innovative technical solutions for the reliable operation of the system energy, energy conversion and use;</p> <p>e) increasing the share of renewable energy sources in the country's energy balance and the efficiency of their use;</p> <p>f) identification of innovative solutions for the development and implementation of intelligent electrical networks ;</p> <p>g) identification of innovative solutions to reduce energy losses throughout the chain energy production, transport, distribution and use;</p> |
| IV | Social challenges | | n/a | |
| V | Economic competitiveness and innovative technologies | 17 | Nanotechnologies | <p>a) development of infrastructure, tools, standards, research capabilities, nanoscale development and innovation;</p> <p>b) pharmaceutical synthesis, processing and supply of drugs through nanotechnologies;</p> <p>c) the industrial exploitation of nanotechnologies through scientific excellence and competition;</p> <p>d) new models and theoretical solutions related to the theoretical interpretation of experimental results that will find applicability in different branches of the economic sector (energy, information and communication technologies, machine building, electronics and robotics, geological explorations, pharmaceutical, cosmetological, food industry, etc.);</p> <p>e) development of alternative energy converters based on reduced dimensional layers, with the use of economically accessible and ecologically attractive technologies for microelectronics, medicine and spintronics.</p> |
| | | 18 | Information technology and digital development | c) elaboration of mechanisms for the implementation of applications and equipment dedicated to access to electronic services; |
| | | 19 | Materials, technologies and innovative product | <p>b) realization of new, innovative materials with remarkable performances and the development of new sustainable technological processes;</p> <p>c) designing new functionalities for special and consumer products;</p> <p>d) realization of materials with advanced properties for exploitation in special conditions;</p> <p>e) development of materials, high-performance structures, cheap for use in the branches of economy;</p> <p>g) elaboration and production of electronic and engineering devices and installations for the health system, agriculture and industry.</p> |

NOTE 1: The numbering and letters are preserved from the Governmental Programme

The comparison between governmental strategic priorities and answers of interviewees regarding the priorities for innovation and areas of intervention show significant commonality, especially in area of agriculture and food, materials development, pharmaceuticals. However, there are some differences as well. For instance, the ICT and digitalization areas in the programme are mainly focused on non-economic approaches and results, and are thus less focused on generating value-addition, increasing the competitiveness of the sector or forging strong connectivity with other sectors. Merely one of the 7 results expected by the Government is connected indirectly to business development.

The business sector is expecting much more from the ICT sector and digitalization is an important ingredient in economic performance, especially due to the Covid-19 crisis. (The programme was elaborated before the Covid-19 crisis started). The Government at present recognizes the importance of digitalization in the business environment and has developed support programmes in this direction through the ODIMM state institution.

Areas for innovation specifically mentioned by interviewees correlate strongly with areas of specialization mentioned on the Smart Specialization Platform for Moldova³⁷, developed with the help of EU assistance, in particular with 4 priority categories: Innovative materials, technologies & products (priority 1), Biotechnology (priority 3), Health & biomedicine (priority 4), and Energy efficiency & use of renewable energy resources (Priority 5). Priority 2 linked to Cultural heritage & social development is less linked to the scope of the study, however interviewees have mentioned potential for innovation media development (imagery, sound, content development etc.)

In conclusion both the Innovation & Research Strategy adopted by the Government and the Smart Specialization priorities have been confirmed largely by the results of the interview process.

3.1.2. AREAS OF SCIENTIFIC RESEARCH WITH GREATER DEVELOPMENT POTENTIAL

Innovation and research in Moldova can be strengthened through 3 action areas:

1. SUPPORT RESEARCH AND INDUSTRY LEADERS.

Build competences and develop R&D based on upscaling innovation and the advanced industry leaders of Moldova, as well as a clear and systemic metric, patents and conversion to products and processes through successful research projects, promoting them at international level, helping them keep pace with modern technologies and helping to integrate them in international advanced value chains. Such firms are identified based on their unique experience and knowledge building education, research and knowledge components and integration in existing innovation and research hubs. As examples could be mentioned nanotechnology research programmes led by the Academy of Sciences or "Cris" Ltd company having full production cycle of monobloc pumps for aggressive environments etc. Mapping of leading successful producers is presented in Figure 9 below.

2. ENHANCE INNOVATION CHAINS: IMPROVE TRANSFORMATION OF RESEARCH INTO MARKETABLE PRODUCTS.

Transformation of research into marketable products is the ultimate objective of innovative business. This process is very complex and has multiple stages. It is important to evaluate existing innovation chains in Moldova which are able to transform research into marketable products. Where it is feasible,

37 <https://s3platform.jrc.ec.europa.eu/regions/MD/tags/MD>

support should be offered to improve missing links or to interconnect to international research and innovation chains, to manage transformation of knowledge and research into value adding products and services. This example may serve R&D in pharmaceuticals, where Moldovan Research institutes have capacities for synthesizing components, ensuring pre-clinical testing services, clinical testing services, and factories that can produce medicines, but they also lack laboratory testing capacity and certification to complete the chain of pharmaceutical product development. For this purpose, a specialized and thorough evaluation of innovation chains is required, based on research capabilities available in Moldova, to develop individual road maps for each of the innovation chains.

3. ADJUST EXISTING R&D SERVICES FOR EXPORT

Developing R&D services for export in areas where Moldova has competence and a relative cost advantage on international markets will permit transformation of research capabilities into value adding services and will enable integration in international research value chains. The most promising areas for intervention would be.

1. Prototyping and testing.
2. Outsourcing of research services in engineering, electronics, mechanics, materials pharmaceuticals.
3. Microelectronics, including optoelectronics, power engineering electronics, biomedical electronics.
4. Information Technologies research.
5. Engineering, architecture design and modelling.
6. Seed testing, selection and production.
7. Construction materials development and testing.

Integration into international R&D chains will ensure that researchers and specialists will bring know-how and tools back to Moldova, in order to transform academic research into valuable services to domestic businesses.

FIGURE 9. INDUSTRY CHAMPIONS AND COMPETENCES.



Source: invest.md

3.1.3. CHALLENGES TO INNOVATION

The R&D sector suffered only recently significant changes in policy regulations switching from centralized to competitive based finance distribution. However, there are still significant challenges and issues to be addressed by the Government and stakeholders. Below are the main issues identified during interviews with major stakeholders and through desk research.

STATE INSTITUTIONS:

1. State institutions and Government have little understanding of innovation processes and governmental role in this sector. This sector is mainly perceived as an extension of the education system, while innovation and research are a cross- functional domain. Ownership needs to be delegated from the Ministry of Education, Culture and Research to most of other Ministries with specific roles in this area.
2. There is a lack of structured information regarding existing innovation projects and high values services and products in Moldova, as well as information about opportunities for the development of innovation. High level officials (Governmental and Moldovan embassy officials) have little knowledge and there is total lack of promotion of R&D and innovation capabilities of Moldova, except in the ICT sector. Innovation capabilities must become part of state programmes for investment attraction and export promotion.
3. There is a series of barriers for innovation activities and investments in R&D that have to be addressed by the Government and policymakers:
 - Universities and public research centres suffer from having to provide full payment of customs taxes, with no possibility of VAT deduction for imported equipment and tools.
 - An unjustifiably- high level of customs taxes and penalties for import, export and temporary imported prototypes, models, and samples for R&D. In some cases, these penalties jeopardize R&D activity.
 - Temporary imports should be simplified and requested terms should not be modified by customs officers at will.
 - The process of transferring valuable EU-certified seeds and agriculture plants to Moldova is highly bureaucratic. There is a heavy vulnerability to corruption for certification of new varieties of agriculture plants and seeds.
 - Difficulties with and a lack of clear procedures for certification of new products in Moldova.
 - Overall administrative barriers and regulations put so much pressure on companies that makes innovation processes difficult or impossible.
4. Investments in R&D are inefficient, insufficient and not promoted due to:
 - A lack of alignment of state funded research to the needs of the economy.
 - Only 2% of state finances in R&D are directed to innovations for business purposes. This is a very low level of financing. A model of financing at different stages of innovation should be put in place. This 2% represents an amount of 8 million Moldovan lei, equivalent to approx. 400 thousand EUR. It was noticed as well that, the procedure for grant application is rather difficult and discouraging for business.
5. Insufficient support and policy improvements for the innovation sector:
 - A lack of fiscal policy support to innovation and R&D activities, except those associated with the ICT sector. A similar model of facilitation as for ICT sector would significantly improve the interest of investors and growth of the sector.
 - A venture capital concept has been elaborated but still not approved. A concept related to business angels was proposed as well and is still not in place. A lack of regulatory framework for investors in

innovation makes the sector rely mainly on state financing instruments.

- Certification procedures for new equipment and products are too bureaucratic. Changes to procedures and enhancement of testing capabilities, providing services at accessible price, is critical for the transformation of innovation concepts into business activities.

ACADEMIC AND EDUCATIONAL ENVIRONMENT:

1. Academic institutions are mainly focused on fundamental research with little orientation to business and economic needs.
2. There are no incentives for professors to study new topics. There is a number of passionate professors, but they lack autonomy and they are rather inhibited by the system in realizing their initiatives.
3. Reduction of state subsidies for students in engineering professions. The financing of university level students and doctoral students should be correlated to the economic needs of the country and development perspectives. A strong emphasis on STEM should be made by the Ministry of Education.
4. Top managers of some state research institutions lack the knowledge and the ability to incentivize researchers when international research programmes are contracted or grants are obtained.
5. Procurement procedures for R&D need less bureaucracy in Universities and Research Centres. While the law has some facilitations, the secondary legislation and regulations developed by the Government do not offer alternatives to the standard procedure. There should be dedicated guidelines for procurement in R&D in public institutions that will ensure required flexibility.

BUSINESS ENVIRONMENT:

1. There are limited competences in process designs and business analytics on both the side of recipients of digital services and IT companies. Thus a high number of failed projects have been reported regarding the digitalization of local business and / or with regard to time to implement solution. This generates a negative attitude towards robust automated solutions.
2. Businesses, especially SMEs have little understanding of IT solutions, how and when IT solutions have to be applied and how to select most suitable solutions for specific business tasks.
3. There is reduced understanding from both sides (the business and academic sectors) on how to work on common R&D projects. There is lack of models of cooperation and information on how to share the economic benefit of the results. The flow of information from both sides is extremely reduced.
4. There is lack of competencies in achieving optimization and efficiency improvement projects in business processes. This undermines change management and innovation in business. Digitalization of inefficient processes increase dissatisfaction with the results.
5. Political affiliation is a critical competition advantage in many sectors. The low level of true market competition in the business environment generates little demand for sound innovation and change.

3.1.4. IMPACTS AND OPPORTUNITIES OF COVID-19 FOR INNOVATION

The COVID-19 crisis has triggered increased demand for digitalization of processes and remote digital solutions especially for sales, marketing, on-line offers, digitalization of logistics and real-time interaction with customers. However, the negative effect of the crisis limits the investment capabilities of economic

agents to make these changes. Significant support is required to realize these transformations.

The Government recognizes the importance of digitalization in both the private sector and public services to minimize social contact in pandemic situations. They have made the necessary first steps to give some support to business for digitalization through ODIMM. The governmental demand for digitalization services may also increase to realize new objectives as consequence of COVID-19. One issue for fast digitalization is similar in the public and private sectors, namely poor understanding of process organization by state institution managers, as well as procedures being poorly described and inefficient, and insufficient numbers of qualified business analysts to offer optimization solutions and to help describe the processes.

3.2. AWARENESS AND ENGAGEMENT WITH 4IR DIGITAL TECHNOLOGIES

The Fourth Industrial Revolution (4IR, also known as Industry 4.0) is driving a paradigm shift that is profoundly changing all aspects of our lives; from the way we work and interact to how goods and services are produced and consumed. The 4IR is the fastest period of innovation ever experienced globally. The integration of digital technologies (i.e. blockchain, AI, IoT, Big Data, 3D printing, VR and IoT) with convergent technologies (i.e. nanotechnology, biotechnology and cognitive science) are increasingly merging the physical, digital and biological realms, with widespread and systemic implications across all socio-economic sectors.

Moldova is among the leading countries in terms of access to digital infrastructure. Approximately 98% of the territory has access to a fiber optic internet connection, and around 99% of the surface of the country is covered by a 4G network. The cost of access to internet services is among the lowest internationally. The companies and population are constantly increasing the adoption rate of the new technologies. The education system includes computer classes and ensures a minimum of computer literacy. At the university level, there are many reputable departments specializing in electronics and information technologies.

Despite the overall readiness level, Moldova is still at a lower stage of 4IR development. According to the Industrial Development Report 2020, Moldova is lagging behind in the development and adoption of 4IR digital technologies in manufacturing (see Figure 10). Forth patent activity of Advanced Production Technologies (ADP) technologies, Moldova occupies one of the lowest positions.³⁸ In contrast, countries with higher engagement with 4IR tend to be able to reap competitive advantages brought by the technology and thus, improve their overall performance competitiveness.

³⁸ See, <https://www.unido.org/resources-publications-flagship-publications-industrial-development-report-series/idr2020>

FIGURE 10. COUNTRIES AND ECONOMIES BY LEVEL OF ENGAGEMENT
WITH ADP TECHNOLOGIES APPLIED TO MANUFACTURING

| Frontrunners (10 economies) | Followers (40 economies) | | Latecomers (29 economies) | | Laggards (88 economies) |
|---|--------------------------------|----------------------------|------------------------------------|----------------------------|---|
| | As producers (23 economies) | As users (17 economies) | As producers (16 economies) | As users (13 economies) | |
| Economies actively engaging with ADP technologies | | | | | |
| China | Australia | Algeria | Bosnia and Herzegovina | Costa Rica | All other economies that, according to the United Nations Statistical Division, had more than 500,000 inhabitants in 2017 |
| France | Austria | Argentina | Bulgaria | Côte d'Ivoire | |
| Germany | Belgium | Bangladesh | Bulgaria | Ecuador | |
| Japan | Brazil | Belarus | Chile | Egypt | |
| Korea (Republic of) | Canada | Colombia | Dominican Rep. | El Salvador | |
| Netherlands | Croatia | Hungary | Estonia | Ethiopia | |
| Switzerland | Czechia | Indonesia | Greece | Malawi | |
| Taiwan Province of China | Denmark | Iran (Islamic Republic of) | Kyrgyzstan | Serbia | |
| | Finland | | Latvia | Tunisia | |
| United Kingdom | Hong Kong SAR, China | Malaysia | Moldova (Republic of) | Turkmenistan | |
| United States | | Mexico | | Uganda | |
| | India | Portugal | New Zealand | Uzbekistan | |
| | Ireland | Romania | Nigeria | Zambia | |
| | Israel | Saudi Arabia | Philippines | | |
| | Italy | South Africa | Slovenia | | |
| | Lithuania | Thailand | Ukraine | | |
| | Luxembourg | Turkey | United Arab Emirates | | |
| | Norway | Viet Nam | Venezuela (Bolivarian Republic of) | | |
| | Poland | | | | |
| | Russian Federation | | | | |
| | Singapore | | | | |
| | Slovakia | | | | |
| | Spain | | | | |
| | Sweden | | | | |

Source: IDR 2020 (UNIDO 2019).

Between 2017 and 2018, Moldova descended two positions in Competitive Industrial Performance Index to occupy the 111th place globally. The composition of the manufacturing sector of Moldova greatly leans towards a resource based (35.9 %) and low tech (26.2 %) cohort that in combination, are accountable for more than 50 % of the sector. It is important to note that the contribution of medium tech has grown considerably to reach 35 %. However, the high-tech sector contribution is only 3 % of the total.³⁹

The country has already in place key infrastructure elements for the adoption of 4IR digital technologies such as the extensive fibre optic and 4G network coverage. Similarly, the important steps were taken towards the deployment of the 5G network that among other things, will be fundamental for the operation of Internet of Things devices in particular and smart factories, in general.⁴⁰ However, regarding the 4IR development, there is a long way ahead. Currently, Moldova is ranked 59th in the ICT Development Index and the employs 26 thousand employees in ICT-related disciplines. The educational system related to ICT in the country remains largely concentrated in the capital, while the rest of the country is lagging behind (see Figure 11). Moreover, besides infrastructure which, the 4IR also demands new skills among the workforce; adequate regulatory

39 See, <https://stat.unido.org/country/MDA.pdf>

40 See, [https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/Spectrum_EUR_CIS/Andrei%20Gavrasi%20\(1\).pdf](https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2020/Spectrum_EUR_CIS/Andrei%20Gavrasi%20(1).pdf)

and policy frameworks. Those dimensions should be assigned with equal importance and be addressed systematically.

FIGURE 11. MAPPING OF THE ICT EDUCATIONAL SYSTEM



Source: invest.md

3.3. MAIN RECOMMENDATIONS MADE BY THE INSTITUTIONS CONSULTED

Moldova need to incentivize the research and innovation sector to stimulate growth and improve cooperation and contributions to the business environment. The potential incentives for research and innovation development mentioned or evaluated during interviews have been suggested as follows:

1. Implementation of fiscal incentives for the R&D sector similar to IT sector, i.e. a unique tax on sales of 7% or other comparable fiscal incentives would trigger commercial R&D development.
2. Eliminate the minimum limit for subsidies offered for a job of 100 people, thus stimulating the creation of jobs in innovation sector that are represented usually by small and micro-companies.
3. Greater State financial support for new technology adoption and /or development.
4. Development of a state acquisition programme for innovations and new technology development needed at national level (for example: development/adaptation of new road building technologies with a maximum usage of local materials and a cost reduction of 5% (10%) per km of road, keeping same characteristics). This innovation / technology acquisition programme have to be aligned to Moldova 2030 priorities. There is a needed for a highly- skilled and open-minded team of experts to develop this programme.
5. Development of a granting scheme for innovation start-ups based on innovation stage of the product development. The Chilean model, which was exported to at least 14 countries, would be an appropriate solution to be evaluated for adoption.
6. Doctoral programmes and research programmes needs to have a certain percentage of research topics and research projects pre-approved by business representatives in order to be financed by the state, thus stimulating research in areas of interest for the business environment.

4. CONCLUSIONS AND RECOMMENDATIONS

SYSTEMIC CHALLENGES

THERE IS AN INSUFFICIENT OR LACK OF COMMUNICATION AND INFORMATION SHARING BETWEEN KEY ACTORS. The report shows that greater integration and information sharing between the Government, academia and the business sector is needed. The existing communication channels and cooperation models are inadequate to enable the creation of sustainable partnerships among them. Research institutions tend to be perceived by government bodies as ineffective and resource-consuming partners. Similarly, the existing initiatives promoting a more significant intervention among actors are still on incipient stages. Thus, targeted interventions are needed to strengthen the cooperation ties between and among academia, the public and private sectors to contribute to an enabling environment for the generation and diffusion of innovation.

MOLDOVA HAS TAKEN STEPS TOWARDS DEVELOPING PLATFORMS TO PROMOTE INDUSTRIALIZATION (I.E., FREE ECONOMIC ZONES) AND THE IT SECTOR BY, FOR EXAMPLE, IMPLEMENTING SUCCESSFUL PILOT EXPERIENCES. However, the number and capabilities of the available platforms continue to be limited, and the communication between academic researchers and businesses in terms of product and technology development, limited. All interviewees confirmed a lack of effective communication channels and a lack of an enabling environment for the development of partnerships. It is therefore essential to put in place effective communication channels between group of actors and facilitate the development of partnerships.

CAPITAL EXPENDITURES IN R&D SECTOR REMAIN LOW, REPRESENTING ONLY 3% OF THE TOTAL BUDGET. The Research and innovation sector in Moldova need significant support programmes to replace obsolete equipment in subsectors that have the potential for development, innovation for local industries and integration in international R&D value chains.

THE GOVERNMENT INSTITUTIONS TEND TO HAVE LIMITED DEDICATED CAPACITIES FOR INNOVATION AND DO NOT PERCEIVE RESEARCH AND INNOVATION AS A SECTOR THAT CAN BRING HIGH VALUE-ADDITION. There should be closer cooperation among government institutions to promote research and innovation as a driver of economic and social prosperity of the country. In particular, the Ministry of Economy and Infrastructure and the Ministry of Education, Culture and Research should take the lead to transform research into productive assets and added value. The above will need a closer alignment of the private sector needs with the research and innovation activities in the country and especially with the 19 strategic priorities identified by the government for the years 2020-2023.

EDUCATION AND SKILLS CHALLENGES

THE AVAILABILITY OF SKILLS AMONG THE WORKFORCE IN MOLDOVA REMAINS UNSUITABLE FOR MEETING THE INTERNATIONAL LABOUR MARKET DEMANDS. Moldova is currently ranked 106th and 114th in terms of graduates' skill sets and quality of vocational training, respectively. The private sector in Moldova reports difficulties in finding sufficiently- skilled employees at the national level. In 2019, Moldova was ranked in the 136th place (among 141 countries surveyed) for the "Ease of finding skilled employees" in the Competitiveness Index. Performing changes in curricula development, further specialization, greater focus on the performance evaluation of programmes, as well as more significant connection with the labour market are needed.

THE RESEARCH AND INNOVATION SECTOR IN MOLDOVA IS AGING. More than 46% of the researchers are over 55 years old, and less than 18% of researchers are younger than 35. Moreover, the number of researchers has dropped since 2008 from 822 researchers per million of the population to 696 in 2018. Besides investments in infrastructure, the research and innovation sector need strong incentives and programmes to attract young people domestically. To this end, specific actions are necessary to promote greater integration between the

research and commercial activities.

THE NUMBER OF RESEARCHERS IN ENGINEERING SCIENCES, TECHNOLOGIES, AGRICULTURE AND NATURAL SCIENCES ARE DROPPING. The education system in Moldova has been changed dramatically in favour of the social sciences. The main focus of the doctoral studies is concentrated in social, economic and humanistic sciences, accounting together for 65% of the total student body. In contrast, engineering, technology, nature and agriculture sciences only accountable for 15.3% of this figure. More generous support of STEM (Science, Technology, Engineering, and Mathematics) in the education system is required, as well as a greater allocation of resources to research and innovation, particularly in areas that will support the industrial and agriculture sectors.

POLICY CHALLENGES

THE LEGAL FRAMEWORK OF THE RESEARCH AND INNOVATION AREA IN MOLDOVA HAS BEEN SIGNIFICANTLY REFORMED AND ALIGNED TO EU AND INTERNATIONAL STANDARDS. The newly-created National Agency for Research and Development, in charge of state fund distribution for research and innovation on a competitive basis, represents a good step towards the development of the sector and an essential shift to the old paradigm. However, there is still a long way ahead. The recently reformed policy and regulatory frameworks need to be continuously reviewed and adjusted to maximize the impact of the academic and research sector on the industrialization and economic development of the country while minimizing the potential negative externalities of transitioning towards an innovation-driven economy.

CHALLENGES IN ADOPTING 4IR

MOLDOVA HAS A GOOD OVERALL READINESS BUT IS LAGGING IN THE ADOPTION OF 4IR DIGITAL TECHNOLOGIES IN THE MANUFACTURING SECTOR. The country has already an extensive fibre optic and mobile network coverage that it is essential for the adoption of digital technologies. However, both the level of integration and contribution of digital technologies in the manufacturing sector remains low. Greater efforts are needed in facilitating an enabling environment for innovation that besides offering a sound infrastructure basis, also promotes the development of new skills among the workforce and conducive regulatory and policy frameworks.

OPPORTUNITIES

THE RESULTS OF THE INTERVIEW PROCESS HAVE CONFIRMED BOTH THE INNOVATION & RESEARCH STRATEGY ADOPTED BY THE GOVERNMENT AND THE SMART SPECIALIZATION PRIORITIES. The study revealed that the areas for innovation mentioned explicitly by interviewees concur with the areas of specialization mentioned on the Smart Specialization Platform for Moldova, developed with the help of EU assistance, in particular with five priority categories: 1) Innovative materials; 2) technologies & products; 3) Biotechnology; 4) Health & biomedicine priority and 5) Energy efficiency & use of renewable energy resources.

MOLDOVA CAN STRENGTHEN THE IMPACT AND SCOPE OF ITS CURRENT POLICY OBJECTIVES BY LEVERAGING FROM INTERNATIONAL PARTNERSHIPS. The joint initiative of the European Union, its Member States and Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova, and Ukraine, known as the Eastern Partnership (EaP), can play a fundamental role in promoting a smooth transition of Moldova towards the 4RI. The close alignment between the objectives EaP and the Government efforts in Moldova related to the digital transformation while safeguarding the environment represents a great opportunity to enhance the impact of current and future initiatives.

MOLDOVA CAN ATTRACT MORE VENTURE CAPITAL FOR POSITIVELY IMPACTING THE INNOVATION ECOSYSTEM. Venture capitalists and angel investors can play a significant role in fostering innovation. Those investments could play an essential role in increasing the number of patents registered in the country, particularly those related to 4IR, that as the report indicated, remain very low. Similarly, an increased flow of resources for

supporting research and innovation is crucial for attracting and forming a new generation of young researchers, thus counteracting the rapidly ageing research population staff. Targeted interventions are needed to ensure that venture capital counteracts the existing asymmetries between the regions of the country detailed in Section 2.5.

INTERESTS FOR DIGITAL TECHNOLOGIES HAVE INCREASED DUE TO THE ONGOING SOCIAL AND ECONOMIC CRISIS. The COVID-19 has created many limitations and restrictions for SMEs all over the world. Amidst the global pandemic, digital technologies have gained greater attention since they offer many possibilities for business continuation, strengthen the competitiveness of companies and improve the resilience of global supply chains. Leveraging from the 4IR digital technologies can boost region's economic growth and improve the overall productivity which can be an impulse for raising wages and increasing socio-economic welfare.

MOLDOVA'S INNOVATION POTENTIAL

Despite the challenges mentioned detailed in this report, Moldova has significant potential for becoming an innovation-driven economy. The country is currently ranked 58th among the 129 countries surveyed by the Global innovation index in 2019. Moreover, Moldova is ranked in 81st place for enabling environment and inputs, but Moldova has succeeded in climbing to 45th place for the output results of the innovation sector, being among the countries with best conversion indexes of input into an output. An increase in the resources and implementation of fiscal facilitation and support can bring good results in the research and innovation sector. The leading sectors are nanotechnologies, materials development, pharmaceuticals and biotechnologies.

ANNEX 1. INTERVIEW GUIDE FOR THE ASSESSMENT OF INNOVATION ENVIRONMENT AND INNOVATION PLATFORMS IN THE REPUBLIC OF MOLDOVA

The interview is conducted with the scope of assessing the existing innovation initiatives and promotion policies, programs, mechanism and incentives; regulatory framework governing innovation in the R&D and academia sector, as well as for the (business) industry sector, and evaluating existing issues, gaps to be addressed, positive practices in the innovation ecosystem in the Republic of Moldova. The questions are posed to obtain a comprehensive quality assessment and complete view and description of topics discussed.

INTERVIEWEES:

1. Key state institutions governing innovation: Ministry of Economy and Infrastructure (MEI), Ministry of Education Culture and Research (MECR), Ministry of Agriculture, Regional Development and Environment (MARDE); National Agency for Research and Development (NARD).
2. Development partners: WB, UNCTAD, USAID, GIZ, EU Commission etc.
3. Managers and representatives of innovation and technology transfer platforms from Chişinău, Bălţi and Cahul: industrial parks, science and technology parks (STP), incubators, FEZ, innovation hubs, IT parks.
4. Business Associations: EBA, AmCham, ATIC, Small business association etc.
5. Academic Institutions: Academy of Science, Technical University, University of Agriculture, University of Medicine.

LIST OF QUESTIONS:

ALL INTERVIEWEES:

1. How would you assess the innovation sector in Moldova and especially the transformation of innovation into business and products?
2. What are the most successful sectors in transformation of innovation into business in Moldova? What are the factors of success?
3. From your experience what are the best solutions to incentivize innovation processes and transformation of innovation into business and products?
4. From your experience, what incentives, actions or programmes remained without effect or reduced effect in Moldovan R&D and innovation environment?
5. What are the key challenges / issues in Moldovan innovation environment from following perspectives:
 - a. Regulatory;
 - b. Academic;
 - c. Financing;
 - d. Business environment;
 - e. External relations, access to new technologies?

6. What are the key opportunities for Moldova to improve the innovation process and to transform innovation into commercial products?
7. What are the bottle necks in the relationship between academic environment and business? Why there is almost no cooperation for innovation and technology development?
8. From your perspective what are the priorities of Moldova to improve R&D, technology transfer and innovation? What would be your recommendations?
9. How do you think Moldova business environment can benefit from 4IR?
10. How Covid-19 impacted your activity and in particular R&D activities?
11. What measures have you taken under the impact of pandemic?
12. How do you think Covid-19 will reshape the innovation environment? What new challenges will be imposed on cooperation and in terms of innovation development paths?
13. What innovations do you think will help put the business environment on-track after being affected by the pandemic?

STATE INSTITUTIONS

14. What are the regulations, strategies and programmes that governs innovation, R&D and technology governance?
15. What current policy changes are in progress?
16. What are the objectives for the coming years in terms of innovation and R&D?
17. What are key governmental support programmes for the development of Innovation, Entrepreneurship and Technology Transfer platforms?
18. How much resources are allocated to innovation, R&D and technology governance?
19. What are the main challenges in the development of innovation, R&D, technology transfer and innovation adoption?
20. What is the most successful experience in terms of policy impact on industrialization of the innovation and transformation of science into business?
21. Are there any policies and strategies toward adoption and promotion of 4IR into business environment?
22. What innovations does the Government need? What innovations would the Government request to improve its efficiency, including in public services?

DEVELOPMENT PARTNERS

23. What activities / programmes do you have in relation with innovation and R&D?
24. What are the sectors of the economy that you are operating in terms of innovation and R&D?
25. What is the funding amount for innovation and R&D activities / programmes?
26. Who are the direct beneficiaries of the programmes?
27. How do the beneficiaries benefit from improvements in R&D and transformation of innovation into commercial products, technology transfer?

ACADEMIC INSTITUTIONS:

28. What are key areas for R&D and innovation in your institution?
29. Do you have any cooperation agreements with business companies? What are the most successful projects?
30. Do you have any cooperation agreements with other research institutions, in the country? From abroad? What are the most successful projects?
31. Do you have patented innovations? Do you have a specialist -licensing manager (lawyer) to facilitate the process of obtaining innovation patents? Do you cooperate with AGEPI?
32. Do you have a dedicated specialist for the promotion of innovation and research to the business environment, industry?
33. Do you have dedicated specialists that help with the transformation of innovations into technologies and potential products?
34. Do you have experience on founding new research and production companies to industrialize innovations?
35. What would you need to improve innovation processes and the transformation of innovations into technologies?

INNOVATION PLATFORMS, BUSINESS ASSOCIATIONS

36. What services do you offer in terms of innovation and technology transfer to entrepreneurs?
37. What are the most successful members of your communities in terms of R&D, transforming innovation into business and products? How do you think what are the key factors for success in this area in Moldova? How successful was the innovative product? Has the company succeeded to enter international market with its product?
38. Have you received support or facilitation for the R&D, innovation of technology transfer activities? What are key conditions of these programmes?
39. What kind of support programmes would be most suitable for you and your members to incentivize innovation and technology transfer?
40. Do you have cooperation agreements with academic institutions? If not, have you tried?
41. Do you have cooperation agreements with platforms, business associations from abroad in terms of experience exchange in terms of innovation, technology development and transfer?
42. How do you think Covid-19 will reshape the innovation hubs and incubators? What would be alternative solutions?



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