

## **The Evolution of the Scientific Publishing System in the Republic of Moldova: Bibliometric Analysis and Implications for Science Policies**

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**Abstract:** This paper examines the evolution of the scientific publishing system in the Republic of Moldova, focusing on the impact of global trends and national science policies. It uses a mixed-methods approach, including literature reviews, policy analysis, and bibliometric data, to assess changes in research output, open access adoption, and the influence of digitalization. The study identifies key challenges and opportunities for enhancing research quality and visibility, providing recommendations for science policies to support scholarly publishing in Moldova and ensure integration into the global scientific community.

**Keywords:** scientific publishing, bibliometric analysis, open access, research evaluation, academic policy, digitalization in research

### **Introduction**

Within the context of the Republic of Moldova's integration into the international scientific community, global trends in scholarly publishing – such as the transition to open access, the growing influence of bibliometrics and alternative metrics, the emergence of new research evaluation models, and the digitalization of editorial processes – exert significant pressure on national research policies. These changes require strategic adjustments to align with international standards, optimize funding mechanisms, and enhance research integrity.

The impact of global trends in scholarly publishing on national regulations and the dissemination of research findings is a complex phenomenon influenced by the interplay between evolving editorial practices and the existing regulatory, cultural, and institutional frameworks within each country (Cujba & Turcan, 2024). A key element shaping this dynamic is open access to research outputs. Open access (OA) publications have emerged as a dominant model in many fields, aiming to democratize access to knowledge (Demeter et al., 2021), eliminate barriers to scientific research, and enhance the visibility and impact of research findings (Figueiredo et al., 2024). However, the transition to OA raises concerns about publication costs and the potential for inequities between researchers from different economic backgrounds (James, 2017; Singh et al., 2021), as well as challenges related to financial sustainability and publication ethics, particularly in the context of the proliferation of predatory journals (Krawczyk & Kulczyk, 2021; Turcan & Cuciureanu, 2024).

In the case of the Republic of Moldova, adopting OA is essential for enhancing the international visibility of its research. However, studies indicate that national open access policies can significantly impact the success of this model, as demonstrated in Brazil (Figueiredo et al., 2024) and Israel (Hadad et al., 2024).

Technological advancements are driving fundamental shifts in scholarly publishing, resulting in an exponential increase in the number of journals and altering how researchers access literature (Kelly, 2020). Furthermore, the digital transformation of publishing has led to greater data availability, enhanced processing capabilities, and the development of innovative tools for scientific communication (Baffy et al., 2020; Duine, 2023). The digitalization of scholarly publishing is being accelerated by technologies such as big data, artificial intelligence algorithms, and blockchain (Švab & Klemenc-Ketis, 2023; Liu & Guo, 2024; Duine, 2023), transforming the scholarly writing process and facilitating research production and dissemination. The shift to digital publishing has dramatically increased since the COVID-19 pandemic. Journals now frequently incorporate multimedia elements, such as videos and infographics, to reach wider audiences (Zhou, 2023). Electronic formats have made scientific information significantly more accessible and readily available, facilitated by online platforms and digital tools designed to enhance dissemination and engagement (Xu, 2013). Digital technologies have exponentially increased data availability and processing capabilities, transforming how scientific research is conducted and published. This trend is expected to continue, leading to more open and collaborative scientific practices (Burgelman et al., 2010). New publishing modalities, such as preprints, multimedia journals, and preprint archiving platforms, are gaining traction, enabling faster research dissemination and broader recognition of diverse contributions (Trial & Einsiedler, 2024).

However, digitalization also raises concerns regarding copyright protection and the validity of scientific data (Zhou, 2020), as well as ethical challenges associated with the use of artificial intelligence, which is necessary to ensure the integrity of scientific communication (Švab & Klemenc-Ketis, 2023). The

quality and integrity of scholarly literature are further affected by rapid changes in publishing practices, including the rise of preprints and the proliferation of for-profit publishers (Alwine et al., 2021; Baptista et al., 2019).

The transition from traditional to electronic scholarly publishing has necessitated the development of new identification systems for journals and authors, such as Digital Object Identifiers (DOIs) for publications and Open Researcher and Contributor IDs (ORCID) for researchers. These advancements facilitate open science and streamline automated data flows. DOIs are widely utilized to ensure the global visibility of scholarly publications (Retteen & Hall-Retteen, 2024). The lack of DOIs can limit the visibility of publications from developing countries within the global flow of scientific information, underscoring the need for alternative publishing models (Turki et al., 2023). ORCID enhances the automation of research information sharing, improves data quality, reduces duplicated efforts, supports open access publishing, and fosters collaboration, thereby increasing research visibility and ensuring proper attribution of contributions (Shapovalov et al., 2024). Consequently, both DOIs and ORCID play a crucial role in enhancing research discoverability and ensuring accurate attribution of publications and data to their respective authors.

Conversely, while these trends enhance accessibility and collaboration, they also raise concerns regarding author integrity and the quality of peer review, necessitating ongoing examination and adaptation within the publishing ecosystem. The increasing number of authors and publications has led to challenges such as outdated peer-review systems, rising retraction rates, and the emergence of predatory journals (Zhou, 2020; Baffy et al., 2020). Furthermore, the traditional peer-review system faces growing criticism for being slow, opaque, and susceptible to conflicts of interest. In this context, open peer-review models, in which the identities of authors and reviewers are disclosed, are being explored as alternative solutions (Park, 2020). While these models can enhance transparency, risks remain regarding reviewer objectivity and social pressures within academia. Therefore, scholarly publishing policies must prioritize maintaining rigorous peer-review standards and supporting ethical publishing practices, ensuring that publication pressure does not compromise the quality and integrity of scientific research.

Traditional indicators of research impact, such as journal impact factors and citation counts, are increasingly being scrutinized. As a result, the use of bibliometrics, altmetrics, and other evaluation models has become more prevalent, influencing how research impact is assessed and how funding and resources are allocated (Du et al., 2023). Recent studies indicate that altmetrics can provide a more immediate measure of a publication's impact by assessing article visibility (Rosenkrantz et al., 2017), although their correlation with traditional citation metrics remains weak (Ellis et al., 2021). Nonetheless, these indicators are highly relevant to science policy, as they assist in evaluating the quality and impact of research outputs (Strielkowski & Chigisheva, 2018). Methodological challenges in assessing the impact of scholarly publications on policy documents underscore the necessity for enhanced bibliometric

approaches to improve transparency in science-policy interactions (Cristofoletti et al., 2024).

Emerging trends in scholarly publishing have significant implications for both science and publishing policies. These trends are influenced by several key factors, including technological advancements, publication pressure, economic considerations, and policy instruments, all of which affect the dissemination of research findings.

The commercialization of academic publishing, driven by the profit motives of publishers and information providers, is resulting in significant transformations within the formal system of scientific communication (Weingart & Taubert, 2017). In this context, open access has encountered challenges such as double-dipping fees imposed by hybrid journals and the uncontrolled escalation of article processing charges (APCs), leading to ongoing debates about the sustainability of open access strategies (Anglada & Abadal, 2023). Furthermore, open access initiatives can inadvertently create economic barriers, as researchers are often required to pay publication fees, which can exclude those with limited financial resources (Kamerlin et al., 2021). However, measures such as revising research evaluation criteria, regulating APCs, and promoting alternative publishing models could help alleviate these issues.

Another key factor is the role of science policy instruments, including national research evaluation systems, academic promotion procedures, and competitive funding mechanisms. These instruments are crucial in shaping publishing practices and stimulating researcher productivity (Korytkowski & Kulczycki, 2019).

The evolving trends in scholarly publishing, driven by technological advancements, economic factors, policy instruments, and other influences, have significant implications for the development of science policy. Adapting to the changing landscape of scholarly publishing is essential to ensure the efficient dissemination of research findings and to address the challenges posed by these trends.

For the Republic of Moldova, aligning with these trends necessitates the implementation of strategic policies that promote publication in prestigious international journals, support open access, and incorporate alternative metrics into research evaluation. Additionally, digitalization and innovative dissemination models present substantial opportunities to enhance both the national and international visibility of Moldovan research.

## **Research methods and objectives**

The paper employs a comprehensive mixed-methods approach, incorporating several key research methods. A literature review is conducted to analyse existing studies on scientific publishing trends, bibliometric indicators, and open-access initiatives, providing a theoretical foundation for the research. Additionally, a policy review assesses existing national research policies and

evaluates their effectiveness in supporting high-quality research dissemination and integration into the global academic community. Quantitative analysis is performed using bibliometric data to measure trends in research output, journal rankings, and scientific conference evaluations within Moldova. Furthermore, a comparative analysis examines Moldova's scientific publishing practices in relation to international benchmarks to identify areas for improvement. By combining these methods, the study aims to provide a comprehensive understanding of Moldova's scientific publishing landscape and offer actionable recommendations for enhancing its effectiveness and global impact.

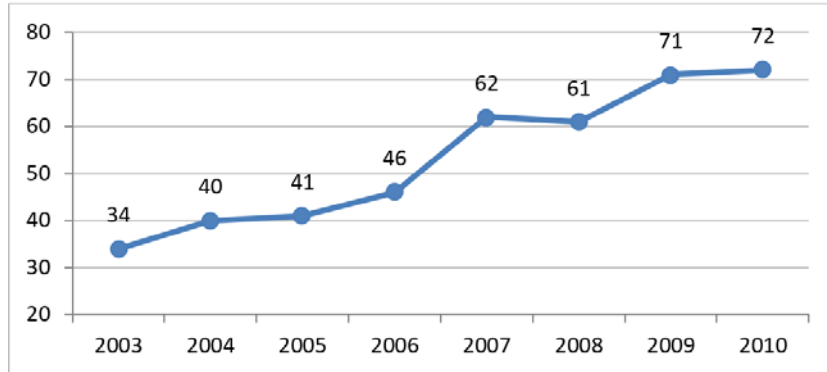
The study's objectives include analysing the evolution of the scientific publishing system in the Republic of Moldova and assessing the effects of national policies and regulations on scholarly publishing. It also aims to evaluate the impact of OA policies on the visibility and accessibility of Moldovan research, while investigating the role of bibliometrics in research impact assessment. Moreover, the study examines the influence of digitalization and innovative dissemination models on Moldovan research and seeks to identify key challenges and opportunities for enhancing the quality, visibility, and impact of research in the country. Based on these findings, the study provides recommendations for science policies that support the development of scholarly publishing in Moldova.

## **Results and Discussions**

### **A general overview of the policies governing the scholarly publishing system in the Republic of Moldova and their effects**

The disruptions in scholarly publishing in the Republic of Moldova were primarily driven by provisions of the Law on Science and Innovation No. 259, enacted on July 30, 2004 (and subsequently amended). This law mandated bibliometric evaluation as a component of the accreditation process for research and innovation organizations, as well as for the certification of scientific and scientific-pedagogical personnel.

According to the law, a mandatory requirement for the accreditation of organizations in the fields of research and innovation was the publication of a periodic scientific journal, with at least 20% of the article authors originating from outside Moldova (Article 99, paragraph 2(g)). As a result, the number of scientific journals published in the Republic of Moldova increased from 40 in 2004 to 62 in 2007 (see Figure 1).



**Figure 1. The number of Moldovan scientific journals from 2003 to 2010**  
**Source:** (Turcan, 2012)

Despite the observed revitalization of publishing activity, it was evident that the implemented measures required additional regulatory support, particularly for monitoring journal activities to ensure the quality of published content. Drawing inspiration from international best practices, in 2008, the Academy of Sciences of Moldova (ASM – the governing body for the scientific field) and the National Council for Accreditation and Attestation (NCAA, responsible for accreditation and certification procedures within science and innovation) decided to establish an evaluation and classification system for scientific journals. Consequently, through Joint Decision No. 212 of November 6, 2008, these bodies approved and implemented the Regulations on the Evaluation and Classification of Scientific Journals.

The evaluation criteria for journals included international indexing and cataloguing, international dissemination, the presence of international authors, the expertise of the editorial board, an established publishing tradition, publication in widely recognized languages, and effective journal promotion. The regulations mandated compliance with technical requirements for structuring published articles, which included an abstract in an internationally recognized language, the maintenance of an expert database, anonymous peer review, and other editorial practices consistent with international standards. Based on their performance, accredited journals were classified into three categories: A, B and C.

The importance of adhering to specific requirements for scientific articles was further emphasized in the Regulations on Scientific and Scientific-Methodological Publications, approved by Decision AT-8/1-2 on December 23, 2010, by the NCAA. This document outlined the mandatory components of a scientific article and specified the content required for each component.

The journal accreditation process began in 2009. Over the following four years, 76 journals were accredited and classified: 74% of journals were assigned to Category C, 24% to Category B, and only 3% to Category A (see Figure 2).

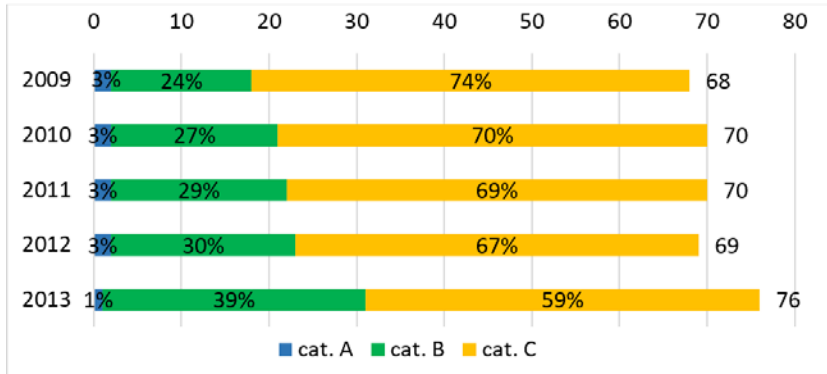


Figure 2. Accredited journals in the Republic of Moldova in 2009-2013, per category

Source: [https://ibn.idsi.md/ro/Graph\\_Stacked?type=categoriiReviste](https://ibn.idsi.md/ro/Graph_Stacked?type=categoriiReviste). Accessed on 15.03.2025

This categorization of scientific journals subsequently enabled differentiated requirements within the certification process for scientific personnel. Amendments to the NCAA Decision AT-1/2, dated February 11, 2010, within the Regulations on the Functioning of Specialized Scientific Councils and the Conferral of Scientific Degrees and Scientific-Pedagogical Titles in the Republic of Moldova (NCAA Decision of November 25, 2004, Protocol No. 1), established varying publication requirements for applicants based on the category of the journals in which their articles were published, as part of the scientific degree awarding procedure.

The introduction of the scientific journal accreditation procedure further enhanced this metric, yielding a 1.6-fold increase from 2009 to 2013. At the same time, in 2013 92% of the articles were published in accredited scientific journals (see Figure 3).

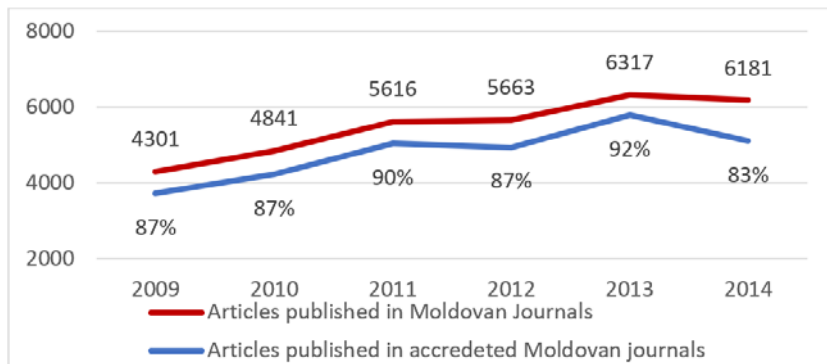
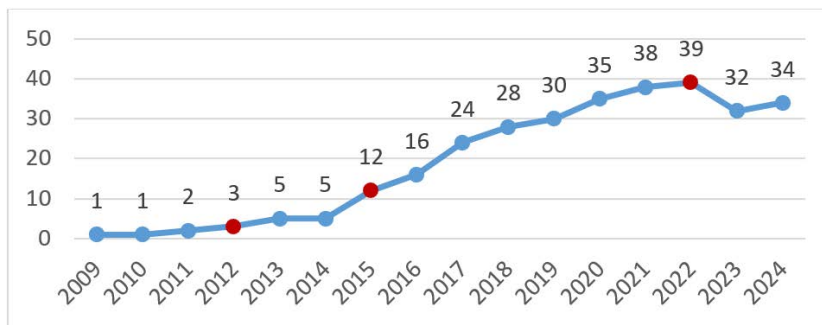


Figure 3. Dynamics of the number of articles in scientific journals published in the Republic of Moldova from 2009 to 2014

**Source:** [https://ibn.idsi.md/ro/Graph\\_Stacked?type=categoriiReviste](https://ibn.idsi.md/ro/Graph_Stacked?type=categoriiReviste). Accessed on 15.03.2025

The accreditation mandate was valid for four years, with re-accreditation scheduled to begin in 2013. In preparation for the re-accreditation process, the regulations were revised by Joint Decision No. 196 of the ASM and the NCAA on October 18, 2012. This revision aimed to enhance the quality of articles by refining eligibility criteria and introducing article assessments. It also sought to improve the international visibility of national journals by incentivizing the inclusion of international experts on editorial boards, publishing articles by international authors, and achieving inclusion in international databases.

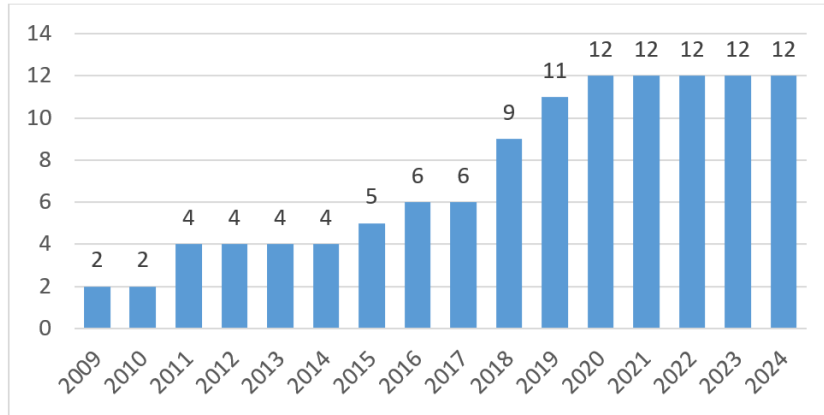
Additionally, open access (OA) to articles has been promoted, and maintaining a journal website has become mandatory. These measures resulted in a significant increase in the number of journals included in the Directory of OA Journals (DOAJ), primarily driven by website evaluations. Consequently, the number of journals listed in DOAJ rose from 3 in 2012 to 12 in 2015 and 39 in 2022 (see Figure 4).



**Figure 4. Moldovan journals registered in DOAJ**

**Source:** <https://doaj.org/>. Accessed on 10.03.2025

To enhance the promotion of journals at the international level, the joint decision of ASM and CNAAN No. 147, dated June 25, 2015, resulted in the division of type B journals into categories B and B+. The regulations established more stringent requirements for the promotion and visibility of publications classified as B+. This initiative led to a significant increase in journal promotion procedures, resulting in a doubling of the number of national journals indexed in the SCOPUS database (see Figure 5).

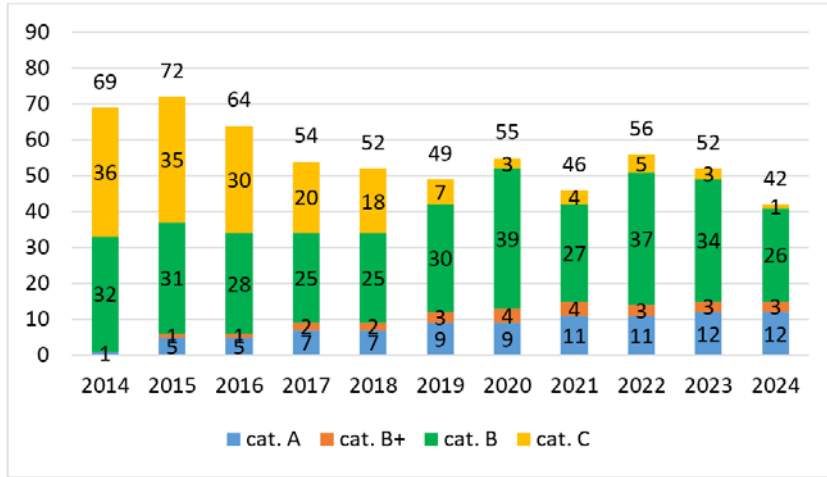


**Figure 5. Moldovan journals indexed in Scopus database**

Source: [https://ibn.idsi.md/ro/journals\\_view\\_scopus/](https://ibn.idsi.md/ro/journals_view_scopus/). Accessed on 20.03.2025

Joint Decision No. 275 of the ASM and NCAA, dated December 17, 2015, introduced an amendment to the Regulations that limited Category C accreditation to a two-year period. Journals that failed to advance to a higher category after this period had their accreditation revoked. This provision resulted in a 12% decrease in the proportion of Category C journals, alongside an 11% increase in Category B/B+ journals and a 12% increase in Category A journals by 2017 compared to 2013. This effect may have also been influenced by the implementation of Government Decision No. 920, issued on November 7, 2014, which approved the Research and Development Strategy of the Republic of Moldova until 2020. This strategy eliminated the accreditation procedure for research and innovation organizations, thereby removing the obligation to maintain a scientific journal. These changes laid the groundwork for subsequent amendments to the regulatory framework through Law No. 190, enacted on September 21, 2017.

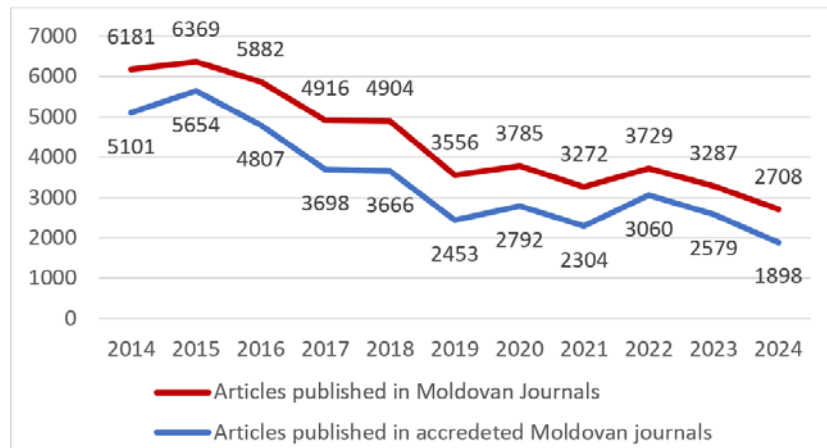
As a result, the number of national journals returned to pre-accreditation levels, and the number of accredited journals decreased from 68-76 between 2009 and 2013 (see Figure 2) to 55-42 between 2018 and 2024 (see Figure 6). This trend indicates that publishers were less inclined to sustain lower-quality journals following the removal of the regulatory mandate.



**Figure 6. Accredited journals in the Republic of Moldova in 2014-2024, per category**

Source: [https://ibn.idsi.md/ro/Graph\\_Stacked?type=categoriiReviste](https://ibn.idsi.md/ro/Graph_Stacked?type=categoriiReviste). Accessed on 15.03.2025

The decline in the number of scientific journals has led to a 2.3-fold reduction in the number of articles published in national journals in 2024 in comparison with 2015 and a 3.0-fold decrease in articles published in accredited national scientific journals (see Figure 7).



**Figure 7. Dynamics of the number of articles in scientific journals published in the Republic of Moldova from 2014 to 2024**

Source: [https://ibn.idsi.md/ro/Graph\\_Stacked?type=categoriiReviste](https://ibn.idsi.md/ro/Graph_Stacked?type=categoriiReviste). Accessed on 15.03.2025

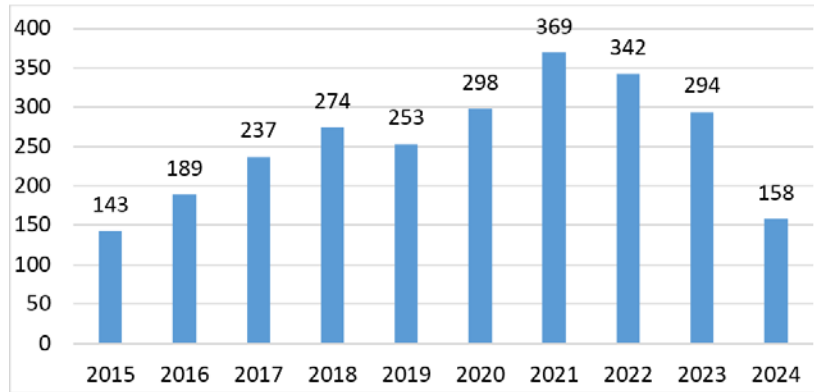
The journal evaluation regulations were revised in 2018 by the National Agency for Quality Assurance in Education and Research (NAQAER, successor of

NCAA) Decision No. 6, dated December 18, 2018. This revision followed the structural reforms implemented within the research and innovation system, as established by Law No. 190 of September 21, 2017. The list of proposed international databases for journal promotion was updated. Additionally, the requirements for journals were revised and strengthened, with specific criteria outlined for websites and publication categories, particularly for higher categories. Category A was subdivided into A and A+, with the latter designated for journals that have an impact factor assigned by the WoS database. For Category B+, the requirements included publication in an internationally recognized language (with the exception of journals in the social sciences and humanities), inclusion in the DOAJ, provision of a journal DOI and author ORCID identifiers, and publication in WoS and/or Scopus databases by the editor-in-chief and at least two editorial board members. These increased requirements led to a 1.7-fold rise in the number of national journals indexed in Scopus and the DOAJ by 2021, compared to 2017.

The journal assessment standards outlined in the Regulations, along with the accreditation application procedure and journal monitoring, were significantly modified by the NAQAER Decision No. 23 on December 19, 2023. This revised version of the Regulations reduced the list of international databases proposed for journal promotion. Greater emphasis was placed on the criteria for evaluating article quality and the procedures for organizing the editorial process and promoting journals. The two-year limitation on Category C accreditation, which resulted in revocation upon failure to advance to a higher category, was eliminated.

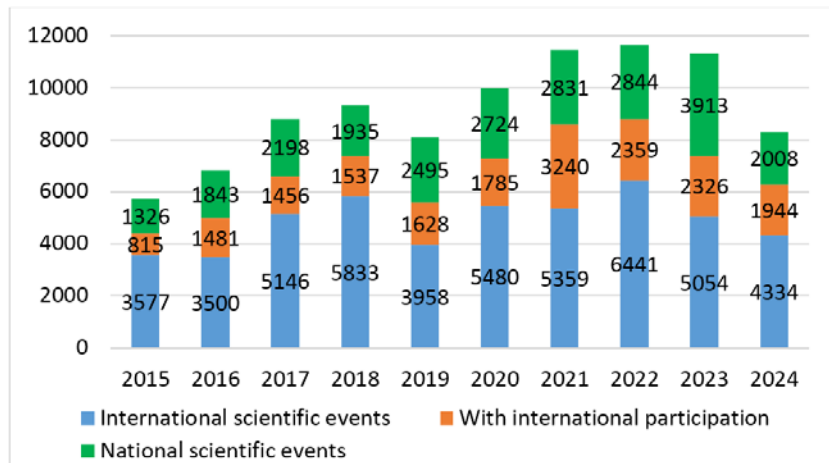
A further revision of the Regulations was enacted by the NAQAER Decision No. 6 on February 6, 2025, which imposes stricter requirements concerning the international visibility of Category C journals.

The implementation of stricter requirements in journal reaccreditation procedures, coupled with the trend of decreasing the number of scientific journals, has led to a migration of scientific articles to collections of materials published within organized scientific events. This shift may be attributed to a more formalized review process for the materials presented. Consequently, there was an increase of scientific events organized from 2015 to 2021 (see Figure 8).



**Figure 8. Number of scientific events organized in the Rep. of Moldova**  
 Source: <https://conferinte.stiu.md/>. Accessed on 15.03.2025

The increase in the number of organized events, particularly the publication of conference materials, has necessitated regulation within this segment of editorial activity in the scientific field. Consequently, by Decision No. AC-1/5.1 of the NCAA dated February 2, 2017, and by Decision No. AT-1/13.6 of the NCAA dated February 16, 2017 the Regulation on the recognition, classification, and recording of scientific events was approved. This regulation established seven categories of scientific events (congresses, conferences, symposiums, colloquia, sessions, seminars, and round tables) and outlined requirements for three types of scientific events (international, with international participation, and national). The distribution of papers per type of event shows that about half of all scientific events organized in the Republic of Moldova are international conferences (see Figure 9).

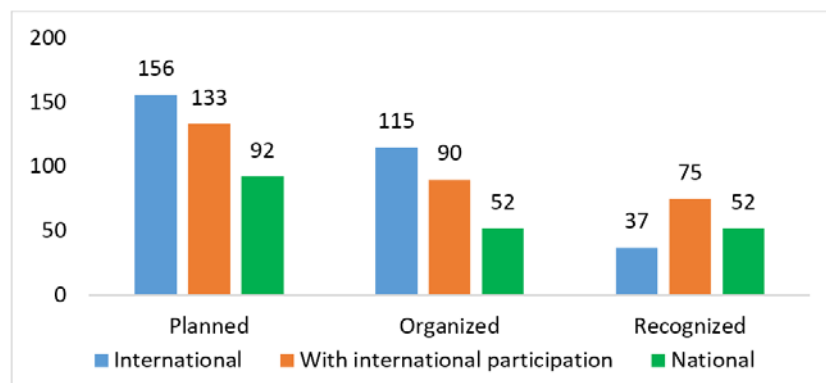


**Figure 9. Distribution of conference papers per type of event organized in the Rep. of Moldova**

Source: [https://ibn.idsi.md/ro/Graph\\_Stacked?type=eventsPub](https://ibn.idsi.md/ro/Graph_Stacked?type=eventsPub). Accessed on 20.03.2025

The amendments to the Regulation on the Recognition, Classification, and Recording of Scientific Events was approved by the decision of the NAQAER No. 38 on October 10, 2018. This document introduces clearer validation procedures for scientific events. The Regulation was significantly revised and approved by the decision of the NAQAER No. 5 on January 28, 2022. This regulation represented a major shift by digitalizing the monitoring and reporting processes through the implementation of the Online Platform for the Registration, Monitoring, and Validation of Scientific Events (<https://conferinte.stiu.md/>). The establishment of this platform led to a trend of decreasing numbers of events organized after 2022, as well as a reduction in the articles included in the events materials (see Figure 8, Figure 9).

The online platform for evaluating scientific events revealed that during the years 2022-2023, only 67% of the planned events were successfully organized. International events were organized at a rate of 73% of the planned total, while national events were organized at a rate of only 57% of the planned total (see Figure 10).

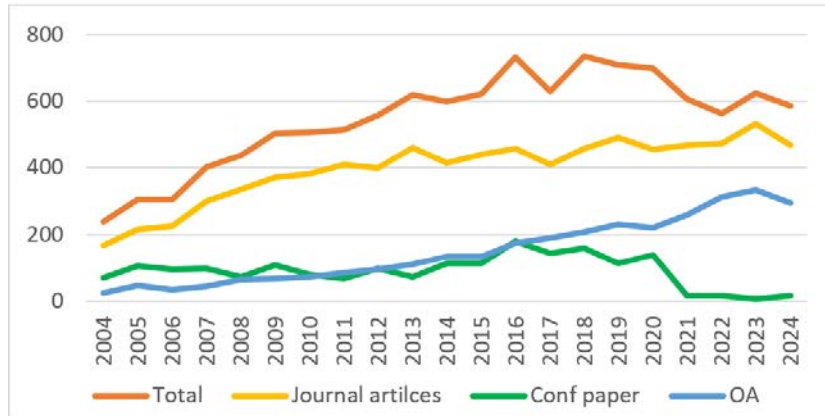


**Figure 10. Events organized, planned and validated (2022-2023)**

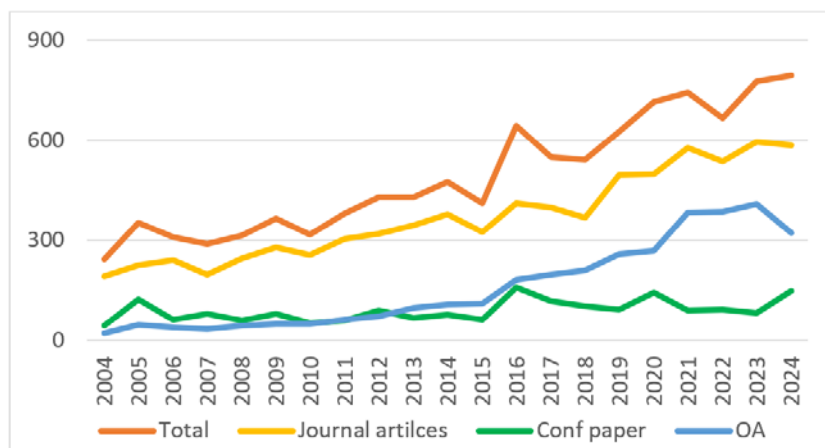
Source: <https://conferinte.stiu.md/>. Accessed on 20.03.2025

100% of the national events and only 32% of the international events were validated (recognized) while preserving the categories declared by the organizers.

Even though academic publishing policies have had a fluctuating effect at the national level, they positively impacted the international visibility of researchers from the Republic of Moldova. An analysis of data from the WoS and Scopus indicates a generally positive trend in the total number of publications of Moldovan authors over the period. This shows increasing research activity and potentially greater integration of Moldovan researchers into the global scientific community (see Figure 11, Figure 12).



**Figure 11. The dynamics of papers of authors from the Rep. of Moldova indexed in Web of Science**  
**Source:** WoS database. Accessed on 21.03.2025



**Figure 12. The dynamics of papers of authors from the Rep. of Moldova indexed in Scopus**  
**Source:** Scopus database. Accessed on 21.03.2025

The number of OA publications has increased significantly in both databases. This reflects a global shift towards OA publishing models and we believe the influence of national policies encouraging OA. The proportion of OA publications relative to the total number of publications has also generally increased, indicating a growing adoption of OA practices by Moldovan researchers.

The analysis of journal articles vs. conference papers show that the first ones consistently make up the larger proportion of publications in both databases,

which is typical for most scientific fields. The number of conference papers also shows some fluctuation, reflecting the level of organization and participation of Moldovan researchers in international conferences (see Figure 9).

In summary, the data indicates a positive trajectory for scientific publishing in the Republic of Moldova, driven by increasing research activity, growing adoption of open access, and the influence of national science policies. However, continued efforts are needed to sustain this progress and further enhance the quality and impact of Moldovan research.

## **Conclusions**

The increasing reliance on bibliometric indicators and alternative metrics for research assessment presents both opportunities and challenges. While these tools offer quantitative insights into research impact, they must be complemented by qualitative assessments to ensure a balanced evaluation framework.

The evolution of the scientific publishing system in the Republic of Moldova has been significantly influenced by global trends such as open access initiatives, bibliometric indicators, and digital editorial processes. These changes necessitate continuous adaptation to maintain competitiveness and relevance in the international research landscape.

To ensure integration into the global scientific community, Moldovan research policies were adjusted to align with international best practices. This includes adopting transparent evaluation criteria, promoting open-access publishing, and optimizing funding mechanisms for research dissemination.

The digitalization of editorial processes and the adoption of international publishing standards play a crucial role in strengthening research integrity. This requires investments in training researchers, improving peer-review mechanisms, and ensuring adherence to ethical publishing practices.

To effectively address these developments, policymakers should implement strategies that support high-quality research dissemination. This includes incentivizing publications in reputable journals, fostering international collaborations, and enhancing the accessibility of research outputs through open-access platforms.

The evolution of Moldova's scientific publishing system presents opportunities for growth and innovation. By proactively adapting to global trends and reinforcing national research policies, the country can strengthen its position within the international academic community and contribute to the advancement of knowledge on a broader scale.

## **Availability of data and materials**

The datasets generated during this study are available from the corresponding author.

## **Acknowledgement**

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