



Research Article

Open Science Practice in Western Balkan Countries

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ABSTRACT

This comprehensive review explores the landscape of open science in the Western Balkan Countries (WBCs), offering insights into existing policies, infrastructure, and practices. The analysis spans a spectrum of stakeholders, encompassing decision-makers, research funds, institutions, and individual researchers. The review is structured into four sections, each shedding light on crucial aspects of open science. The initial section investigates Open Science /Open Access (OS/OA) policies in WBCs, providing a foundation for understanding the regulatory landscape. The second section delves into OS/OA repositories within the region, emphasizing the significance of digital platforms for research dissemination. The third section focuses on OA practices, elucidating the prevalence of national OA scientific journal in Directory of Open Access Journals (DOAJ). Additionally, a bibliometric analysis of OA publishing in the WBCs, based on Scopus-indexed articles since 2012, offers valuable insights into disciplinary representation in OA practices. The final section examines the intersection of OS/OA and public engagement, particularly within the realm of psychology. Highlighting examples from the STAR Center, this section showcases initiatives that contribute to the development of OS/OA policies, infrastructure, and practices in Serbia, underscoring the Center's dedication to citizen science.

Key words: open science, open access, citizen science, keyword coincidence analysis, DOAJ

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Introduction

One of the fundamental principles of Open Access and Open Science (OA/OS) is the imperative that research, funded by various entities, should be made accessible to the public. Changes in the approach to scientific research are illustrated by the UNESCO recommendation on open science (UNESCO recommendation on Open science; UNESCO, 2021), as a universal framework for access to scientific work. According to UNESCO, the key pillars of open science are open scientific knowledge, open scientific infrastructure, scientific communication, open engagement of members of society and open dialogue with society as a whole (UNESCO, 2021).

This accessibility ensures that the scientific community, industry, citizens, and others can derive benefit from the outcomes of these endeavors. The prominence of this principle is evident across OA/OS policies, underscoring the societal responsibility inherent in scientific research. Consequently, OA/OS assumes a key role in increasing trust in scientific practices, addressing the reproducibility challenges facing the field, and fortifying the reliability and integrity of research outcomes.

The disposition of decision-makers and the research community toward open science is manifested in their willingness to embrace transparency in the rules and procedures governing scientific research. Namely, respect for the principles of OS has become an integral part of the policies of science financiers, both international, such as the European Commission (European Commission, 2016), and national (e.g., *Zakon o nauci i istraživanjima* - Law on Science and Research, 2019). Achieving this transparency involves the implementation of policies, the development of infrastructure, and the raising of awareness regarding the significance of open science for the advancement of knowledge (Lawrence, 2001).

This review aims to offer a comprehensive understanding of the prevailing policies, infrastructure, and practices related to open science in the Western Balkan countries. Such an analysis is crucial for gaining insights into past initiatives and anticipating future developments in OS involving a diverse range

of stakeholders, including decision-makers, research funds, research institutions, and individual researchers. The review is organized into four sections: the first focuses on Open Science policies in Western Balkan countries, the second on Open Science repositories in the region, the third on Open Access practices, and the final section delves into Open Science and public engagement practices within the realm of psychology, featuring examples from the STAR Center.

Open science policies in Western Balkan countries

The survey conducted for this review resulted from the Embedding RRI in Western Balkan Countries: Enhancement of Self-Sustaining R&I Ecosystems (WBC-RRI.NET) project. It employed a custom-made questionnaire designed to comprehensively address all pertinent aspects of Open Access and Open Science (OA/OS) resources in the WBCs. Divided into three distinct parts, the questionnaire aimed to elucidate national or institutional legislative documents related to the implementation of OA/OS principles, assess existing open science practices and technical resources, and gauge attitudes towards OA/OS among decision-makers.

The questionnaire, created using the open-source Google Form, was distributed online in English. Invitations to participate were extended to all universities and research institutes in Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia—approximately 50 institutions in total.

The responsible individuals from diverse institutions in the WB region, including academic entities, research institutes, and governmental bodies, contributed to the survey. Notable participants include Co-PLAN Institute for Habitat Development in Albania, POLIS University in Albania, the Ministry of Science and Technological Development in Montenegro, and the University of Belgrade in Serbia, among others.

The survey encompasses data collected up to July 1st, 2022, with additional information gathered until December 1, 2023. The questionnaire remains continuously accessible for interested participants on the WBC-RRI.NET website: [Survey Questionnaire Link](#).

In broad terms, OA/OS policies are categorized as national, funding, and institutional. This classification, while not always explicit, helps in understanding the diverse nature of documents considered as policies, ranging from laws and strategies to guidelines (Table 1).

As of now, Albania does not have a national OA/OS policy. However, there is a notable initiative among researchers to sign the Declaration on Open Science at the national level as part of the National Initiatives for Open Science in Europe (NI4OS) project. Additionally, research grants from public funds necessitate an OA Policy Regulation document, and specific projects incorporate Data Management Plans.

Table 1

Links to the OS policies at WBCs

Country	National OS policies	Institutional OS policies	Open data policies
Albania	Declaration on OS		
Bosnia and Herzegovina			Data Archive for Social Sciences in Bosnia and Herzegovina – DASS-BiH
Montenegro	Ministry of Education of Montenegro		
North Macedonia	National Open Science Cloud Initiative		
Serbia	Ministry of Education, Science and Technological Development of Republic of Serbia	University of Novi Sad University of Kragujevac University of Belgrade State University of Novi Pazar University of Niš University of Priština University of Arts in Belgrade Criminal Police University Institute of Technical Sciences of SANU Balkan Institute of SANU Institute of Plant Protection and Environment Institute of Architecture and Urbanism of Serbia Institute of Animal Husbandry, Belgrade-Zemun Institute of Field and Vegetable Crops University of Belgrade – Faculty of Chemistry Faculty of Special Education and Rehabilitation Maize Research Institute „Zemun Polje“	University of Novi Sad: Decision on Amendments to the Bylaw on Doctoral Studies – related to the Data Management Plan

Bosnia and Herzegovina lacks national or institutional OA/OS policies. Nevertheless, the Data Archive for Social Sciences was established in 2018,

serving as the national service for the preservation and dissemination of social science research data. The archive, developed within the Centre for Development Evaluation and Social Science Research, has adopted a preservation policy.

Montenegro has made strides by adopting a National policy of OA/OS in 2020. This policy encompasses an action plan focusing on various aspects, including OA to scientific papers, national academic publishing, research data, research infrastructures, and the promotion of OS skills through training programs.

In North Macedonia, the National Open Science Cloud Initiative has adopted a National policy in the form of a declaration in 2021. Embracing The European Open Science Cloud ecosystem and existing international thematic repositories, researchers and stakeholders are encouraged to sign the declaration.

Serbia has demonstrated commitment to OS with the adoption of the National open science platform by the Ministry of Education, Science, and Technological Development in 2018 (MPNTR, 2018). The platform mandates open access to the final, published or peer-reviewed versions of scientific publications and recommends immediate open access to primary research data. Higher education and research institutions, including the University of Novi Sad, have also adopted institutional open science policies, with specific regulations regarding Data Management Plans. The Science Fund of the Republic of Serbia has implemented open access publishing and open data treatment in alignment with FAIR (findability, accessibility, interoperability, and reusability) principles for all research projects applying for grants.

This overview provides a snapshot of the current landscape of OA/OS policies and practices in the WBCs, paving the way for a detailed exploration in the subsequent sections of this review (e.g. WBC-RRINET, 2022).

Open science infrastructure in Western Balkan countries

The second part of the previously described survey was related to the technical resources, and information infrastructure at WBCs, as well to attitudes

towards OA/OS among decision makers and includes questions such as “How do researchers at your institution pay for Article Processing Charges (APC)?”

In Albania, researchers predominantly utilize international OA/OS repositories, such as Zenodo. Notably, a public repository is housed within the non-profit organization Co-PLAN, dedicated to sustainable development and good urban governance. The repository is managed by IT professionals and researchers, with institutional resources supporting its maintenance. Publishing in open-access journals incurs APC costs, primarily covered by project funds. However, researchers also rely on personal and institutional resources, showcasing a multi-faceted funding approach (Figure 1).

Table 2

Links to the OS repositories at WBC

Country	National repositories	Institutional repositories	Thematic repositories
Albania		Co-PLAN : a non-profit organization	
Bosnia and Herzegovina		University of Banja Luka "E-theses" of the University of Banja Luka University of Zenica	Data Archive for Social Sciences in Bosnia and Herzegovina – DASS-BiH
Montenegro		University of Montenegro "E-theses" of the University of Montenegro	
North Macedonia		University Ss. Cyril and Methodius in Skopje, Faculty of EE and IT	
Serbia	NaRDuS (National Repository of Dissertations in Serbia) Repositories of the PhD theses at the University of Belgrade, University of Novi Sad, University of Niš and University of Kragujevac are included in NaRDuS	University of Belgrade - SPIRA Collection of 32 institutional repositories University of Kragujevac University of Novi Sad State University of Novi Pazar* University of Arts in Belgrade* University of Niš* Full lists of repositories in Serbia can be found at National portal of Open Science	<i>National Repository of Agricultural Education -</i> CaSA NaRA The Jewish Digital Library Repository of psychological instruments in Serbian - REPOPSI

While Bosnia and Herzegovina lacks formal OA/OS policies, certain higher education institutions have established repositories to enhance the visibility of scientific work. Institutions like the University of Banja Luka and the

University of Zenica, along with the Data Archive for Social Sciences in Bosnia and Herzegovina (DASS-BiH), maintain digital repositories with a combination of Ministry of Science support and internal funding. Maintenance responsibilities fall on IT professionals, librarians, and researchers. APC costs for open-access journal publication are primarily borne by project funds and researchers' personal resources (Figure 1). Some institutions also offer occasional support. Despite these positive initiatives, it's acknowledged that these examples may not represent the entire research community in Bosnia and Herzegovina.

In Montenegro, only the University of Montenegro currently practices depositing research results into an institutional repository. However, the survey lacks information on how the repository is financed and maintained, as well as the resources researchers depend on for APC.

In North Macedonia, the institutional OA/OS repository is housed at the University Ss. Cyril and Methodius in Skopje, Faculty of EE and IT. Research institutions in the country generally do not allocate funds for OA/OS resources, but researchers receive substantial support for APC charges (Figure 1). The repository maintenance is undertaken by researchers, with minimal involvement from the IT sector or librarians.

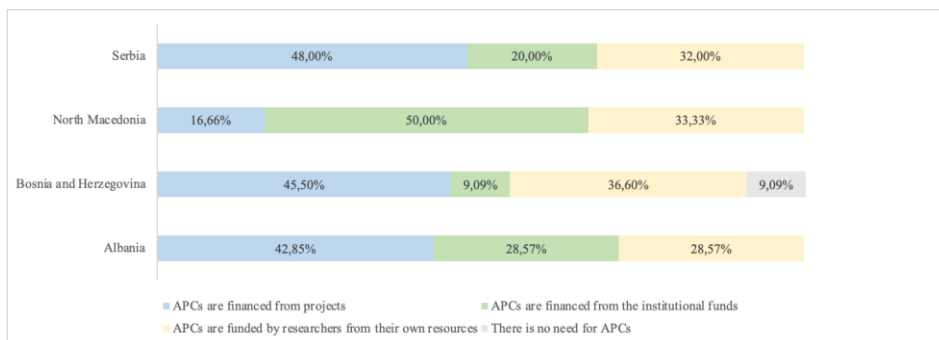


Figure 1. APC charges in WBCs

Serbia hosts numerous research institutions equipped with digital repositories; nevertheless, some repositories face challenges in terms of continuous maintenance and functionality. Examples include the repositories

associated with the University of Niš, State University in Novi Pazar, and the University of Arts in Belgrade, as outlined in Table 2. The responsibility for repository maintenance is predominantly shouldered by librarians and the IT sector, underscoring their pivotal role in supporting science and research initiatives.

A notable issue within the landscape of open access/open science (OA/OS) repositories in Serbia is the absence of a standardized system. Many repositories rely on the dedication of individual institutions rather than a regulated framework, hindering overall progress in this domain. Funding for repositories primarily comes from institutional resources, making them susceptible to fluctuations in institutional income and financial stability.

In general, in all WBCs researchers often resort to project grants or personal funds to cover APCs associated with OA publications (Figure 1). This points to a significant gap in widespread institutional support for open science practices.

The reliance on individual grants or personal finances places a burden on researchers and may impede the broader adoption of open science principles. Addressing these challenges calls for a concerted effort to establish a more structured and sustainable framework for OA/OS repositories in all WBCs. This may involve developing standardized practices, securing dedicated funding streams, and fostering collaboration between institutions, librarians, and the IT sector.

Open access publishing practice in Western Balkan countries

In all WBCs, a prevailing culture exists wherein universities and scientific institutions actively publish scientific journals. These national resources serve as vital platforms for researchers, forming a cornerstone of academic discourse. Aligning publishing practices with the principles of OS/OA becomes crucial for ensuring the continued growth and relevance of these journals. Notably, a significant number of these journals follow the *diamond* OA model, where government funding supports their publication, relieving researchers from the burden of APCs. The indexing of these journals in the DOAJ holds paramount

importance, as it enhances their visibility and accessibility on a global scale. Table 3 provides an overview of the current number of journals from WBCs indexed in DOAJ, signifying their presence and recognition within the broader scholarly community.

These numbers highlight the substantial presence of open access journals, particularly in Serbia. The inclusion of scientific journals in the DOAJ indicates a commitment to OS/OA principles, making research findings more accessible to a global audience. This approach enhances the visibility of local research and fosters collaboration and knowledge exchange on an international scale.

Table 3

Number of scientific journals indexed in DOAJ in WBCs

Country	Number of journals
Albania	4
Bosnia and Herzegovina	44
Montenegro	9
North Macedonia	16
Serbia	211

In order to gain an insight into the practice of OA publishing in the WBCs, a bibliometric analysis of all scientific articles indexed in the Scopus database, since 2012, was conducted. The dataset was compiled in December 2023 using the Python wrapper for the Scopus RESTful API, *pybliometrics* package (Rose & Kitchin, 2019). In the first step, all scientific articles affiliated with one of the WBCs were retrieved, while in the second dataset was limited to articles published in OA. In the Gold OA model, articles are published in fully OA journals. These journals make their content freely accessible to the public. Authors typically pay an APC to the publisher to cover the costs associated with the publication process. This funding model ensures that the final published version of the article is immediately available to readers without any subscription or paywall barriers. Green OA refers to the practice of authors self-archiving a

version of their manuscript in a repository, such as an institutional repository or a subject repository, after it has been published in a subscription-based (non-open access) journal. The term "Bronze Open Access" is not as commonly used as Gold or Green. It might be used informally to refer to articles that are freely available on a publisher's website but are not published in fully open access journals. In the Hybrid Open Access model, a journal is a traditional subscription-based journal, but individual articles can be made open access on payment of an additional fee (Article Processing Charge or APC). This allows authors to choose which articles to make OA while the rest remain behind a paywall. Table 4 shows the number of papers published in different options of OA from all WBCs.

Table 4

Number and % of OA scientific articles indexed in Scopus from WBCs

Year	Albania			Bosnia and Herzegovina			Montenegro			North Macedonia			Serbia		
	N	OA	%OA	N	OA	%OA	N	OA	%OA	N	OA	%OA	N	OA	%OA
2012	245	54	22.04	612	177	28.92	186	75	40.32	464	165	35.56	6052	2323	38.38
2013	412	239	58.01	607	214	35.26	235	104	44.26	556	195	35.07	5982	2458	41.09
2014	447	277	61.97	633	263	41.55	300	146	48.67	629	290	46.10	5961	2698	45.26
2015	366	210	57.38	696	348	50.00	267	108	40.45	673	318	47.25	5944	2807	47.22
2016	286	126	44.06	731	394	53.90	319	147	46.08	663	355	53.54	6069	2984	49.17
2017	292	152	52.05	904	474	52.43	382	184	48.17	658	359	54.56	6145	3228	52.53
2018	355	195	54.93	1015	583	57.44	384	217	56.51	713	431	60.45	6431	3593	55.87
2019	399	236	59.15	1204	779	64.70	472	307	65.04	774	453	58.53	7002	4369	62.40
2020	544	335	61.58	1283	844	65.78	533	362	67.92	780	488	62.56	6941	4427	63.78
2021	684	475	69.44	1532	1051	68.60	501	347	69.26	844	584	69.19	7692	5224	67.91
2022	757	501	66.18	1462	1069	73.12	457	316	69.15	925	616	66.59	7883	5540	70.28
Total	4787	2800	58.49	10679	6196	58.02	4036	2313	57.31	7679	4254	55.40	72102	39651	579.18
Bronze		332	11.85		697	11.24		276	11.93		518	12.17		4330	10.92
Gold		488	17.42		1657	26.74		511	22.09		693	16.29		6572	16.57
Green		1814	64.78		3726	60.13		1470	63.55		2921	68.66		27893	70.34
Hybrid		166	5.92		116	1.87		56	2.42		122	2.86		856	2.16
		2800			6196			2313			4254			39651	

Note. N – number of published articles; OA – number of articles published in OA; %OA – % of articles published in OA.

Across all countries, Green OA is the dominant category, with the highest percentage of articles made freely accessible through repositories or institutional platforms. The distribution between Bronze (predominantly self-archiving) and Gold (articles published in fully open access journals) varies, with

percentage of the Gold OA being higher in Bosnia and Herzegovina and Montenegro. Hybrid OA, where some articles are freely accessible while others require payment, represents a relatively small percentage across all countries. Serbia stands out with a notably higher total number of articles, reflecting a substantial contribution to OA publishing in the region.

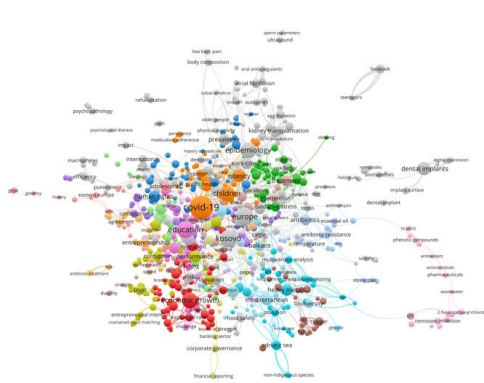


Figure 2. Keyword coincidence map for OA articles in Albania

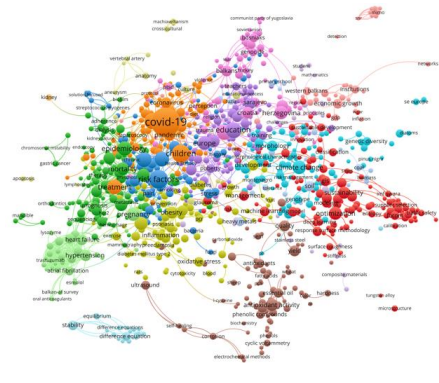


Figure 3. Keyword coincidence map for OA articles in Bosnia and Herzegovina

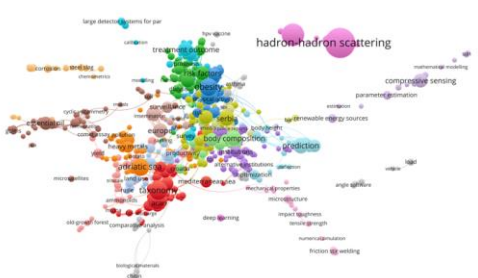


Figure 4. Keyword coincidence map for OA articles in Montenegro

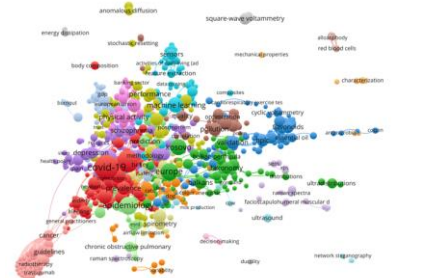


Figure 5. Keyword coincidence map for OA articles in North Macedonia

Figure 2 shows the keyword coincidence analysis of scientific articles published in OA from Albania. The visualization reveals distinct clusters of OA articles, each representing a thematic concentration within the academic landscape. The orange cluster emerges prominently, encompassing scientific papers primarily focused on COVID-19. This cluster extends to incorporate

related health behaviors and conditions, such as obesity, public health, and depression, highlighting the interconnectedness of these topics in the literature. The red cluster stands out as well, featuring a substantial number of OA articles related to economic themes. Topics within this cluster span economic growth, savings, and migration, showcasing a significant scholarly discourse on economic subjects in the Albanian OA literature. The light blue cluster is indicative of marine science, pollution, and biodiversity. This thematic grouping reflects a notable concentration of research on environmental aspects, particularly those related to marine ecosystems and pollution dynamics.

Figure 3 shows the keyword coincidence analysis of scientific articles published in OA from Bosnia and Herzegovina. Similar to the previous case, the largest cluster is centered around the topic of COVID-19, signifying a significant scholarly focus on this subject. This cluster is closely associated with the green cluster, which encompasses health-related topics such as epidemiology, prognosis, and pregnancy, indicating a comprehensive exploration of health aspects related to the pandemic. Furthermore, two distinct clusters in light and dark purple delve into broader themes including Europe, education, Bosnia, Herzegovina, the Balkans, and trauma. These clusters suggest a multidisciplinary approach, encompassing geopolitical, educational, and sociocultural dimensions within the scholarly discourse. Additional thematic clusters are evident in the analysis: a brown cluster relates to antioxidants, showcasing a focused exploration of this specific area. Meanwhile, a red cluster pertains to sustainability and traffic, indicating a scholarly interest in issues related to environmental sustainability and transportation dynamics.

Figure 4 provides a visual representation of the shows the keyword coincidence analysis of scientific articles published in OA from Montenegro. A notable and entirely independent cluster is dedicated to physics-related topics, possibly in collaboration with CERN, and specifically mentions hadron-hadron scattering. The independence of this cluster underscores the depth and breadth of scientific contributions in the field of physics from Montenegro. Other clusters within the analysis cover diverse topics. The light green cluster focuses on body composition, suggesting a specialized area of research in health

sciences. The red cluster is associated with taxonomies in biology, indicating an interest in systematic classification within the biological sciences. In addition, the dark green cluster encompasses topics in medicine, including risk factors and disease prognosis. This cluster suggests a substantial body of research in medical sciences, emphasizing factors influencing health outcomes and prognostic indicators.

Figure 5 shows the keyword coincidence analysis of scientific articles published in OA from North Macedonia. The largest cluster, highlighted in red, is dedicated to the topic of COVID-19, indicating a significant focus on research related to the pandemic. The second-largest cluster, depicted in green, encompasses broader geopolitical themes such as Europe and the Balkans. This suggests a multidisciplinary approach within the scholarly discourse, exploring regional and international dimensions. The purple cluster is notable for its emphasis on medical topics, primarily focusing on mental health. This suggests a substantial body of research in the field of medicine, particularly addressing aspects related to mental well-being. The prominence of this cluster underscores the importance of mental health research within the scientific output from North Macedonia.

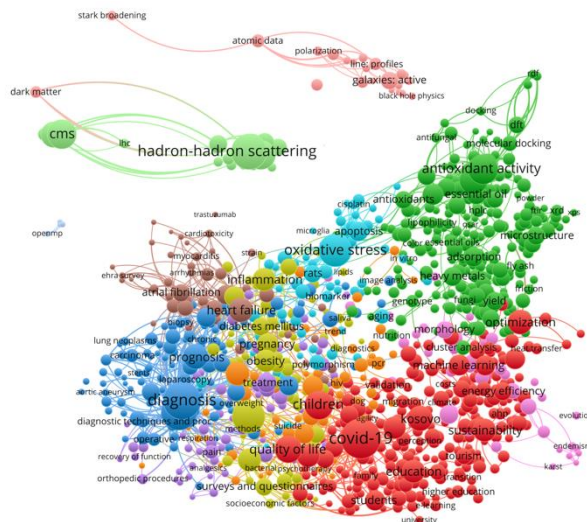


Figure 6. Keyword coincidence map for OA articles in Serbia

Figure 6 shows the keyword coincidence analysis of scientific articles published in OA from Serbia. Similar to Montenegro, there is a notable and independent cluster dedicated to physics, specifically focused on hadron-hadron scattering, indicating collaboration with CERN. Additionally, another independent cluster in light pink also pertains to physics, covering diverse topics such as galaxies, black holes, and polarization, showcasing the breadth of research within this field. The largest cluster, marked in red, is dedicated to the COVID-19. Intriguingly, this cluster intertwines with a range of other themes, including sustainability, education, and even machine learning, indicating a multidisciplinary approach in studying the pandemic's various aspects. The blue cluster concentrates on medical topics, encompassing diagnostics, prognosis, and diagnostic techniques. This suggests a substantial body of research in the field of medicine, particularly focusing on diagnostic methods and prognostic indicators. Another noteworthy cluster, marked in green, is associated with the study of antioxidants with heavy metals and essential oils, reflecting research in the field of chemistry and environmental science.

These findings collectively underscore the dynamic and varied research landscapes within the WBCs, emphasizing both global concerns like COVID-19 and region-specific interests in fields such as physics, medicine, and environmental science. The OA nature of the publications emphasizes a commitment to the accessibility and dissemination of research findings, as well as resources for APC.

Open Science and Public Engagement in Psychology: Insights from STAR Center

Open science in STAR Center

The STAR Center has an important role in advancing Open Science initiatives in Serbia, particularly through its coordination of the first Open Science project in the country, BEOPEN - Boosting Engagement of Serbian Universities in Open Science. This project, supported by

the European Commission, marked a significant step forward in promoting Open Science practices within the Serbian academic landscape. One of the notable outcomes of the BEOPEN project is the establishment of a national *Platform for open science* in Serbia (MPNTR, 2018), as well as national [Portal for Open Science](#). This portal serves as a centralized hub, facilitating and promoting various aspects of Open Science, including OA, data sharing, and collaborative initiatives. Furthermore, as a result of the BEOPEN project, each university in Serbia now manages institutional repositories dedicated to OS.

The first Manual for Open Science in Serbia (Smederevac et al., 2020) addresses various prevailing misconceptions and prejudices against OS/OA in a detailed manner. Also, the manual provides an in-depth exploration of open repositories of scientific publications, offering insights into the functionalities of the DSpace-CRIS platform. This platform serves as the foundation for the institutional repositories of Serbian universities, including the University of Novi Sad, the University of Niš, the State University of Novi Pazar, and the University of Arts in Belgrade. The manual further outlines a comprehensive data treatment plan, emphasizing the adherence to FAIR principles. For researchers engaged in the review processes for scientific journals, the manual presents a dedicated chapter on Open Peer Review. The manual extends its coverage to include guidance on the usage and deposit of open-source code, recognizing the paramount importance of open source to researchers in the IT sector. It acknowledges the familiarity of most data processing researchers with the popular statistical environment R (R Core Team, 2013). Moreover, it highlights the relatively rare but evolving topic of Open Methodology in science. It cites examples of good practice in psychology, engineering and technology, and veterinary medicine. The chapter on Open Methodology is positioned as an indispensable component of the overarching narrative of OS, emphasizing its relevance alongside the burgeoning field of citizen science.

Members of the STAR Center have contributed significantly to the advancement of research evaluation practices by translating the Leiden Manifesto for Research Metrics (Hicks et al., 2015, translated in Serbian by Smederevac & Pajić, 2016). This translation provides a framework for establishing

additional criteria in the assessment of scientific impact. The Leiden Manifest is originally formulated to guide research institutions and scholars in the responsible use of metrics. This translation enhances understanding and facilitates the adoption of principles that promote a more comprehensive and nuanced approach to evaluating scientific contributions.

The first OA interactive textbook in statistics in Serbia, entitled [Primena tehnika vizualizacije u bazičnoj statistici](#) (Pajić, 2020), signifies a notable milestone in the field of statistical education. This groundbreaking resource provides comprehensive information about various statistical procedures. What sets it apart is the incorporation of state-of-the-art visualizations that go beyond traditional explanations, offering readers an interactive and visually engaging experience. This approach aims to enhance the understanding of the logic behind statistical procedures, making the learning process more accessible and intuitive. By embracing open access principles, this textbook contributes to the broader accessibility and democratization of knowledge in the field of statistics, fostering a culture of open education and collaborative learning in Serbia.

The STAR Center's open questionnaires serve as a valuable resource for researchers engaging in scientific studies, particularly those requiring diverse instruments. In the realm of psychology, numerous instruments are protected by strict authorship and commercial licenses. Therefore, the availability of open questionnaires becomes pivotal, providing researchers with an important and freely accessible repository of various psychological measures.

The first segment of this resource encompasses instruments either created by members of the STAR Center or those translated and validated for use in the Serbian population. This collection serves as a comprehensive toolkit for researchers seeking a wide array of psychological assessments (see [Open psychological questionnaires](#)).

The second segment draws from The International Personality Item Pool (IPIP), a pioneering OS project spearheaded by Lewis Goldberg. The project's objective is to grant researchers unrestricted access to questionnaire items for assessing diverse psychological phenomena. With a repository of 3320 items, a

majority of which have been translated into numerous languages worldwide, the IPIP project facilitates the creation of a multitude of instruments for personality and psychological construct assessments. Utilizing this set of items, researchers can freely explore simulations of multidimensional constructs, one-dimensional scales, or items translated into Serbian, enabling the development of new instruments tailored to specific phenomena (e.g., Nikolašević et al., 2012). Currently, 2544 items from the IPIP project have been translated into Serbian, further expanding the range of accessible resources for psychological research in the region (Smederevac et al., 2016) (also see [IPIP - International Personality Item Pool; items in Serbian](#)).

Citizen science in STAR Center

STAR Center has been fostering citizen science projects since 2020, when the first psychological citizen science project in Serbia started. In the period from the introduction of the state of emergency, the STAR Center (former Center for Behavioral Genetics) conducted research to study emotional reactions to the COVID-19 pandemic in Serbia. Citizen scientists worked actively to promote research, engage participants and motivate them to fill out questionnaires every day. The results of the survey were regularly available on the website created for this study, and social networks, media and citizen scientists contributed to their dissemination. The survey lasted 5 weeks and included 1526 participants and a total of 18 478 responses. In the first week, 889 respondents participated in the research, during the second week 885, during the third week 698, during the fourth week 639 and during the fifth week 595 (Branovački et al., 2021; Oljača et al., 2020; Sadiković et al., 2020).

EkOtisak, a project on climate science and artistic action for the citizens of Novi Sad, received funding from Novi Sad, the European Capital of Culture. This initiative addressed climate challenges through the innovative fusion of art and science, facilitated by the Center for the Promotion of Science. In collaboration with the Faculty of Philosophy, the Academy of Arts at the University of Novi Sad, and the organization Zeleni Sad, the project unfolded from July 20 to August 7, 2022. Themed as art+science: EkOtisak (ecoprint), this unique intersection actively engaged artists, scientific researchers, civil society organizations, and citizens in exploring daily habits contributing to the carbon footprint. The project included a

survey probing citizens on various aspects, workshops covering topics like eating habits and climate change, and culminated in an exhibition at the Rectorate of the University of Novi Sad, and a program hosted on the Strand as part of the seventh edition of the art+science events.

The ongoing GENIUS (Genetic and environmental influences on psychological adaptation of children and adults) project, supported by the Science Fund of the Republic of Serbia, aims to explore genetic and environmental influences on the psychological adaptation of children and adults. This initiative actively engages diverse societal actors outside academia, utilizing public engagement platforms like science festivals, Researchers' Night, the annual Twin Day, and collaboration with Civil Society. Recognizing the importance of accessibility and engagement, GENIUS emphasizes building on community best practices to foster a new scientific culture. The project involves citizens in mutual learning, facilitates the exchange of scientific information, and ensures the accessibility of research outcomes. A citizen science network, established as part of its open science strategy, serves as a knowledge-exchange platform through a cycle of webinars for citizen scientists, promoting collaborative learning.

In appreciation of citizen scientists' contributions, the STAR Center, a key participant in GENIUS, awards badges and certificates based on the degree and type of involvement in project tasks. Detailed information about the activities and achievements of citizen scientists can be explored on the project's dedicated webpage: GENIUS Webinars. Additionally, students attain the status of citizen scientists upon participating in any project phase, receiving badges and certificates depending on their degree and type of involvement in project tasks.

The STAR Center's commitment to citizen science is further underscored by the translation of 10 principles of citizen science in Serbian (ECSA, 2015), as well as publication of the first [Guide for citizen science](#) in Serbia (Dinić et al., 2022), which encapsulates emphasizing engagement with diverse topics. While the STAR Center employs systematic approaches to citizen science, its activities span various scientific disciplines, including biology, medicine, and psychology.

The diversity of projects such as GENIUS, EkoTisak, and the study of mental well-being during the COVID-19 pandemic reflects the center's dedication to

fostering interdisciplinary engagement. It is crucial to acknowledge the STAR Center's role as a driving force in facilitating citizen science initiatives and its commitment to advancing scientific knowledge while integrating these activities into diverse academic realms.

The members of the STAR Center play a proactive role in elevating the standing of social sciences and humanities, as evidenced by their active contributions to various programs aimed at popularizing science (Smederevac, 2022). Their engagement reflects a commitment to advancing the fields of social science and humanities in Serbia. Notably, the STAR Center holds a unique position as the only center of excellence in social science and humanities within the country. This distinction underscores the center's pivotal role in driving excellence, fostering research, and promoting the broader impact of social sciences and humanities in the Serbian academic landscape.

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Conflict of interest

We have no conflict of interest to disclose.

Data availability statement

The data used in this study is not available for sharing due to Elsevier's terms and conditions. They can easily be retrieved using a valid institutional subscription.

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