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GLOBAL UNIVERSITY
NETWORK FOR INNOVATION

Higher Education in the World Report 8
Special Issue

New Visions for Higher Education towards 2030

Abridged version

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List of Abbreviations

CLO	Chief Learning Officer
COIL	Collaborative Online International Learning
DESD	Decade of Education for Sustainable Development
EHEA	European Higher Education Area
ERA	European Research Area
ESD	Education for Sustainable Development
EUA	European University Association
FAIR	Findable, Accessible, Interoperble, Reusable
GUNi	Global University Network for innovation
HBCUs	Historically Black Colleges and Universities
HEIs	Higher Education Institutions
IAU	International Association of Universities
ILO	International Labour Organization
MCU	Magna Charta Universitatum
MDGs	Millennium Development Goals
OECD	Organisation for Economic Co-operation and Development
PKM	Personal Knowledge Mastery
RDF	Researcher Development Framework
RRI	Responsible Research and Innovation
SDGs	Sustainable Development Goals
SDLC	Software Development Life Cycle
SDSN	Sustainable Development Solutions Network
STEM	Science, Technology, Engineering and Mathematics
SwafS	Science with and for Society
THE	Times Higher Education
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
WCED	World Commission on Environment and Development
WEF	World Education Forum
WHEC	World Higher Education Conference

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References

Anand, S. (2021). Tagore, Social Responsibility and Higher Education in India. In B. Hall & R. Tandon (Eds.), *Socially Responsible Higher Education: International Perspectives on Knowledge Democracy* (203-215). BRILL/SENSE.

Belkhiria, E., Al-Zo'by, M. & Ayari, A. (2021). Language, Identity and Transformation: The Case of Arabic in Qatari Higher Education. In B. Hall & R. Tandon (Eds.), *Socially Responsible Higher Education: International Perspectives on Knowledge Democracy* (125-137). BRILL/SENSE.

Cuenca Morales, J. & Mora Motta, C. L. (2021). Education outside the Classroom: Social Commitment in University Education. In B. Hall & R. Tandon (Eds.), *Socially Responsible Higher Education: International Perspectives on Knowledge Democracy* (95-105). BRILL/SENSE.

Dussel, E. (1993). Europa, Modernidad y Eurocentrismo. *Revista de Cultura Teológica* 4: 69-81.

https://doi.org/10.19176/rct.v0i4.14105

Ezeyanya, C. A. (2011). *Education and Indigenous Knowledge in Africa: traditional bonesetting and Orthopaedic Medicine in West Africa*. Washington DC Howard University

Grosfugel, R. (2013). The Structure of Knowledge in Westernized Universities: Epistemic Racism/Sexism and the Four Genocides/Epistemicides of the Long 16th Century. *Human Architecture: Journal of the Sociology of Self-Knowledge,* XI (1): 73-90.

Gutberlet, J., Tremblay, C. & Moraes, C. (2014). The Community-Based Research Tradition in Latin America. In: Munck R., McIlrath L., Hall B., Tandon R. (Eds), *Higher Education and Community-Based Research.* Palgrave Macmillan, New York.

https://doi.org/10.1057/9781137385284_12

Hall, B. L. & Tandon, R. (2017). Decolonisation of Knowledge, Epistemicide, Knowledge Democracy in Higher Education. *Research for All*

Hall, B. L. & Tandon, R. (Eds.), (2021). *Socially Responsible Higher Education: International Perspectives on Knowledge Democracy.* BRILL/SENSE.

https://lccn.loc.gov/2021010874

Lebakeng, J. T., Manthiba Phalane, M. & Dalindjebo, N. (2006). Epistemicide, Institutional Cultures and the Imperative for the Africanisation of Universities in South Africa. *Alternation* 13, (1): 70-87.

Lepore, W., Hall, B. & Tandon, R. (2020). The Knowledge for Change Consortium: A Decolonising Approach to International Collaboration in Capacity-Building in Community-Based Participatory Research.*Canadian Journal of Development Studies,* Nov 11.

Moolman, B. & McMillan, J. (2021). Social Infrastructures at the Nexus of Education and Justice. In B. Hall $ R. Tandon (Eds.), *Socially Responsible Higher Education: International Perspectives on Knowledge Democracy* (55-66). BRILL/SENSE.

de Sousa Santos, B. (2007). Beyond Abyssal Thinking: From Global Lines to Ecologies of Knowledge. *Eurozine,* 33, 45–89.

Visvanathan, S. (2009, May). The Search for Cognitive Justice. *Knowledge in question, a symposium on interrogating knowledge and questioning science.*

http://bit.ly/3ZwMD2

Open Science: Observations for Universities as Agents of Paradigm Change

Eva Méndez and Núria Bautista-Puig

Abstract

Universities are fundamental niches for research and knowledge generation. Ensuring that the results of research are freely accessible, and promoting a more collaborative and participatory science, is essential to improving the effectiveness of R+I systems, and to opening up Universities' knowledge to the society that sustains them. Open Science implies a new paradigm promoted by the European Commission and embraced in November 2021 by all UNESCO countries, the aim of which is to move from 'publish as quickly as possible' to 'share as soon as possible'.This document characterises Open Science and includes fundamental reflections for its implementation by Universities, taking into account the key role of higher education institutions (HEI) in the effective shift to a new research paradigm, providing examples, initiatives and pointing out the main problems that researchers face in putting Open Science into practice. However, also reflected here is the commitment of many universities and university alliances to Open Science, particularly in Europe, through the creation of the new European Research Area (ERA), in which OS is a structural element.

1. Introduction. Collaboration, equity and sustainability for a global Open Science (OS)

Research and Innovation (R&I) play a fundamental role in Higher Education Institutions (HEIs), and their results are a vital asset for creating a better society. Research is becoming increasingly complex, digital, interdisciplinary, data-driven, dependent on large-scale computing capabilities and highly competitive. Digital technologies, in particular the World Wide Web, enable distributed collaborative research behaviour (David et al., 2008) and the possibility to communicate knowledge immediately, transparently, collaboratively, openly and globally. The Web, and the openness of research and innovation processes and collaboration, provide an opportunity to envisage a promising transformation of the way we do science. Despite this, **the way we conduct, publish, fund and evaluate research has not changed since the 20th century** (Méndez, 2021).

In universities, we have been talking about open science for many years now, but not always as a serious concept. OS policies and mandates, until quite recently, focused solely on Open Access (OA) to scientific publications, and often conflicted with national policies and with universities' other underlying interests such as rankings, which dominate policies and behaviours, **pushing researchers towards the traditional "publish or perish" and subjecting them to the tyranny of 20th-century metrics and the business of scientific publishers.**

HEIs are key institutions in the 2030 Agenda[1]. One of the biggest challenges facing universities in the 21st century is how to effectively manage their efforts to solve societal problems, such as those tackled through the Sustainable Development Goals (SDGs), in an increasingly complex, competitive and changing global environment (Păunescu et al., 2022). **OS is also an essential enabler of the 2030 Agenda[2], and can be seen as a concrete way to reduce inequalities (SDG 10) and leave no one behind.** It must also be adapted to universities in less developed countries where they do not have the funding needed for research. Investments should create a virtuous circle in which changes in research outcomes generate more funding in the long term (Onie, 2020). "Failure to address structural inequalities directly means that those who are already privileged will see their advantages increase, especially because they have greater influence over the way Open Science is implemented" (Ross-Hellauer, 2022).

1. See: Global University Network for Innovation (GUNI). Rethinking HEIs for Sustainable and Inclusive Societies: https://www.guninetwork.org/files/concept_note_guni_2021_new_visions_for_he_2030_def.pdf
2. See: Towards Global Open Science: Core Enabler of the UN 2030 Agenda: https://research.un.org/conferences/OpenScienceUN

2. The concept of Open Science, and challenges for universities

2.1 Open Science: a new global paradigm for research and innovation

OS is a new way of conceiving research through collaborative work, openness and transparency in all stages of research, and bringing science closer to society more effectively. It requires a radical transformation in the way research is conducted, and requires the current model to undergo a paradigm shift (Anglada & Abadal, 2018).

OS emerged in the fields of economic history and the sociology of science, which focus on the economic dimension of knowledge and intellectual capitalism in the late 17th century. In the sociology of science, the principle of openness is seen as inherent to academic activity and can be traced back to the original precepts underpinning the conduct of researchers (Merton, 1974). The race to be the first to claim credit in science has traditionally provided a strong incentive for scientists to make their knowledge public. The sharing of scientific knowledge created with public money, however, poses a social and political problem.

Most theories and definitions characterise OS as a "movement"; however, as well as the activism side, OS has a political discourse and a set of traits and modes of behaviour that shape the nature of research as a system, and which transcend the basic discussion of "open vs. closed" science. Because of this, we prefer to speak of a new paradigm and a new attitude for and towards research (Méndez, 2021).

Although the European Commission's policies, actions, recommendations and funding programmes have helped to legitimise OS as a term and "brand", it was not until the recommendations of UNESCO, in November 2021, that a consensus definition was reached and the name "Open Science" was chosen over other possible names (Open Scholarship, Open Research or Open Knowledge). Thus, Open Science is defined as:

> "an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems." (UNESCO, 2021).

Yeratziotis et al. (2022) highlight the impact of research on society, which should be a natural consequence of OS, as it encompasses all disciplines, for different groups and societal actors, and multiple levels of analysis, methods and complex interdependencies between Academia, Business, Government, Society and Environment. The quintuple helix model recognises the distinct roles that these main actors have in the innovation system, highlighting the importance of actively integrating citizens into research, development and innovation. Ignat & Ayris, (2020) emphasise that OS enables knowledge sharing between the scientific community, society and business, making it possible to increase the recognition and the social and economic impact of science. **OS is more than just open access to data and publications; it is the opening up of the scientific process as a whole, strengthening the concept of scientific social responsibility. The practical implementation of OS creates multiple opportunities for innovation, and enables new products, services, businesses and companies to be developed.**

In addition to the three main public statements of Budapest (2001), Berlin (2003) and Bethesda (2003) (known as the three Bs), which focused on open access to publications, the last 20 years have seen recommendations, manifestos and all kinds of documents supporting OS or aspects of it.[3] The European Commission (EC) has boosted the analysis, feasibility and motivation of OS, creating specific working groups, documents and observations that mark various milestones in its development (e.g. EC, 2016; Hessels et al., 2021; OSPP-REC, 2018, O'Carroll et al., 2017, 2017b, etc.). However, many of these reports show that we are still in a transitional process, as indicated by the inclusion of "Towards" in the title of many of them (EC, 2021; CSES,

3. See: Charters and Principles in Scholarly Communication: http://tinyurl.com/scholcomm-charters. To date (March 2022), this living document includes over 120 declarations, manifestos, etc.

2020; Méndez et al., 2020). Nevertheless, universities and other research institutions have always been considered the main stakeholders in this complex and necessary scenario.

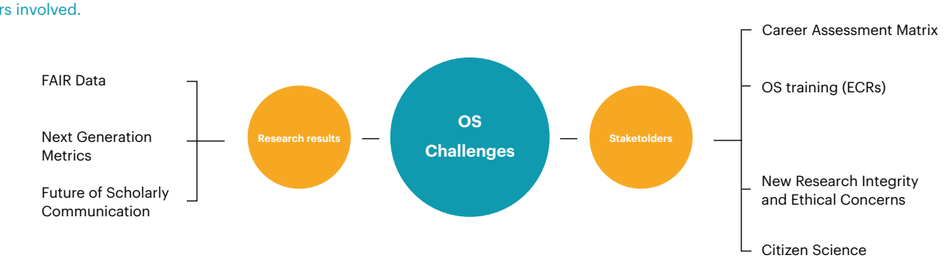
The EC has been the driving force behind OS policies, which have been taken up by the 27 Member States and other European countries outside the EU. Several states have thus launched specific national policies to promote and implement OS. The Scholarly Publishing and Academic Resources Coalition (SPARC Europe) and the Digital Curation Centre (DDC), publish an annual report on the current situation regarding OS policies in Europe. The latest of these reports (Sveinsdottir et al., 2021) recognises that 12 of the 27 EU Member States have an OS policy, with varying strategies: centralised policy at government level (such as France) or through participatory methodologies (such as Finland). Switzerland's policy is worth noting for the fact that universities are the ones leading the transition to OS. Regardless of the level of leadership they have in the corresponding national strategies, European universities are fundamental actors, to a greater or lesser extent, and their evolution is properly monitored through the annual survey of the European University Association (EUA) on OS (Morais et al., 2021).

The EC's latest prospective study by the Rathenau Institute looks at the effects of global variations in OS practices on the European research system. It makes a geographical comparison between China, the United States and the EU to analyse the geopolitical developments and coordination mechanisms used by the EU and these two vast and disparate countries. In 2019, China presented 32% of its scientific publications in OA, compared to 43% in the US and 45% in the EU (Hessels et al., 2021, based on information taken from the Web of Science). The EU is making a coordinated effort to create a global infrastructure – the European Open Science Cloud (EOSC) – where several interested universities have signed up to be members or observers of the EOSC association. In other parts of the world, the same approach is being taken, but at different speeds and with varying levels of commitment. In some countries, HEIs have other priorities and require OS to be redesigned to suit their needs (Onie, 2020) or to ensure that their needs are met through OS. However, creating national infrastructures for research data and the promotion of Open Science is already a fairly common initiative (e.g. the African Open Science Platform; the CSTCloud in China; the Malaysian Open Science Platform (MOSP); the National Research Data Infrastructure (NFDI) in Germany; and the Australian Research Data Commons, (ARDC).) Since 2019, there has been talk of creating a Global Open Science Cloud infrastructure that helps to address complex problems and scientific challenges through interdisciplinary research data. OS is a global effort that requires the whole world to play an active role. UNESCO not only defines OS as a global public good, but also includes the need for international cooperation between different actors in all countries and in key areas.

2.2. The challenges of Open Science and how universities can address them

OS cannot be delayed any longer, and HEIs are playing a key role in its implementation. In the latest HEIW7 report, Ayris & Labastida (2019) highlight the eight fundamental challenges or pillars identified by the EC and emphasise the need for universities to undergo a change of culture in order to face these challenges, as described in the League of European Research Universities (LERU) report. If we remove the specificity of the European EOSC, and summarise it as the need for Findable, Accessible, Interoperable and Reusable (FAIR) research data infrastructures, then these challenges or pillars can be extrapolated to any HEI, not just in Europe, and can be categorised into challenges either related to research results, or to the stakeholders involved (Fig. 1)

Figure 1. Main OS challenges related to research results and to the stakeholders involved.



Source: adapted from (Méndez, 2021)

In addition to these more or less universally accepted challenges, we must include another: **equity**, which also derives from UNESCO (2021) and **is crucial to ensure that OS is not the norm solely in the most prosperous or developed countries and institutions, but that all HEIs have the resources they need to transition to OS.** Universities must embrace a culture that promotes diversity and equal opportunities, articulating shared values that create a shared research and innovation system, and establishing the necessary legal and social framework to implement it.

As we have highlighted on numerous occasions (Méndez, 2021; Méndez et al., 2020), **OS does not only need policies, statements and recommendations; it also needs Practical Commitments for Implementation (PCIs) from all stakeholders involved.** PCIs are measures that put into practice the principles and values of OS; they are realistic and include a concrete action plan. In Spain, the Digital Agenda 2025 (Government of Spain, 2020) defines the country's priorities in the current context, and the challenges and developments foreseen for the coming years, and includes the actions that the EUA will take to support them. It highlights three priorities: universal and permanent OA to all research results; FAIR research data; and institutional accountability in research evaluation, which is undeniably the game changer (cf. 3.1).

3. Keys to implementing Open Science in HEIs: transforming and collaborating

3.1. The Gordian Knot: The change needed in the research evaluation system

The current research system works under the irrational and anachronistic imperative to "publish or perish", and the success of an academic career is measured by the papers a researcher publishes – not in just any scientific journal, but in those considered "good" according to metrics that, much like the journal impact factor (JIF), cannot measure the quality of a paper but only the popularity of the journal in which it is published. The JIF was originally intended to help libraries decide which journals to purchase for their collections, but it has since become the basic trusted metric used to evaluate research articles (McKiernan et al., 2019) and, worse still, for determining promotion in research careers.

This type of evaluation based on quantitative indicators and exclusively on publications is the biggest barrier to OS, and is recognised as such by everyone involved in the science system. Since 2021, the EC has facilitated efforts to reform the research evaluation system. In December 2020 it published a Scoping Report (EC, 2021) to boost the process of reviewing and building a consensus with stakeholders with the aim of establishing responsible evaluation. This evaluation reform is part of the policy agenda of the European Research Area (ERA). For that purpose, the Commission has brought together a coalition of organisations (led by the EUA and ScienceEurope) to implement the reform. These organisations include other university networks, which have stated their position (e.g. the Young European Research Universities Network (YERUN) and the League of European Research Universities (LERU), and agree on the need for greater multidimensionality in the evaluation process. **Evaluating researchers solely based on the number of highly cited articles they have published in journals with a high JIF underestimates the value of other contributions, limits reproducibility and discourages researchers from collaborating.** The need for multidimensional evaluation is highlighted in the career assessment matrix (CAM) (O'Carroll et al., 2017b) and is also reflected in the Dutch position paper Room for Everyone's Talent.[4]

Universities usually highlight their autonomy when describing their evaluation and promotion systems, but 75% of HEIs acknowledge the prevalence of the JIF as an indicator in individual evaluations. However, some countries are taking a different approach to research evaluation, such as the Netherlands, where universities have created a Strategy Evaluation Protocol (SEP 2021-2027), and individual institutions have established systems of incentives not based on qualitative indicators.

3.2. Science is yours: participatory research structures within universities

Engaging society and societal actors has been a priority for the EU over the last five years (EC, 2017; Lamy et al., 2017). However, there is still a lack of mechanisms to

4. See: https://www.nwo.nl/sites/nwo/files/media-files/2019-Recognition-Rewards-Position-Paper_EN.pdf

systematise the involvement of citizens in HEI research. Several studies have shown that society can play a meaningful role in debates on science and technology, and that this win-win interaction can help to strengthen democracies and decision-making (Marzuki, 2015; Renn et al., 1993). In this regard, **at a time of heightened concern over citizens' lack of faith in science, it is more important than ever to establish institutionalised mechanisms that include citizens in the conduct and governance of science and innovation in HEIs** (Mejlgaard et al., 2018). To engage society in research, OS creates a framework where there is a need to shift from seeing science as a product to seeing science as a process, and to foster competition between researchers for collaboration that goes beyond universities and boosts innovation.

Although many projects include participatory methodologies for this key OS challenge, citizens' contributions need to be more meaningful at numerous stages of the entire research process. For that purpose, universities need to provide infrastructures and programmes to develop such practices. The way universities choose to establish this type of practice varies, from makerspaces (hackerspaces or FameLab) (Niaros et al., 2017), to science shops (Leydesdorff & Ward, 2005) and living labs (Schuurman et al., 2011) (also recently called Open Labs). Living labs are spaces for testing, validation, development and co-creation at all stages of a design and commercialisation process (Leminen et al., 2017) and have been implemented by both companies (Merz et al., 2007) and universities (Nesterova & Quak, 2016).

Committed and innovative universities must put citizens at the heart of OS, in line with the principles of Responsible Research and Innovation (RRI). There has been significant progress in recent years, but there is still a long way to go before this is a widespread approach in universities.

3.3. Research quality: scientific integrity and reproducibility

Another aspect that universities need to pay attention to **is quality of research, which can be compromised by initiatives and behaviour falsely presented as OS.** OS sometimes breeds opportunistic behaviour, such as editorial practices that have resulted in fraudulent journals, and others that – while not considered outright fraud – have encouraged predatory behaviour. A new ethical code of good practice is needed to guarantee the reproducibility of science and a new integrity in the universities of today to guarantee a proper transition to the OS paradigm.

The new ethics required by OS and data-driven science presents a fundamental challenge and still lacks a shared or global vision that goes beyond pre-established codes of ethics (e.g. ALLEA, 2017). Reproducibility is a continuum based on three main research processes: reproduction (re-creation of a study by a third party, using the original setting, data and analysis methodology), replication (more general re-creation of results, using the same analytical method but on different datasets) and re-use (more flexible re-use of results beyond the original research context (transdisciplinarity) (Lusoli, 2020).

HEIs must establish ethical and technical protocols for data sharing that guarantee broad reproducibility/replicability and reuse, including the publication of negative results, which are currently discriminated against in scientific output. From a technical point of view, making data FAIR is no small matter. It requires investment and monitoring by universities, which are not always prepared to go any further than funders' requirements to create a data management plan (DMP). Publishing all the data that underpins a piece of research can save resources and avoid repeating failed experiments. We cannot estimate how much it costs HEIs to make their data compliant with FAIR principles, but we do know how costly it is if they are not (PwC EU Services., 2018).

3.4. Strength in numbers: university networks and alliances for implementing Open Science.

From a supra-institutional point of view, university networks in Europe (EUA, YERUN, LERU, CESAER, etc.) and internationally (GUNI, IUA, ACA, etc.) have played – and continue to play – a very important role. European university alliances have also joined them through EC-funded projects in the EU. This initiative presents an opportunity to work together, to reflect and to deepen university collaboration in a multilateral environment. **University alliances can serve as role models or test-beds** for new approaches (Claeys-Kulik, 2021), particularly to bring about the **real, cross-institutional implementation of OS through solid PCIs.** To maximise synergies in research and innovation policies, the

EC complemented the funding of the Erasmus+ European Universities Initiative through a specific call for proposals for the Horizon 2020 Science with and for Society (SwafS) programme. All partnerships therefore have a project in which **"mainstreaming Open Science practices" was one of the transformation modules** highlighted in the call. OS is an essential part of all the projects funded in this call, and thus also in the partnerships and institutions involved in them: for example, YUFERING (YUFE alliance, Fig.3) and RIS4CIVIS (CIVIS alliance), which have a specific OS work package (WP); and ENHANCERIA (ENHANCE alliance), where OS is a cross-cutting theme throughout the project.

4. Final observations: Knowledge+Open = Universities 2030

Sometimes it can feel like the ideals, values and recommendations of OS remain the same, and the only thing that changes is the target year for bringing about the change. The EC initially set 2020 as its target year for making all publications open; we are now in 2022 and still a long way from meeting that target. The target year for universities is now 2030, as well as for OS and the SDGs. Universities are trying to establish OS policies, but these are increasingly being referred to as "open-washing", which is when action plans are undermined by the pressure of the anachronistic and absurd publication system, or by the purely binary method of monitoring compliance with requirements (e.g. research data is listed as either open or not open, while the level of compliance with FAIR principles is not assessed).

Looking towards 2030, the EUA[5] is presenting **Universities 2030 as institutions that are open, transformative and transnational; sustainable, diverse and engaged; strong, autonomous and accountable.** The EC-commissioned report Towards a 2030 Vision on the Future of Universities in Europe identified several transformation modules. One of these was "knowledge-driven universities in the context of digital changes: the transition to open science (through FAIR and open data) and Open Access". The report also highlighted the need for greater citizen trust in the knowledge produced by universities through collaboration (citizen science) (CSES, 2020). With the same 2030 target, the final report of the Open Science Policy Platform (OSPP) (Méndez et al., 2020) proposed the five attributes that a **shared knowledge-based research system should fulfil by 2030:** an academic career structure that rewards diverse outcomes, practices and behaviours; a research system that is trustworthy and transparent; a research system that enables innovation; a research culture that facilitates diversity and equal opportunities; and a research system that is built on evidence-based policies.

5. See: Universities without walls: A vision for 2030 https://eua.eu/downloads/publications/universities%20without%20walls%20%20a%20vision%20for%202030.pdf

Figure 2. The 2022 Open Science calendar of the YUFE alliance, YUFERING project. DIY-OS Calendar (YUFERING), *January*

Source: adapted from (Méndez, 2022)

Although universities have made an effort to incorporate knowledge and OS into their systems since the beginning of the 21st century, **they are still a long way from becoming Open Knowledge Institutions.** This concept – which was also highlighted in the GUNI *Higher Education in the World 7* report (Benneworth et al., 2019) – defines universities in 2030 as Open Knowledge Institutions, collaborating at various levels (country, region), with different partners (multi-stakeholders) and from a transdisciplinary perspective.

Aside from all the definitions and references given in this article, **OS means giving science back to the researchers who carry it out, and to the society that funds it. Science is like a parachute: if it is not open, it cannot help us.** Universities have a fundamental role to play in creating an ecosystem of innovation and research that allows knowledge to become open and of value for society.

References

ALLEA. (2017). *The European Code of Conduct for Research Integrity* (Revised Ed.). ALLEA – All European Academies.

https://allea.org/wp-content/uploads/2017/05/ALLEA-European-Code-of-Conduct-for-Research-Integrity-2017.pdf

Anglada, L., & Abadal, E. (2018). ¿Qué es la ciencia abierta? *Anuario ThinkEPI,* 12, 292.

https://doi.org/10.3145/thinkepi.2018.43

Ayris, P., & Labastida, I. (2019). Open Science: A Cultural Change for Universities. In *Higher Education in the World Repor7: Humanities and Higher Education: Generating Synergies between Science, Technology and Humanities*.

https://www.guninetwork.org/files/download_full_report_heiw7.pdf (pp. 351-358)

Benneworth, P., Olmos-Peñuela, J., Montgomery, L., Neylon, C., Hartley, J., & Wilson, K. (2019). The 'Open' University as a Transformer of Public Service Ideals. In Higher Education in the World Report 7: *Humanities and Higher Education: Generating Synergies between Science, Technology and Humanities*.

https://www.guninetwork.org/files/download_full_report_heiw7.pdf (pp. 453-461)

CSES (2020). Centre for Strategy & Evaluation Services LLP, Whittle, M., & Rampton, J. (2020). *Towards a 2030 vision on the future of universities in Europe*. European Commission. Publications Office.

https://data.europa.eu/doi/10.2777/510530

Claeys-Kulik, A.-L. (2021). The future of Europe's universities: Opportunities and limits of alliances as testbeds. *European University Association blog*.

https://www.eua.eu/resources/expert-voices/253-the-future-of-europe%E2%80%99s-universities-opportunities-and-limits-of-alliances-as-testbeds.html

David, P. A., Besten, M. D., & Schroeder, R. (2008). *Will E-Science Be Open Science?* 15.

https://doi.org/10.2139/ssrn.1317390

EC (2016). European Commission. Directorate General for Research and Innovation. *Open innovation, open science, open to the world: A vision for Europe*. Publications Office.

https://data.europa.eu/doi/10.2777/061652

EC (2021) European Commission. Directorate-General for Research and Innovation. *Towards a reform of the research assessment system: Scoping report*. European Commission. Publications Office.

https://data.europa.eu/doi/10.2777/707440

Government of Spain (2020). España Digital 2025. *Vicepresidencia Primera del Gobierno. Ministerio de Asuntos Económicos y Transformación Digital*.

https://portal.mineco.gob.es/ca-es/ministerio/estrategias/Pagines/00_Espana_Digital_2025.aspx

Hessels, L. K., Koens, L., & Diederen, P. J. M. (2021). *Perspectives on the future of open science: Effects of global variation in open science practices on the European research system*. European Commission. Directora-

te-General for Research and Innovation. Publications Office.

https://data.europa.eu/doi/10.2777/054281

Ignat, T., & Ayris, P. (2020). Built to last! Embedding open science principles and practice into European universities. *Insights the UKSG Journal,* 33, 9.

https://doi.org/10.1629/uksg.501

Irwin, A. (1995). Citizen science: *A study of people, expertise and sustainable development*. Routledge.

Jhangiani, R. S., & Biswas-Diener, R. (Eds.). (2017). *Open: The Philosophy and Practices that are Revolutionizing Education and Science.* Ubiquity Press.

https://doi.org/10.5334/bbc

Lamy, P., Brudermüller, M., Ferguson, M., Fris, L., Garmendia, C., Gray, I., Gulliksen, J., Kumala, H., Maher, N., Plentz Fagundes, M., Wozniak, L. A., & Zic Fuchs, M. (2017). *LAB - FAB - APP: Investing in the European future we want : report of the independent High Level Group on maximising the impact of EU research & innovation programmes.*

http://dx.publications.europa.eu/10.2777/477357

Leminen, S., Rajahonka, M., & Westerlund, M. (2017). Towards Third-Generation Living Lab Networks in Cities. *Technology Innovation Management Review,* 7(11), 21-35.

https://doi.org/10.22215/timreview/1118

Leydesdorff, L., & Ward, J. (2005). Science shops: A kaleidoscope of science-society collaborations in Europe. *Public Understanding of Science,* 14(4), 353-372.

https://doi.org/10.1177/0963662505056612

Marzuki, A. (2015). Challenges in the Public Participation and the Decision Making Process. *Sociologija i Prostor.*

https://doi.org/10.5673/sip.53.1.2

McKiernan, E. C., Schimanski, L. A., Muñoz Nieves, C., Matthias, L., Niles, M. T., & Alperin, J. P. (2019). *Use of the Journal Impact Factor in academic review, promotion, and tenure evaluations* [Preprint]. PeerJ Preprints.

https://doi.org/10.7287/peerj.preprints.27638v2

Mejlgaard, N., Woolley, R., Bloch, C., Buehrer, S., Griessler, E., Jaeger, A., Lindner, R., Madsen, E. B., Maier, F., Meijer, I., Peter, V., Stilgoe, J., & Wuketich, M. (2018). A key moment for European science policy. *Journal of Science Communication,* 17(03), C05.

https://doi.org/10.22323/2.17030305

Méndez, E. (2021). Open Science por defecto. La nueva normalidad para la investigación. *Arbor, 197*(799), a587.

https://doi.org/10.3989/arbor.2021.799002

Méndez, E., Lawrance, R., MacCallum, C. J., Moar, E., & Open Science Policy Platform Members. (2020). *Towards a shared research knowledge system: Final report of the open science policy platform.* European Commission. Directorate-General for Research and Innovation.

https://doi.org/10.2777/00139

Méndez, E., Sánchez-Moreno, M., & Bautista-Puig, N. (2022). *DIY-OS Calendar (YUFERING).*

https://doi.org/10.5281/ZENODO.5961562

Merton, R. K. (1974). *The sociology of science: Theoretical and empirical investigations* (4. Dr.). Univ. of Chicago Press.

Merz, C., Louw, R. D., & Ullrich, N. (2007). Collaborative working environments for enterprise incubation – The Sekhukhune Rural Living Lab. *Proceedings of the IST Africa., 10.*

Montgomery, L., Hartley, J., Neylon, C., Gillies, M., Gray, E., Herrmann-Pillath, C., Huang, C.-K. (Karl), Leach, J., Potts, J., Ren, X., Skinner, K., R. Sugimoto, C., & Wilson, K. (2018). Open Knowledge Institutions. *MIT Press OA Books.*

https://doi.org/10.21428/99f89a34

Morais, R., Saenen, B., Garbuglia, F., Berghmans, S., & Gaillard, V. (2021). *From principles to practices: Open Science at Europe's universities 2020-2021 EUA Open Science Survey results.* European University Association.

https://eua.eu/downloads/publications/2021%20os%20survey%20report.pdf

Nesterova, N., & Quak, H. (2016). A City Logistics Living Lab: A Methodological Approach. *Transportation Research Procedia,* 16, 403-417.

https://doi.org/10.1016/j.trpro.2016.11.038

Niaros, V., Kostakis, V., & Drechsler, W. (2017). Making (in) the smart city: The emergence of makerspaces. *Telematics and Informatics,* 34(7), 1143-1152.

https://doi.org/10.1016/j.tele.2017.05.004

O'Carroll, C., Kamerlin, L., Brennan, N., Hyllseth, B., Kohl, U., O'Neil, G., & Van Den Berg, R. (2017). *Providing researchers with the skills and competencies they need to practise Open Science.* European Commission. Directorate-General for Research and Innovation.

https://data.europa.eu/doi/10.2777/121253

O'Carroll, C., Rentier, B., Cabello Valdés, C., Esposito, F., Kaunismaa, E., Maas, K., Metcalfe, J., & Vandevelde, K. (2017b). *Evaluation of research careers fully acknowledging Open Science practices: Rewards, incentives and/or recognition for researchers practicing Open Science.* European Commission. Directorate-General for Research and Innovation.

http://dx.publications.europa.eu/10.2777/75255

Onie, S. (2020). Redesign open science for Asia, Africa and Latin America. *Nature, 587*(7832), 35-37.

https://doi.org/10.1038/d41586-020-03052-3

OSPP-REC. (2018). *OSPP-REC Open Science Policy Platform Recommendations.* European Commission. Directorate-General for Research and Innovation.

https://data.europa.eu/doi/10.2777/958647

Păunescu, C., Lepik, K.-L., & Spencer, N. (2022). Introduction: An Overview of the Research. En C. Păunescu, K.-L. Lepik, & N. Spencer (Eds.), *Social Innovation in Higher Education* (pp. 1-8). Springer International Publishing.

https://doi.org/10.1007/978-3-030-84044-0_1

Purcell, W. M., & Lumbreras, J. (2021). Higher education and the COVID-19 pandemic: Navigating disruption using the sustainable development goals. *Discover Sustainability, 2*(1), 6.

https://doi.org/10.1007/s43621-021-00013-2

PwC EU Services. (2018). *Cost-benefit analysis for FAIR research data:* Cost of not having FAIR research data. European Commission. Publications Office.

https://data.europa.eu/doi/10.2777/02999

Renn, O., Webler, T., Rakel, H., Dienel, P., & Johnson, B. (1993). Public participation in decision making: A three-step procedure. *Policy Sciences, 26*(3), 189-214.

https://doi.org/10.1007/BF00999716

Ross-Hellauer, T. (2022). Open science, done wrong, will compound inequities. *Nature, 603(7901), 363-363.*

https://doi.org/10.1038/d41586-022-00724-0

Sveinsdottir, T., Davidson, J., & Proudman, V. (2021). *An* Analysis of Open Science Policies in Europe, v7 (Versión 7). Zenodo.

https://doi.org/10.5281/ZENODO.4725816

UNESCO. (2021). *Recomendación de la UNESCO sobre la Ciencia Abierta.* United Nations Educational, Scientific and Cultural Organization, UNESCO.

https://unesdoc.unesco.org/ark:/48223/pf0000379949_spa

Yeratziotis, A., Aadland, T., Brandshaug, S. W., Mettouris, C., Vanezi, E., & Papadopoulos, G. A. (2022). Design of a Social Innovation Competence Framework to Educate Entrepreneurs in Developing on the International Stage. En C. Păunescu, K.-L. Lepik, & N. Spencer (Eds.), *Social Innovation in Higher Education* (pp. 87-106). Springer International Publishing.

https://doi.org/10.1007/978-3-030-84044-0_5