

Open Science: an evolving ecosystem

1

Ana María Cetto
Instituto de Física UNAM, and LATINDEX

4th Open Science Fair Madrid, 25 September 2023

“Charting the course: *reimagining* Open Science for next generations” OSFair2023

2

- An Open-Science ecosystem?
 - On natural and human ecosystems
- The fragmented landscape of open access
 - Different concepts, different strategies
- From OA to OS
 - By which route, under which principles?
- The UNESCO OS principles
 - Towards Utopia?
- The openness of science
 - And the way forward.

An Open-Science ecosystem?

3

It is becoming commonplace to refer to the OS scene as an 'ecosystem' (ES). This suggests a closer look at the basic features of an ES.

- ***Basic definition:*** a community or group of living organisms that live in and interact with each other in a specific environment.
- ***Natural ES*** are “balanced” systems: the interactions between the different organisms contribute to a certain stability.
- The natural imbalances tend to ***offset each other permanently.***
- Some ES ***evolve*** slowly while others can transform very quickly.
- In ***extreme*** cases, they can even disappear.
- Natural ES ***have no finality or purpose of their own.***

Artificial ecosystems

4

- Human-made structures where *biotic and abiotic* components are made to interact with each other for survival.
- They are *not self-sustaining* and can perish without human help.
- They have very *limited genetic diversity* and *a low chance of evolution*.
- The nutrient cycles are *always incomplete*.
- The nature of all *closed* ES is to *wind down*.
- They are made for a *purpose* - a human purpose.

Human ecosystems

5

- People can bring into being new things that have not existed before.
- If we continue to consider most of the people on Earth as burdens to be shouldered or as customers to be served, we will fail.
- At the center, in platforms as currently designed, there is limited intelligence and sensitivity to the realities of people.
- Technology can connect people and augment their abilities,
- but value creation is accomplished through billions of daily creative acts.

Adapted from J.F. Moore et al, The human ecosystem, J. Digital Economy 1:1, 53 (2022).

Towards a theory of (OS) ecosystems

6

- The ES approach is an *inclusive* way to become engaged, to think *systemically*, to imagine better futures and *co-create* them.
- *Modularity* enables ES emergence as it allows distinct yet inter-dependent organizations to coordinate without full hierarchical fiat.
- Interactions make them interesting—specifically, the co-existence of *different types of complementarities*.
- The distinct parts of the ES represent organizations that are separated by “*thin crossing points*”.
- Behavior in an ES, and ultimately, its success, is affected by the *rules of engagement* and the *nature of standards*.

Adapted from M.G. Jacobides et al, Towards a theory of ES. Strat. Manag. J., 39:8, 2255 (2018).

OA as an “ecosystem”

7

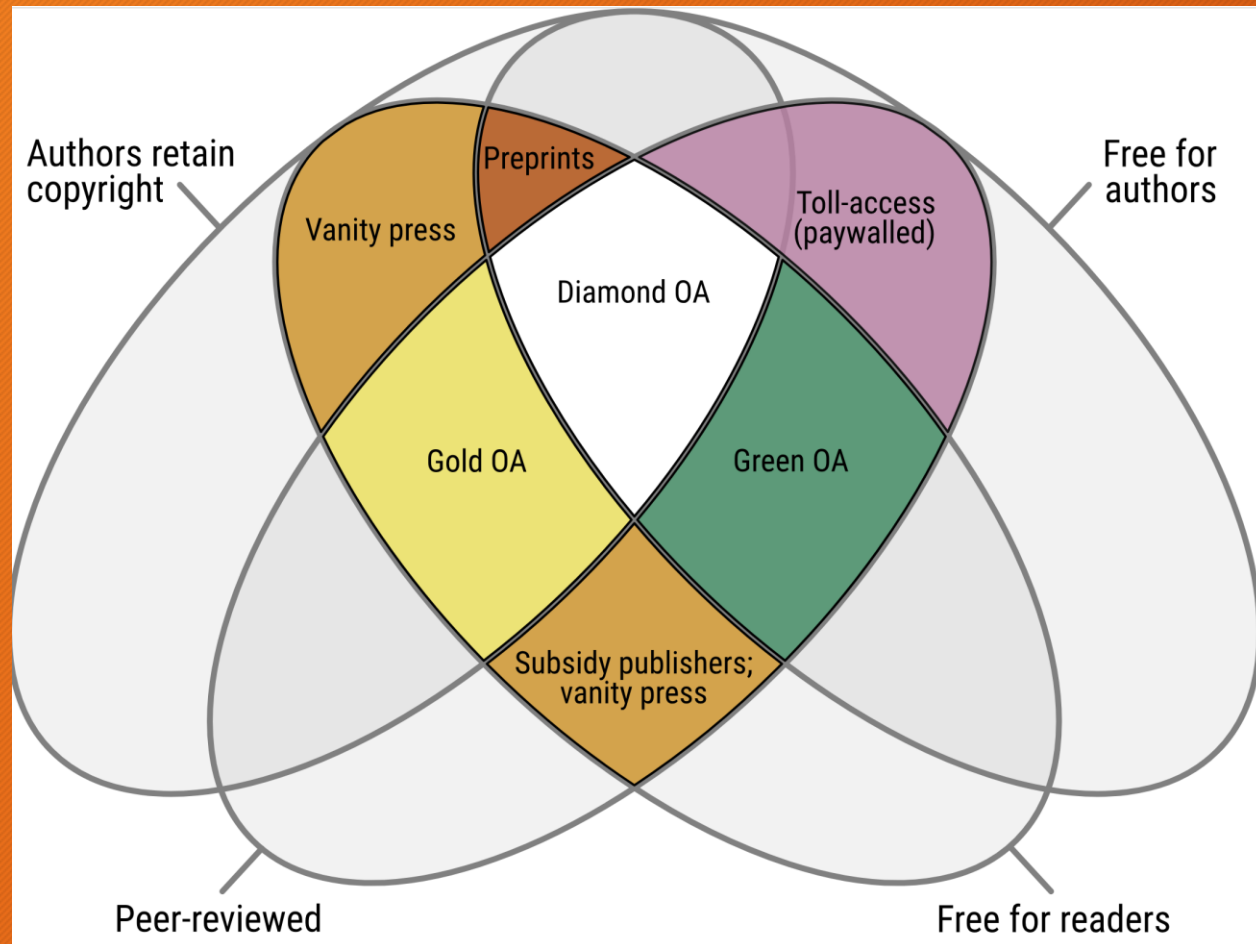
- *OS ES: a community supported by a foundation of interacting organizations and individuals—the organisms of the OS world.*
- *It produces goods and services of value to users, themselves members of the ES.*
- *Over time, the stakeholders co-evolve their capabilities and roles and tend to align themselves with the directions set by one or more central organizations.*
- *Those holding leadership roles may change over time, but the function of ES leader is valued by the community,*
because it enables members to move toward shared visions
and to find mutually supportive roles.

Are we on the right track?

Let us start with a cursory look at the OA landscape.

The fragmented landscape of Open Access...

8



Different types of open access in scholarly publishing

J.I. Farquharson, F.B. Wadsworth, Fabian B., *Volcanica*. 1 (1): i-ix (2018). (Cited in Wikipedia)

... and conflicting trends

OpenAPC 2005, 3 entries, total €8.991

9

€4.265

Springer Science + Business Media

€2.983

Future Medicine Ltd

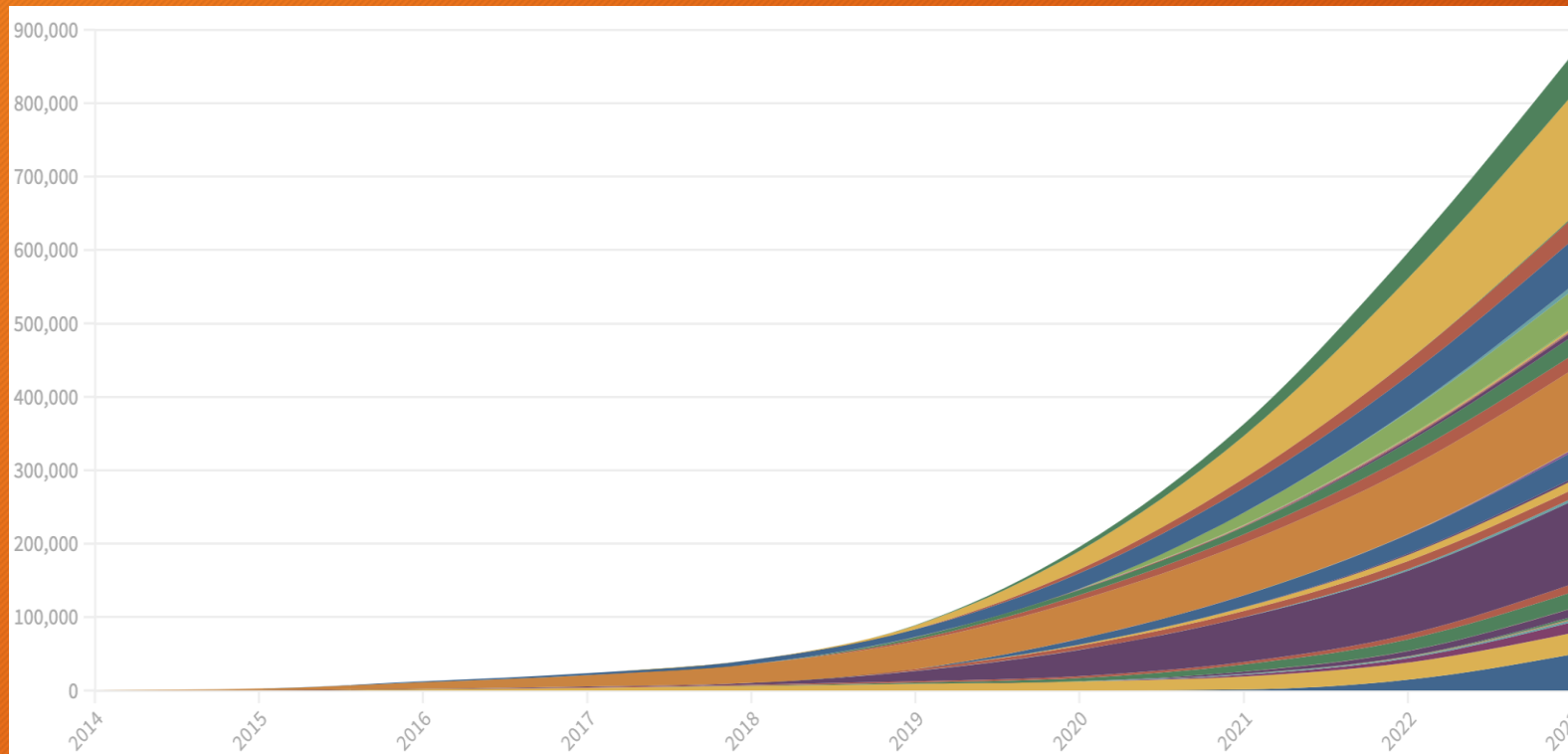
€1.743

Optical Society of America (OSA)

Note: “Page charge” -in addition to subscription fees- has been a common practice among journals since the 20th century.

Transformative agreements, number of articles

11



Source: [ESAC Transformative Agreement Registry](#) • Click on a country to filter.

Last updated: 11-08-2023

“APCs beget APCs. The more funds that are available to pay them, the more journals will feel pressured to charge them.”

J.P. Alperin, *Nature* 610, 233 (2022).

Total industry revenues

12

- Annual revenues of USD 19.000 million
- Market dominated by 5 major publishers: Elsevier, Black & Wiley, Taylor & Francis, Springer Nature and SAGE
- Together they control more than 50% of the market
- Elsevier is the largest with ca.16 % of the total: 3000 journals, profit margin ca. 40 % (more than Microsoft, Google and Coca Cola)
- John Wiley (pay-per-access): 400 journals, revenues of USD 1,000 million.

<https://www.thebookseller.com/news/elsevier-records-2-lifts-revenue-and-profits-960016> (25.2.2020).

Rise of predatory or deceptive publishing

13

A natural consequence

*Madre, yo al oro me humillo,
él es mi amante y mi amado,
pues de puro enamorado
de continuo anda amarillo.
Que pues doblón o sencillo
hace todo cuanto quiero,
poderoso caballero
es don Dinero.*

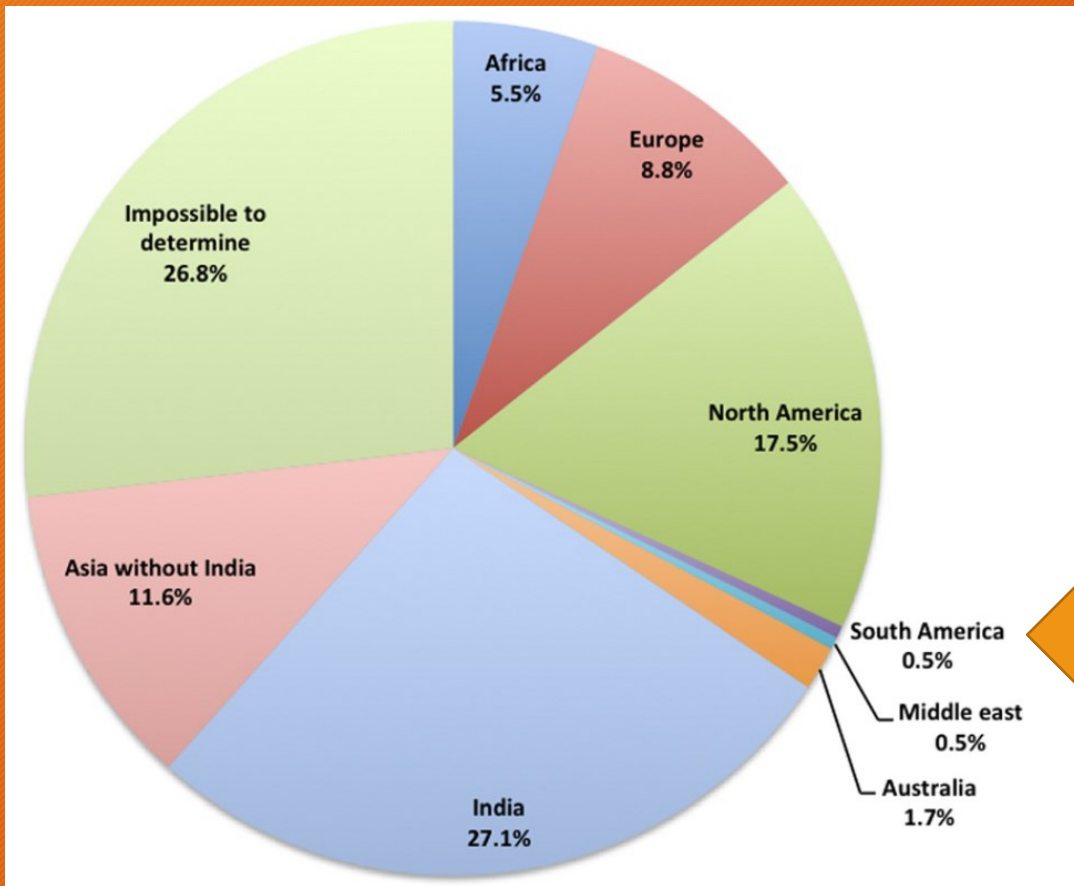
Francisco de Quevedo
(1580-1645)

In 2010-14, so-called predatory publishers took in about \$75 million and published nearly half a million articles in c. 8,000 journals. C. Shen & B.-C. Björk, BMC Medicine 13:230 (2015)

As of 2022, almost one third of the 100 largest publishers (by journal count) could be deemed predatory. A. Nishikawa-Pacher, J. Documentation. 78 (7): 450, 2022

Predatory publishers by geographic region

14



2010-14

Total number of publishers:
656, mostly 10-99 journal
publishers

C.Shen & B.-C. Björk, BMC
Medicine 13:230 (2015)

Latin America: barely 0.5 %
Why?

Free and open access, the Latin American tradition

15



Languages in Latin America and the Caribbean

16

Spanish

Portuguese

French

Quechua

Guarani

Aymara

Náhuatl

Maya

...



Latindex.org

Online Regional Information System for Scientific Journals from Latin America, the Caribbean, Spain and Portugal

latindex

✓ Seleccione un idioma

- Español
- Portugués
- Inglés
- Francés
- Holandés
- Alemán
- Italiano
- Ruso
- Catalán
- Vasco
- Gallego
- Coreano**
- Chino
- Latín
- Maya
- Náhuatl
- Otros idiomas

Linguistic diversity in Mexico



17

<https://www.gob.mx/semarnat/articulos/riqueza-cultural-y-biologica-de-mexico#:~:text=La%20diversidad%20natural%20es%20de,fibras%2C%20energ%C3%ADa%20y%20agua,>

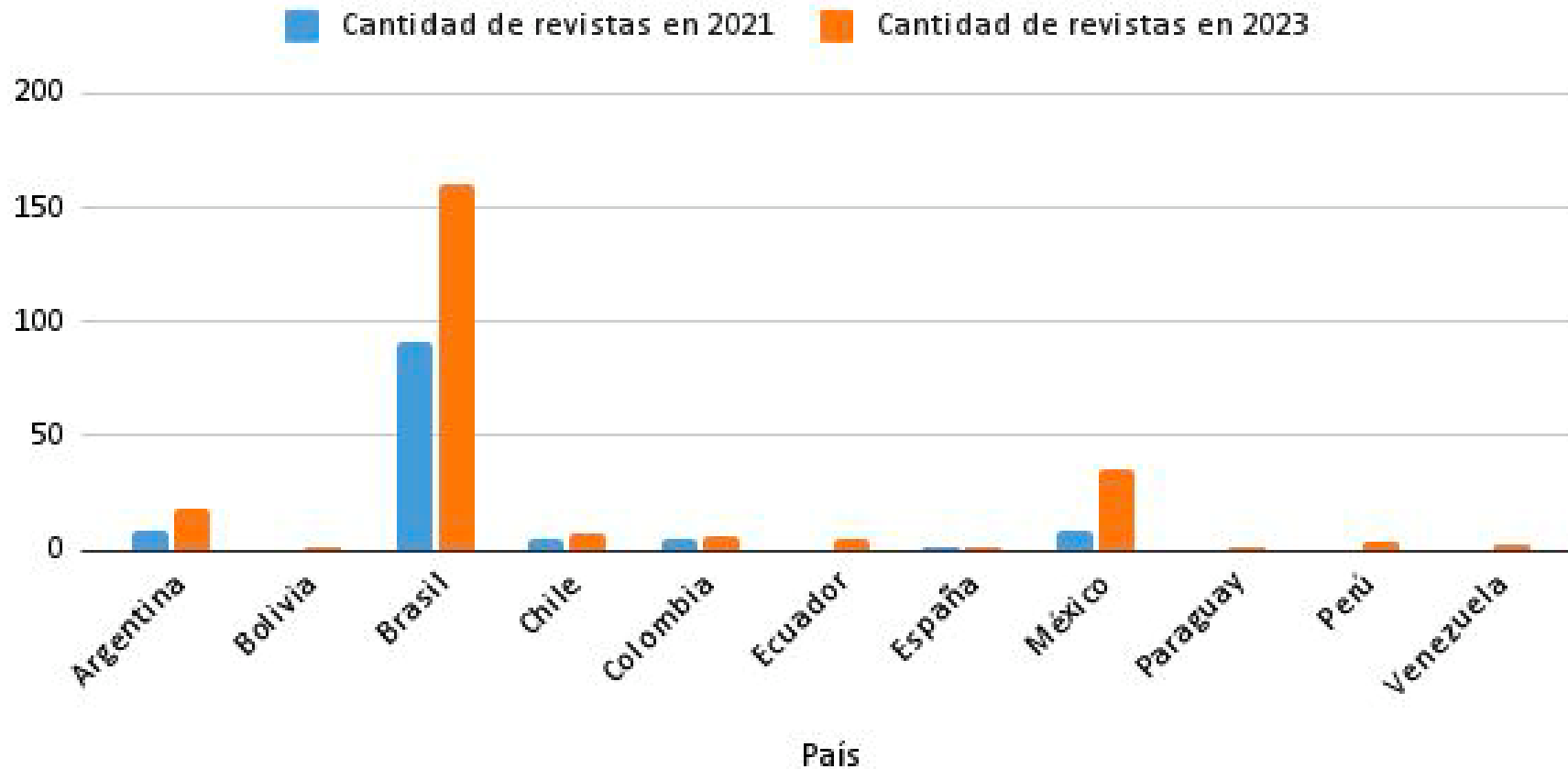
Free and open access, a reality

18



**Co-authorship
in free-and-
open access
journals, data
from Redalyc,
2022.**

Journals charging APCs in Latin America, 2021 - 2023



From OA to OS, by which route, under which principles?

20

- “The data ES appears to be moving away from centralization, it is becoming *more diverse*, and *less integrated*, thereby exacerbating the discovery and re-usability problem for both human and computational stakeholders”.
- “*All* research objects should be Findable, Accessible, Interoperable and Reusable both for machines and for people”.
- “The FAIR Data principles... help researchers adhere to the expectations and requirements of their *funding agencies*”.

The universe to become a metadataverse steered by the precepts of funding agencies...

The UNESCO OS principles: towards Utopia?

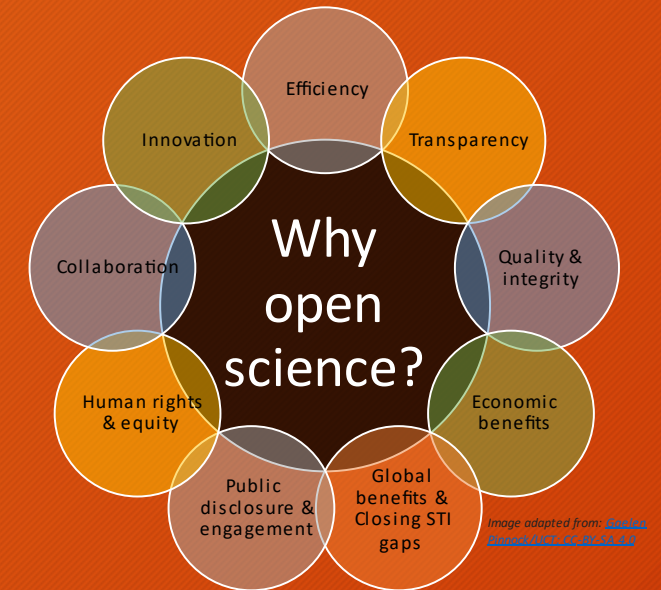
21

- Quality and integrity
- Collective benefit
- Equity and fairness
- Diversity and inclusiveness

The core values of OS



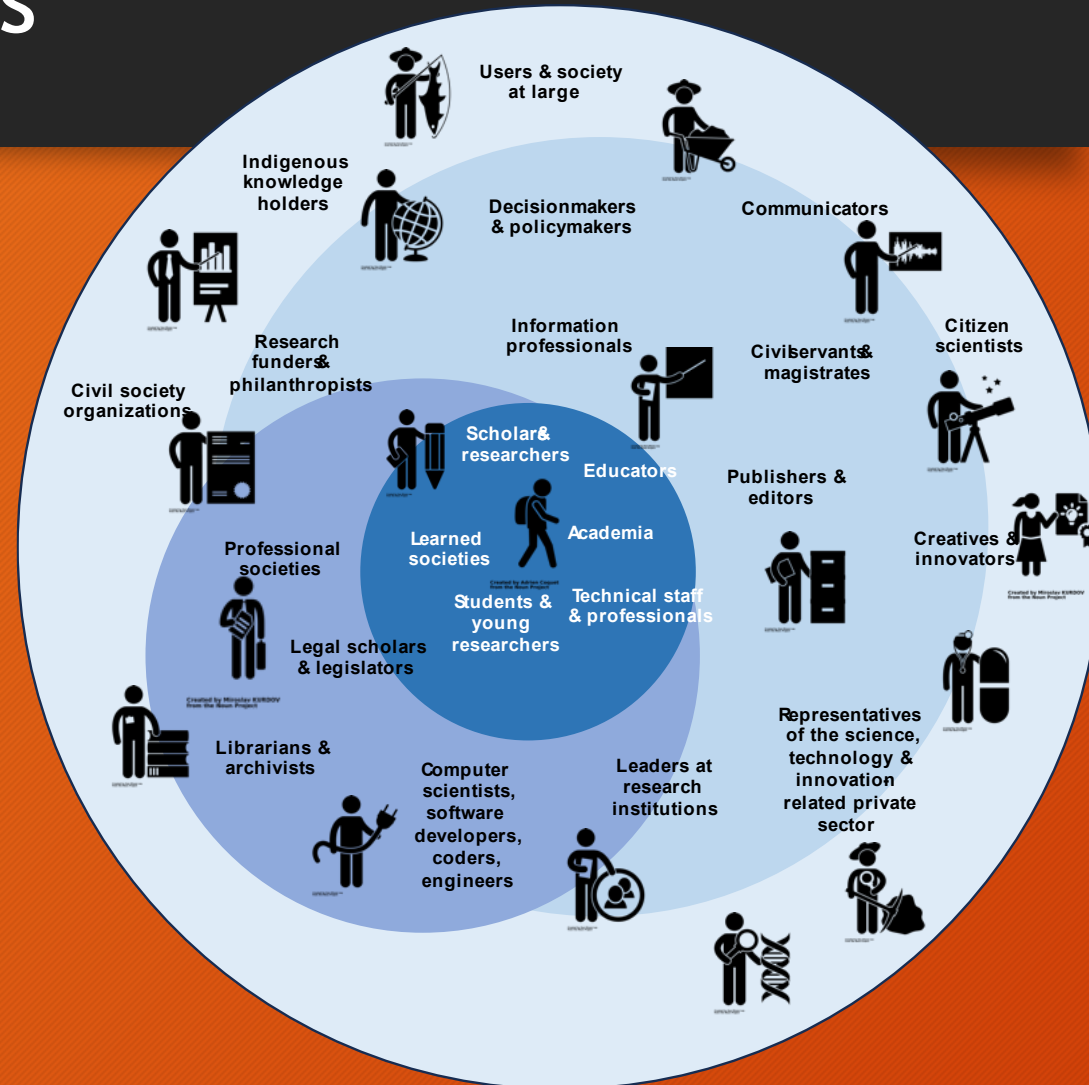
The key pillars of OS



Some benefits of OS

Examples of OS actors

Each of them has a role to play in the operationalization of OS – as well as benefits to gain.



Implementing the recommendation

23

- ✓ Significant - albeit uneven - progress in policy adoption and creation of OA - and OS - infrastructures.

Main challenges identified by the working groups:

- ❑ Changing the conventional scientific culture
- ❑ Building the necessary human and institutional capacities
- ❑ Having adequate OS infrastructures in place, including connectivity
- ❑ Reviewing the criteria for assessing scientific quality
- ❑ Addressing negative or unintended consequences of OS practices.

 Moving away from for-profit business models that exacerbate inequities and run counter to UNESCO's OS principles and values.

The openness of science and the way forward

24

- OS is about making sure not only that scientific *knowledge is accessible*
 - but also that the *production of that knowledge* itself is *inclusive, equitable and sustainable*.
- OS is not an end in itself,
 - but a means towards fairer, more equitable, diverse and inclusive research systems,
 - better geared towards the production, dissemination and use of scientific knowledge,
 - that helps address societal challenges with benefits for all.

 The path towards a true Open-Science ecosystem.

Thank you for your attention!

