

• No sustainability science without open science

Marie-Lise Sabrié,
IRD, Scientific and Technological Culture Dept., Marseille, France
Hugo Catherine,
IRD, Open Science Dept., Montpellier, France
Pascal Aventurier,
IRD, Scientific and Technological Culture Dept., Marseille, France
Jean-Christophe Desconnets and François Sabot,
IRD, Open Science Dept., Montpellier, France

Background

The recent global health crisis, much like the climate disruption that humanity as a whole now faces, has served to further illustrate the urgent need to promote equitable access to scientific information, to facilitate the sharing of research data, to reinforce international scientific collaborations and to develop public policies informed by scientific progress, in order to tackle the planetary emergency and make our societies more resilient. These challenges are at the very core of open science, an indispensable priority not only in the context of the sustainable development goals (SDGs), but also for the implementation of sustainability science. The connections between sustainability science and open science have not received much academic attention, but in this article we propose a brief analysis.

Contact

mso@ird.fr
mcst@ird.fr

Further reading

GOVAART G. H. et al., 2022 – The Sustainability Argument for Open Science. *Collabra: Psychology*, 8 (1).

Open science will be essential to achieving the SDGs

Sustainability science is an essential pillar of the response to the societal and environmental challenges enshrined in the sustainable development goals (SDG). However, the new knowledge generated by research is often not sufficiently accessible or widely-shared to reach the international scientific community, inform public policies, foster a more inclusive model of economic development and bolster the resilience of our societies in the face of major crises. By virtue of its commitment to the values of sharing, free circulation and reproduction of knowledge, collaboration, transparency and scientific integrity, open science is an indispensable element of research for the SDGs. The Covid-19 pandemic offers a striking example of how open science, by providing universal access to research publications and data, can play a vital role in pandemic response (publishing viral genomes, accelerating the pace of scientific communication via preprint platforms, broader circulation of data to inform political decision-making etc.). Above and beyond its pertinence to health-related, environmental, economic and social challenges, open science is at the heart of SDG 9 (building resilient infrastructure, promoting sustainable industrialisation and fostering innovation), which recommends universal access to digital infrastructure such as internet services, particularly in less advanced nations, at an affordable cost and in fair conditions. It is also an essential tool for the democratisation of institutions, as championed by SDG 16 (promoting peaceful and inclusive societies, providing access to justice for all and building effective,

accountable and inclusive institutions at all levels), with its commitment to the free circulation of information and the protection of fundamental freedoms in this domain. Finally, it is of direct relevance to SDG 17 (strengthening the means of implementation and revitalizing the Global Partnership for Sustainable Development), with its focus on expanding access to science, technology and innovation under the aegis of more equitable international partnerships – particularly North-South and South-South partnerships.

Open science to guarantee the sustainability of research

Open science is of vital importance to SDG-oriented research, ensuring its efficacy and productivity; in doing so, it works to make research more sustainable. Open access to data drives down the costs associated with repeat data gathering, promotes the transfer and reuse of data, and thus makes it possible to conduct more research with the same scientific raw material. Opening up the source code of software allows for community editing and collective learning (open-source debugging, transparency of changes, more effective testing of new versions). By guaranteeing access to data, tools and methods, open science promotes the quality and reproducibility of data. Open access to publications helps to reduce redundancy, plagiarism and fraud in scientific publishing, making it easier to verify scientific knowledge and submit it to critical analysis. By creating open-source documentary archives and data warehouses, it also allows for long-term, low-cost (and thus more equitable) sharing of scientific

output, something which is of particular importance for researchers in the Global South who face major obstacles in terms of both publication outlets and access to international scientific literature. Finally, as a means of boosting the visibility of academic output, it helps to make scientific progress and innovations more readily available for use by political decision-makers, economic actors and civil society.

Open science promotes interdisciplinarity

Sustainability science exhorts researchers to break down the silo walls between different disciplines and adopt an interdisciplinary approach to the complex challenges of the SDGs, which are resolutely interdependent. Synonymous with sharing and exchange, open science ensures that the data produced in one discipline can be reused in other domains, facilitating and accelerating collaborative work and the production of new knowledge. Closely associated with open science, the FAIR principles of data management (Findable, Accessible, Interoperable, Reusable; see Desconnets J.-C., Sabot F., 2022 – « Données numériques et durabilité ». In : *Sustainability Science*, Marseille, IRD : 150-153) reflect the central importance of interdisciplinarity in sustainability science. Above and beyond data, free access to scientific publications is conducive to interdisciplinarity in so far as it makes the scientific literature of a given discipline more visible and more accessible to others. This in turn facilitates the dissemination of research results and the reappropriation of conceptual approaches formerly confined to individual disciplines.

Open science strengthens the bonds between science and society

Sustainability science demands stronger connections between science and society. It promotes the co-construction of knowledge, which requires close collaboration between researchers and non-academic stakeholders at every stage of the research process. Here again, open science has a vital role to play. Firstly because it ensures the broadest possible access to research data, publications and software code for all communities, academic and non-academic. As such it is indispensable for the implementation of participatory research programmes, working to boost the skills and capacities of non-academic actors, allowing them to become better informed and thus to be recognised as fully-fledged actors in research processes. Open science also brings about a shift in the way that research fits into society more broadly: by ensuring that scientific information is more widely circulated, it is a valuable weapon against misinformation and the propagation of false information. Above all, by reinforcing the democratisation of knowledge and bolstering research integrity, it can help to strengthen trust in science in society at large.

KEY POINTS

In order for the benefits of open science to truly contribute to the development of sustainability science, certain conditions will need to be met, including:

- a new approach to the evaluation of research, not founded exclusively on quantitative criteria but instead considering the intrinsic quality of scientific studies, their diversity and their societal impact, among other factors;
- closing the digital divide which continues to penalise many parts of the world, particularly in the Global South, with access to data warehouses and open archives, as well as the possibility of creating new ones;
- improved digital literacy among researchers and engineers of all disciplines, ensuring that they are capable of fully capitalising on the opportunities offered by open science;
- national and international policies, backed up with resources, to support the development of the culture and practice of open science within scientific communities.

SUSTAINABILITY SCIENCE

UNDERSTAND, CO-CONSTRUCT, TRANSFORM

Volume 2

Collective thinking coordinated
by Olivier Dangles and Marie-Lise Sabrié

IRD Éditions

**French National Research Institute for Sustainable Development
Marseille, 2023**

D2S follow-up of the articles: Claire Fréour and Magali Laigne
Editorial coordination: Marie-Laure Portal-Cabanel
Cover: Charlotte Devanz
Design and layout: Aline Lugand

Cover photo: Rock painting, Cueva de las Manos, Argentina.
© IRD/O. Dangles - F. Nowicki/*Une Autre Terre*

Photo p. 14: Cast net fishing: casting the net (New Caledonia).
© IRD/P. Dumas

Photo p. 52: Farm work with a plough (Morocco).
© IRD/G. Michon

Photo p. 86: Launch of the participatory observatory on vulnerability to erosion:
training ecoguards (Anjouan, Comoros).
© IRD/N. Mirhani

Photo p. 112: Modelled map showing the damage caused by flooding
and the success or failure of recommended measures (Madagascar).
© IRD/Didem/Rijasolo

Photo p. 138: Rice LMI workshop on rice improvement to cope with the constraints of climate change.
© IRD/F. Carlet-Soulages

Photo p. 164: Graphic animation of the Franco-Brazilian network for the sustainable development
of the North-East semi-arid region (ReFBN) (Brazil).
© IRD/M. Disdier

This publication is open-access and made available to the public under the terms of the Creative Commons license CC BY-NC-ND 4.0, which can be viewed at <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.en>. Under this license, the original work can be freely redistributed as long as the authors and publishers are credited and a link to the license CC BY-NC-ND 4.0 is provided. Modifications are not authorised and the work must be published in its entirety. The material may not be used for commercial purposes.



© IRD, 2023

PDF version ISBN: 978-2-7099-3003-1