national programme
open science

Open Science 2030 in the Netherlands

NPOS2030 Ambition Document

Version 0.91 | 21 april 2022

Preface

Open Science is a global transition to making scientific research practices more open and collaborative, for greater scientific and societal impact. The goal of the NPOS2030 Programme is to facilitate all national stakeholders to collaborate in this transition from science ‘as is’ to science ‘as will be’, in alignment with international initiatives. The Netherlands is among the leading countries taking up Open Science; a position we owe to efforts from stakeholders individually, and jointly under the NPOS flag. Building on this solid foundation, we will now accelerate this transition towards achieving our Open Science ambitions in practice.

The foundations of the Netherlands National Programme Open Science (NPOS) are rooted in 2017, when the National Plan Open Science was signed by a large group of stakeholders from the Netherlands. The developments in the years to follow, and the new insights they brought, are taken into account in the new NPOS2030 Ambition document, of which you will find version 0.91 below.

Through an Open Consultation at the end of 2021, 78 institutions, networks, communities and individuals gave their constructive feedback on version 0.8 of the Ambition document. From these responses, 11 general points of advice were distilled. These general points and other specific feedback were considered to get to this new version of the Ambition Document. The responses to the Open Consultation also form a starting point for the creation of the NPOS Rolling Agenda for the next decade.

This revised Ambition Document includes a Definition of Open Science and the Guiding Principles that underlie this Programme; the NPOS Vision for Open Science in the year 2030; the Strategic Goals for the Programme and the cross-cutting Requirements.

The Rolling Agenda will describe the action lines (first for the period 2023-2025) that will be made to work towards the strategic goals of the Programme. For each action line, the relation to the cross-cutting requirements will be addressed.

Together, this revised NPOS Ambition Document, the NPOS Rolling Agenda, and a description of the NPOS governance, will form the NPOS2030 Multi Annual Plan.

11 points of advice from the Open Consultation

From the feedback received in the Open Consultation, 11 points of advice were distilled. Below, we describe how these are considered in the next steps towards a well-supported NPOS2030 Multi Annual Plan:

1. Follow up on the intention to actively involve stakeholders in the Rolling Agenda;
2. Consider setting up an editorial board for the Rolling Agenda, that will include a delegate for the Universities of Applied Sciences;
3. Better connect the guiding principles and vision with the programme lines and the key action lines;
6. Position requirements such as recognition and rewards as key action lines in all programme lines;
8. Consider Renaming Citizen Science into Citizen Engagement or Societal Engagement.
These points are part of the process for creating the Rolling Agenda.

4. Add Open Education as a 4th programme line
5. Extend existing programme lines to capture open software
These points of advice will also be considered in the process of formulating the Rolling Agenda. Specific respondents to the open consultation will be invited to join this discussion. In the case of Open Education, further exploration is needed before the Steering Group can come to a decision.

7. Better explain sovereignty and how it connects to the programme lines.
The definition of sovereignty in this Ambition Document has been rewritten; moreover, one proposed action line for the Rolling Agenda is to develop guiding principles for sovereignty.

9. Clarify the goal of both the Ambition Document and the Rolling Agenda.
As stated above, this revised Ambition Document includes the:

- Definition of Open Science and the Guiding Principles that underlie this Programme
- Vision that NPOS has for Open Science in the year 2030
- The strategic goals for the NPOS
- Cross-cutting Requirements for all action lines

All paragraphs that described elements of implementation (action lines) in version 0.8 are taken out of the Ambition document. These action lines will be incorporated in the Rolling Agenda. Moreover, elements that referred to the NPOS Governance are transferred to a document on NPOS Governance and Organisation. Together, this revised NPOS Ambition Document, the NPOS Rolling Agenda and the NPOS Governance and Organisation will form the coming NPOS2030 Multi Annual Plan.

10. Consider taking sufficient time for a well-supported ambition and agenda.
The Rolling Agenda for the NPOS for the first three years (2023-2025) will be evaluated and updated in due time for the period after that. If there are reasons to do so, the Ambition Document can be updated during this process as well.

11. Consider following the respondent's call for a more ambitious approach.
Overall, the respondents to the Open Consultation supported the Guiding Principles that underlie this Programme, the NPOS Vision for the year 2030 and the importance of the cross-cutting requirements. All other elements (on implementation or governance) are transferred to the Rolling Agenda and the Governance Description that will take further shape in the coming months.

Ambition Document

Definition of Open Science

Open Science is defined by UNESCO (2021)[1] 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.

In this definition, *scientific knowledge* comprises a wide variety of scientific publications, research data, metadata, educational resources, software and source code, and open hardware. The NPOS embraces the UNESCO Recommendation on Open Science as a guideline for the Open Science activities in the Netherlands.

Guiding Principles

Open Science is based upon a set of core values:

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

These core values can be translated into several key principles. The action lines carried out within the NPOS should operationalise these principles and uphold these values.

NPOS commits to the following guiding principles:

1. ***Scientific knowledge is a public good and access to it is a universal right***

   Open scientific knowledge is intended to contribute to collective benefits. To this end, academia should be equitable and fair: it should provide equality of opportunities for everyone to access, participate in, benefit[2] and learn from, and contribute to the scientific process and its outputs.

[1] UNESCO Recommendation on Open Science (2021): https://en.unesco.org/science-sustainable-future/open-science/recommendation#:~:text=UNESCO%20Recommendation%20on%20Open%20Science%20complements%20the%202017%20Recommendation%20on,Recommendation%20on%20Open%20Educational%20Resources.

[2] Article 27 of the Universal Declaration of Human Rights - United Nations (1948): https://www.ohchr.org/EN/UDHR/Documents/UDHR_Translations/eng.pdf

2. *Scientific outputs and processes must be as open as possible, but as restricted as necessary*

Transparency about the processes of creating and sharing scientific knowledge is the central tenet of Open Science, and a boundary condition to all of its core values. Scientific outputs and processes should be Findable, Accessible, Interoperable and Reusable (FAIR[3]). However, there are valid reasons to restrict access to outputs or processes (e.g., compliance with privacy regulations, or when dealing with intellectual property, non-disclosure agreements, or knowledge security). This does not mean these outputs and processes must be fully closed: in many cases, the meta-information can be made available. That is why the NPOS adheres to the principle that scientific outputs and processes should be 'as open as possible, but as restricted as necessary'.

3. *Reproducibility and scrutiny are essential to safeguard the quality and integrity of scientific work*

More openness about the scientific process and its outputs allows for reproducibility (i.e., repeating the same analysis with the same data, by a different analyst), replicability (i.e., similar findings using new data), and reuse.
By scrutinising results and their underlying materials and processes, the integrity of the work can be safeguarded, and its claims verified. Reproducibility, replicability, (open) peer review and verification (re)build trust in scientific knowledge and a strong foundation for subsequent work, which improves the quality of research and education and speeds up scientific progress.

4. *Diversity, equity, and inclusiveness are crucial for the success of Open Science*

Open Science embraces the diversity of topics, disciplines, practices, languages, outputs, and processes of different (scientific and societal) communities. The scientific community itself needs to be representative of the society it aims to serve. Diversity, equity, and inclusion within the research community are crucial for the success of Open Science. Collaboration and participation should be promoted, both within the scientific community and outside. This includes researchers, teachers, professionals, and research institutions (universities, academic medical centres, universities of applied sciences, research and technology organisations, enterprises), funding organisations, publishers, service organisations, companies, NGO's, governmental organisations and citizens.

[3] Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. Sci Data 3, 160018 (2016). https://doi.org/10.1038/sdata.2016.18

5. *Academic and digital sovereignty must be safeguarded*

To guarantee scientific knowledge as a public good for collective benefit, it is important to consider the sustainability, governance, and financial models of scholarly infrastructure, (retention of) copyright and open licensing of scientific work. The risks of becoming more and more dependent on commercial or foreign providers and their terms of use in all stages of the research life cycle asks for open (not-for-profit) alternatives for digital services and regulation. Academic sovereignty[4] is the ability to autonomously take decisions on policies and the content and organisation of research and education, and determine the role of academia in society. Digital sovereignty[5] entails autonomy regarding sustainable digital information services and infrastructure. Concerted action lines are needed to maintain (or retrieve) academic sovereignty. Joint understanding of principles and frameworks is needed, as are collective action lines for implementing those principles in public systems as well as commercial ones. This includes assessment which data, output and services are critical and must be publicly steered to safeguard academic sovereignty. The infrastructures for research (meta)data and research assessment should serve the community and be designed, used, and maintained according to scholarly values[6].

[4] Academic sovereignty: https://www.universiteitenvannederland.nl/publieke-waarden-en-academische-soevereiniteit.html
[5] Digital sovereignty: https://eua.eu/resources/expert-voices/250:safeguarding-academic-and-digital-sovereignty-a-model-for-action.html
[6] Guiding Principles on Management of Research Information and Data: https://zenodo.org/record/6074944#.YmAJUtpBw2w

Vision: What Open Science will bring in 2030

By 2030, scientific knowledge is freely available, accessible, and reusable for everyone. The scientific process and its outputs are transparent, to the benefit of both science and society. Through careful and responsible scrutiny (e.g., open peer review), the integrity and quality of scientific work can be verified and, if necessary, corrected. Academics are well-supported and well-trained in making their scientific outputs FAIR and machine-readable, so they can be reproduced, replicated, and reused by themselves and others. This leads to increased trust in scientific knowledge, both within and outside academia, and speeds up scientific progress and global collaboration and participation.

There are new ways to disseminate digital research results and there are possibilities for protected sharing of these results. Scientific outputs and processes are supplemented and enriched by FAIR (meta)data. The distinction between data, software, publications, and other outputs will become fluid as they will be published together or with links to each other.

New scientific products are made possible through novel digital services. Digital infrastructures are governed based on public values and sustainability, to ensure that scientific knowledge remains a public good for collective benefit. Policies and regulations are in place to guide interactions with (commercial) service providers.

The Netherlands has strengthened and expanded its leading role in Europe and beyond, to change academia for the better. Open Science is the standard practice across all scientific disciplines from basic to applied sciences, in the natural, medical, social sciences and the humanities. A new system of recognition and rewards is in place, which does justice to scientific teamwork as well as stimulating and appreciating individual contributions to Open Science.

There is a stronger link with, and impact on, societal challenges and sustainable development goals. Next to fundamental research, there are many diverse and transdisciplinary scientific collaborations and options for knowledge-sharing and -cocreation through deeper engagement with societal actors, improving the quality of science and scientific output. Communities of stakeholders, including government, industry, and the public, are engaged with the research life cycle from agenda-setting, research performance to evaluation and communication of outcomes. Citizens are enabled to find and explore scientific output more easily, enabling them to gain knowledge and expertise that was previously only available for professional academics. There is support and training available for these societal interactions. This environment of active collaboration and participation ensures that the distance between academia and society becomes smaller, and builds trust.

Strategic goals for NPOS

The strategic goals for the NPOS Multi Annual Plan follow from the Vision and are in line with the UNESCO Recommendation.
In 2030 the efforts of the NPOS have led to:

- close collaboration between knowledge institutions, government, industry, and citizens to strengthen the international position of Dutch science and optimise the processes of creating, sharing, and communicating knowledge for the benefit of society.
- inclusive, efficient, and transparent processes of scientific (co-)creation, evaluation, quality assurance and communication.
- the removal of barriers to reading and reusing all scientific output, so everyone can access scientific knowledge in a sustainable way and benefit from it.
- products of and for knowledge creation, like data and software, being findable, accessible, interoperable, and reusable (FAIR), and open in as far regulations allow.

These strategic goals form the starting point for the Rolling Agenda of the Multi Annual Plan.

Requirements to realise Open Science

To reach the situation from the Vision and achieve the strategic goals, Open Science practices must be implemented and embedded. This requires a change of culture in the scientific community and in society. Therefore, the NPOS action lines will address a set of essential requirements[7] needed for this culture change, and thus for implementing an Open Science ecosystem in the Netherlands:

Make Open Science possible through Open Infrastructures

It should be possible for researchers and teachers to make scholarly output and research and educational materials FAIR (Findable, Accessible, Interoperable, and Reusable) and, as far as possible, open for all in an easy way without too much time investment. This requires (inter)national agreements regarding a technical and organisational infrastructure, which must be implemented in collaboration with all national stakeholders and (inter)national partners, in line with the European Open Science Cloud (EOSC) and innovative publication platforms. This infrastructure should facilitate the standardisation of workflows, open standards for the creation of metadata and the interoperability of research objects within and across disciplines, allowing geographically dispersed groups of people to collaborate across institutional and academic boundaries. In designing, implementing, and connecting research and education infrastructure, the principles of digital and academic sovereignty should always be upheld.

Make Open Science easy through Support & Training

Researchers, teachers, and students should be familiar with the skills and knowledge to engage in Open Science, and with the support provided by data stewards and research software engineers, data competence centres, and citizen science knowledge centres to fulfil the ambitions of Open Science. Open Science values and practices should be embedded in research groups and educational curricula and incorporated into policies, similar to the University Teaching Qualification (UTQ/BKO), to “facilitate and accelerate the transition that simultaneously realigns research and education and

[7] Based on “Center for Open Science – Strategy for culture change”: https://www.cos.io/blog/strategy-for-culture-change

empowers students for a transformative role after graduation."[8] This requires professionalisation of current scientific, support and teaching staff and the emergence of new roles like data stewards and research software engineers. Furthermore, the training capacity and training materials on relevant topics should be increased. Collaboration at a national level and a common training framework for skills and knowledge are key to ensure the effective use of teaching capacity and new resources.

Make Open Science normative through active Community Engagement

The transition towards an open academic culture requires lively networks of Open Science communities of academics, support staff and interested non-academics in different domains, both national and international, to create awareness of the Open Science principles and practices[9]. Within these communities, members can learn from each other's experiences and share their good practices and wishes during events, workshops, and regular meetings. To explore and create a sustainable and equitable system of knowledge creation and sharing, societal stakeholders should be included in this transition. Engagement with society, for instance via Public Engagement and Citizen Science projects, should be encouraged to provide for open, inclusive, and participatory processes for knowledge creation. This requires building capacity at knowledge institutions and creating and sharing good practices.

Make Open Science rewarding through incentives (Recognition & Rewards)

In the current academic environment, practices reflecting the Open Science values (ranging from sharing results, altruistic cooperation, and engaging with stakeholders outside academic institutions) are not the norm yet, as they generally are not rewarded. However, many societal challenges require transparency, inter- and transdisciplinary collaboration and close cooperation with actors in society, including citizens, entrepreneurs, policy makers and industry. To facilitate the transition to Open Science, reward structures should change in such a way that its values and practices are fit to improve the quality of science and its impact and are better recognized and rewarded[10, 11]; taking Open Science into account in the process of selecting new staff and evaluation for promotion of existing staff; and incorporating Open Science as a point of evaluation in annual staff interviews and evaluations. To this end, concrete quantitative metrics for and qualitative evaluation of contributions (scientific output, as well as activities like leadership, mentoring, reflection, and teamwork) to Open Science values and practices need to be developed.

[8] de Knecht et al. (2021) Reshaping the Academic Self: Connecting Education & Open Science: https://zenodo.org/record/5345573

[9] Armeni, K., Brinkman, L., Carlsson, R., Eerland, A., Fijten, R., Fondberg, R., Heininga, V. E., Heunis, S., Koh, W. Q., Masselink, M., Moran, N., Baoill, A. Ó., Sarafoglou, A., Schettino, A., Schwamm, H., Sjoerds, Z., Teperek, M., Van Den Akker, O. R., Van't Veer, A., & Zurita-milla, R. (2021). Towards wide-scale adoption of Open Science practices: The role of Open Science communities. Science and public policy, 1-7. https://doi.org/10.1093/scipol/scab039

[10] VSNU (2019) Position paper Room for everyone's talent: http://vsnu.nl/recognitionandrewards/wp-content/uploads/2019/11/Position-paper-Room-for-everyone%E2%80%99s-talent.pdf

[11] Strategy Evaluation Protocol 2021-2027: https://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/SEP_2021-2027.pdf

Make Open Science compulsory through Policies and Regulations

Open Science is a vital instrument towards a more effective, more reliable, more trustworthy, more equitable and more innovative shared research knowledge system to the benefit of society at large. It is important to consider the governance of scientific knowledge and the retention (or retrieval) digital and academic sovereignty through the adherence to guiding principles[12] and through supportive legislation and regulations at local, national and/or European levels (e.g., on copyright retention and open licensing, European Knowledge Act). Knowledge institutions can only make the transition towards Open Science if governments provide support at the (inter)national level, for example through financial investments or consistent European Open Science policies.

An integrated systemic approach to facilitate Open Science

The road towards Open Science is characterised by reforms in many practices and activities throughout the workflow of everyone involved in the scientific process. Hence, enabling the transition to Open Science requires an integrated and systemic approach at institutional, national, and international level, working on a range of coherent topics and with all stakeholders.

The foundations of the Netherlands National Programme Open Science (NPOS) are rooted in 2017, when the National Plan Open Science was signed by a large group of stakeholders from the Netherlands. Since then, many other stakeholders have joined, and several organisations in the Dutch science field have started to develop or implement (local) Open Science programmes or shared platforms, including corresponding requirements, policies, and practices[13,14]. In addition, some organisations are already addressing related themes such as reliable knowledge about science, academic sovereignty, and open education.

The national ambitions correspond closely with these local programmes, but also with the ambitions on Open Science as described by the European Commission and the Pillars of Open Science of the Open Science Policy Platform (OSPP)[15].

The National Programme Open Science aims to:

- set collective Open Science-ambitions with this large group of stakeholders, including the government, knowledge institutions, academics and scientific organisations, Open Science service providers, industry and citizens (the *quadruple helix*);

[12] Guiding Principles on Management of Research Information and Data: https://www.universiteitenvannederland.nl/files/Guiding%20Principles%202.0(1).pdf

[13] UU: https://www.uu.nl/en/research/open-science
TUD: https://www.tudelft.nl/open-science
UvA: https://www.uva.nl/binaries/content/assets/uva/nl/over-de-uva/over-de-uva/beleid-en-financien/open-science-programma-uva-2020-2024.pdf
VU: https://vu.nl/en/about-vu/more-about/open-science
RUG: https://www.rug.nl/research/research-data-management/policy/openscience/
UM: https://www.maastrichtuniversity.nl/research/open-science

[14] https://www.nwo.nl/open-science

[15] The Open Science Policy Platform (OSPP) defines eight pillars of Open Science: (1] FAIR Data, 2] Research Integrity, 3] Next Generation Metrics, 4] Scholarly Communication, 5] Citizen Science, 6] Education and Skills, 7] Rewards and Incentives, and 8] EOSC.

- coordinate and facilitate national collaboration to remove barriers and create the right conditions for Open Science, in alignment with international initiatives, making the transition from science ‘as is’ to science ‘as will be’;
- monitor and evaluate the progress on the collective Open Science-ambitions and goals;
- promote the interests of the Open Science stakeholders to the government and European partners.

The NPOS as a coordinating body only implements those tasks which cannot be performed by existing institutions, research groups, service providers or networks (the ‘Subsidiarity Principle’). NPOS invites these stakeholders to engage in action lines and their implementation outlined in the strategic agenda of the National Programme Open Science. Based on national priorities and available funding, NPOS will fund these activities. Stakeholders may choose to centralise resources and coordination for specific action lines.

The action lines of the program focus on different organisational levels:

- **Local: bottom-up communities** of both scientists and societal stakeholders are strengthened and involved in the NPOS.
- **Local: (clustered) local competence centres** are set up and/or expanded to accelerate the implementation of Open Science practices within knowledge institutions.
- **Domain-specific: thematic competence centres,** namely Life Science & Health (LSH), Natural and Engineering Sciences (NES) and Social Sciences and Humanities (SSH) are strengthened to create and implement domain-specific standards and good practices, in cooperation with the local competence centres.
- **National:** if required for specific action lines, national coordination teams or negotiation/ purchasing teams are set up.

Implementation of the NPOS action lines will be carried out in close alignment to each other. Together, all action lines contribute to achieving the strategic goals.
In the next few years, all NPOS stakeholders (see Figure 2) will evaluate the progress, monitor new developments, and accordingly update the action lines to achieve our goals in a Rolling Agenda. With this approach the NPOS Steering Board gives ample room for new bottom-up initiatives, (strategic) goals and action lines, and will coordinate these when necessary.

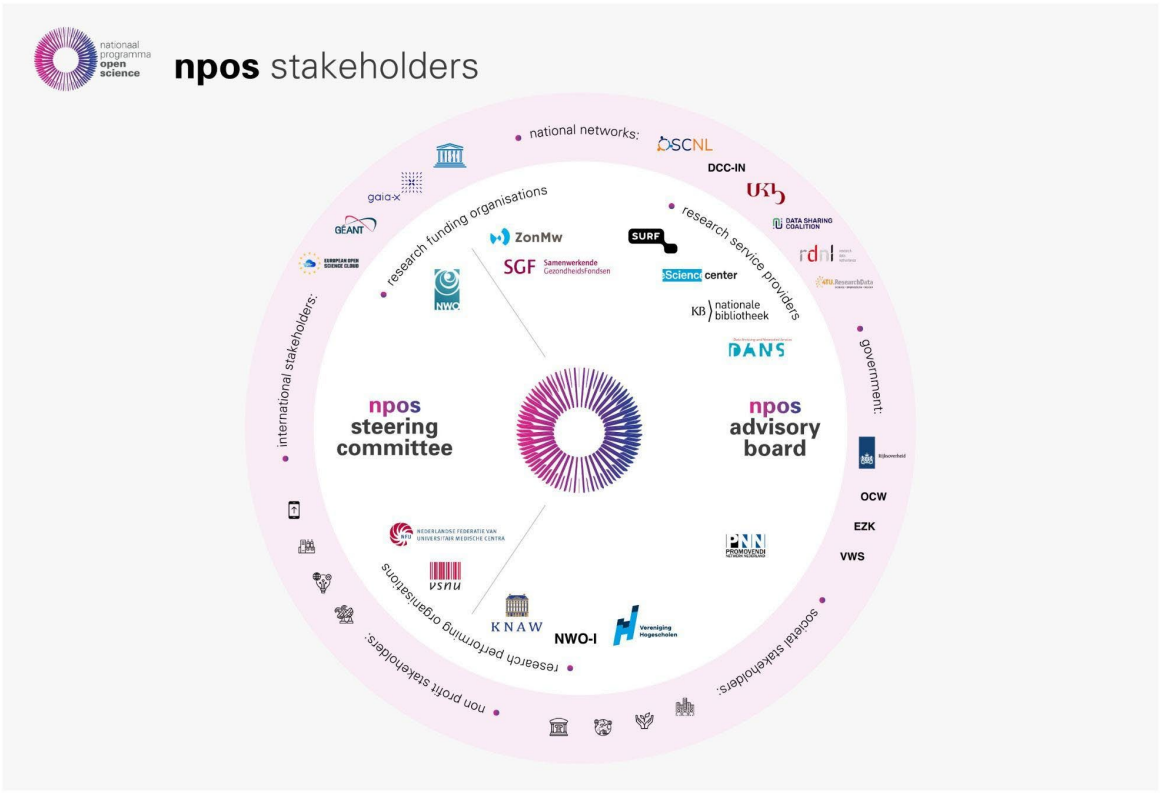

Figure 2. Overview of NPOS stakeholders [to be extended]