nationaal programma open science

Open Science 2030 in the Netherlands

NPOS2030 Ambition Document and Rolling Agenda

Version 1 | December 7, 2022

DOI: 10.5281/zenodo.7433767

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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 Netherlands National Open Science Programme (NPOS) is to facilitate all national stakeholders that are jointly taking responsibility for the Open Science Agenda in the Netherlands, in alignment with international initiatives. From 2023 on, this facilitating role will be taken up by the new National Initiative on Open Science led by Dutch Research Council NWO, due to the fact that the ministry of Education, Culture and Science will make 20 million euros per year available for Open Science until 2032.

This Ambition Document includes the guiding principles that underlie our shared endeavours for the years to come; the vision for Open Science in the year 2030, the strategic goals we are working towards, and cross-cutting requirements for all actions to be taken up. An open consultation in which 78 institutions, networks, communities and individuals gave their constructive feedback, was part of the process of defining our shared ambitions in the Ambition Document.

The Rolling Agenda is a living document that describes the underlying objectives for each of the strategic goals. It is written by different representatives of the broader community and has the support of partners involved in the NPOS Steering Committee, Advisory Board and Editorial Board.

In the process of formulating the Rolling Agenda, the framework of strategic goals and requirements as laid out in the Ambition Document has already proven to be a robust basis to align objectives. Now that we are taking a step towards implementation, organising the same alignment on definitions and scope of objectives comes first.

The broad group of partners and stakeholders behind this shared Rolling Agenda all bring in different perspectives on the shared list of objectives. Objectives are more relevant to some partners than others. Some objectives will have high priority and will be coordinated by the National Initiative, others can be taken up by partners separately. Moreover, in a long-term Rolling Agenda like this, objectives can be added or adjusted over time, in order

to adjust to future developments.

This flexibility in the way we work towards our shared values and strategic goals: together, but sometimes in different compositions, truly reflects the values of co-creation, cooperation and open science.

Stan Gielen
Chair NPOS Steering Committee

Jet de Ranitz
Chair Advisory Board

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Chairs Editorial Board NPOS Rolling Agenda

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.

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[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.

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 actions 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.

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

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

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

[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

and technology organisations, enterprises), funding organisations, publishers, service organisations, companies, NGO's, governmental organisations and citizens.

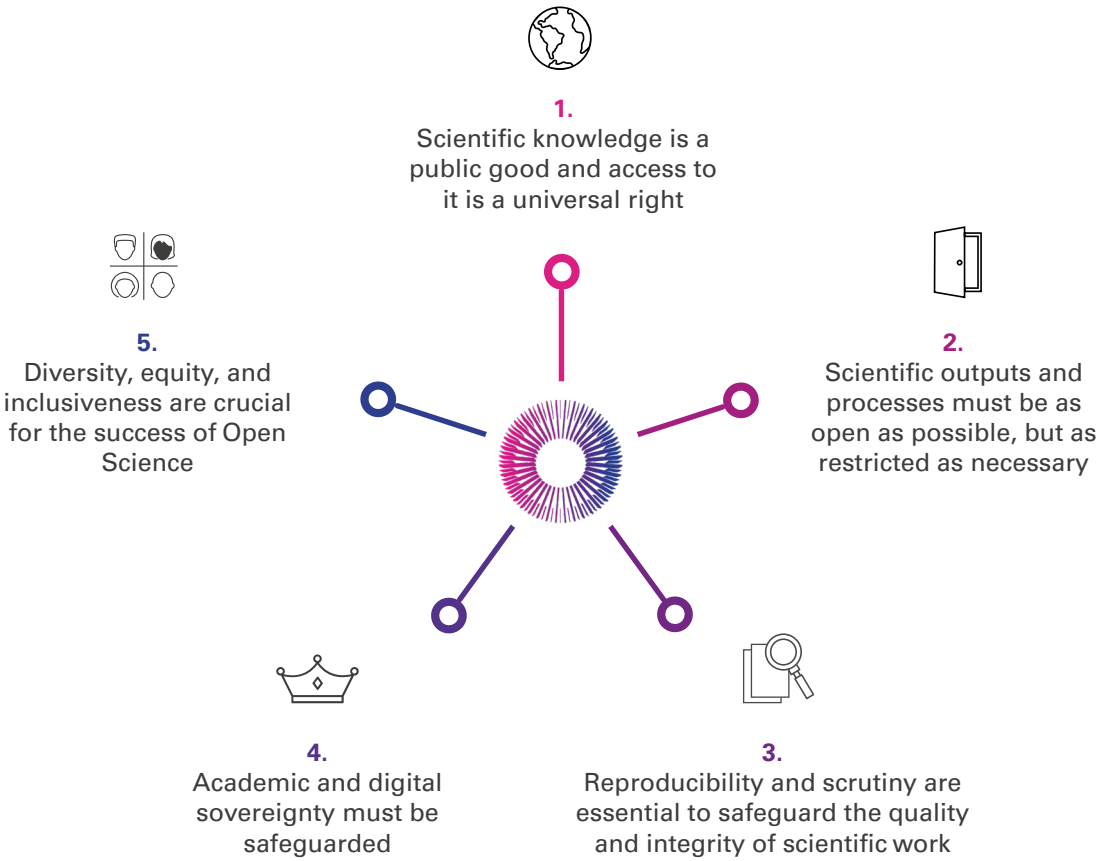
5. Academic and digital sovereignty must be safeguarded

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 actions are needed to maintain (or retrieve) academic sovereignty. Joint understanding of principles and frameworks is needed, as are collective actions 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://vsnu.nl/en_GB/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://www.universiteitenvannederland.nl/files/Guiding%20Principles%202.0(1).pdf

npos guiding principles



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

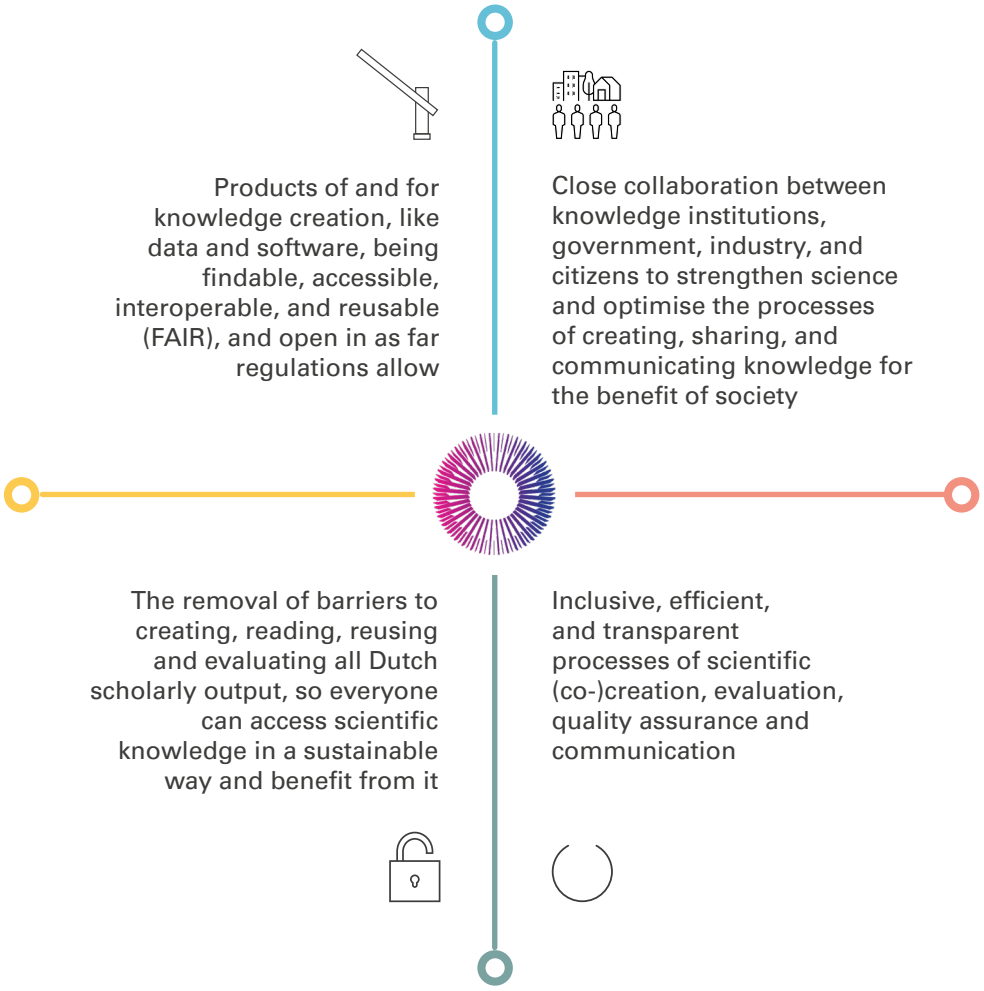
The strategic goals for the NPOS Multi Annual Plan follow from the Vision and are in line with the UNESCO Recommendation.

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 creating, reading, reusing and evaluating all Dutch scholarly 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 basis for the Rolling Agenda of the Multi Annual Plan.

npos strategic goals



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 actions 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.

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

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 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 Academic 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 academic 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.

[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

Make Open Science rewarding through incentives (Recognition & Rewards)

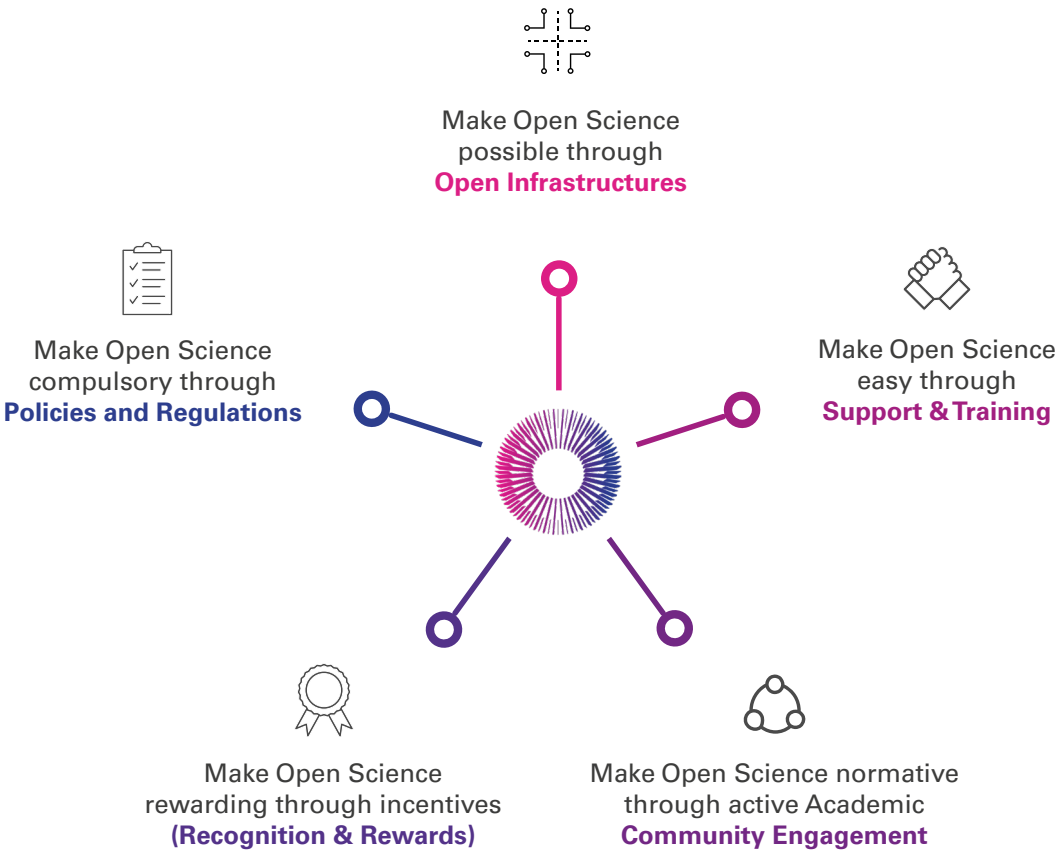
In the current academic environment, practices reflecting the Open Science values (ranging from sharing results, altruistic cooperation, and engaging with stakeholders outside academic institutions) are not the norm yet, as they generally are not rewarded. However, many societal challenges require transparency, 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.

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.

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

requirements to realise open science



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);

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[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.

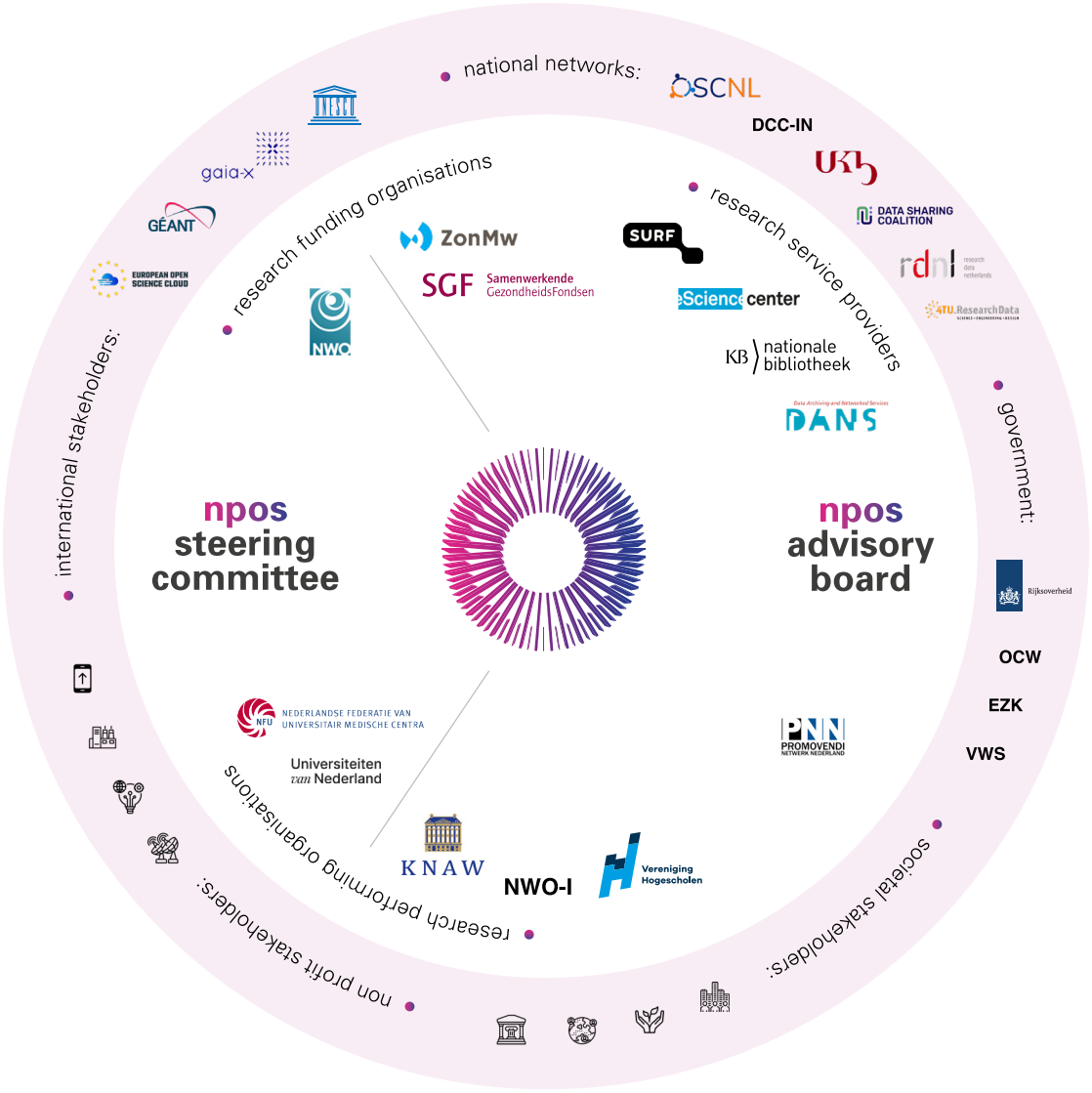
The NPOS as a coordinating body only implements those tasks which cannot be performed at a more local level (the 'Subsidiarity Principle'). This means that most actions from the National Programme will be carried out at the involved knowledge institutions and service providers and subsequently, NPOS funds will largely flow towards existing institutions and service providers. Stakeholders may choose to centralise resources and coordination for specific actions. If possible, existing legal entities and collaborative structures will be used for this centralisation.

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 actions will be carried out in close alignment to each other. Together, all actions 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 actions 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 actions, and will coordinate these when necessary.

npos stakeholders



Rolling Agenda

Introduction

The NPOS 2030 Rolling Agenda lists which objectives and underlying actions are needed to reach each of the four NPOS strategic goals for 2030 as described in the Ambition Document. This condensed document describes the key objectives from the Rolling Agenda. Some of these objectives and actions under different strategic goals overlap with each other. Over the course of the next 10 years, we expect the goals, objectives and actions to become even more related. It is crucial to closely evaluate progress and monitor new developments in intermediate phases and update the objectives and actions in the Rolling Agenda accordingly.
This is why we categorise the objectives in this document in two ways: first along the four strategic goals, and second along the five cross-cutting requirements for the culture change towards Open Science (see illustration below). These two ways of listing the objectives highlight the interconnectedness of the different goals and requirements and objectives.

Strategic goals for NPOS

0. Overarching Objectives

The following overarching objectives aim to ensure that overarching boundary conditions for the success of the National Programme/Initiative are met:

0.1 In 2022, a clear governance structure has been realised for the National Programme/Initiative on Open Science (e.g. Regieorgaan OS), in which all relevant stakeholders have a role.

0.2 In 2023, national Open Science-related networks are more closely connected to each other, and are in the position to influence, collaborate with and benefit from the NPOS.

0.3 In 2023, there is broad awareness of Open Science practices at all levels (strategic, tactical and operational) within the Dutch knowledge institutions. There are funding instruments that focus on collecting, developing and sharing examples/good practices of Open Science practices and processes, both within academia and with societal partners.

0.4 In 2025, Open Science practices and interventions are continuously and thoroughly monitored and assessed to understand their impact. Funding instruments for meta-research are implemented and harmonised, and are taken into account in the process of the Rolling Agenda. Evidence-informed and open indicators of science have been developed, are openly available for analysis (see objective 3.2) and are used in evaluations.

0.5 In 2025, all Open Science Communities (OSCs) are thriving, and form an entry point of research community engagement for NPOS actions. The scope of OSCs has extended beyond academia and includes all research performing organisations (e.g. Universities of Applied Science). There is structural financial support available to warrant the capacity for community building and community management in a sustainable manner.

0.6 There is continuous effort in raising and maintaining awareness on Open Science through events (e.g. the Netherlands National Open Science Festival: MEET SHARE INSPIRE CARE).

1. Towards Societal Engagement and Participation

Strategic goal: In 2030, there is 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.

Rationale

Societal engagement is an essential part of realising Open Science, providing opportunities for open, inclusive and participatory processes for knowledge creation. Societal engagement is a two-way process with the goal of generating mutual benefit for the research institution and the public and private partners they engage. The full spectrum of societal engagement practices includes Science Communication, Public Engagement, Societal Dialogue and Citizen Science[16]. Of these practices, Citizen Science focuses on co-production and collaboration, but the boundaries of these practices should be seen as fluid.

Societal engagement with science contributes to solving societal challenges and a better quality of societal knowledge, not only by addressing the priority issues from a societal perspective (thanks e.g. to citizens being involved in formulating questions), but also by increasing the level of scientific thinking and acting. Moreover, interaction with societal actors may challenge the current scientific paradigm and create new ways of 'thinking' and 'doing' science, thus opening new avenues where solutions may lie for current (major) societal challenges.

Objectives

1.1 In 2025, RPOs, RFOs, and HEIs recognize the value and impact of Societal Engagement approaches to science, policy and society. Participatory and inclusive research practices are embedded as part of mainstream research, funding, education and innovation processes. Dedicated funding programmes and policy instruments serve to support and sustain Societal Engagement initiatives at all scales in all domains of knowledge production.

[16] https://www.ucd.ie/research/portal/outcomesandimpacts/publicengagementandengagedresearch/

1.2 In 2025, there is a strong and active national Citizen Science practitioners network that collaborates closely with the Centre for Science Communications & Public Engagement and the Open Science Communities network, has a diverse range of members across the Quadruple Helix, and facilitates knowledge exchange, transdisciplinary collaboration, the further development of best practice and new innovations, and the formation of new multi-stakeholder initiatives across a wide range of domains.

1.3 In 2030, stakeholders from across all sectors of society and all components of the Quadruple Helix have clear pathways to participate in open and collaborative processes of scientific knowledge creation, evaluation, and communication to the benefit of society and its members, in all domains of research. There is a central online repository of consolidated research and best practice made widely available to all actors (see also objective 3.4).

1.4 In 2030, Citizen Science-generated data, knowledge, insights and practices are easily gathered, hosted and aggregated via data infrastructures and technical tools, such that these data are integrated into mainstream processes for research, policy-making and decision-making.

1.5 In 2030, capacity for Societal Engagement has been built up such that a wide range of different stakeholders & actors have been identified and engaged, their needs addressed in context, and training, skills development, and knowledge exchange have been facilitated and implemented, with dedicated support embedded within institutions, and support secured for the ongoing development of new resources and novel applications.

2. Towards Inclusive and Transparent Scientific Processes

Strategic goal: In 2030, there are inclusive, efficient, and transparent processes of scientific (co-) creation, evaluation, quality assurance and communication.

Rationale

Constant scrutiny and progressive insight are at the core of science. 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. More openness about intermediate steps in the scientific process (e.g. grant applications, protocols, notebooks, reviews) and its outputs allows for reproducibility, replicability, and reuse. (Open) peer review and verification in different stages of the scientific process (re)build trust in scientific knowledge and build a strong foundation for subsequent work.

Therefore, inclusivity and transparency about intermediate steps in the research process should be the norm and Open Science principles have to be embedded in all scientific processes. Moreover, proper recognition should be given to all involved in these intermediate stages, which asks for revaluation of existing policies.

Objectives

2.1 In 2025, replication and reproducibility of scientific claims are recognized and rewarded as crucial parts of the research process. Good practices are collected and shared, and dedicated funding instruments have been established for replication and reproduction.

2.2 In 2026, there is uniformity between policies of stakeholders in the Netherlands regarding the Recognition & Rewards of sharing intermediate steps of scientific processes. Pioneers of these practices are recognized as academic leaders.

2.3 In 2030, there is (a network of) infrastructure(s) that sustainably and efficiently connects the different intermediate outputs in the scientific process (e.g. grant applications, protocols, notebooks, reviews), to make them easily findable, searchable and reusable.

2.4 In 2030, publication, review and curation are decoupled. Preprints are the norm, and (post-publication) peer review platforms are recognized and supported.

2.5 In 2030, Open Science principles are embedded at the core of educational curricula for Bachelor/Master students, researchers, support staff and societal partners, both in content and form. This includes educational assignments, academic leadership courses, and information skills courses.

3. Towards Open Scholarly Communication

Strategic goal: In 2030, barriers to creating, reading, reusing and evaluating all Dutch scholarly output are removed, so everyone can access scientific knowledge in a sustainable way and benefit from it.

Rationale

Scholarly communication is the system through which research and other scholarly output are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use[17]. The main ambition for the Netherlands is to invest in a more inclusive, sustainable and just scholarly communication system. In addition we strive for a more open and more publicly steered system.

We define scholarly output as any element of research that can be represented as a digital object and can be made FAIR and freely accessible via an Open Access licence. The transition to open science requires unambiguous ways of working and collaborating, especially with societal partners. Hence, scholarly communication focuses on all intermediate results – a shift from 'version of record' to 'records of versions' – such that all can participate/contribute to research in all stages. I.e., not only previous versions of peer-reviewed articles (e.g., preprinting and preprint peer review) but all output in conducting research ('opening research as much as possible'). Scholarly outputs need to become more interlinked at the different stages of the research life cycle, contributing to a fluid evolution of diverse forms of documentation.

Objectives

3.1 From 2023 onwards there is national coordination for the systematic steering and monitoring of innovations towards just and open scholarly communication. This includes quality assurance, cost control, supportive policies at national and at the institutional level, and further development of guiding principles for safeguarding public values and digital sovereignty.

[17] Scholarly Communication Overview - Scholarly Communication Toolkit - LibGuides at ACRL

3.2 In 2027, the digital infrastructure for scientific publications and metadata is sustainable and preferably open, and supports publication, (re-)use and analysis by anyone. This includes the development of a national publication platform and an Open Knowledge Base, as well as support for existing open archives, repositories and infrastructures (such as Publinova) for publication, data, software and other scholarly outputs.

3.3 In 2030, all scholarly output from publicly financed knowledge institutions from the Netherlands is freely and sustainable available and reusable under an open licence, where possible without an embargo period. This includes a harmonised multi-route approach (green, diamond, as well as gold Open Access) which emphasises sustainability, cost-effectiveness and public values.

3.4 In 2030, there will be a public platform for scientific publications, that allows everyone in the Netherlands to re-use global scholarly output for their professional and societal engagement practices.

4. Towards FAIR and Open Research Outputs

Strategic goal: In 2030, products of and for knowledge creation, like data and software, are findable, accessible, interoperable, and reusable (FAIR), and open in as far as regulations allow.

Rationale

Optimal use and reuse of research outputs is an important aspect of Open Science. Researchers and their digital systems should easily be able to find, access, and combine interoperable datasets, software, and other research objects to process, archive, curate, share, analyse, and publish research outputs for verification and reuse.

Making research outputs findable, accessible, interoperable and reusable (FAIR) requires infrastructure and sufficient support capacity, but also alignment, collaboration and standardisation. All underlying data will be FAIR by design where possible, with restrictions

for access when necessary. Rich and machine-readable metadata is FAIR by default, and will allow judgement of usefulness, quality, and conditions for access via national, institutional, and domain-specific data infrastructures.

For research software, a research software ecosystem is needed, to allow optimal development, (re-)use and benefit from open research software. A future in which open and excellent software instrumentation is the norm, allows the Dutch open science community to push the boundaries and possibilities of scientific research.

Objectives

4.1 In 2025, there is national coordination on the implementation of standardised and machine-actionable FAIR digital research outputs and associated FAIR metadata, that connects local, domain-specific, national and international (e.g. EOSC) levels.

4.2 In 2025, there is wide-spread attention for the efficiency, effectivity, openness, integrity, consistency, and sustainability of open research software in relation to infrastructural facilities and environmental impact. There are institutional policies, aligned with international developments, and guidelines for research software management and ecological implications of open research software.

4.3 In 2025, 40% of the digital scientific objects and corresponding meta-information in RPOs has been made FAIR, through mandated FAIR expert teams in RPOs, assisted by FAIR expert teams in domains; in 2030, this will be 75%.

4.4 In 2027, Dutch FAIR research services and infrastructure are efficiently organised and connected, closely linked to the European digital infrastructure. There are FAIR data service infrastructures based upon major data sharing initiatives (e.g. SURF, DANS), including a network of FAIR data portals as part of EOSC.

4.5 In 2027, it will be possible to share FAIR research objects ('as open as possible, as restricted as necessary'); Dutch stakeholders have harmonised the conditions for access to sensitive data. There is a national data governance expert platform to design and

implement nationally harmonised policies for access to FAIR data, with specific attention to sensitive data.

4.6 In 2030, a professional community of well-trained data stewards has been established and there is enough structural capacity (in FTEs, as well as in expertise) at Research-Performing Organisations (RPOs) to facilitate making digital scientific objects FAIR. There is a nationally coordinated training programme for data stewards.

4.7 In 2030, the Dutch open science community has access to a robust, cost-effective, and sustainable research software ecosystem, which allows for publication and archiving of software in online software repositories (e.g. GitHub, Gitlab) by RPOs, as well as integration and interoperability with existing national, international, and domain-oriented archives and Current Research Information Systems.

4.8 In 2030, all researchers are optimally equipped to use, develop, share, and benefit from open research software. There are dedicated funding instruments for the development of open research software.

4.9 In 2030, there is sufficient capacity and expertise of research support staff to enable the use of open research software. There is a nationally coordinated training programme and a training network for researchers and support staff (following the train-the-trainer principle).

4.10 In 2030, all research based on the use of research software (including data, publications, methods, and analyses) is transparent, verifiable, reproducible, and reusable. Both research and support staff are recognized and rewarded for their active involvement in the development, maintenance, and application of research software.

Requirements to realise Open Science

The objectives and actions in the Rolling Agenda also correspond to five essential requirements for the culture change towards open science, as described in the Ambition Document. In order to illustrate this consistency across objectives for the different strategic goals, we list the same objectives by requirement as well:

1. Make Open Science possible through Open Infrastructures

Corresponding objectives for this requirement are:

1.3 In 2030, stakeholders from across all sectors of society and all components of the Quadruple Helix have clear pathways to participate in open and collaborative processes of scientific knowledge creation, evaluation, and communication to the benefit of society and its members, in all domains of research. There is a central online repository of consolidated research and best practice made widely available to all actors (see also objective 3.4).

1.4 In 2030, Citizen Science-generated data, knowledge, insights and practices are easily gathered, hosted and aggregated via data infrastructures and technical tools, such that these data are integrated into mainstream processes for research, policy-making and decision-making.

2.3 In 2030, there is (a network of) infrastructure(s) that sustainably and efficiently connects the different intermediate outputs in the scientific process (e.g. grant applications, protocols, notebooks, reviews), to make them easily findable, searchable and reusable.

3.2 In 2027, the digital infrastructure for scientific publications and metadata is sustainable and preferably open, and supports publication, (re-)use and analysis by anyone. This includes the development of a national publication platform and an Open Knowledge Base, as well as support for existing open archives, repositories and infrastructures (such as Publinova) for publication, data, software and other scholarly outputs.

3.4 In 2030, there will be a public platform for scientific publications, that allows everyone in the Netherlands to re-use global scholarly output for their professional and societal engagement practices.

4.4 In 2027, Dutch FAIR research services and infrastructure are efficiently organised and connected, closely linked to the European digital infrastructure. There are FAIR data service infrastructures based upon major data sharing initiatives (e.g. SURF, DANS), including a network of FAIR data portals as part of EOSC.

4.7 In 2030, the Dutch open science community has access to a robust, cost-effective, and sustainable research software ecosystem, which allows for publication and archiving of software in online software repositories (e.g. GitHub, Gitlab) by RPOs, as well as integration and interoperability with existing national, international, and domain-oriented archives and Current Research Information Systems.

2. Make Open Science easy through Support & Training

Corresponding objectives:

1.5 In 2030, capacity for Societal Engagement has been built up such that a wide range of different stakeholders & actors have been identified and engaged, their needs addressed in context, and training, skills development, and knowledge exchange have been facilitated and implemented, with dedicated support embedded within institutions, and support secured for the ongoing development of new resources and novel applications.

2.5 In 2030, Open Science principles are embedded at the core of educational curricula for Bachelor/Master students, researchers, support staff and societal partners. This includes educational assignments, academic leadership courses, and information skills courses.

4.3 In 2025, 40% of the digital scientific objects and corresponding meta-information in RPOs has been made FAIR, through mandated FAIR expert teams in RPOs, assisted by

FAIR expert teams in domains; in 2030, this will be 75%.

4.6 In 2030, a professional community of well-trained data stewards has been established and there is enough structural capacity (in FTEs, as well as in expertise) at Research-Performing Organisations (RPOs) to facilitate making digital scientific objects FAIR. There is a nationally coordinated training programme for data stewards.

4.9 In 2030, there is sufficient capacity and expertise of research support staff to enable the use of open research software. There is a nationally coordinated training programme and a training network for researchers and support staff (following the train-the-trainer principle).

3. Make Open Science normative through active Academic Community Engagement

Corresponding objectives:

0.2 In 2023, national Open Science-related networks are more closely connected to each other, and are in the position to influence, collaborate with and benefit from the NPOS.

0.3 In 2023, there is broad awareness of Open Science practices at all levels (strategic, tactical and operational) within the Dutch knowledge institutions. There are funding instruments that focus on collecting, developing and sharing examples/good practices of Open Science practices and processes, both within academia and with societal partners.

0.5 In 2025, all Open Science Communities (OSCs) are thriving, and form an entry point of research community engagement for NPOS actions. The scope of OSCs has extended beyond academia and includes all research performing organisations (e.g. Universities of Applied Science). There is structural financial support available to warrant the capacity for community building and community management in a sustainable manner.

0.6 There is continuous effort in raising and maintaining awareness on Open Science

through events (e.g. the Netherlands National Open Science Festival: MEET SHARE INSPIRE CARE).

1.2 In 2025, there is a strong and active national Citizen Science practitioners network that collaborates closely with the Centre for Science Communications & Public Engagement and the Open Science Communities network, has a diverse range of members across the Quadruple Helix, and facilitates knowledge exchange, transdisciplinary collaboration, the further development of best practice and new innovations, and the formation of new multi-stakeholder initiatives across a wide range of domains.

4. Make Open Science rewarding through incentives (Recognition & Rewards)

Corresponding objectives:

1.1 In 2025, RPOs, RFOs, and HEIs recognize the value and impact of Societal Engagement approaches to science, policy and society. Participatory and inclusive research practices are embedded as part of mainstream research, funding, education and innovation processes. Dedicated funding programmes and policy instruments serve to support and sustain Societal Engagement initiatives at all scales in all domains of knowledge production.

2.1 In 2025, replication and reproducibility of scientific claims are recognized and rewarded as crucial parts of the research process. Good practices are collected and shared, and dedicated funding instruments have been established for replication and reproduction.

2.2 In 2026, there is uniformity between policies of stakeholders in the Netherlands regarding the Recognition & Rewards of sharing intermediate steps of scientific processes. Pioneers of these practices are recognized as academic leaders.

2.4 In 2030, publication, review and curation are decoupled. Preprints are the norm, and (post-publication) peer review platforms are recognized and supported.

4.8 In 2030, all researchers are optimally equipped to use, develop, share, and benefit from open research software. There are dedicated funding instruments for the development of open research software.

4.10 In 2030, all research based on the use of research software (including data, publications, methods, and analyses) is transparent, verifiable, reproducible, and reusable. Both research and support staff are recognized and rewarded for their active involvement in the development, maintenance, and application of research software.

5. Make Open Science compulsory through Policies and Regulations

Corresponding objectives:

0.4 In 2025, Open Science practices and interventions are continuously and thoroughly monitored and assessed to understand their impact. Funding instruments for meta-research are implemented and harmonised, and are taken into account in the process of the Rolling Agenda. Evidence-informed and open indicators of science have been developed, are openly available for analysis (see objective 3.2) and are used in evaluations.

3.1 From 2023 onwards there is national coordination for the systematic steering and monitoring of innovations towards just and open scholarly communication. This includes quality assurance, cost control, supportive policies at national and at the institutional level, and further development of guiding principles for safeguarding public values and digital sovereignty.

3.3 In 2030, all scholarly output from publicly financed knowledge institutions from the Netherlands is freely and sustainable available and reusable under an open licence, where possible without an embargo period. This includes a harmonised multi-route approach

(green, diamond, as well as gold Open Access) which emphasises sustainability, cost-effectiveness and public values.

4.1 In 2025, there is national coordination on the implementation of standardised and machine-actionable FAIR digital research outputs and associated FAIR metadata, that connects local, domain-specific, national and international (e.g. EOSC) levels.

4.2 In 2025, there is wide-spread attention for the efficiency, effectivity, openness, integrity, consistency, and sustainability of open research software in relation to infrastructural facilities and environmental impact. There are institutional policies, aligned with international developments, and guidelines for research software management and ecological implications of open research software.

4.5 In 2027, it will be possible to share FAIR research objects ('as open as possible, as restricted as necessary'); Dutch stakeholders have harmonised the conditions for access to sensitive data. There is a national data governance expert platform to design and implement nationally harmonised policies for access to FAIR data, with specific attention to sensitive data.

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