PaNOSC

Photon and Neutron Open Science Cloud

H2020-INFRAEOSC-04-2018

Grant Agreement Number: 823852

Deliverable:

D9.4 - Dissemination and Outreach activities

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 823852

Project Deliverable Information Sheet

Project Reference No.	823852
Project acronym:	PaNOSC
Project full name:	Photon and Neutron Open Science Cloud
H2020 Call:	INFRAEOSC-04-2018
Project Coordinator	Andy Götz (andy.gotz@esrf.fr)
Coordinating Organization:	ESRF
Project Website:	www.panosc.eu
Deliverable No:	D9.4
Deliverable Type:	Report
Dissemination Level	Public
Contractual Delivery Date:	30/11/2022
Actual Delivery Date:	05/12/2022
EC project Officer:	Flavius Alexandru Pana

Document Control Sheet

Document	Title: D9.4 – Dissemination and outreach activities
	Version: 1.1
	Available at: https://github.com/panosc-eu
	Files: 1
Authorship	Written by: Nicoletta Carboni
	Contributors:
	Reviewed by: Jordi Bodera
	Approved: Andy Götz

List of participants

Participant No.	Participant organisation name	Country
1	European Synchrotron Radiation Facility (ESRF)	France
2	Institut Laue-Langevin (ILL)	France
3	European XFEL (XFEL.EU)	Germany
4	The European Spallation Source (ESS)	Sweden
5	Extreme Light Infrastructure ERIC (ELI-ERIC)	Belgium
6	Central European Research Infrastructure Consortium (CERIC-ERIC)	Italy
7	EGI Foundation (EGI.eu)	The Netherlands

Table of Contents

1. Introduction

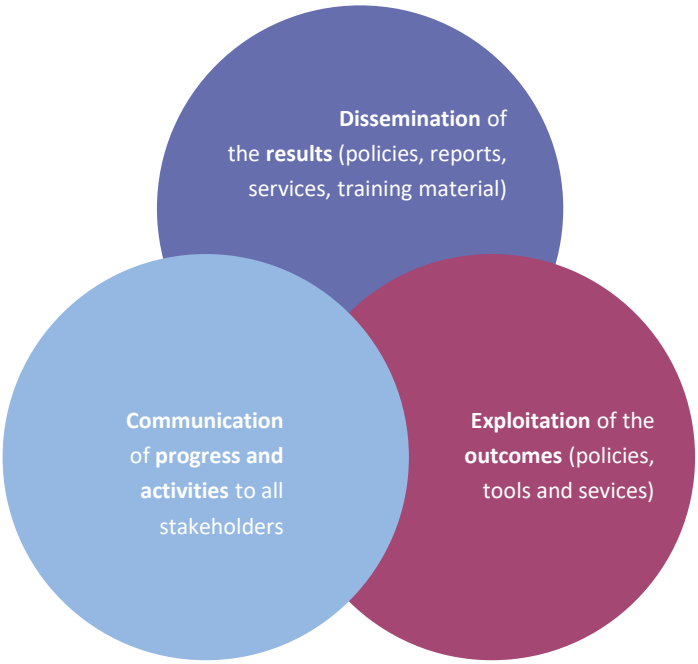
Since the very start of the project, PaNOSC WP9 has being implementing a various number of actions to disseminate the project's key milestones and achievements, with the goal of raising awareness about PaNOSC and its goals among its stakeholders, increase the knowledge about FAIR principles and FAIR data, and stimulate the adoption of FAIR data practices among the community of users of photon and neutron (PaN) facilities, while ensuring EU visibility. The final goal has been to increase the impact of the actions carried out in all the policy and technical WPs by constantly informing and engaging with the community of PaN facilities and users, RIs' staff and managers, policy makers, PaN initiatives, scientific journals, EOSC players, and more.

The Communication Strategy and Plan of the PaNOSC project, which was drafted after its start in 2019 and updated in early 2021, provided the guidelines to properly reach this goal, by defining the main project's target audiences, key messages and media used according to the specific communication objectives and needs, as well as to the type of output to be achieved.

This document, following an overview of the main PaNOSC communication and dissemination objectives as already outlined in D9.1, aims to showcase the results of the strategy and work plan laid out in the WP to reach out to the widest number of stakeholders by using a mix of channels and tools, towards the overarching goal of driving a cultural change in the PaN user community, by stimulating the adoption of more FAIR Open Data practices among the PaN scientific community.

2. PaNOSC Communication and Dissemination Objectives

The work package dedicated to Communication and Dissemination – WP9 supported the project's objectives by providing tools and actions to increase the visibility and favour the exploitation of project's outputs and results.



The main project's communication objectives have been the following:

Ensure a smooth and effective communication exchange within the project partnership, guaranteeing a proper flow of information throughout the different bodies of the management structure by following the principles of cooperation and transparency, and by respecting the rules on confidentiality.

Strengthen project partners' coordination and networking by means of internal communications tools fully dedicated to the project and its partners, and by providing the proper online and offline environment for open discussion of common challenges and exchange of best practices.

Increase the visibility of PaNOSC through the publication of the project's outputs (policies, standards, methodologies, technical and operational information, software, etc.) and the dissemination of results among relevant stakeholders, also via outreach activities and events.

Involve, whenever possible, PaN user communities, national PaN RIs, policy makers and funding agencies to increase the relevance of the project's results, stimulate change by transferring the developed policies and tools and nudge towards their adoption.

Support communication actions aimed at affecting changes among main stakeholders (see Table 2)[1].

Increase the awareness and knowledge among the PaN communities at both the national and European level about the work of PaNOSC, stimulating the best possible use of the guidelines, policies and tools developed throughout the project.

Widen the network of IT professionals and staff involved in the development of the EOSC to favour exchanges of knowledge and best practices.

Collaborate with other EOSC clusters, as well as with the PaNOSC sister project, ExPaNDS, by maintaining frequent updates on the project progress and developed policies, strategies, tools and technologies, fostering their adoption towards the construction of a harmonised federated and cross-disciplinary EOSC service catalogue.

Enhance the project's impact by disseminating the project's relevant documents, information, services and achievements to stakeholders at the regional, national and European levels, to stimulate action towards the implementation of policies and tools, and towards the core INFRAEOSC programme's goal of putting forward the EOSC, by setting up and integrating the necessary services for effective data preservation and open access for immediate and future sharing and re-use.

Assist exploitation of outputs and results, and ensure PaNOSC's legacy by making available best practices and relevant documentation to stakeholders after the end of the project.

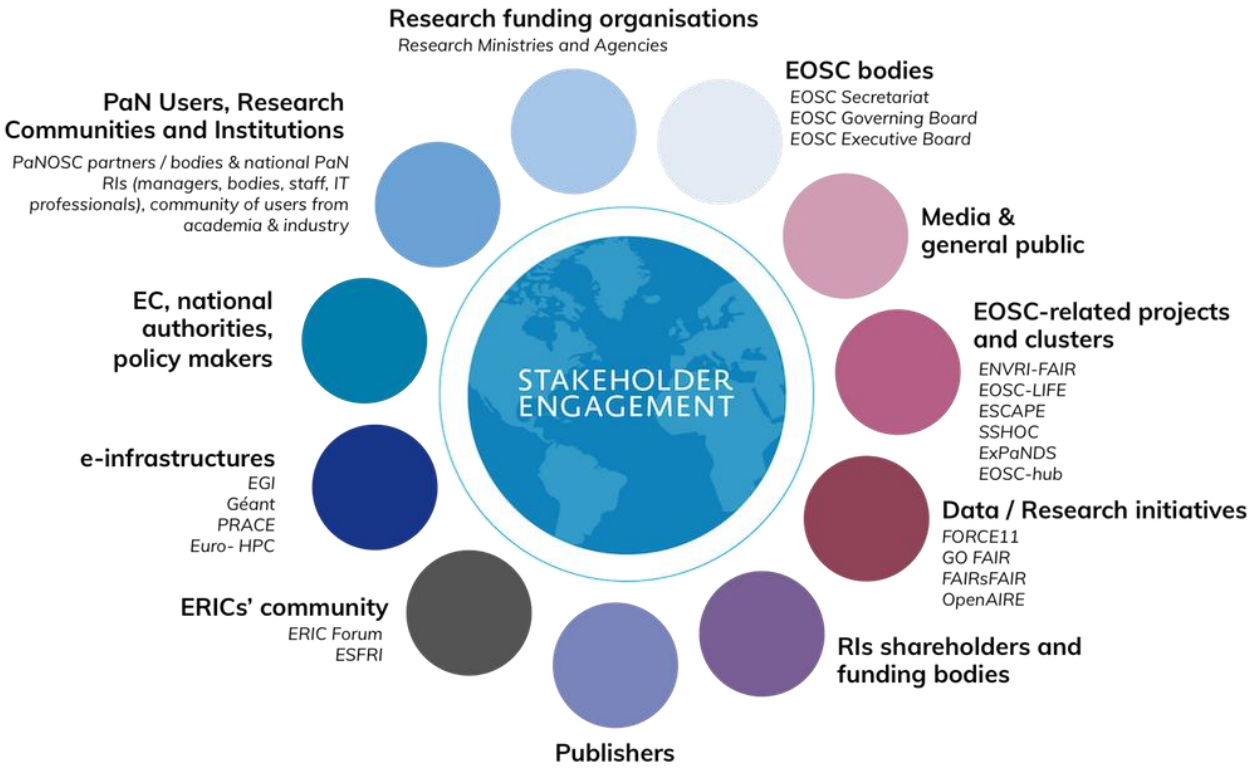
[1]Table 2 shows the main changes that the project affected, linked to the related actions, target groups and key performance indicators (KPI).

N.	EXPECTED CHANGE	ACTIONS	TARGET	KPI
1	Higher number of PaN RIs using the PaNOSC FAIR data policy framework to update and adopt a FAIR data policy at their site	• Involvement of PaN RIs in the making of a harmonised FAIR open data policy • Presentation of PaNOSC data policy to national Ministries for Science and Research.	• RIs' bodies / managers	• No. of PaN research infrastructures adopting the proposed PaNOSC open data policy 7 adopted it, 9 are in the process of adopting it, 1 has planned to adopt it
2	Higher number of users accessing open data through the EOSC	• Presentation of PaNOSC and its services to the PaN user community • Promotion of the EOSC services through all available channels, events and and platforms • Publication and distribution of training material developed in the project	• PaN user community • Other EOSC projects / clusters	• No. of users accessing the EOSC services (details in related WPs' deliverables) • No. of training modules published/distributed (details in related WPs' deliverables)
3	Increased awareness of the benefits of the EOSC and its services for the PaN user community	• Dissemination of project results that benefit the whole community through all available media channels, and public events. • Coordinated promotion of EOSC services with the other clusters	• PaN user community • Policy makers • Media and the public	• No. of dissemination articles published > **82** • No. of dissemination events attended > **52** • No. of invited talks as PaNOSC representative(s) on topics of relevance for the project and its partners > **83**
4	Making PaNOSC infrastructure and software sustainable in the long-term	• Engage with PaN facilities to support adoption of services in the long-term	PaN facilities	• No. of facilities committing to sustain the developed services: **DMPs** (> 3 adopted, 9 in progress, 3 planned to adopt), **DOIs** (10 adopted, 5 in progress, 1 planned), NeXus HDF5 (10 adopted, 5 in progress), **search API** (8 adopted, 3 in progress, 2 planned), **Open Data Portal** (11 adopted, 5 in progress, 1 planned), **AAI** (7 adopted, 5 in progress, 2 planned), JupyterLab (9 adopted, 4 in progress, 1 planned), **VISA** (5 adopted, 4 in progress, 1 planned), VINYL (9 adopted), e-learning platform (8 adopted, 2 in progress).
5	Integration of developed services into the EOSC	• Contribution of PaNOSC data, resources and services to the EOSC service catalogue	• PaN user community • PaN RIs	• Number of services integrated into the EOSC > **5** (PaN Software Catalogue, e-learning platform and training catalogue, Human Organ Atlas, PaNOSC Open Data Portal, Search API service).

***Table 2. List of expected changes that the project has affected**

3. PaNOSC stakeholders

The main stakeholders of the project have been identified at its very start – as detailed in D9.1 – PaNOSC Communication and Dissemination Plan – and later refined in collaboration with WP7 on sustainability – as from D7.1 - PaN EOSC Stakeholder Feedback. The image below showcases the PaNOSC key stakeholders' map, also available on the project's website:



Throughout the implementation of the project, all such stakeholders have been targeted for both communication and dissemination purposes, using a mix of tools and channels.

3.1 Examples of organisations reached through promotion / dissemination

Below is an overview of some of the organisations reached through the promotional activities implemented in WP9 via social media, email, PaNOSC and partners' websites, newsletters of the partners and PaN initiatives, poster presentations and (online and onsite, or hybrid) events.

(e-)Research Infrastructures, ERICs, PaN initiatives	Universities	EOSC-related projects and bodies
- ESRF, European Synchrotron Radiation Facility - CERIC-ERIC, Central European Research Infrastructure Consortium - ILL, Institut Laue-Langevin - European XFEL - ELI ERIC, Extreme Light Infrastructure - ESS ERIC, European Spallation Source - Diamond Light Source - ALBA Synchrotron	- Dublin City University - University Sains Malaysia - University of Modena and Reggio Emilia - University of Genoa - Policitecnico di Milano - University of Duisburg-Essen - Copenhagen University Library - University of Szeged - UCL, University College London - University of Maribor	- EOSC Association - ExPaNDS - EOSC Life - ENVRI FAIR - ESCAPE - SSHOC - EOSCsecretariat.eu - EOSC Future - FAIRsFAIR - DAPHNE EU Project

(e-)Research Infrastructures, ERICs, PaN initiatives	Universities	EOSC-related projects and bodies
- German Electron Synchrotron DESY - Science and Technology Facilities Council (STFC) – UKRI - MAX IV Laboratory - National Synchrotron Radiation Facility SOLARIS - BNC, Budapest Neutron Centre - Elettra-Sincrotrone Trieste S.c.p.A. - HZB, Helmholtz Zentrum Berlin - HZDR, Helmholtz-Zentrum Dresden-Rossendorf - PSI, Paul Scherrer Institut - SOLEIL Synchrotron - National Institute of Materials Physics - National Institute of Chemistry (Slovenia) - CNRS - Scientific Research Center of the Slovenian Academy of Sciences and Arts - ELIXIR - Brookhaven National Laboratory - CNR-Institute for Photonics and Nanotechnologies, Italy - Forschungzentrum Julich - FORTH-IESL - Foundation for Research and Technology Hellas - Institute of Applied Physics RAS - Institute for Nuclear Research (ATOMKI), Debrecen (HU) - Institute of Biophysics, Biological Research Centre, Szeged - Institute of Biotechnology, Czech Academy of Sciences - Institute of Physics, Chinese Academy of Sciences - Max-Planck Institut für Kernphysik - Wigner Physics Research Center - INFN Frascati - SLAC National Accelerator Lab - Argonne National Laboratory - SESAME Synchrotron - Brookhaven National Laboratory - LENS, League of Advanced European Neutron Sources - LEAPS, League of European Accelerator-based Photon Sources - Lightsources.org - Neutronsources.org - DARIAH ERIC - CESSDA ERIC - E-RIHS - ESS ERIC, European Social Survey - CLARIN ERIC - SHARE ERIC - CERN	- University of Ljubljana - University Library Maribor - Universite de Montreal - University of Manchester - Budapest University of Technology and Economics - Ecole Polytechnique, France - Friedrich-Schiller-Universität Jena - University of Debrecen - The Ss. Cyril and Methodius University, Skopje - University of Belgrade - Instituto Superior Tecnico, Lisbon - Kyoto University - Leibniz University Hannover - Linkoping University - Montpellier University - University of Pécs - Princeton University - Queen's university Belfast - Xidian University - University of Szeged - University of Strathclyde - University of Sarajevo - University of Perugia - University of Liverpool - University of Kaiserslauten - University of California San Diego - University of Amsterdam - Universidad de Salamanca - Technische Universitaet WienUniversity of Texas at Austin - Ohio State University - Technical University of Crete - Shenyang Agricultural University - Queen's university Belfast - Humboldt Universitaet Berlin - Monash University - Shanghai Tech University - University Utrecht - Arizona State University - Tohoku University - Tilburg University - University of Nottingham - University of Ljubljana - Tampere University - University of York - University of Saskatchewan - University of Tirana - Macquarie University - University of Fribourg - Technical University of Denmark	- EOSC-Pillar - EOSC-Nordic - EOSC-Synergy - NI4OS-Europe - CS3MESH4EOSC - EOSC-Hub - EOSC Governing Board - EOSC Executive Board - EOSC Financial Sustainability Task Force - EOSC AAI Task Force **Policy Makers** - European Commission - Slovenian Ministry of Education, Science and Sport - Slovenian Ministry of Public Administration - French Ministry for Higher Education, Research and Innovation - Italian Ministry for University and Research - Polish Ministry of Science and Higher Education - Czech Ministry of Education, Youth and Sports - Slovenian State Secretary - Austrian Federal Ministry of Education, Science and Research - National Research, Development and Innovation Office – Hungary - Romanian Ministry of Education **e-infrastructures** - EGI Foundation - Open AIRE - NRA - ISTerre-CNRS - LEGI Grenoble INP - Barcelona Supercompunting Center - GÉANT - GARR **Publishers (and related journals)** - ACS - APS - Cell Press - Springer Nature - IUCr - Journal of Biological Chemistry - Wiley - RSC - PNAS **OTHER** - RDA, Research Data Alliance - HDF5 Group

4. Overview on the channels and tools deployed for outreach and dissemination

WP9 contributed to set-up and deploy all useful and relevant channels and tools to inform and engage with project's stakeholders on the project's outputs (reports, best practices' guidelines, policies, standards, methodologies, technical and operation information, guidance documents, [video] tutorials, etc.). The main online channels used to communicate the PaNOSC activities have been the PaNOSC website, mailing lists and social media. The content for outreach and dissemination has been also further distributed by the partners' websites and newsletters, or through the EOSC channels (EOSC Association, EOSC Portal, EOSCsecretariat,eu, FAIRsFAIR, ExPaNDS and EOSC cluster projects) and PaN projects and initiatives (lightsources.org, neutronsources.org, LENS and LEAPS initiatives), as well as via the channels provided by the EC, such as CORDIS. Zenodo has been used to publish all deliverables and articles of interest for the PaN community. By the end of the project, a dissemination article has been published and released in the October 2022 issue of the Project Repository journal, which reaches out to a global audience of circa 220,000 people.
Posters, infographics and brochures were released for online distribution, as well as for their showcase at events and user meetings.

4.1 PaNOSC website

The PaNOSC website has been the main communication and dissemination tool used to promote project activities, disseminate results and make all project public reports, services and deliverables accessible. It has been continuously updated with posts about the projects' milestones and achievements. The structure of the website has been upgraded when necessary, by adding new sections and updating older ones, according to the specific needs of the project and of the PaN community.
The following sections have been incorporated in the website to meet the outreach needs occurred during the period of the project implementation:

- **"Use cases" section**: following the launch of a call for use cases at the end of 2020, targeting users of PaN facilities, in 2021 a new website section was created, to collect and showcase factual examples of the use that can be made of the services being developed in the project, for data stewardship, data transfer, (remote) data analysis, and data and experiments' simulation. The section has been kept updated throughout the next two years, as new use cases were received by the scientists involved in the research activities of the partners.
- **"Publications" section**: to meet the EC requirements and provide evidence of the green and peer-reviewed open access publications released in the frame of the project, a dedicated section has been added to the website's "materials" section, to have all released publications in one single place. This also includes articles and software released in the project's account on Zenodo.
- In the **"About" section**, new pages have been added, including a map of the project's stakeholders and a general section on Research Infrastructures.
- **"Data" section**: following the release of the PaNOSC FAIR data policy framework, a new section has been created and added to the main website's menu, to present the key points of the framework, an overview of FAIR principles, and a detailed article on PaNOSC work towards making data FAIR and Open from their collection through to publication. The section also includes a page on "The DOI for data", which has been added once the video was released at the end of 2020, with the involvement of all PaN facilities members in the LEAPS and LENS initiatives.
- "**Services" section**: this was created once the website was released in spring 2019. In the following period, the pages dedicated to specific services (data analysis, data storage, data simulation, data catalogue, e-learning) have been updated in the second half of the project implementation period, to ensure the information about the status of the work was updated, and to showcase for whom and for which scope each service has been developed for, as well as to provide updated references to the source codes and to useful videos and demos

produced throughout the project.

4.2 Social Media Platforms

Twitter and YouTube have been chosen as key social media platforms for the project.
Twitter has been used to update the PaN community and other relevant stakeholders about the project's publications, position papers, milestones and achievements, and to promote EOSC-related events, as well as events organised within the project, or to which PaNOSC actively contributed.
YouTube has been deployed to upload events' recordings, video interviews with PaNOSC contributors and PaN users, demos about the services developed, announcements and promotional videos about PaN facilities and FAIR open data. These have been embedded in the project's website and further promoted through the Twitter account, as well as via the communication channels of the partners, including other social media platforms and newsletters.
A detailed overview of the social media performance of PaNOSC-related publications is available in section 8. of this report.

4.3 Digital (and printed) brochures

In November 2020 and later in November 2022, two brochures highlighting the main project's achievements were released. The 1st one was released after the 1st EC review held in the summer 2020, and summarises the main achievements after the first 18 months since the project's start (download on Zenodo). The 2nd and final brochure is an update of the previous one and gives a summary of major PaNOSC services and developments, with links to the source codes of the software developed, to the services in the EOSC Portal and to some video resources released throughout the project (download on Zenodo).

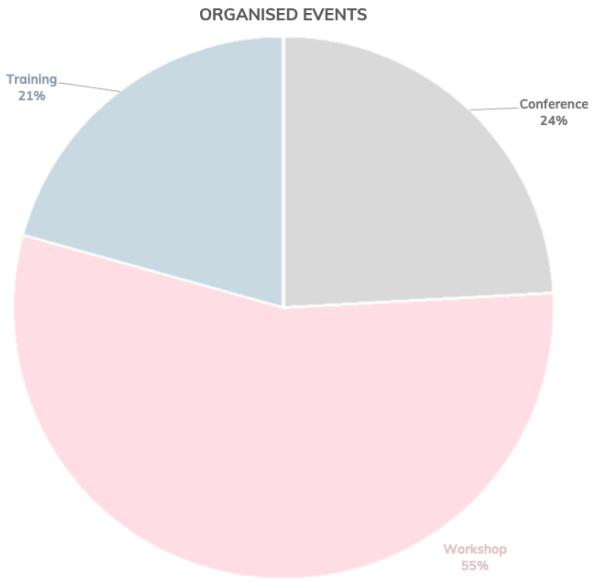
4.4 Promotional materials (rollups, posters, gadgets, etc.)

Different types of promotional material have been produced (and partly printed) for different means.

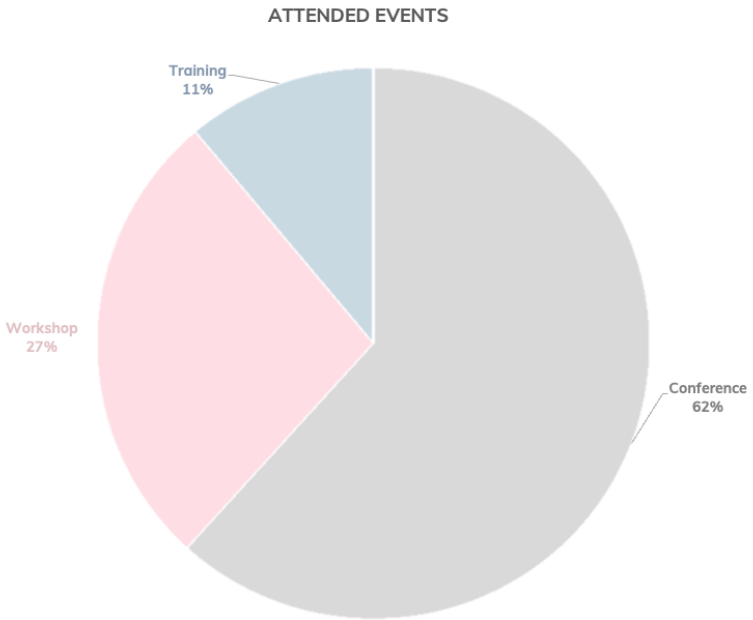
- PaNOSC **rollups** summarising the project's main goals, services and work packages have been printed and made available to the partners for attendance to PaNOSC and EOSC-related events. All PaNOSC rollups are available in the project's repository on GitHub.
- **Posters** on upcoming events, on PaNOSC goals, services and use cases, on FAIR data and on the e-learning platforms have been designed to be presented at either online or onsite events (user meetings, annual project meetings and dissemination events). All PaNOSC posters are available in the project's repository on GitHub.
- Several **banners** have been designed in particular to promote PaNOSC events across digital communication channels, as well as to highlight PaNOSC services and goals.
- In occasion of the PaNOSC Summer School organised in the frame of WP8 with the support of WP9 in 2022, **gadgets** such as bags and usb sticks have been purchased and distributed to PhD students and researchers attending the event.

4.5 Events

Overall, **31 events** were organised in the frame of the project, often with the contribution of WP9, either in the organisation and/or in the promotion and dissemination of the related outcomes.



PaNOSC also actively contributed to **81 events** (meetings, workshops, conferences and training events) organised by other projects and initiatives, by RIs, ERICs, e-infrastructures, ESFRI and the EC.



In the tables below is the full list of events organised, or attended by PaNOSC (**grey**: conference; **pink**: workshop; **blue**: training), including the number of attendees per event, when such data has been made available. Considering the outbreak of the pandemic, which occurred after almost one year since the project's start, many events moved online. Although this did not allow to meet in person and thus limited the networking possibilities between the various' project's stakeholders, such condition also gave the chance to many more project's contributors than initially planned, to attend many events that it would have been otherwise impossible to attend.

ORGANISED EVENTS			
EVENT'S NAME	**DATE**	**LOCATION**	**No. attendees**
PaNOSC kick-off meeting	15-16 January 2019	ESRF, Grenoble – France	~60
1st PaNOSC OASYS School	14-16 May 2019	ESRF, Grenoble – France	33
WP3 kick-off meeting	May 2019	Copenhagen – Denmark	10
WP4 kick-off meeting	25-26 June 2019	Schenefeld – Germany	25
HDF5 European Workshop for Science and Industry	17-18 September 2019	ESRF, Grenoble – France	67
WP3 face-2-face meeting	18-19 September 2019	ILL, Grenoble – France	9
h5py code camp	19-20 September 2019	ESRF, Grenoble – France	23
Jupyter workshop @ICALEPCS2019	5 October 2019	New York – USA	100
PaNOSC 1st Annual Meeting (conference)	4-5 November 2019	CERIC-ERIC, Trieste - Italy	62
Joint ExPaNDS and PaNOSC meeting on Data Catalogue Services	11-12 February 2020	European Spallation Source, Lund – Sweden	
ICAT metadata catalogue online meeting	10-11 March 2020	ESRF, online	
ViNYL development sprint 2020	1-30 April 2020	Online	10
ExPaNDS/PaNOSC Technical Workshop: The Portal Architecture test experience	8 October 2020	Online	114
PaNOSC / ExPaNDS Annual Meeting & EOSC Symposium	9-11 November 2020	ELI-DC, online	120
WP8 User Stories' Workshop	8 January 2021	Online	15
PaN ESCAPE Data Management Workshop	12 January 2021	Online	77
UmbrellaID technical training	4 February 2021	Online	43
PaNOSC & ExPaNDS Internal Workshop "Train the Trainers" / 1	9-11 February 2021	Online	31
PaNOSC & ExPaNDS Internal Workshop "Train the Trainers" / 2	23-24 March 2021	Online	31
PaNOSC WP3 Catalogue Integration Best Practices Meeting	18-20 May 2021	Online	65
European HDF5 Users Online Meeting	7-8 July 2021	Online	
ExPaNDS & PaNOSC 2nd Symposium	26 October 2021	Online	118
WP3 workshop - Data hub use cases	16 November 2021	Online	50
WP5 Development Sprint	March 2022	Online	6
UmbrellaID Workshop: Keycloak	3 May 2022	Online	39
PaNOSC / ExPaNDS F2F meeting	14-15 June 2022	ELI Beamlines in Dolny Brezany (Czech Republic)	14 June: 80 15 June: 60
Online workshop for the VISA platform	16 September 2022	Online	78
PaNOSC Summer School 2022	12-16 September 2022	ELI ALPS, Szeged - Hungary	28
ExPaNDS & PaNOSC 3rd PaN EOSC Symposium @ICRI2022	18 October 2022	Online + Brno - Czech Republic	12 onsite, 32 online
PaNOSC and ExPaNDS initiatives towards Open Data for the Photon and Neutron (PaN) Community	3 November 2022	Online	
PaNOSC Closing Event	29-30 November 2022	Online + Grenoble - France	65 onsite / 61 online

EVENTS to which PaNOSC contributed			
EVENT'S NAME	**DATE**	**LOCATION**	**No. attendees**
ESFRI RIs and EOSC Workshop	30 January 2019	London – UK	150
ESCAPE kick-off meeting	7-8 February 2019	Paris – France	97
FAIRsFAIR kick-off meeting	14-15 March 2019	Amsterdam – The Netherlands	71
EOSC-hub week 2019	10-12 April 2019	Prague – Czech Republic	300
EGI Conference 2019	6-8 May 2019	Amsterdam – The Netherlands	
LEAPS-IT, CalipsoPlus + UmbrellaID	13-15 May 2019	PSI, Villigen – Switzerland	37
"Dashboarding with project Jupyter" workshop	3-6 June 2019	Paris – France	
EOSC Jam Session	6-7 June 2020	Turin – Italy	
Jupyter Community workshop	11-13 June 2019	Berkeley – USA	
Challenges and Opportunities of Digital Transformation in Fundamental Research with Photons and Neutrons	13-14 June 2019	DESY, Hamburg – Germany	
Building Open Science in Europe. The road ahead for the EOSC community	20 June 2019	Tallin – Estonia	
European Conference for Neutron Scattering, ECNS (WP5)	20 June – 5 July 2019	St. Petersburg – Russia	572 from 33 countries
CASUS Opening Symposium (SIMEX, a start-to-end simulation platform for experiments at advanced light sources)	26-28 August 2019	Görlitz – Germany	
Joint EOSC project meeting	9-10 September 2019	Brussels - Belgium	
ExPaNDS kick-off meeting	11-12 September 2019	Hamburg - Germany	46
International Conference on Advanced Neutron Sources – ICANS XXIII (Examples on using McStas Union components and Python interface	13-18 October 2019	Chattanooga – USA	120
RDA Plenary side event: "EOSC services, collaboration & RDA	21 October 2019	Helsinki – Finland	
2nd LEAPS plenary meeting	18-19 November 2019	PSI, Villigen – Switzerland	130
FAIRsFAIR 1st Synchronisation Workshop	25 November 2019	Budapest – Hungary	no info available
EOSC Symposium 2019	28-29 November 2019	Budapest – Hungary	143
EOSC day @CNRS	22 January 2020	CNRS, Paris – France	
DESY & European XFEL user meetings	30-31 January 2020	DESY / European XFEL Hamburg – Germany	
ESRF user meeting	3-5 February 2020	Grenoble – France	
FAIRsFAIR 2nd Synchronisation Workshop	29 April – 11 June 2020	Online	60
EOSC Landscape Validation Workshop	27-28 April 2020	Online	
European RIs for a smarter future (ePosters Hall)	15 May 2020	ESFRI / Croatian Presidency of the EU Council, online	
EOSC-hub week 2020	18-20 May 2020	Online	517
ORSO Workshop	26 May 2020	Online	
Science in the City Festival @ESOF 2020	2-6 September 2020	EuroScience, Trieste - Italy	
Joint Meeting of Polish Synchrotron Radiation Society and SOLARIS Users	9-11 September 2020	SOLARIS - online	
Joint ESS / ILL user meeting	23-25 Sept. 2020	ESS / ILL - online	
2nd ESFRI RIs-EOSC Workshop "Research Infrastructures shaping EOSC" goes digital	6-7 October 2020	ESFRI / online	
HDF5 User Group Meeting 2020	13-16 October 2020	HDF5 User Group / online	60
EOSC Governance Symposium	19-22 October 2020	EOSC Secretariat / online	
EGI Virtual Conference / PaNOSC: Achieving a Photon and Neutron community federated cloud in EOSC	2-5 November 2020	EGI / online	44
Realising the European Open Science Cloud	16-19 November 2020	EOSC hub / FREYA / SSHOC, online	

EVENTS to which PaNOSC contributed			
EVENT'S NAME	**DATE**	**LOCATION**	**No. attendees**
LENS General Assembly	19 November 2020	LENS Initiative, online	
LEAPS Plenary Meeting	25 November 2020	LEAPS initiative, online	
Knowledge Network (Mreža Znanja) 2020 conference	25 November 2020	ARNES, NI4OS-Europe,SLING / online	340
SOLEIL User Meeting (SU2 2021)	21 January 2021	Online	~200
DESY and European XFEL user meetings	25-29 January 2021	Online	~200
ESRF user meeting	8-10 February 2021	Online	~300
2nd online workshop of the Battery2030+ Initiative	12 March 2021	Online	
Service R&D for Archiving and Preservation for Research Environments @RDA Plenary 17	19 April 2021	Online	
RDA House of Commons Debate on commonalities and collaboration for thematic services, training and governance towards the EOSC	19 April 2021	Online	81
17th Research and Data Alliance (RDA) Plenary virtual meeting / Sharing FAIR Data on COVID research at PaN Facilities	22 April 2021	Online	81
CERIC/ACCELERATE - HERCULES Specialised Course	9 June 2021	Online	30
ESFRI Science Clusters' Long-Term Commitments to Open Science	11 June 2021	Online	
EOSC Symposium 2021	16-17 June 2021	Online	~1,000 EOSC stakeholders from +63 countries
IUCr workshop "When should small molecule crystallographers publish raw diffraction data?"	11-12 August 2021	Online	
ELISS 2021	24-27 August 2021	Online	100
ExPaNDS Symposium for Librarians and data policy staff	30 September 2021	Online	48
DanScatt Annual Meeting	8-9 October 2021	DTU Campus in Lyngby, Denmark	180
RDA France 2021	11-14 October 2021	Online	60
EGI Conference 2021	19 October 2021	Online	34
ELI Beamlines User Meeting	20-21 October 2021	Online and F2F at ELI Beamlines (Dolní Břežany, Czech Republic)	311
LEAPS Plenary Meeting	20-21 October 2021	Online	137
Better Data for Better Science Workshop	28-29 October 2021	Online	60
ELI Alps User Workshop	8-9 November 2021	ELI Alps, Szeged, Hungary	161
PSB Webinar - Publishing and open science	15 November 2021	Online	
Science Mesh workshop 2022	26 January 2022	Online	70
3rd ESFRI-EOSC Workshop on RIs and EOSC	25-26 January 2022	Online	
OASYS practicals - Hercules school 2022	15 & 17 March	Grenoble – France	7
Online NFDI NeXus Workshop	17-18 March 2022	Online	63
SRI 2021 – 14th International Conference on Synchrotron Radiation Instrumentation	31 March 2022	Online	
Workshop "EOSC, un atout pour la recherche"	08 April 2022	Online	126
EIROforum Conference – Grand challenges in AI and data science	28 April 2022	Online	30
SHHOC Final Conference - "Advancing SSH Research with SSHOCingly good and sustainable Resources"	06 April 2022	Online + Brussels	290

EVENTS to which PaNOSC contributed			
EVENT'S NAME	**DATE**	**LOCATION**	**No. attendees**
Workshop: National policies relevant to EOSC deployment. Status, gaps and steps towards harmonisation	4 May 2022	Online + Strasbourg (France)	80
MonaCOSTE summer school - Modeling Nanomaterials for Energy Transport and Storage	8-13 May 2022	Villa Clythia - Fréjus (France)	40
European HDF5 User Group Meeting 2022	31 May 2022	Saint Paul-lez-Durance	
European User Offices Meeting - EUOM 2022	13-14 June 2022	ELI Beamlines in Dolny Brezany (Czech Republic)	41 in person, 21 online
ESOF 2022 - PaNOSC online session - Open Data for healthier societies: a virtuous cycle?	16 July 2022	Online	30
ICNS 2022	21-25 August 2022	Buenos Aires - Argentina	10
ELI Summer School	30 August - 2 September 2022	ELI Alps, Szeged, Hungary	50 onsite participants
vscode-h5web – a VSCode extension to explore and visualize HDF5 files	31 August 2022	HDF Group, online	43
NOBUGS conference 2022	19-22 September	PSI in Villigen - Switzerland	110 onsite + 150 online
EGI Conference 2022	20-22 September 2022	Prague – Czech Republic	~40
ESS ILL User Meeting 2022 (Poster session)	5-7 October 2022	Lund - Sweden	320
"ESCAPE to the Future" final conference	25 October 2022	Brussels - Belgium	
EOSC Symposium 2022	16-19 November 2022	Prague – Czech Republic	50

Events targeted a wide variety of stakeholders, spanning RI managers and staff, IT professionals, software developers, data scientists, open-source software initiatives (e.g. Jupyter), engineers, scientists and researchers from the photon and neutron community in the fields of materials science, cultural heritage, life sciences, energy research, and more, all ESFRI science clusters, EOSC and EOSC-projects representatives, ESFRI and the EC, representatives from national ministries for science and research from the project partners' countries, e-infrastructures, not for profit organisations with a focus on data and data solutions (e.g., HDF5 group, OpenAire), PaN initiatives (LENS, LEAPS, lightsources.org, neutronsources.org, ENSA), user associations (ESUO), user communities (e.g., IUCr) and PaN facilities' user offices, publishers, FAIR and open data initiatives (e.g. RDA), universities and private companies.

5. Examples of dissemination & outreach events targeting multiple audiences

Dissemination of the project's outputs to wider audiences is crucial to increase the value and impact of the results achieved in the project. Throughout the project, WP9 supported the promotion and dissemination of the outcomes of a wide number of events organised within the project, and/or attended by PaNOSC contributors. Also, WP9 specifically developed and submitted a set of proposals to take part in key events to increase the project's visibility at a larger scale. These include:

- E-poster presentation at the **European Research Infrastructures for a Smarter Future conference** organised by ESFRI and hosted by the Croatian Presidency of the Council of the EU (May 2020).
- Video presentations in the ERF-AISBL booth at the **Science in the City Festival at ESOF 2020** in Trieste (September 2020) – A set of video interviews with PaN staff and scientists was showcased at the booth of the European Research Facilities' AISBL at the Science in the City Festival held both online and onsite in Trieste in the summer 2020.

- **ExPaNDS & PaNOSC 1st PaN EOSC Symposium** (November 2020) – PaNOSC and ExPaNDS' WPs for communication and dissemination, jointly with ELI ERIC, organised the 1st PaN EOSC Symposium, which was held online next to the two projects' annual meeting.
  The event aimed to present use cases and perspectives for future EOSC services, with the involvement of high-level representatives of ESFRI and EOSC, as well as of the EOSC-hub and EOSC-Life projects, who provided insights on the perspectives opening up for the PaN communities in the next phase of EOSC. A panel discussion followed, with the aim of collecting feedback and advice from PaN users on their requirements, in order to better address their needs in the development of the technologies and services to make PaN data FAIR.
  A detailed overview of the event can be found here.

- **ExPaNDS & PaNOSC 2nd PaN EOSC Symposium** (October 2021) – WP9, jointly with ExPaNDS' WP6, organised and promoted the 2nd edition of the PaN EOSC Symposium, open to all external stakeholders, such as scientists, users and decision makers, and attended by 120 IT professionals, scientists and managers from the PaN community. The event aimed to showcase a selection of use cases related to some of the tools and services developed in the EOSC projects, for FAIR data catalogues, data analysis and simulation. The event also focused on project outcomes and sustainability models, with contributions from the chairs of the LEAPS and LENS initiatives. A detailed overview of the event can be found here.

- **PaNOSC online session - *Open Data for healthier societies: a virtuous cycle?*** at **ESOF 2022** (July 2022) – The online session was organised jointly by PaNOSC WP9 and ExPaNDS WP6 and hosted three expert scientists in the life sciences domain to present three virtuous examples of the use of Open Data: the Protein Data Bank (PDB), COVID Moonshot Consortium and the Human Organ Atlas, which led to setting up open data banks and portals for faster discoveries and breakthroughs in the life sciences domain and beyond. In addition, Andrew Harrison, CEO of Diamond Light Source and former chair of the LEAPS initiative, presented how European photon sources embraced and reacted to the new challenge posed by the pandemic. The recordings of the event are available here.

- **ExPaNDS & PaNOSC 3rd PaN EOSC Symposium at ICRI 2022** (October 2022) – The 3rd edition of the PaN EOSC Symposium aimed to share the major results achieved in making FAIR data a reality at PaN facilities across Europe, and explore how a "PaN Data Commons" can be integrated into the EOSC, in collaboration with the other ESFRI cluster projects. The event welcomed 44 between online and onsite attendees from RIs, ERICs, scientific journals, PaN initiatives and EOSC cluster projects. WP9 contributed to its organisation and promotion, and released a detailed report with the overview of discussions held during the event.

- **PaNOSC Closing Event - Paving the way towards the PaN Data Commons** (November 2022) –Together with ESRF, WP9 co-organised the final dissemination event of the project, which aimed to present the way forward for the major results achieved during the four years of the project. The project's contributors gathered to discuss about the future and sustainability of the tools, software and services developed to make data FAIR at European PaN facilities, towards the implementation of a PaN Data Commons to further contribute to the EOSC. The event has also been an opportunity to collect feedback and expectations of PaN scientists on their view on the future of FAIR data. Moreover, an overview of the policy issues related to the further implementation of the EOSC was addressed, by involving representatives of the EOSC and (e-) RIs. Other EOSC-related projects took part to share their best practices and lessons learnt from the experiences of their communities.
  The event took place in a hybrid format. 65 participants attended onsite and 61 attended remotely. These included IT staff and managers, RIs' managers, communications specialists, EOSC project contributors and coordinators, expert scientists.

6. Content category

The information distributed through the various PaNOSC communication channels aimed at increasing the awareness about the project's goals, increase the knowledge about FAIR and open data and stimulate the use of the services developed and the adoption of FAIR data practices across the community of PaN users and staff scientists at PaN facilities.

The types of content published include:

- Video interviews and articles on scientists' views on the benefits of FAIR Open Data, partly released in the Women in Science section of the project's website.
- Video interviews, articles and demos on the services developed for data analysis, data simulation and e-learning.
- Articles reporting the main outcomes of PaNOSC annual events.
- Use cases (articles, videos and posters), made available both on the project's website and on the project's repository on GitHub.
- Presentations on PaNOSC workplan, services and results, with a view on sustainability issues, in occasion of PaN user meetings, EOSC-related events and other dissemination events.
- Periodical reports highlighting the progress of the project.
- Highlights on latest publications released in the frame of the project.
- Summaries of the main project's achievements, in the form of posters and brochures.
- Position papers on the future of the EOSC released in collaboration with other EOSC cluster projects.
- Video recordings of events in which PaNOSC actively contributed.
- Reports and strategic documents by key stakeholders, such as LEAPS, LENS, and EOSC actors.
- Promotional articles about upcoming events organised by the projects and related projects/initiatives.

7. Examples of promotional campaigns developed and implemented in the frame of WP9

- **Call for use cases:**

At the end of 2020, PaNOSC launched a call for use cases to collect concrete examples of the use of the services developed in the project directly from the PaN community, and to further develop them, according to the needs and requirements notified. Within WP9 and in collaboration with the project coordinator, a submission form had been developed in the previous month and then published on the PaNOSC website with the information about the scopes of the call. The announcement of the call, directed to the partners and their users, was distributed internally to beamline scientists and some selected users. Also, the partners kept on promoting it at the user meetings of their facilities, and a video was showcased at the ESRF user meeting in 2021, and later released on YouTube. Although the internal milestone to collect a minimum of 10 use cases per partner has not been met, 31 use cases on the various services (data analysis, simulation, data transfer and e-learning) have been collected and released on both the website and the PaNOSC repository on Github.

Posters and presentations with selected use cases have been prepared and showcased to the PaN user community, in particular at user meetings, which the partnership has been continuously targeting throughout the whole project. The pandemic has set some limits to the possibility of reaching out to the PaN user community in this sense, and despite the great efforts, in some occasions e-poster presentations have not been as effective as they could be if they had taken place onsite. However, some of the PaNOSC use cases raised some great interest in the community and allowed collecting inputs to further improve the software and tools later developed in the project.

Among the solutions found to tackle the issues posed by the pandemic, is that of videos interviews with demos on the use of the software and portals developed for data analysis and data simulation, which have been widely promoted through the project's and the partners' online channels available. Some selected use cases and interviews were also presented at onsite events targeting a wider public, such as the Science City Festival at ESOF 2020 in Trieste where, among others. the video interview with Hans Fangohr about the citizen science example of the OSCOVIDA portal to analyse and visualise data about the trends of the pandemic, was showcased to the visitors at the ERF-AISBL booth that CERIC-ERIC contributed to setup.

Stakeholder type	No. of stakeholders reached
Users reached at user meetings	~1700
Users reached at summer schools	~300
(e-)Research Infrastructures reached through the call	32
RIs managers and staff	+500
Views on YouTube of demos and talks on PaNOSC use cases	~2000

- **"The DOI for data":**

In the spring/summer 2020, all PaN facilities in PaNOSC and ExPaNDS and members in the LEAPS and LENS initiatives have been actively involved in a video project sponsored by PaNOSC and coordinated by WP9, with the goal of increasing the knowledge and awareness on the importance of data DOIs to trace data from their production to publication, to guarantee the traceability of all the details of experiments. This includes the request for beamtime, the experimental parameters and conditions, the instrumentation used, the data obtained, the analysis of this data, and the names of the research team members. All PaN RIs, as well as LEAPS and LENS, agreed to be cited in the video as promoters of the initiative. The video, which upgraded the version previously produced in the frame of the FILL2030 H2020 project, was released at the end of August 2020 and further promoted in the following months

A dedicated page on "DOI for data" was published in the PaNOSC website, with the embedded video, which gained **~1200 visualisations** on the PaNOSC youtube channel. On Twitter, the related posts gained over +8000 impressions and ~200 engagements.

In line with this action, WP9, in collaboration with the FILL2030 H2020 project, carried out the preparatory work for an action to advocate the editors of scientific journals to actively support the vitiation of data DOIs in their published articles. A letter was prepared and sent, together with the video promoting the use of data DOIs across the PaN community across the PaN user community, to the main publishers releasing articles related to PaN science.

Stakeholder type	No. of stakeholders reached
Users	~1200 on YouTube
Publishers	28

- **Women in Science**

By the time the PaNOSC project was submitted, the partnership committed to highlight stories of women contributing to PaN science. To this aim, a number of interviews have been realised with women involved in PaNOSC, or involved in research activities at PaN facilities, to share their views on open and FAIR data. Such video-interviews have been published in a dedicated section of the PaNOSC website together with summary articles of their main views. In occasion of the International Day of Girls and Women in Science, such contributions have also been highlighted with a specific post on Twitter in February 2022, which gained ~1500 impressions and ~50 engagement actions.

Interview	No. of people reached
Claire Walsh on Human Organ Atlas	~100 views on YouTube +2000 impressions on Twitter ~75 engagements on Twitter
Mousumi Upadhyay Kahaly on FAIR data	116 views on YouTube ~1850 impressions on Twitter ~50 engagements on Twitter
Alessandra Gianoncelli on FAIR and open data	61 views on YouTube +4000 impressions on Twitter 60 engagements on Twitter
Stella d'Ambrumenil on pan-learning 1	111 views on YouTube ~5000 impressions on Twitter ~110 engagements on Twitter
Stella d'Ambrumenil on pan-learning 2 (interview)	110 views on YouTube ~1200 impressions on Twitter ~40 engagements on Twitter
Radio interview with Ornela De Giacomo and Alessandra Gianoncelli on CERIC, PaNOSC and the EOSC	Broadcasted live as part of the regional programme of the national broadcasting service RAI) 49 views on YouTube ~200 impressions on Twitter 35 engagements on Twitter
Elisa Bergami on the benefits of Open Science for the community of researchers in the Environmental Sciences	71 views on YouTube ~3000 impressions on Twitter 34 engagaements on Twitter
Alessa Gambardella on the advantages EOSC could bring to HeritageScience	260 views on YouTube ~8500 impressions on Twitter ~120 engagements on Twitter Partly showcased in the EOSC Secretariat video on the EOSC (2454 views on Youtube)

- **Video interviews on the benefits of open data**

This action has been carried out since the very early stages of the PaNOSC project, and aimed at finding scientists and researchers who could act as ambassadors towards the PaN community of users, to promote the usefulness and benefits of FAIR Open Data, and of the EOSC. Part of the interviews to women scientists listed above focused on this topic. However, more video interviews have been produced and released on the project's channels with this scope. Below is the full list:

- Interview with Dr. Aljosa Hafner on the possible use and benefit of the EOSC for the photon and neutron user community (197 views on YouTube, 1330 impressions on Twitter, ~20 engagements on Twitter. Part of the video was showcased in the EOSC Secretariat video on the EOSC).
- Interview with Dr. Alessa Gambardella on the advantages of the EOSC for cultural heritage science (see table in previous paragraph for related data).
- Interview with Andy Götz about PaNOSC and the EOSC (135 views on YouTube, ~10000 impressions on Twitter, ~125 engagements on Twitter).
- Interview with Matthew Bowler on structural biology and the EOSC (100 views on YouTube, ~8000 impressions on Twitter, ~120 engagements on Twitter).

- Interview with Jonathan Taylor on EOSC (158 views on YouTube, ~4000 views on Twitter, ~80 engagements on Twitter. Part of the video was also showcased in the EOSC Secretariat video on the EOSC).
- Interview w CERIC user, Elisa Bergami, on the benefits of Open Science for Environmental Sciences (see table in previous paragraph for related data).
- Interview with Dr. Stella d'Ambrumenil on Open Data (see table in previous paragraph for related data).
- Video interview with Mousumi Upadhyay Kahaly on FAIR data (see table in previous paragraph for related data).
- Interview with PaN user Petr Čermák on the benefits of Open Data and Open Science (released on both PaNOSC and ILL youtube channels. Gained ~130 views on Youtube

- **Human Organ Atlas**

WP9 has contributed to promote an important achievement of ESRF and useful case study for the PaN community: the Human Organ Atlas (HOA), a human data portal of 3D scans of human organs with micron resolution for different pathologies, including COVID-19. The release of the portal has been possible also thanks to the contribution of the PaNOSC project, as its portal frontend is based on the PaNOSC search portal and API.

Once the HOA had been released, PaNOSC contributed to its promotion, by posting a news article on the website, posting on social media, and distributing the news to its mailing list of stakeholders. Moreover, a video interview was produced with Claire Walsh, one of the scientists behind the implementation of the HOA.Dr. Walsh was also invited as panellist in the PaNOSC and ExPaNDS online session on *Open Data for healthier societies* at ESOF 2022, as well as at the PaNOSC closing event, to present the use case and give a user perspective on the services developed up to now in the project, and on the way forward towards more FAIR data practices at PaN facilities. The HOA was also presented at various events among the use cases showcased in the PaNOSC presentations by the project coordinator, Andy Götz, such as at the EOSC Symposium 2022.

8. Communication and Dissemination: online performance monitoring

Below is an overview of the online performance of the PaNOSC communication channels per reporting period, and respectively: from December 2018 to May 2020 (18 months), from June 2020 to November 2021 (18 months), and from December 2021 to November 2022 (12 months).

YEARLY PERFORMANCE OF ONLINE CHANNELS:

	1st reporting period (**18** months)	2nd reporting period (**18** months)	3rd reporting period (**12** months)
PaNOSC Website users	1901	2029	1837
Website page views	12443	13776	8301
PaNOSC Twitter followers	395	656	740
Engagement rate	0,6%	0,8%	2%

The engagement of the online audience with the PaNOSC Twitter account has slightly increased throughout the project, which showcases an increased interest and interaction towards the content shared in the PaNOSC platforms.

9. Open Access publications

In the frame of PaNOSC, several publications have been released, spanning scientific papers, datasets, software and demos, policy papers, policies, reports and brochures.

Ten peer-reviewed open access publications have been released throughout the project's implementation period. Below is the comprehensive list, with DOIs.

1. Juncheng E, Y. Kim, J. Bielecki, M. Sikorski, R. de Wijn, C. Fortmann-Grote, J. Sztuk-Dambietz, J. C. P. Koliyadu, R. Letrun, H. J. Kirkwood, T. Sato, R. Bean, A. P. Mancuso, and C. Kim, Expected resolution limits of x-ray free-electron laser single-particle imaging for realistic source and detector properties, Structural Dynamics 9, 064101, **2022**; DOI: https://doi.org/10.1063/4.0000169
2. M. Sanchez del Rio, R. Celestre, J. Reyes-Herrera, P. Brumund, M. Cammarata, A fast and light tool for partially-coherent beamline simulations in fourth generation storage rings based on coherent mode decomposition, Journal of Synchrotron Radiation, Vol. 29, **2022**, DOI: https://doi.org/10.1107/S1600577522008736
3. X. J. Yu, X. Chi, T. Smulders, A. T. S. Wee, A. Rusydi, M. Sanchez del Rio and M. B. H. Breese, Beamline simulations using monochromators with high d-spacing crystals, Journal of Synchrotron Radiation, Vol. 29, part 5, 1157-1166, **2022**, DOI: https://doi.org/10.1107/S160057752200707X
4. E, J., Stransky, M., Jurek, Z. et al. Effects of radiation damage and inelastic scattering on single-particle imaging of hydrated proteins with an X-ray Free-Electron Laser. Sci Rep 11, 17976, **2021**, DOI: https://doi.org/10.1038/s41598-021-97142-5
5. M. Beg, J. Taka, T. Kluyver, A. Konovalov, M. Ragan-Kelley, N.M. Thiery, H. Fangohr, Using Jupyter for Reproducible Scientific Workflows, in Computing in Science & Engineering, vol. 23, no. 2, pp. 36-46, **2021**, DOI: https://doi.org/10.1109/MCSE.2021.3052101
6. M. Manfredda, A. Hafner, S. Gerusina, N. Mahne, A. Simoncig, M. Zangrando, and L. Raimondi WISER wavefront propagation simulation code: advances and applications, Proc. SPIE 11493, Advances in Computational Methods for X-Ray Optics V, 114930B, **2020**; DOI: https://doi.org/10.1117/12.2568574
7. A. Götz, J. Bodera Sempere, A. Campbell, A. de Maria, M. del Rio, R. Dimper, J. Kieffer, A.Solé, T. Vincent; S. Caunt, J. Hall, J. F. Perrin, N. Carboni, A.Hafner, R. Pugliese, M. Bertelsen, T. H. Rod, T. S. Richter, J. Taylor, J. C. E, H. Fangohr, C. Fortmann-Grote, T. Kluyver, R. Rosca, F. Gliksohn, L. Schrettner, Enabling Open Science for Photon and Neutron Sources, ICALEPCS2019 Proceedings, JACoW Publishing, 30 August **2020**, DOI: https://doi.org/10.18429/JACoW-ICALEPCS2019-TUBPL02
8. H. Fangohr, M. Beg, M. Bergemann, V. Bondar, S. Brockhauser C. Carinan, R. Costa, F. Dall'Antonia, C. Danilevski, J. C. E, W. Ehsan, S. G. Esenov, R. Fabbri, S. Fangohr, G. Flucke, C. Fortmann, D. Fulla Marsa, G. Giovanetti, D. Goeries, S. Hauf, D. G. Hickin, T. Jarosiewicz5, E. Kamil, M. Karnevskiy, Y. Kirienko, A. Klimovskaia, T. A. Kluyver, M. Kuster, L. Le Guyader, A. Madsen, L. G. Maia, D. Mamchyk, L. Mercadier, T. Michelat, J. Möller, I. Mohacsi, A. Parenti, M. Reiser, R. Rosca, D. B. Rueck, T. Rüter, H. Santos, R. Schaffer, A. Scherz, M. Scholz, A. Silenzi, M. Spirzewski, J. Sztuk, J. Szuba, S. Trojanowski, K. Wrona, A. A. Yaroslavtsev, J. Zhu, J. Reppin, F. Schlünzen, M. Schuh, E. Fernandez-del-Castillo, G. Sipos, T. H. Rod, J. R. Selknaes, J. W. Taylor, A. Campbell, A. Götz, J. Kieffer, J. Hall, E. Pellegrini, J. F. Perrin, Data exploration and analysis with Jupyter Notebooks, ICALEPCS2019 Proceedings, JACoW Publishing, **2020**, DOI: https://doi.org/10.18429/JACoW-ICALEPCS2019-TUCPR02

9. J. C. E, A. Hafner, T. Kluyver, M. Bertelsen, M. Upadhyay Kahaly, Z. Lecz, S. Nourbakhsh, A. P. Mancuso, and C. Fortmann-Grote, VINYL: The VIrtual Neutron and x-raY Laboratory and its applications, Proc. SPIE 11493, Advances in Computational Methods for X-Ray Optics V, 114930Z, **2020**; DOI: https://doi.org/10.1117/12.2570378
10. R. Dimper, A. Götz, A. De Maria, M. Solé V.A., Chaillet, B. Lebayle, ESRF Data Policy, Storage, and Services, Synchrotron Radiation News, Volume 32, Issue 3, **2019**, DOI: https://doi.org/10.1080/08940886.2019.1608119

The PaNOSC partners have also been active in ensuring that all public deliverables and more green open access publications would be available on the project's community page on Zenodo at: https://zenodo.org/communities/panosc/.
Overall, 46 PaNOSC publications have been released on Zenodo reaching ~9000 views and ~6400 downloads.

Below is the full list:

1. C. Formann Grote, Example dataset for openPMD conform wavefront propagation data (wavefront domain extension), November 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.3524710
2. C. Formann Grote, Example dataset for openPMD-conform molecular dynamics data (MD domain extension), 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.3525950
3. A. Hafner, Example Photon raytracing openPMD data, 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.3532901
4. A. Götz, A. Petzold, A. Asmi, N. Blomberg, G. Lamanna, R. Dekker, ESFRI cluster projects - Position papers on expectations and planned contributions to the EOSC, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.3675080
5. A. Götz, PaNOSC position paper on the EOSC, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.3689419
6. C. Formann Grote, SIMEX test data, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.3750540
7. A. Götz, J-F. Perrin, H. Fangohr, D. Salvat, F. Gliksohn, A. Markvardsen, A. McBirnie, A. Gonzalez-Beltran, J. Taylor, B. Matthews, PaNOSC FAIR Research Data Policy framework, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.3826039
8. O. Appleton, A. Asmi, I. Bird, R. Dekker, N. Blomberg, R. Dimper, T. Ferrari, A. Grant, S. Jones, N. Manola, A. Petzold, N. Rettberg, D. Robertson, V. Tenhunen, D. Testi, M. van de Sanden, EOSC - a tool for enabling Open Science in Europe, 2020, DOI: https://doi.org/10.5281/zenodo.4044009
9. R. Pugliese, G. Kourousias, F. Billè, M. De Simone, A. Olivo, D. Favretto, M. Del Bianco, R. Passuello, Remotisation technologies for enabling access; from software and robots to protocols and policies, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4081591
10. N. Carboni, A. Götz, PaNOSC key achievements in first 18 months, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4247622
11. C. Formann Grote, libpyvinyl-v0.0.2, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4245764
12. J. E, C. Formann-Grote, SimEx, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4249614
13. A. Hafner, Demonstration of OASYS as a remote application (web service), 2020, Zenodo, https://doi.org/10.5281/zenodo.4250965
14. K.T. Butler, M. Duc Le, Data/code for Interpretable, calibrated neural networks for analysis and understanding of neutron spectra, 2020 Zenodo, DOI: https://doi.org/10.5281/zenodo.4088239

15. C. Cuciniello, S. Daenke, T. Ferrari, P. Fuhrmann, A. Götz, J. Hrusak, R. Luek, F. Maia, Booklet of presentations from the PaN EOSC Symposium 2020, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4279165
16. A. Götz, D. Salvat, F. Schluenzen, A. Ashton, R. Dimper, White paper on suitability of HNScienceCloud and European Open Science Cloud for synchrotron and FEL applications, 2021, Zenodo, https://doi.org/10.5281/zenodo.4558933
17. G. Lamanna, I. Bird, A. Petzold, A. Asmi, M. Brus, N. Blomberg, M. Räß, R. Dimper, A. Götz, R. Dekker, ESFRI Science Clusters Position Statement on Expectations and Long-Term Commitment in Open Science, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.4889502
18. A. Götz, J. Taylor, R. Dimper, J-F. Perrin, F. Gliksohn, D. Roccella, K. Wrona, T. Ivănoaica, J. Malka, S. Collins, PaNOSC Guidelines on best practices implementing a research data policy, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.4899343
19. A. Götz, J. Helliwell, T. Richter, J. Taylor, The vital role of primary experimental data for ensuring trust in (Photon & Neutron) science, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5155881
20. J. E, Codes for studying the effects of radiation damage and inelastic scattering on single-particle imaging of hydrated proteins with an X-ray Free-Electron Laser, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5243147
21. A. Ashton, C. Biscari, P. Čermák, J-C. Deinert, F. von Delft, P. Fuhrmann, A. Götz, K. Madi, R. McGreevym Y. Sue, M. Upadhyay Kahaly, Booklet of presentations from the PaN EOSC Symposium 2021, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5636330
22. F. Bolmten, C. Lobley, J. Taylor, J. Malka, A. Olivo, T. Ivanoacia, H. Görzig, DMP Template for facility users, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5639427
23. A. Götz, J. Bodera Sempere, Data Management Plan, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5887683
24. J. Bodera Sempere, A. Götz, J-F. Perrin, PaNOSC Project Initiation Documentation, 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.5887669
25. J. Bodera Sempere, A. Götz, Mid-year summary 2019, 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.5887701
26. J. Bodera Sempere, R. Dimper, A. Götz, Report of annual workshop 2, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.5887867
27. J. Bodera Sempere, R. Dimper, A. Götz, Mid-year summary 2021, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5887952
28. N. Carboni, PaNOSC D9.2 – PaNOSC website, 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.5897424
29. L. Greenwood, J. Hall, H. Fangohr, T. Kluyver, R. Rosca, Deliverable: Prototype Remote Desktop and Jupyter Service (4.2), 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.5905322
30. H. Fangohr, K. Galal, J. Hall, T. Kluyver, C. Reis, R. Rosca, W. Turner, T. Vincent, Deliverable: Report on the current technical elements of data analysis at each partner site (4.1), 2019, Zenodo, DOI: https://doi.org/10.5281/zenodo.5905386
31. J-F. Perrin, G. La Rocca, Deliverable: D6.1 – Data Hub, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.5912965
32. T. Ivanoaica, L. Schrettner, M. Dostal, J. Majer, B. Bagó, Deliverable D6.2 : Integration of local compute resources into EOSC portal, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.5913422

33. J-F. Perrin, D6.3 - Integration of the PaN AAI into the EOSC, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.5913471
34. J-F. Perrin, D6.4 - Demonstration of the PaN software catalogue integration into EOSC - Support document, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.5913488
35. R. Pugliese, T. Ivanoaica, A. Olivo, PaNOSC D2.4 Integration of the policy in the User Access and facility information systems, 2021, Zenodo, DOI: https://doi.org/10.5281/zenodo.5916919
36. O. De Giacomo, T. Ivanoaica, A. Zennaro, PaNOSC D7.2 - Photon and Neutron EOSC metrics and costs model, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.6010456
37. A. Weeks, G. Szabó, R. Hvězda, F. Gliksohn, T. Ivanoaica, ELI ERIC Data Policy, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.6515902
38. M. Bertelsen, McStasScript release 0.0.46, 2020, Zenodo, DOI: https://doi.org/10.5281/zenodo.4247598
39. M. Bertelsen, S. d'Ambrumenil, J. E, A. Hafner, G. N. Nagy, S. Nourbakhsh, M. Upadhyay Kahaly, C. Fortmann-Grote, PaNOSC-ViNYL/ViNYL-notebooks: v1.0.1, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.6562105
40. J. Bodera Sempere, A. Götz, PaNOSC Mid-year summary 2022, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.6598751
41. O. De Giacomo, A. Zennaro, G. La Rocca, T. Ivanoaica, D7.3 PaN EOSC Business model reference document, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.7147688
42. J-F. Perrin, F. Dall'Antonia, S. Schoen, E. Moge, T. Wetzel, E. Querol Baladia, A. Manzi, L. Leroux, Virtual Infrastructure for Scientific Analysis (VISA) Workshop, 2022, Zenodo DOI: https://doi.org/10.5281/zenodo.7108456
43. J. E, C. Kim, M. Sikorski, Simulation and analysis scripts for SPI with detector noise, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.6946153
44. F. Dall'Antonia, Remote Desktop and Jupyter Service deployed at EOSC (4.3), 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.7333305
45. N. Carboni et al. PaNOSC key achievements, 2022, Zenodo DOI: https://doi.org/10.5281/zenodo.7347536
46. N. Carboni, D. Robertson, F. de Jong, A. Petzold, G. Lamanna, J. Helliwell, N. Blomberg, R. McGreevym, M. van Daalen, A. Götz, P. Furhmann, A. Weeks, F. Gliksohn, T. Ivanoaica, Overview of 3rd Photon and Neutron (PaN) EOSC Symposium 2022, 2022, Zenodo, DOI: https://doi.org/10.5281/zenodo.7347991

The list of both peer-reviewed and green open access publications has also been published and is available on a dedicated page on the project's website:
https://www.panosc.eu/publications/

10. Conclusions

Overall, after four years of implementation of the project, it can be stated that the activities carried out for the outreach to the PaNOSC key stakeholders have been numerous and varied, in terms of both content types and channels deployed for dissemination.

PaNOSC has assembled the first bricks to make FAIR data a reality at photon and neutron facilities. The services, tools and software resulting from the work carried out in the technical WPs, as well as the data policy, the policy papers and the training activities (both in presence and online), have been widely promoted and disseminated. Further exploitation of the results will be possible through continuous dissemination even after the end of the project by all partners, in particular considering that some of the major developments have been completed and implemented at all partners by the time PaNOSC was close to its completion.

Also, the change of culture among the PaN community towards a more FAIR approach in managing (meta)data throughout its whole lifecycle - which was set as one of the long-term goals of the project – is still a great challenge across clusters and scientific domains. Quite a wide share of researchers across all domains is still not aware of the FAIR principles and of the importance and benefits of FAIR data. PaNOSC efforts in disseminating articles and publications, views and opinions of expert scientists through presentations, videos, posters and events addressing both expert and lay publics, as well as in providing concrete examples and best practices of the use of FAIR data services, have been key to initiate such a cultural shift in the PaN community, by targeting PaN users and scientists from all scientific domains, (e-) research infrastructures, academics and early-stage researchers, publishers and RIs' staff. A continuous joint effort involving communication specialists, managers of research infrastructures, scientists, user officers and IT staff needs to keep going to ensure that the community is not only informed about the current data curation practices, but is also committed to, and actively involved, in adopting FAIR data practices for the benefit of science and its future advancements.

Data FAIRness should become a priority in the agenda and in the workplan of PaN facilities across all levels (both managers and staff), up to when academics and scientists will become themselves ambassadors of such practices. Up to then (and even further), dedicating time and resources for dissemination and outreach to the scientific community on these topics will be crucial for FAIR (data) science to be a sustainable reality in the long run.