graph.openaire.eu

# OpenAIRE Services and the Research Graph

## *Open and Sustainable monitoring in the Era of Open Science*

**Paolo Manghi**

*OpenAIRE AMKE, CTO*

*Institute of Information Science and Technologies, National Research Council, Italy*

@openaire_eu

## Tracking Open Science

Reproduciblity and transparency require tracking of all outcomes of science and related ”context”

## Monitoring Open Science

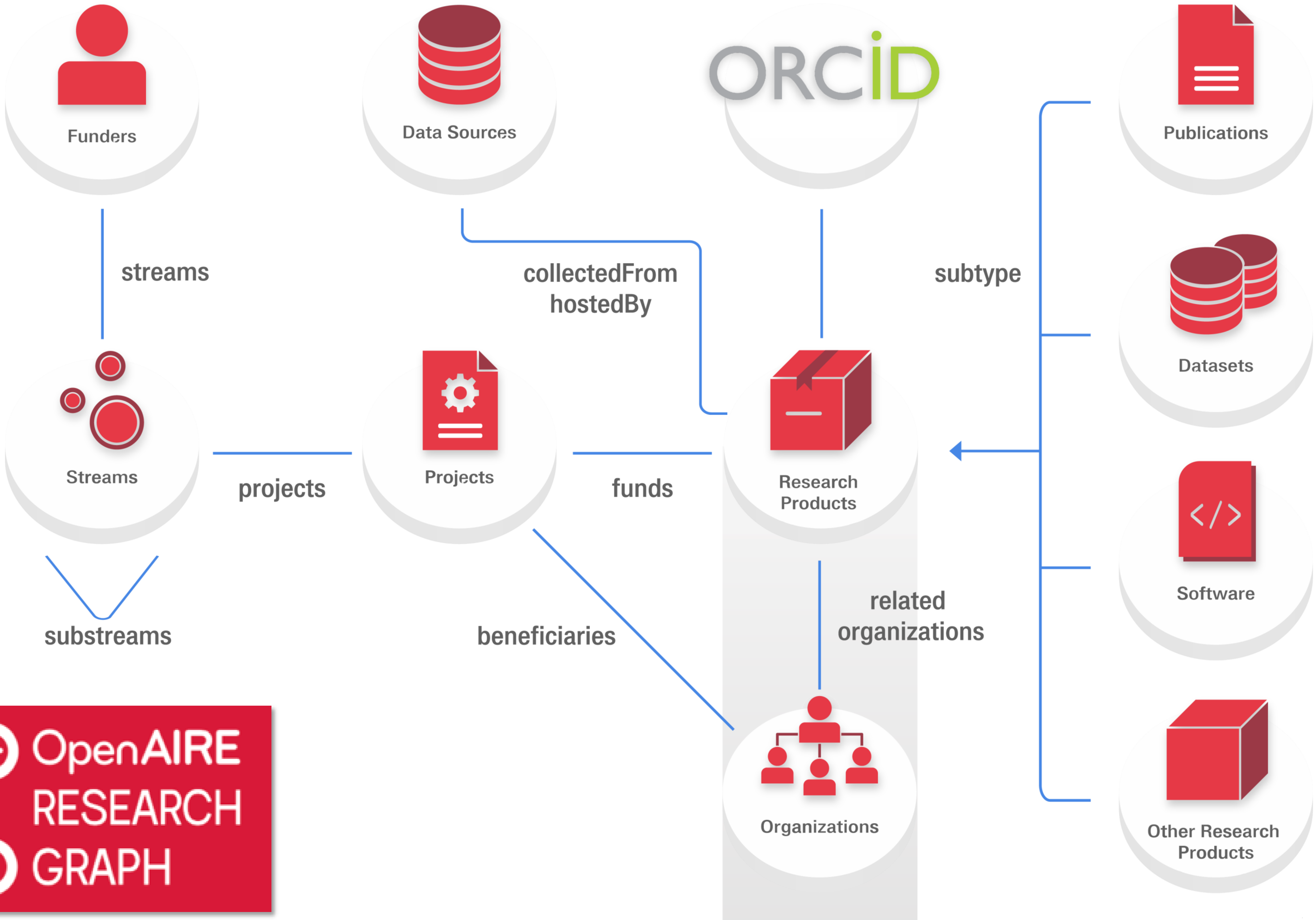
Monitoring quality, impact, and ”open scienceness” of science should be a transparent, reproducible process for all, inclusive of research “context”

## Discovery Open Science

Discovery of reproducibe science outcomes must find new ways, driven by “scientific intentions” that go beyond the “find articles related to a research topic”.

# Tracking Open Science: the OpenAIRE Research Graph

OpenAIRE
RESEARCH
GRAPH



Funders

Data Sources

ORCID

Publications

streams

collectedFrom
hostedBy

subtype

Datasets

Streams

projects

Projects

funds

Research
Products

Software

substreams

beneficiaries

related
organizations

Organizations

Other Research
Products

OpenAIRE
RESEARCH
GRAPH

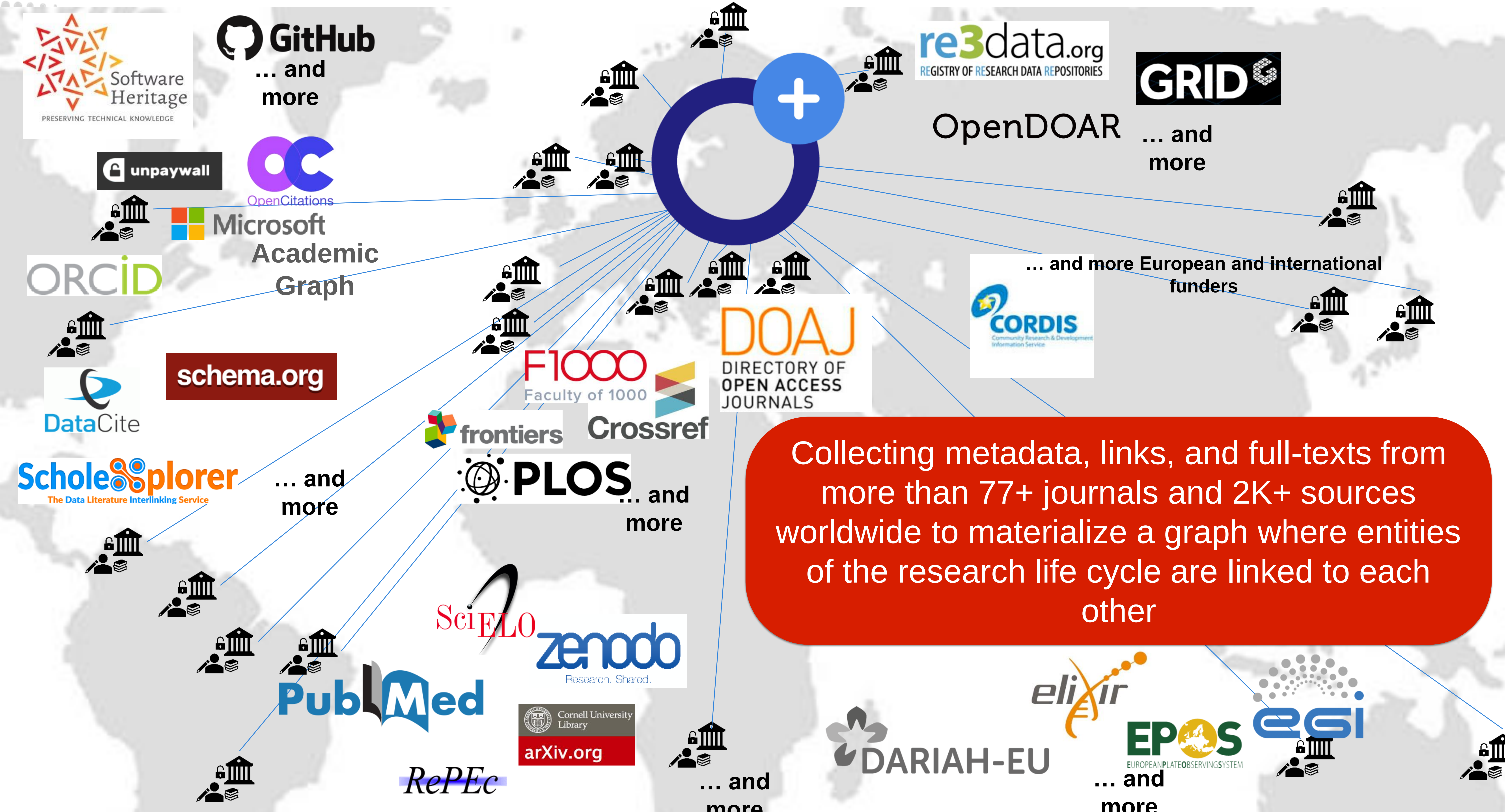
OpenAIRE RESEARCH GRAPH

**Providing an open metadata research graph of interlinked scientific products, with Open Access information, linked to funding information and research communities**

creative commons 0 cc ZERO

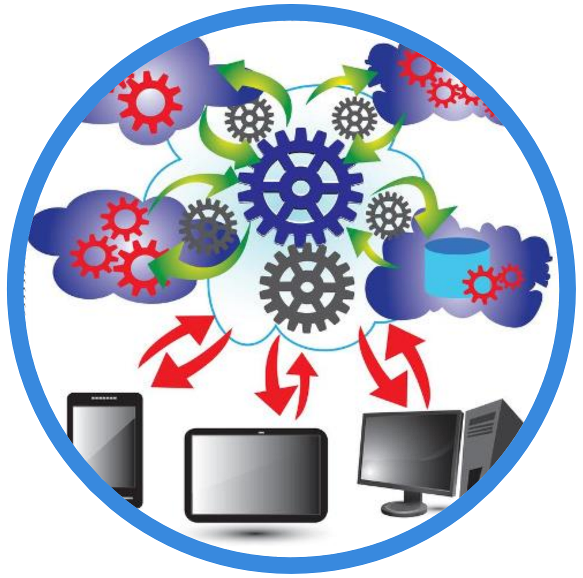
cc BY

- Open
- Complete
- De-duplicated
- Transparent
- Participatory
- Decentralized
- Trusted


Software Heritage
PRESERVING TECHNICAL KNOWLEDGE
GitHub
… and more
unpaywall
OpenCitations
Microsoft Academic Graph
ORCID
schema.org
DataCite
ScholeXplorer
The Data Literature Interlinking Service
… and more
re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES
GRID
OpenDOAR
… and more
… and more European and international funders
CORDIS
Community Research & Development Information Service
F1000
Faculty of 1000
Crossref
DOAJ
DIRECTORY OF OPEN ACCESS JOURNALS
frontiers
PLOS
… and more
SciELO
zenodo
Research. Shared.
PubMed
Cornell University Library
arXiv.org
RePEc
… and more
DARIAH-EU
elixir
EPOS
EUROPEAN PLATE OBSERVING SYSTEM
egi
… and more

Collecting metadata, links, and full-texts from more than 77+ journals and 2K+ sources worldwide to materialize a graph where entities of the research life cycle are linked to each other

# Data wrangling challenges



### HETEROGENEITY

Standards, crosswalks, community and cross-community view

GUIDELINES.openaire.eu

VERY POOR
POOR
FAIR
GOOD
EXCELLENT

### QUALITY & ACCURACY

Trust and stability of the data: researchers and operators in the loop

PROVIDE (validation, brokering), user feedback, PIDs

### COMPLETENESS

Practices, sharing of technology and data (Knowledge Graphs)

Open Science publishing workflows, RDA OSG interoperability

# OpenAIRE Research Graph: the supply chain

**Data sources**

**Figures (Jan 2019-today):**
- Direct data sources +2400
- Products +360Mi
- Harvested/mined links 236Mi +
- Full-texts 14.Mi+

**Aggregation**

Validator

OpenAIRE PROVIDE

Dataverse Project · eprints · DSPACE · DataCite · euroCRIS

OpenAIRE RESEARCH GRAPH RAW

**Deduplication**

Different records representing the same entity (results or organization) are merged in one

Metadata records corresponding to equivalent objects are merged. Pre-print, post-print, published versions are considered equivalent for stats & monitoring purposes

**Enrichment**

Full-text mining 13 algorithms: dataset, project, research-initiatives, patent, software, pdb, affiliations, communities, concepts, covid-19, citations, similarity, classification

Propagation of properties via relationships

OpenAIRE RESEARCH GRAPH

**Figures (Apr 2021):**
- Data sources 94K+
- Publications 123Mi
- Datasets 14Mi +
- Software 200K
- Others 8Mi

Funders 23
Projects 2.8Mi
Organizations 276K

**Stats analysis**

OpenAIRE MONITOR

**indexing**

OpenAIRE EXPLORE

OpenAIRE CONNECT

OpenAIRE DEVELOP

APIs

**Figures (2020):**
1,7Mi/y API hits
650K/y user visits

EC Partipant Portal

OpenAIRE

European Commission

# OpenAIRE Research Graph: PIDs

## Authors

ORCID

Microsoft Academic

## Organizations

GRID

ROR

CORDIS
Community Research & Development Information Service

and other funders

## Products

DataCite
FIND, ACCESS, AND REUSE DATA

EMBL-EBI

arXiv.org

Identifiers.org

Crossref

## Funders/Projects

CORDIS
Community Research & Development Information Service

FCT Fundação para a Ciência e a Tecnologia

NWO

Science Foundation Ireland sfi For what's next

ACADEMY OF FINLAND

and other funders

## Data sources

re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES

OpenDOAR

DOAJ
DIRECTORY OF OPEN ACCESS JOURNALS

+ journal lists from publishers

FAIRSFAIR
Fostering Fair Data Practices in Europe

## Services (fortcoming…)

EUROPEAN OPEN SCIENCE CLOUD

…Clusters and RIs service catalogues

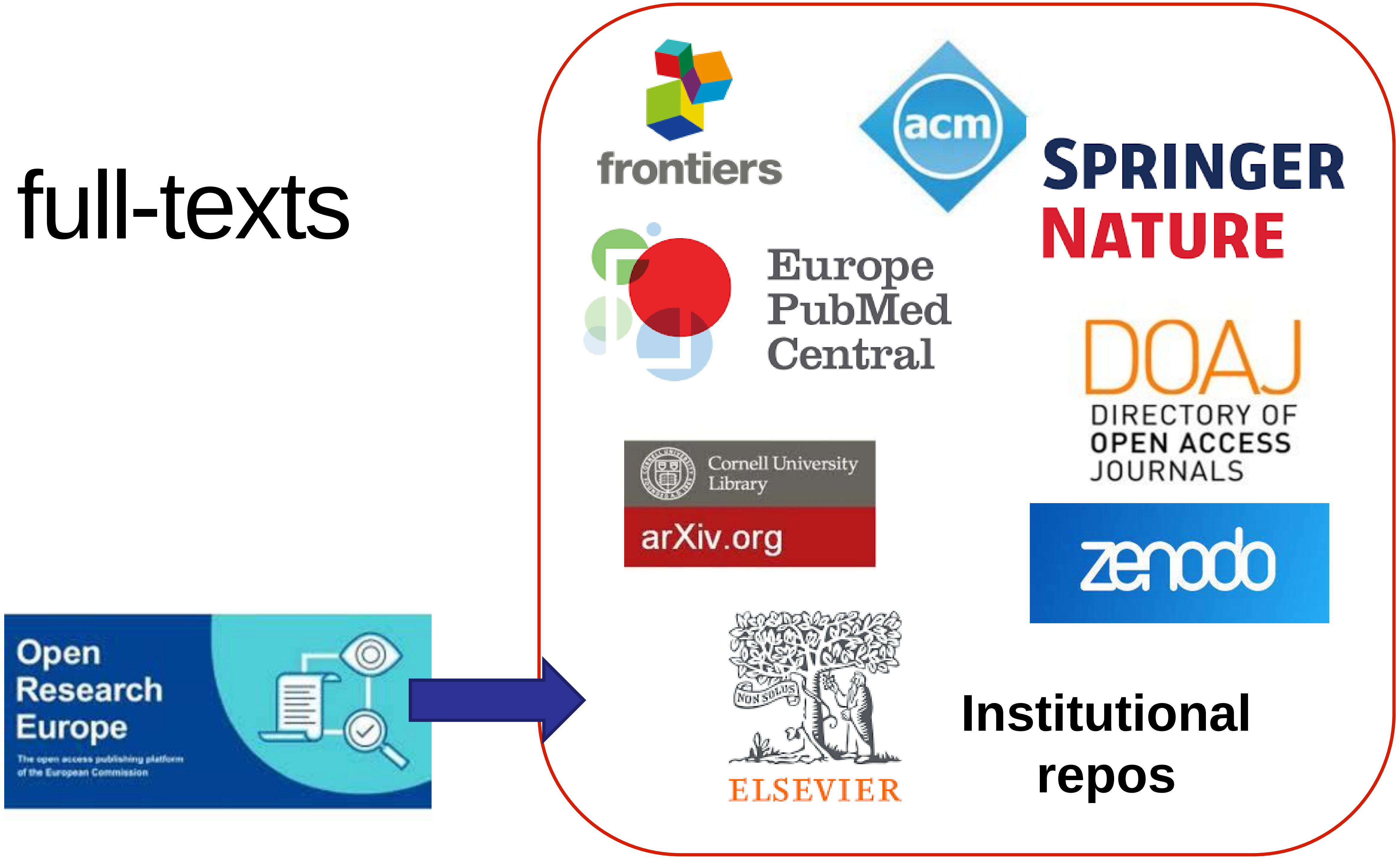
OpenAIRE

European Commission

# OpenAIRE Research Graph: PDFs for full-text mining

Publication full-texts

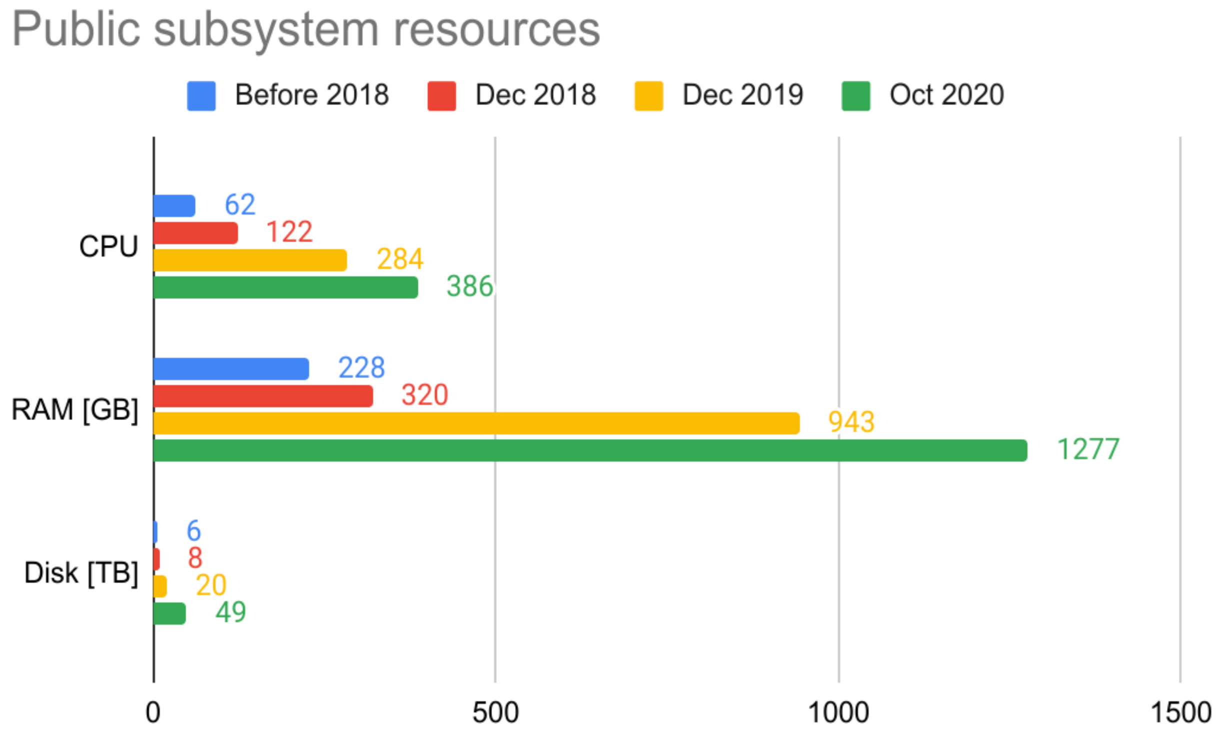
14.Mi+

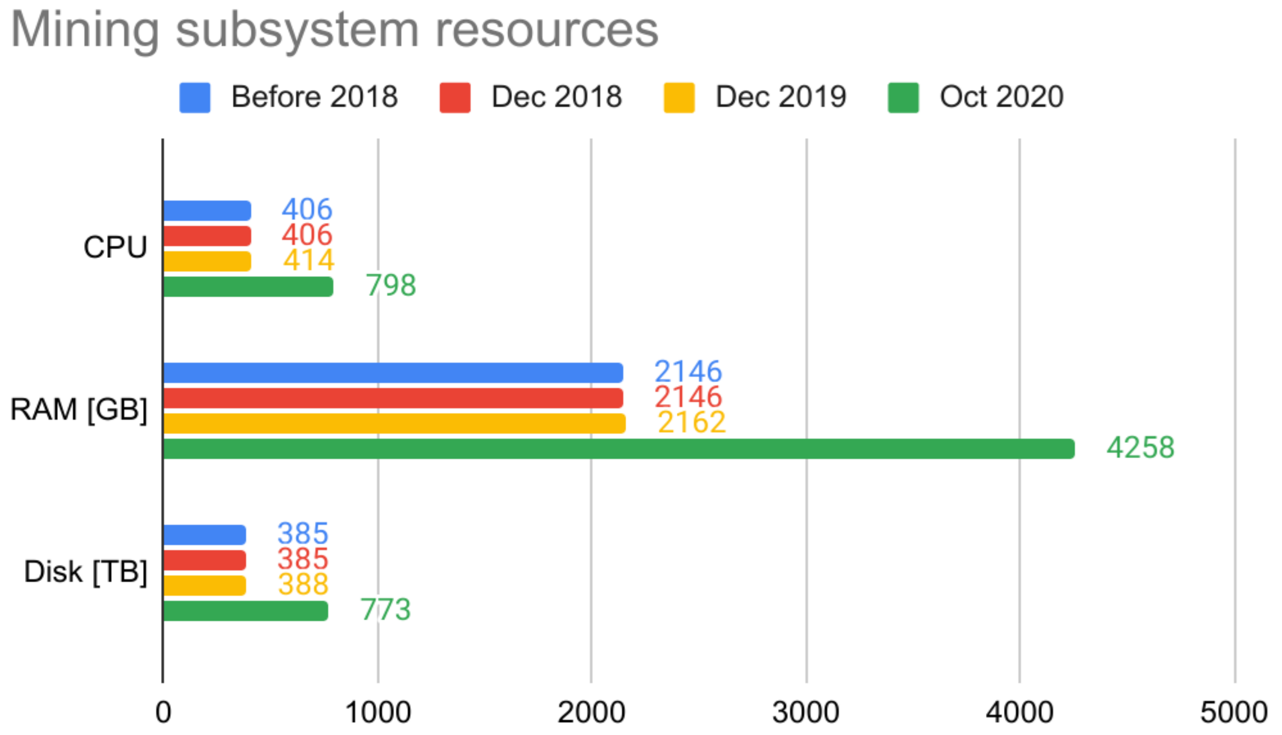

Open Research Europe
The open access publishing platform of the European Commission
frontiers
acm
SPRINGER NATURE
Europe PubMed Central
DOAJ
DIRECTORY OF OPEN ACCESS JOURNALS
Cornell University Library
arXiv.org
zenodo
ELSEVIER

**Institutional repos**

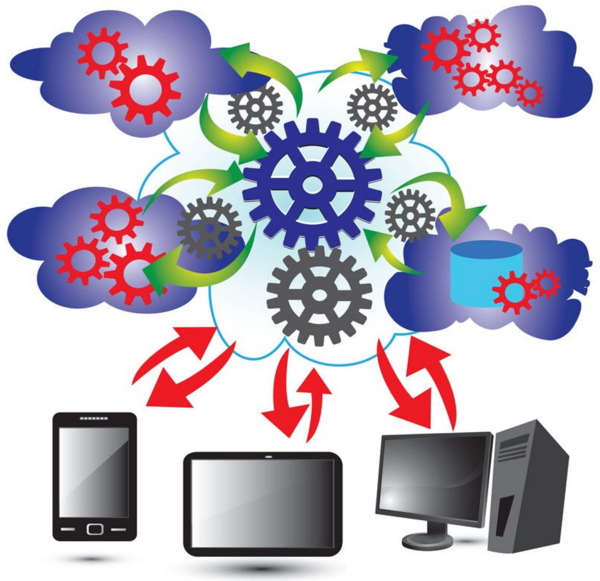
# System infrastructure

| Public System | Mining System | Data provision System | Testing System |
|---|---|---|---|
| 44srv | 38srv | 23srv | 16srv |
| 386CPU | 798CPU | 154CPU | 102CPU |
| 1277GB | 4.3TB | 430GB | 326GB |
| 49TB | 773TB | 24TB | 10TB |


Public subsystem resources


Mining subsystem resources

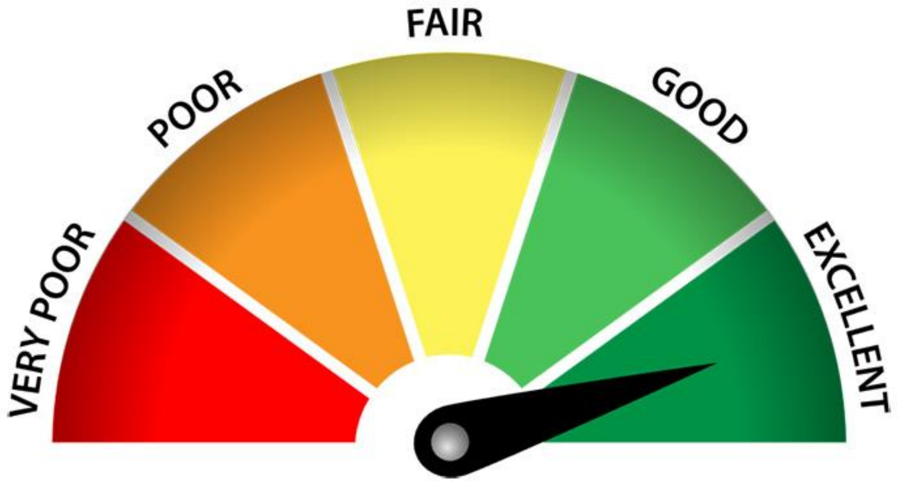
# Tracking Open Science: Challenges



## Heterogenity

Standards, crosswalks, community and cross-community view

GUIDELINES.openaire.eu



## Quality and accuracy

Trust and stability of the data: researchers and operators in the loop

PROVIDE (validation, brokering), user feedback, PIDs

## Completeness

Practices, sharing of technology and data (Knowledge Graphs)

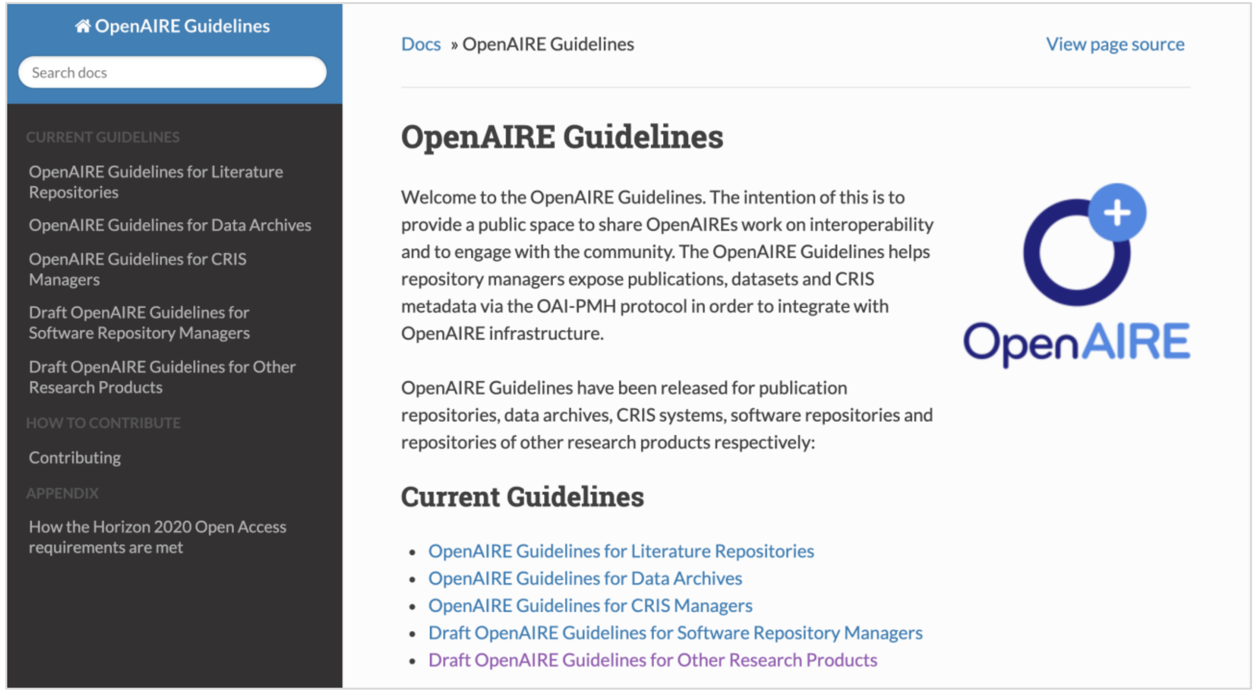
Open Science publishing workflows, RDA OSG interperability, CRISs

# OpenAIRE PROVIDE : data source managers

**VALIDATE**

**REGISTER**

- Registration of data sources
  - Repositories
  - Data archives
  - Software repositories
  - CRIS systems
- Validation against OpenAIRE Guidelines
- RDA FAIR Maturity Guidelines


OpenAIRE Guidelines
Search docs
CURRENT GUIDELINES
OpenAIRE Guidelines for Literature Repositories
OpenAIRE Guidelines for Data Archives
OpenAIRE Guidelines for CRIS Managers
Draft OpenAIRE Guidelines for Software Repository Managers
Draft OpenAIRE Guidelines for Other Research Products
HOW TO CONTRIBUTE
Contributing
APPENDIX
How the Horizon 2020 Open Access requirements are met
Docs » OpenAIRE Guidelines
View page source
OpenAIRE

## OpenAIRE Guidelines

Welcome to the OpenAIRE Guidelines. The intention of this is to provide a public space to share OpenAIREs work on interoperability and to engage with the community. The OpenAIRE Guidelines helps repository managers expose publications, datasets and CRIS metadata via the OAI-PMH protocol in order to integrate with OpenAIRE infrastructure.

OpenAIRE Guidelines have been released for publication repositories, data archives, CRIS systems, software repositories and repositories of other research products respectively:

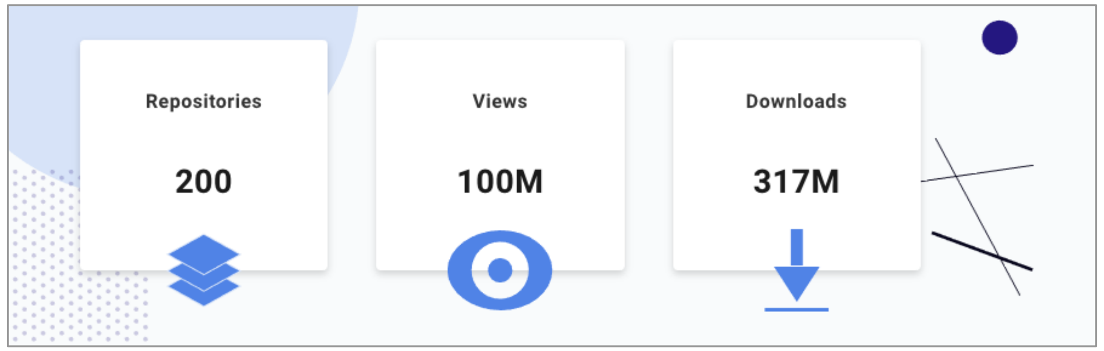
### Current Guidelines

- OpenAIRE Guidelines for Literature Repositories
- OpenAIRE Guidelines for Data Archives
- OpenAIRE Guidelines for CRIS Managers
- Draft OpenAIRE Guidelines for Software Repository Managers
- Draft OpenAIRE Guidelines for Other Research Products

# OpenAIRE PROVIDE : added value functions

## Usage statistics for Institutional Repositories

OpenAIRE UsageCounts



Repositories 200

Views 100M

Downloads 317M

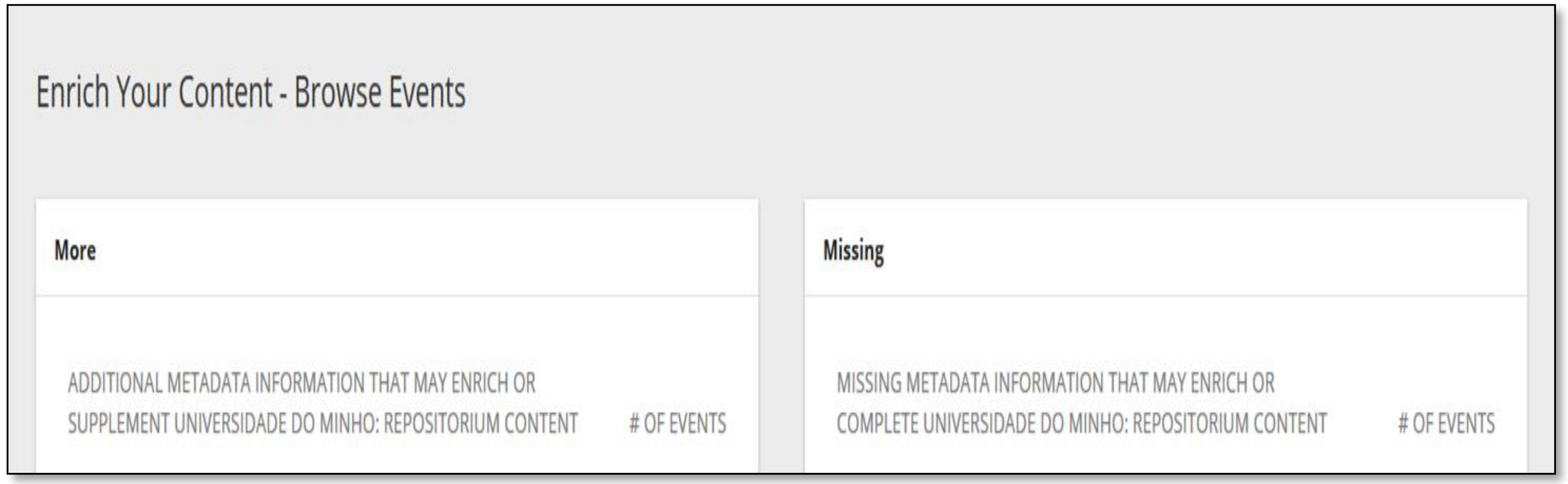
## Brokering of metadata

## ENRICH

OA Broker

**Improve your metadata.**
**Get more connections**

OA Broker service offers a wealth of information on scholarly communication data. Find out what interests you and subscribe to enrich your records.



Enrich Your Content - Browse Events

More

ADDITIONAL METADATA INFORMATION THAT MAY ENRICH OR SUPPLEMENT UNIVERSIDADE DO MINHO: REPOSITORIUM CONTENT

# OF EVENTS

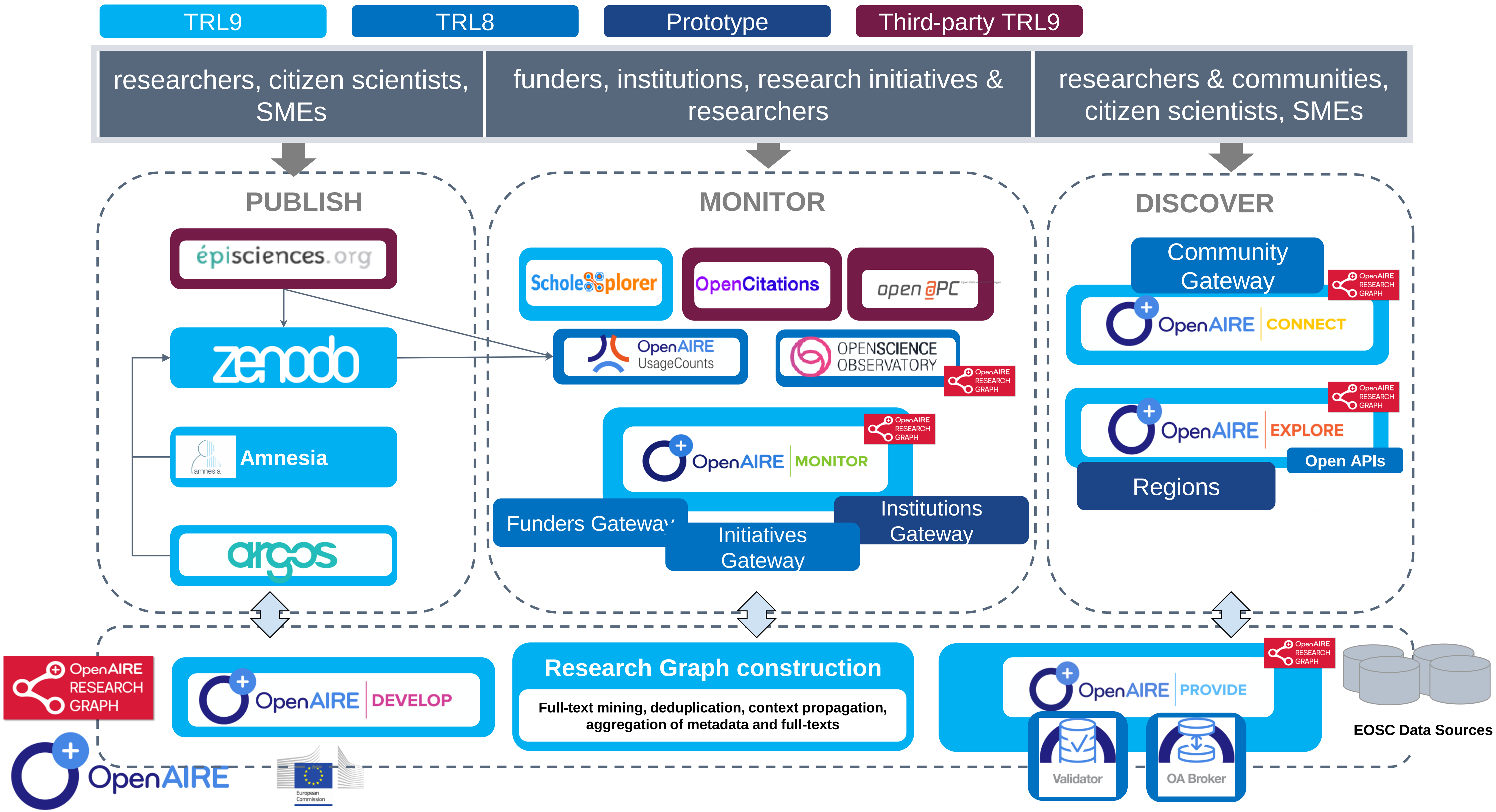
Missing

MISSING METADATA INFORMATION THAT MAY ENRICH OR COMPLETE UNIVERSIDADE DO MINHO: REPOSITORIUM CONTENT

# OF EVENTS

# Monitoring and Discovery Open Science: Sustainability via provision of services

# OpenAIRE Services



TRL9

TRL8

Prototype

Third-party TRL9

researchers, citizen scientists, SMEs

funders, institutions, research initiatives & researchers

researchers & communities, citizen scientists, SMEs

## PUBLISH

- episciences.org
- zenodo
- Amnesia
- argos

## MONITOR

- ScholeXplorer
- OpenCitations
- openAPC
- OpenAIRE UsageCounts
- OPENSCIENCE OBSERVATORY
- OpenAIRE MONITOR
- Funders Gateway
- Initiatives Gateway
- Institutions Gateway

## DISCOVER

- Community Gateway
- OpenAIRE CONNECT
- OpenAIRE EXPLORE
- Open APIs
- Regions

OpenAIRE RESEARCH GRAPH

OpenAIRE DEVELOP

**Research Graph construction**

Full-text mining, deduplication, context propagation, aggregation of metadata and full-texts

OpenAIRE PROVIDE

Validator

OA Broker

**EOSC Data Sources**

OpenAIRE

European Commission

# PUBLISH: researchers, SMEs, citizen scientists

épisciences.org

zenodo

Amnesia

argos

- Overlay journals (HAL, Zenodo,etc.)
- Catch-all repository
- Desktop tool for the anonymization of sensitive data
- Machine-actionable DMPs

TRL9

TRL8

Prototype

Third-party TRL9

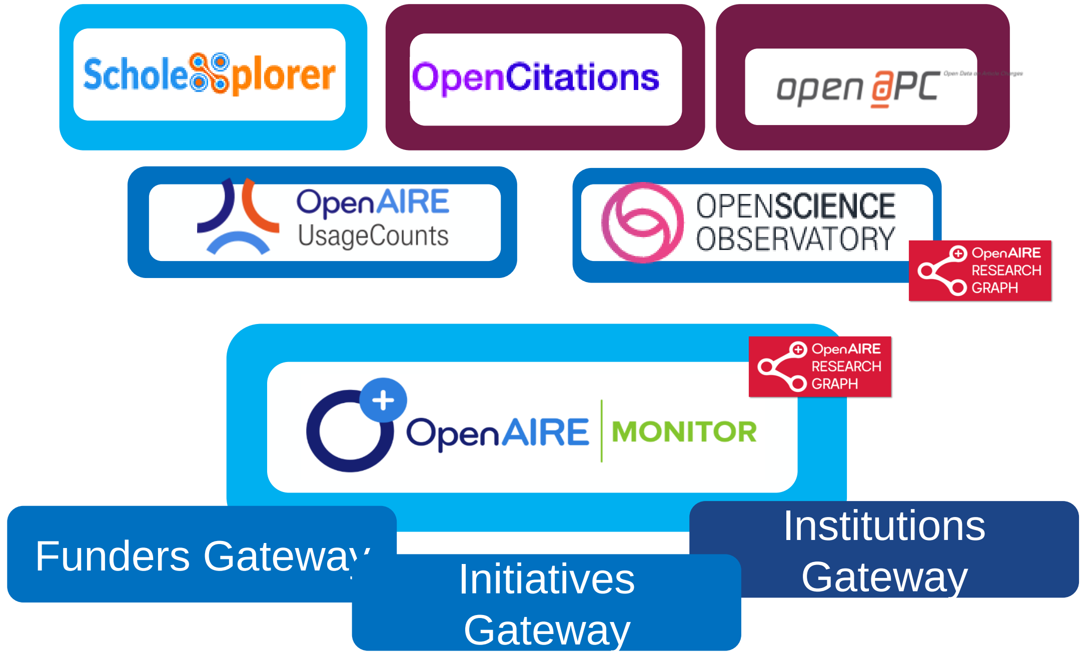
OpenAIRE

European Commission

# MONITOR

## Data Services

- Data-Article links
- Article-Article links
- APC stats for Europe
- Usage statistics


ScholeXplorer
OpenCitations
openAPC
OpenAIRE UsageCounts
OPENSCIENCE OBSERVATORY
OpenAIRE RESEARCH GRAPH
OpenAIRE MONITOR
OpenAIRE RESEARCH GRAPH

Funders Gateway

Initiatives Gateway

Institutions Gateway

## Portals

- Research Impact for Funders, Institutions and Research Infrastructures
- Open Science Impact for countries

TRL9
TRL8
Prototype
Third-party TRL9

# MONITOR

## Data Services

- Data-Article links
- Article-Article links
- APC stats for Europe
- Usage statistics

**4 Bi acccesses**

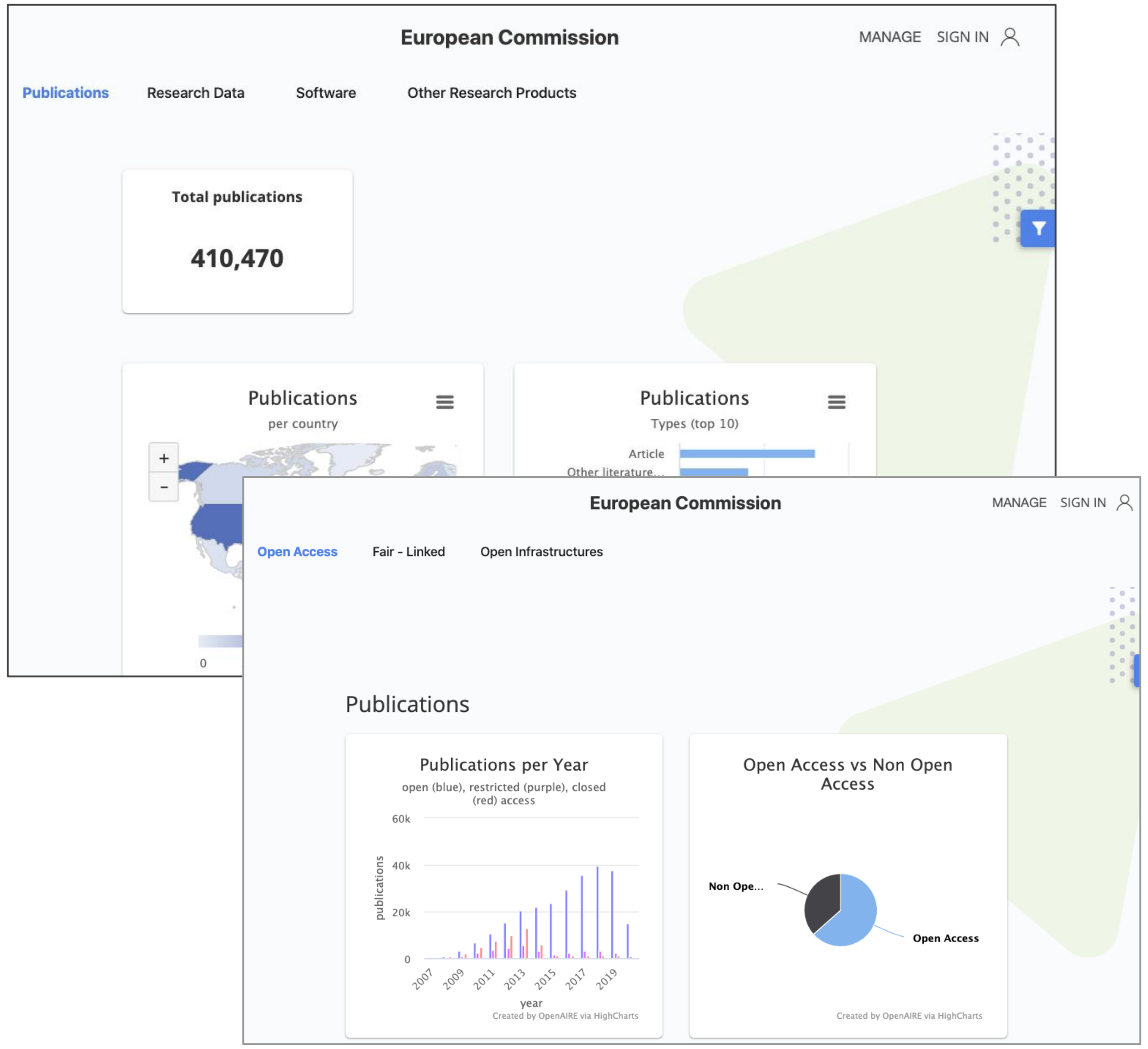
ScholeXplorer
OpenCitations
open APC
OpenAIRE UsageCounts
OPENSCIENCE OBSERVATORY
OpenAIRE RESEARCH GRAPH

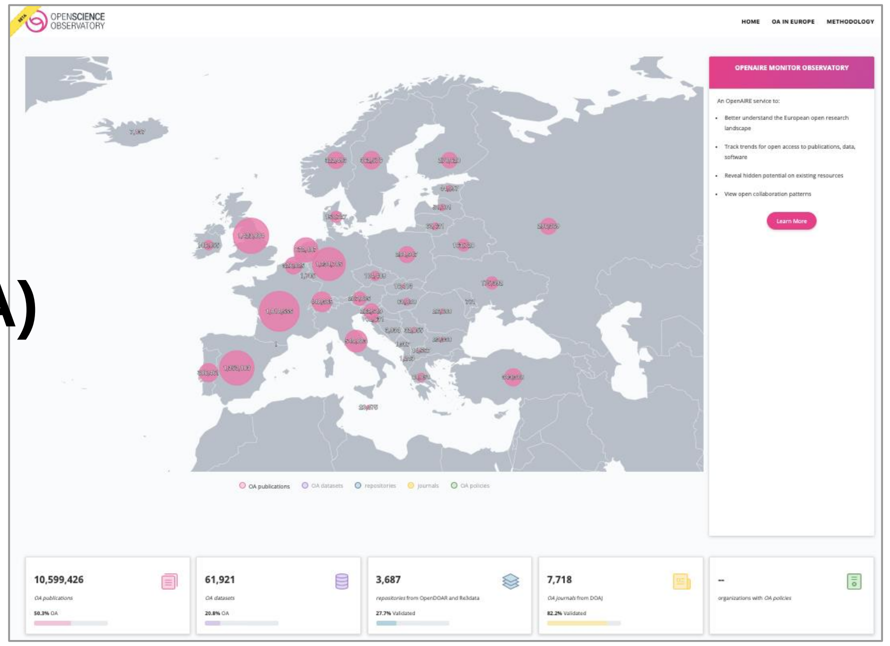
OpenAIRE MONITOR
OpenAIRE RESEARCH GRAPH

Funders Gateway
Initiatives Gateway
Institutions Gateway

**21 funders (32 in BETA)**

**3 initiatives (8 in BETA)**


European Commission
MANAGE
SIGN IN
Publications
Research Data
Software
Other Research Products
Total publications
410,470
Publications
per country
Publications
Types (top 10)
Article
Other literature...
European Commission
MANAGE
SIGN IN
Open Access
Fair - Linked
Open Infrastructures
Publications
Publications per Year
open (blue), restricted (purple), closed (red) access
60k
40k
20k
0
publications
2007
2009
2011
2013
2015
2017
2019
year
Created by OpenAIRE via HighCharts
Open Access vs Non Open Access
Non Ope...
Open Access
Created by OpenAIRE via HighCharts


BETA
OPENSCIENCE OBSERVATORY
HOME
OA IN EUROPE
METHODOLOGY
OA publications
OA datasets
repositories
journals
OA policies
Learn More

OPENAIRE MONITOR OBSERVATORY

An OpenAIRE service to:

- Better understand the European open research landscape
- Track trends for open access to publications, data, software
- Reveal hidden potential on existing resources
- View open collaboration patterns

10,599,426
OA publications
50.3% OA

61,921
OA datasets
20.8% OA

3,687
repositories from OpenDOAR and Re3data
27.7% Validated

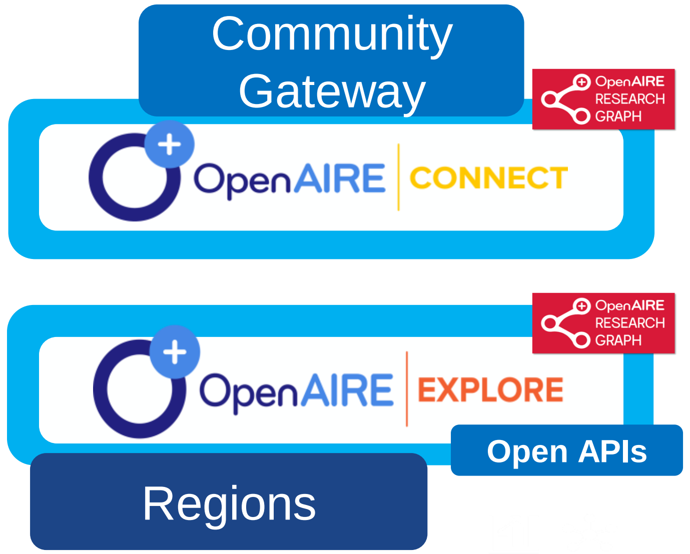
7,718
OA journals from DOAJ
82.2% Validated

--
organizations with OA policies

# DISCOVER

## Portals

- Discovery and stats for Communities
- Discovery and stats for for Countries



Community Gateway

OpenAIRE RESEARCH GRAPH

OpenAIRE CONNECT

OpenAIRE RESEARCH GRAPH

OpenAIRE EXPLORE

Open APIs

Regions

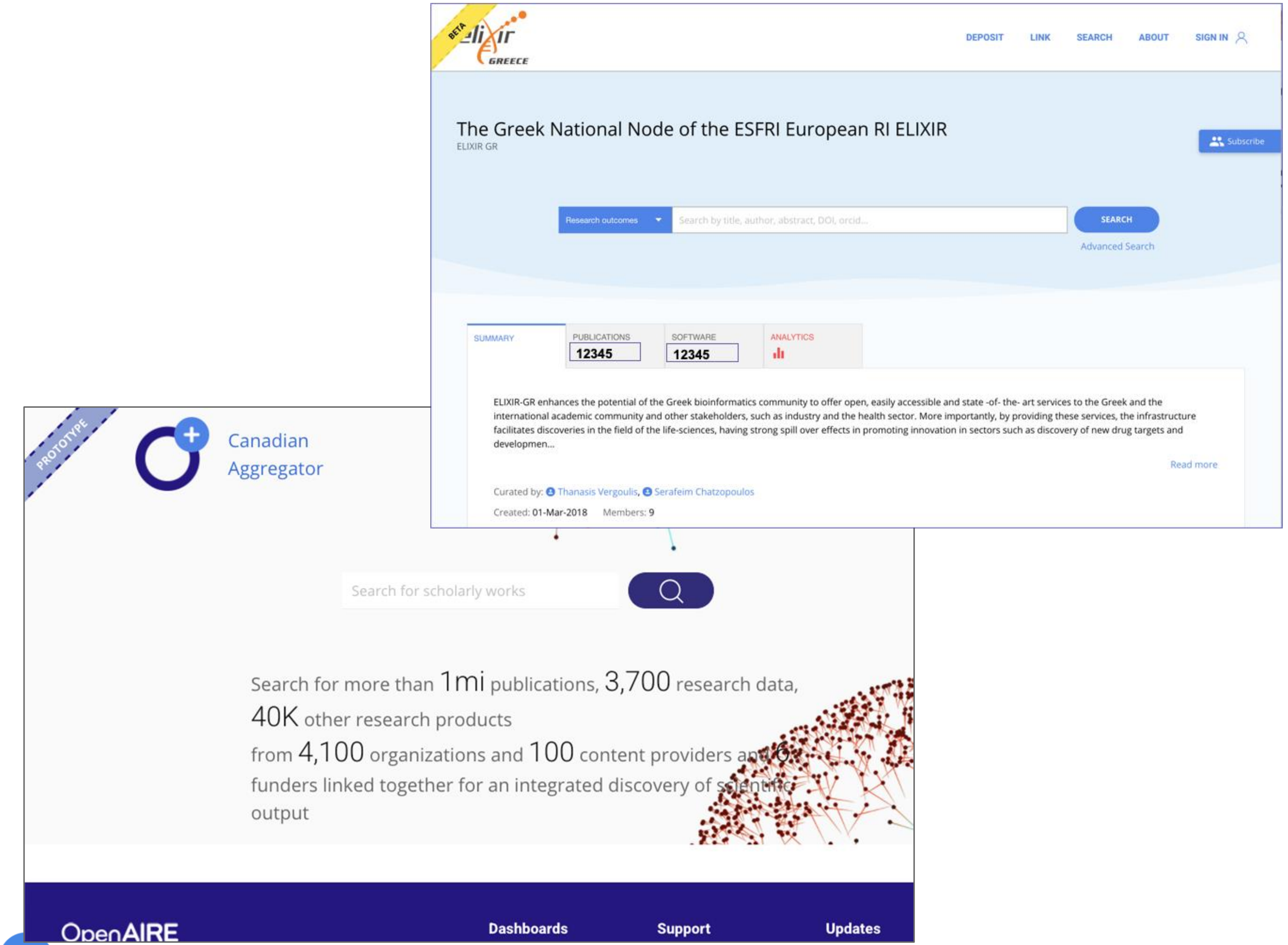
TRL9

TRL8

Prototype

Third-party TRL9

# DISCOVER


BETA
elixir GREECE
DEPOSIT
LINK
SEARCH
ABOUT
SIGN IN
Subscribe
Research outcomes
Search by title, author, abstract, DOI, orcid...
SEARCH
Advanced Search
SUMMARY
PUBLICATIONS
12345
SOFTWARE
12345
ANALYTICS

The Greek National Node of the ESFRI European RI ELIXIR

ELIXIR GR

ELIXIR-GR enhances the potential of the Greek bioinformatics community to offer open, easily accessible and state -of- the- art services to the Greek and the international academic community and other stakeholders, such as industry and the health sector. More importantly, by providing these services, the infrastructure facilitates discoveries in the field of the life-sciences, having strong spill over effects in promoting innovation in sectors such as discovery of new drug targets and developmen...

Read more

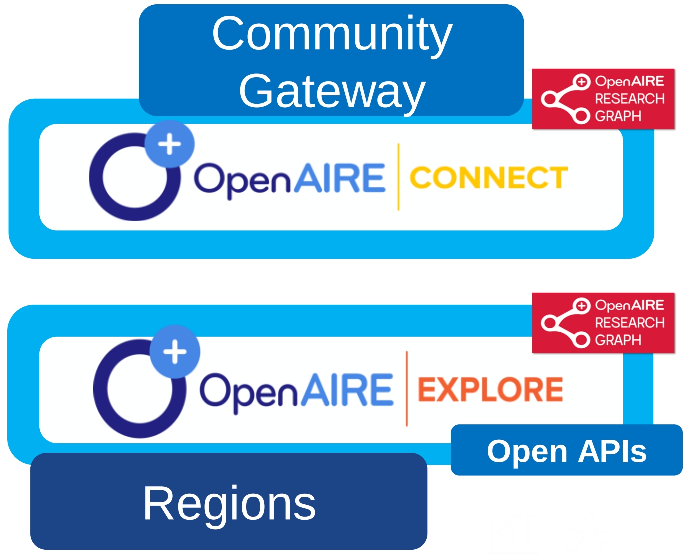
Curated by: Thanasis Vergoulis, Serafeim Chatzopoulos

Created: 01-Mar-2018 Members: 9

PROTOTYPE
Canadian Aggregator
Search for scholarly works
OpenAIRE
Dashboards
Support
Updates

Search for more than 1mi publications, 3,700 research data, 40K other research products from 4,100 organizations and 100 content providers and 6 funders linked together for an integrated discovery of scientific output

## 5 communities (7 in BETA)


Community Gateway
OpenAIRE RESEARCH GRAPH
OpenAIRE CONNECT
OpenAIRE RESEARCH GRAPH
OpenAIRE EXPLORE
Open APIs
Regions

# APIs and access

DEVELOP

## Access points

REST APIs with tokens
Linked Open Data

Dumps in Zenodo

## Numbers

EXPLORE: Average API hits per month 1,7Mi

(54Mi per year)

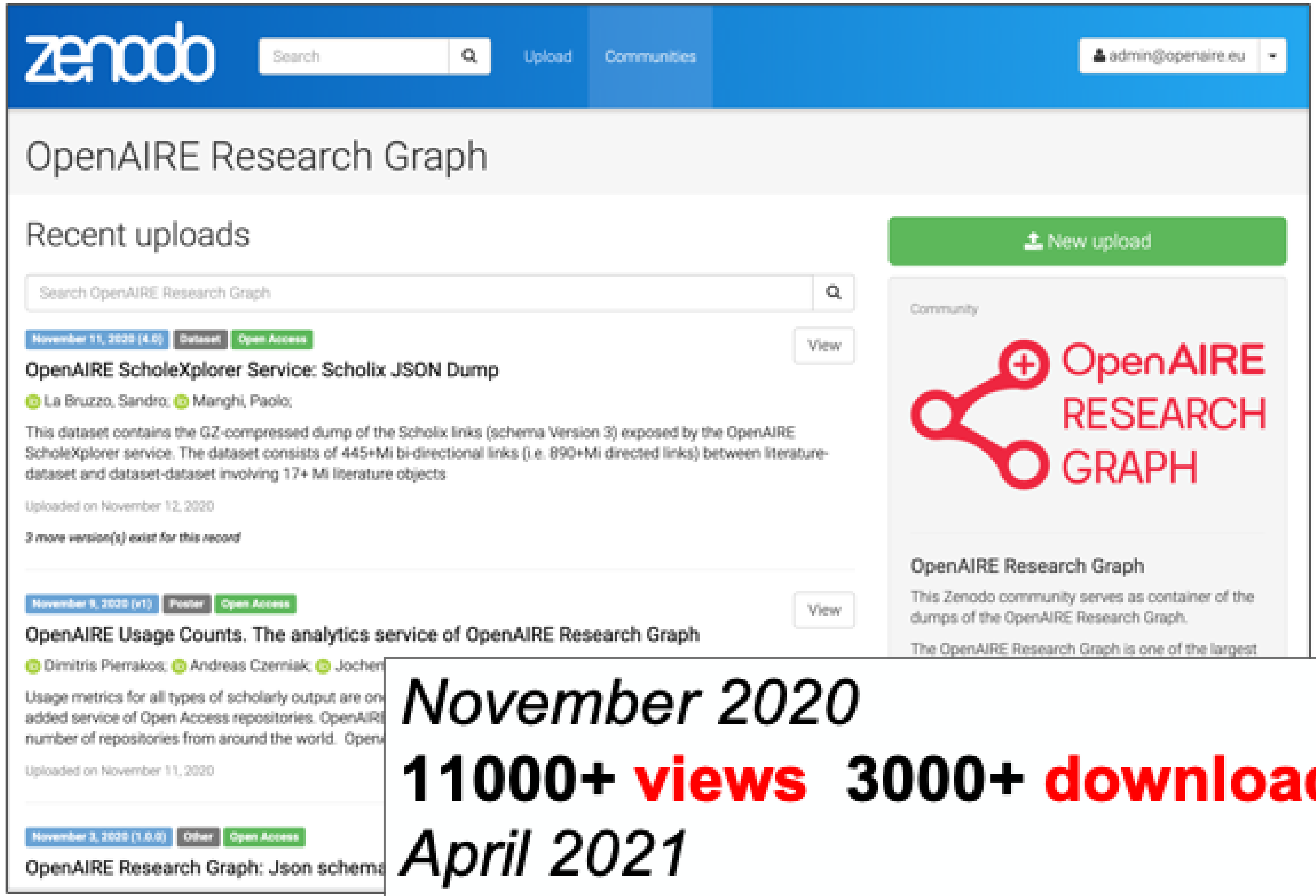
Scholexplorer: 4Bi per year

http://develop.openaire.eu

# OpenAIRE Graph Dumps

**DEVELOP**

- OpenAIRE Research Graph
- OpenAIRE COVID-19
- OpenAIRE Communities
- OpenAIRE LOD
- DOIBoost
- Scholexplorer
- OpenAIRE RDF PID Graph



OpenAIRE Research Graph

Recent uploads

Search OpenAIRE Research Graph

November 11, 2020 (4.0) Dataset Open Access

OpenAIRE ScholeXplorer Service: Scholix JSON Dump

La Bruzzo, Sandro; Manghi, Paolo;

This dataset contains the GZ-compressed dump of the Scholix links (schema Version 3) exposed by the OpenAIRE ScholeXplorer service. The dataset consists of 445+Mi bi-directional links (i.e. 890+Mi directed links) between literature-dataset and dataset-dataset involving 17+ Mi literature objects

Uploaded on November 12, 2020

*3 more version(s) exist for this record*

November 9, 2020 (v1) Poster Open Access

OpenAIRE Usage Counts. The analytics service of OpenAIRE Research Graph

Dimitris Pierrakos; Andreas Czerniak; Jochen

Usage metrics for all types of scholarly output are on
added service of Open Access repositories. OpenAIRE
number of repositories from around the world. Open

Uploaded on November 11, 2020

November 3, 2020 (1.0.0) Other Open Access

OpenAIRE Research Graph: Json schema

OpenAIRE Research Graph

This Zenodo community serves as container of the dumps of the OpenAIRE Research Graph.

The OpenAIRE Research Graph is one of the largest

*November 2020*

**11000+ views 3000+ downloads**

*April 2021*

**14700+ views 6100+ downloads**

https://zenodo.org/communities/openaire-research-graph

# Consumers

DEVELOP

EUROPEAN OPEN SCIENCE CLOUD

The Graph as EOSC Resource Catalogue

DARIAH-EU egi EPOS elixir

Research infrastructures

AGINFRA instruct ERIC SDSN GREECE CLARIN

ORCID Early 2021

Connecting Research and Researchers

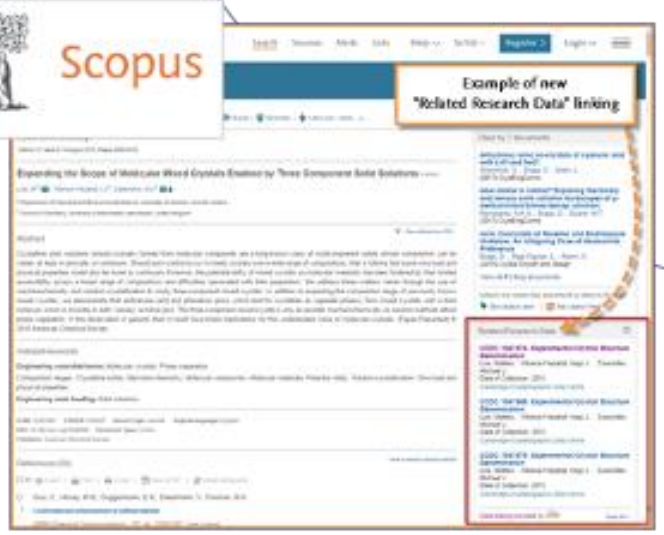
SciVal

2030 CONNECT

a United Nations online technology platform for the SDGs

OpenAIRE RESEARCH GRAPH

Scopus

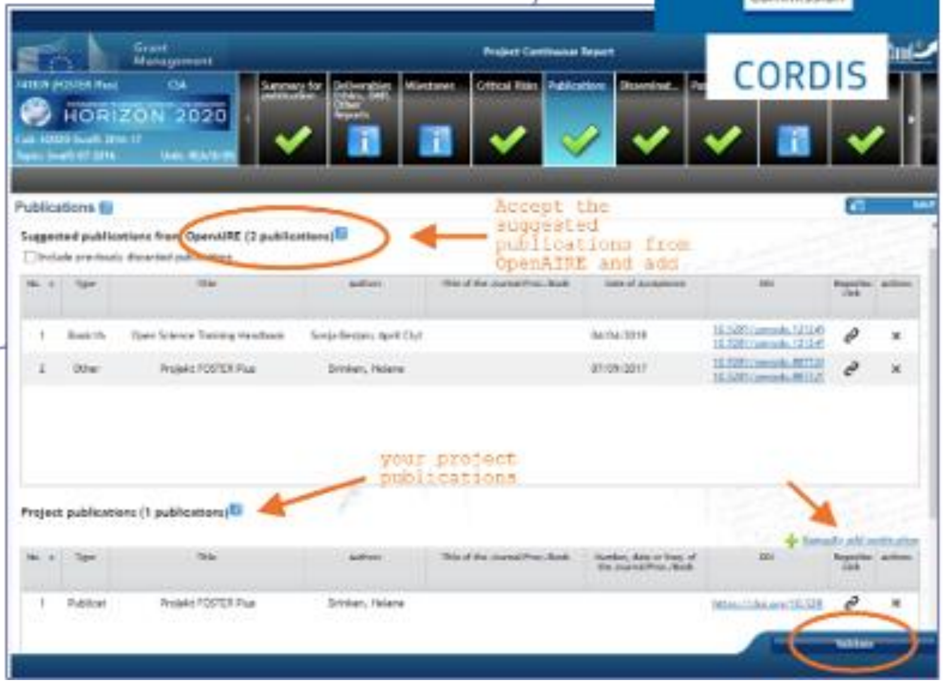


Example of new "Related Research Data" linking

Mendeley

European Commission

CORDIS


Grant Management
Project Continuous Report
HORIZON 2020
Summary for publication
Deliverables
Milestones
Critical Risks
Publications
Disseminat...
Publications
Suggested publications from OpenAIRE (2 publications)
Project publications (1 publications)

Accept the suggested publications from OpenAIRE and add

your project publications

DSPACE

eprints repository software

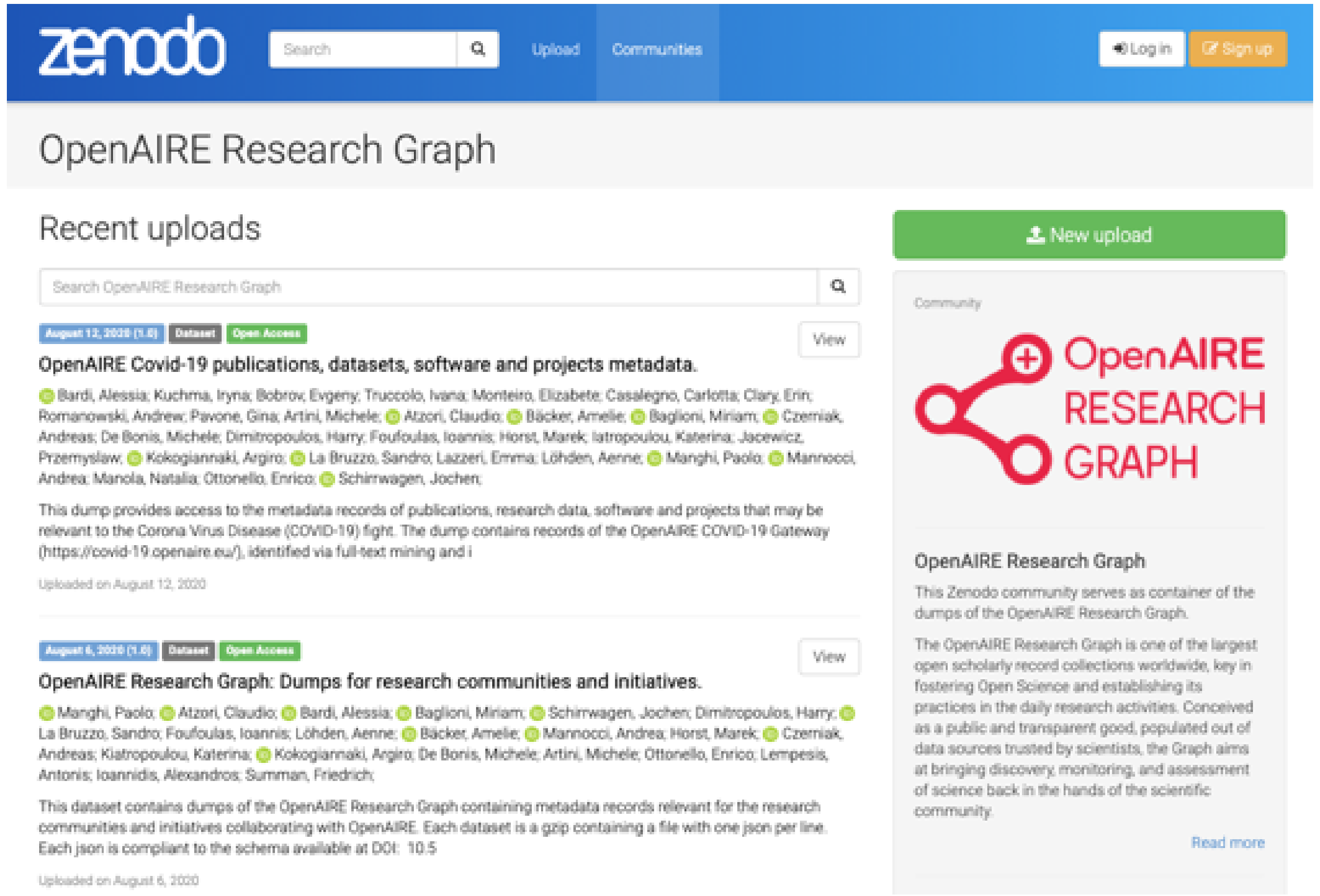
OpenAIRE

European Commission

# OpenAIRE Research Graph: Open APIs and Dumps

## Supporting third-parties at building added-value services

- http://develop.openaire.eu
- https://zenodo.org/communities/openaire-research-graph



OpenAIRE Research Graph

Recent uploads

**OpenAIRE Covid-19 publications, datasets, software and projects metadata.**

Bardi, Alessia; Kuchma, Iryna; Bobrov, Evgeny; Truccolo, Ivana; Monteiro, Elizabete; Casalegno, Carlotta; Clary, Erin; Romanowski, Andrew; Pavone, Gina; Artini, Michele; Atzori, Claudio; Bäcker, Amelie; Baglioni, Miriam; Czerniak, Andreas; De Bonis, Michele; Dimitropoulos, Harry; Foufoulas, Ioannis; Horst, Marek; Iatropoulou, Katerina; Jacewicz, Przemyslaw; Kokogiannaki, Argiro; La Bruzzo, Sandro; Lazzeri, Emma; Löhden, Aenne; Manghi, Paolo; Mannocci, Andrea; Manola, Natalia; Ottonello, Enrico; Schirrwagen, Jochen;

This dump provides access to the metadata records of publications, research data, software and projects that may be relevant to the Corona Virus Disease (COVID-19) fight. The dump contains records of the OpenAIRE COVID-19 Gateway (https://covid-19.openaire.eu/), identified via full-text mining and i

Uploaded on August 12, 2020

**OpenAIRE Research Graph: Dumps for research communities and initiatives.**

Manghi, Paolo; Atzori, Claudio; Bardi, Alessia; Baglioni, Miriam; Schirrwagen, Jochen; Dimitropoulos, Harry; La Bruzzo, Sandro; Foufoulas, Ioannis; Löhden, Aenne; Bäcker, Amelie; Mannocci, Andrea; Horst, Marek; Czerniak, Andreas; Kiatropoulou, Katerina; Kokogiannaki, Argiro; De Bonis, Michele; Artini, Michele; Ottonello, Enrico; Lempesis, Antonis; Ioannidis, Alexandros; Summan, Friedrich;

This dataset contains dumps of the OpenAIRE Research Graph containing metadata records relevant for the research communities and initiatives collaborating with OpenAIRE. Each dataset is a gzip containing a file with one json per line. Each json is compliant to the schema available at DOI: 10.5

Uploaded on August 6, 2020

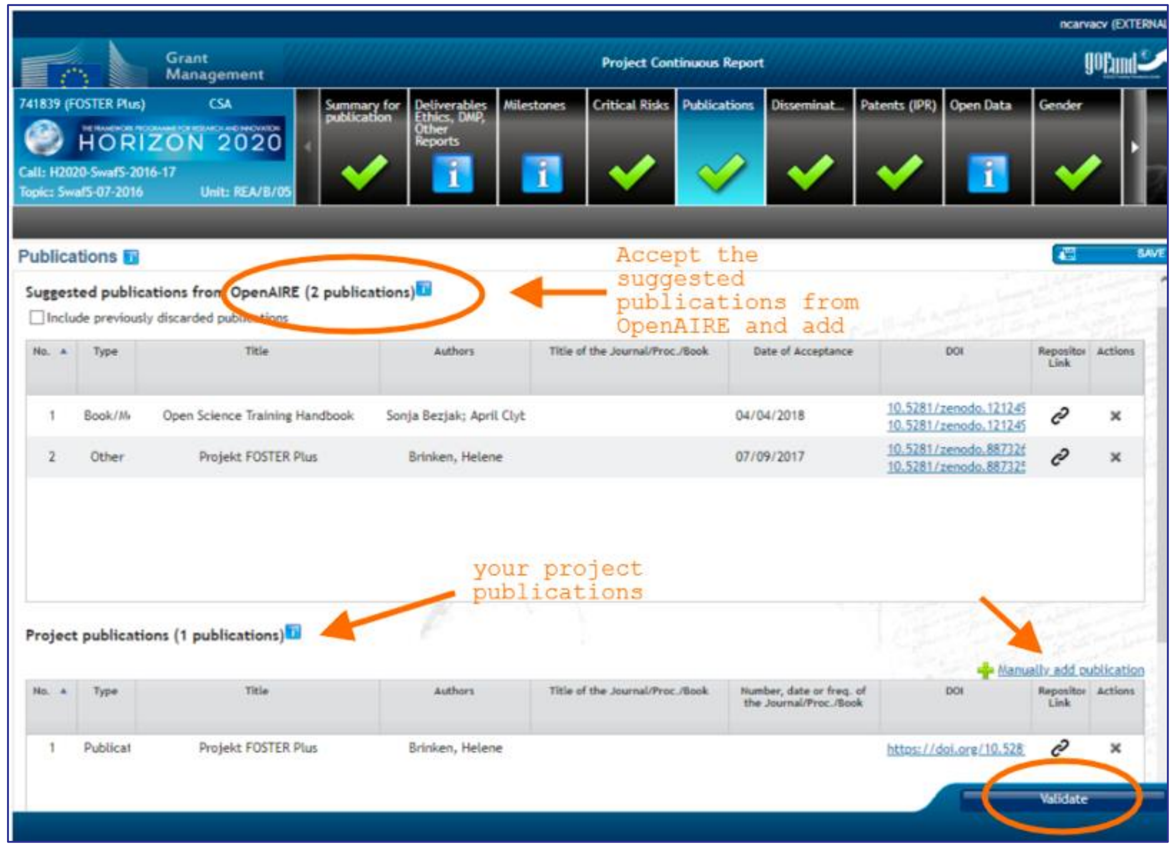
OpenAIRE Research Graph

This Zenodo community serves as container of the dumps of the OpenAIRE Research Graph.

The OpenAIRE Research Graph is one of the largest open scholarly record collections worldwide, key in fostering Open Science and establishing its practices in the daily research activities. Conceived as a public and transparent good, populated out of data sources trusted by scientists, the Graph aims at bringing discovery, monitoring, and assessment of science back in the hands of the scientific community.

# APIs integration with third-party services

## EC SYGMA



ncarvacv (EXTERNAL
Grant Management
Project Continuous Report
741839 (FOSTER Plus)
CSA
HORIZON 2020
Call: H2020-SwafS-2016-17
Topic: SwafS-07-2016
Unit: REA/B/05
Summary for publication
Deliverables Ethics, DMP, Other Reports
Milestones
Critical Risks
Publications
Disseminat...
Patents (IPR)
Open Data
Gender
SAVE

**Publications**

Accept the suggested publications from OpenAIRE and add

**Suggested publications from OpenAIRE (2 publications)**

☐ Include previously discarded publications

| No. | Type | Title | Authors | Title of the Journal/Proc./Book | Date of Acceptance | DOI | Repository Link | Actions |
|---|---|---|---|---|---|---|---|---|
| 1 | Book/M | Open Science Training Handbook | Sonja Bezjak; April Clyt | | 04/04/2018 | 10.5281/zenodo.12124<br>10.5281/zenodo.12124 | | ✖ |
| 2 | Other | Projekt FOSTER Plus | Brinken, Helene | | 07/09/2017 | 10.5281/zenodo.88732<br>10.5281/zenodo.88732 | | ✖ |

your project publications

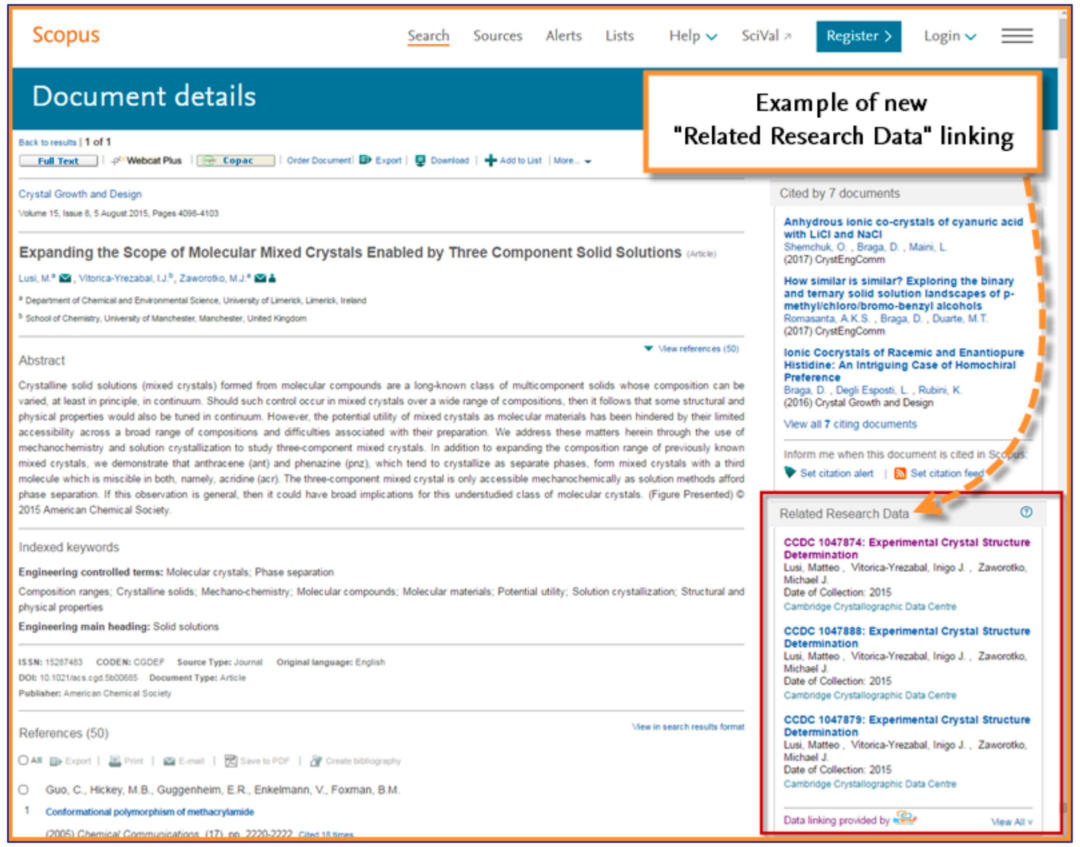
**Project publications (1 publications)**

Manually add publication

| No. | Type | Title | Authors | Title of the Journal/Proc./Book | Number, date or freq. of the Journal/Proc./Book | DOI | Repository Link | Actions |
|---|---|---|---|---|---|---|---|---|
| 1 | Publicat | Projekt FOSTER Plus | Brinken, Helene | | | https://doi.org/10.528 | | ✖ |

Validate

## Scopus



Scopus
Search
Sources
Alerts
Lists
Help
SciVal
Register
Login
Back to results | 1 of 1
Full Text
Webcat Plus
Copac
Order Document
Export
Download
Add to List
More...
View references (50)
View in search results format
All
Export
Print
E-mail
Save to PDF
Create bibliography
Set citation alert
Set citation feed
View All

Document details

Example of new "Related Research Data" linking

Crystal Growth and Design

Volume 15, Issue 8, 5 August 2015, Pages 4098-4103

**Expanding the Scope of Molecular Mixed Crystals Enabled by Three Component Solid Solutions** (Article)

Lusi, M.[a], Vitorica-Yrezabal, I.J.[b], Zaworotko, M.J.[a]

[a] Department of Chemical and Environmental Science, University of Limerick, Limerick, Ireland

[b] School of Chemistry, University of Manchester, Manchester, United Kingdom

Abstract

Crystalline solid solutions (mixed crystals) formed from molecular compounds are a long-known class of multicomponent solids whose composition can be varied, at least in principle, in continuum. Should such control occur in mixed crystals over a wide range of compositions, then it follows that some structural and physical properties would also be tuned in continuum. However, the potential utility of mixed crystals as molecular materials has been hindered by their limited accessibility across a broad range of compositions and difficulties associated with their preparation. We address these matters herein through the use of mechanochemistry and solution crystallization to study three-component mixed crystals. In addition to expanding the composition range of previously known mixed crystals, we demonstrate that anthracene (ant) and phenazine (pnz), which tend to crystallize as separate phases, form mixed crystals with a third molecule which is miscible in both, namely, acridine (acr). The three-component mixed crystal is only accessible mechanochemically as solution methods afford phase separation. If this observation is general, then it could have broad implications for this understudied class of molecular crystals. (Figure Presented) © 2015 American Chemical Society.

Indexed keywords

**Engineering controlled terms:** Molecular crystals; Phase separation

Composition ranges; Crystalline solids; Mechano-chemistry; Molecular compounds; Molecular materials; Potential utility; Solution crystallization; Structural and physical properties

**Engineering main heading:** Solid solutions

**ISSN:** 15287483 **CODEN:** CGDEF **Source Type:** Journal **Original language:** English

**DOI:** 10.1021/acs.cgd.5b00685 **Document Type:** Article

**Publisher:** American Chemical Society

References (50)

○ 1 Guo, C., Hickey, M.B., Guggenheim, E.R., Enkelmann, V., Foxman, B.M.
Conformational polymorphism of methacrylamide
(2005) Chemical Communications, (17), pp. 2220-2222. Cited 18 times.

Cited by 7 documents

**Anhydrous ionic co-crystals of cyanuric acid with LiCl and NaCl**
Shemchuk, O., Braga, D., Maini, L.
(2017) CrystEngComm

**How similar is similar? Exploring the binary and ternary solid solution landscapes of p-methyl/chloro/bromo-benzyl alcohols**
Romasanta, A.K.S., Braga, D., Duarte, M.T.
(2017) CrystEngComm

**Ionic Cocrystals of Racemic and Enantiopure Histidine: An Intriguing Case of Homochiral Preference**
Braga, D., Degli Esposti, L., Rubini, K.
(2016) Crystal Growth and Design

View all 7 citing documents

Inform me when this document is cited in Scopus:

Related Research Data

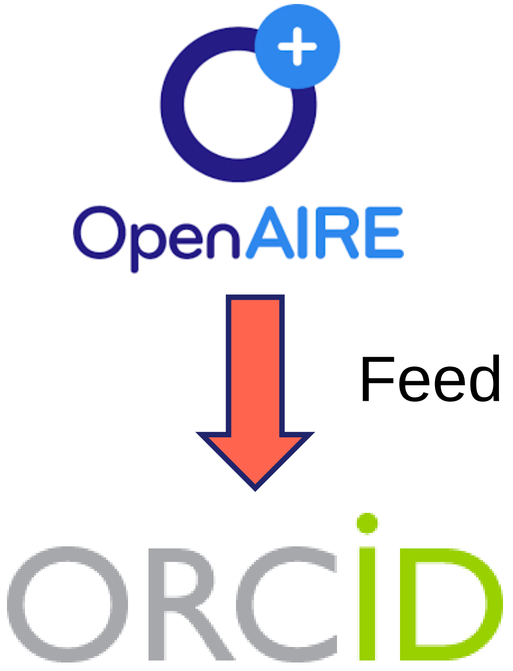
**CCDC 1047874: Experimental Crystal Structure Determination**
Lusi, Matteo, Vitorica-Yrezabal, Inigo J., Zaworotko, Michael J.
Date of Collection: 2015
Cambridge Crystallographic Data Centre

**CCDC 1047888: Experimental Crystal Structure Determination**
Lusi, Matteo, Vitorica-Yrezabal, Inigo J., Zaworotko, Michael J.
Date of Collection: 2015
Cambridge Crystallographic Data Centre

**CCDC 1047879: Experimental Crystal Structure Determination**
Lusi, Matteo, Vitorica-Yrezabal, Inigo J., Zaworotko, Michael J.
Date of Collection: 2015
Cambridge Crystallographic Data Centre

Data linking provided by

## ORCID



OpenAIRE
ORCID

Feed

OpenAIRE DEVELOP

ScholeXplorer

OpenAIRE PROVIDE

OpenAIRE

European Commission

# Call for collaboration

## Improving quality and completeness the Graph

Data and infrasructure sharing

OpenAIRE support to access to Graph data (metadata and full-text) and access to full-text mining infrastructure

Embedding improvements as part fo the data provision workflow of the Graph

Devising new Open Science services for the community

## Improving service provision

graph.openaire.eu

# Thank you!

**Paolo Manghi (OpenAIRE/CNR-ISTI)**

paolo.manghi@openaire.eu

graph.openaire.eu

European Commission