



Consiglio Nazionale
delle Ricerche



ISTITUTO DI SCIENZA E TECNOLOGIE
DELL'INFORMAZIONE "A. FAEDO"



Science. Set free.

OpenAIRE Graph

An open resource for Open Science

Claudio Atzori, PhD
CNR-ISTI



Research evaluation and Open Science a transition in the making



CITATION INDEX

Sample Display

Cited Item	VOL	PG	YR	Citing Item
cited author ANSANELLI V 87 AM J SURG BOLLER M	148	117		citing author AM J ROENTG
Both of these items by ANSARA I were references used by Wagner C in his article from Metallurgical Transactions—B.	91	MONATSCHEFTE CHEMIE SEMIN CHIM ETAT SOLI WAGNER C	102 1855	7 485 97
year of publication, journal abbreviation, volume & page	88	AM J GASTROENTEROL ANDERSSON A REDDI K K 88 S MED J WAYNE KS	50 456 42 173 97 73 2308 97 61 888 114 15 97	
Both these authors cited ANSARI AH's paper in their articles in Obstetrics and Gynecology	89	AM J OBSTET GYNEC PENTTLA M 90 FERTILITY STERILITY STRUVE FA YOUNG JK	103 511 8 299 97 R 21 873 33 741 97 3 322 97	
undated item	ANSEAU MR "IN PRESS CANTOR B	ACT METALL	24	845 97
Source Index entry for ar- ticle by Pezat M which makes reference to the 1982 paper by Anselin F.	ANSELIN F 83 CR HEBDOMAD SE ACAD PEZAT M 85 T AM NUCL SOC BLANCHARD P	256 2618 18 381 97 20 23 151 97 M		

SOURCE INDEX ENTRY

PEZAT M
* TANGUY B VLASSE M PORTIER J HAGENMUL P—(FR)
RARE EARTH NITRIDE FLUORIDES
J SOL ST CH 18(4):391-390 87 A4684
288

ISI® Journal Accession Number

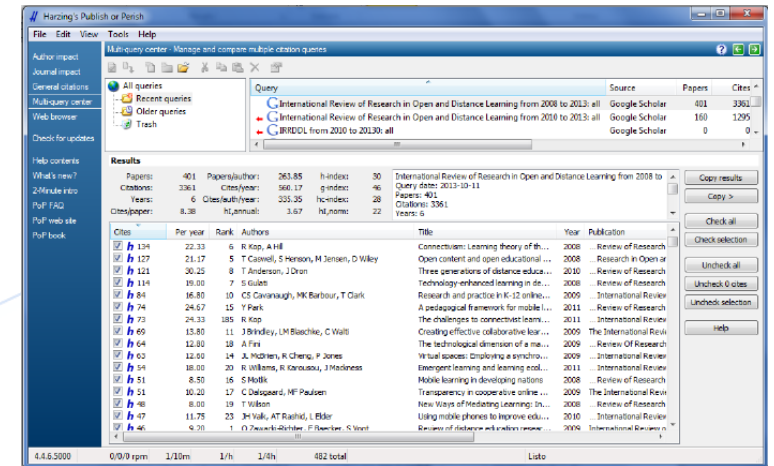
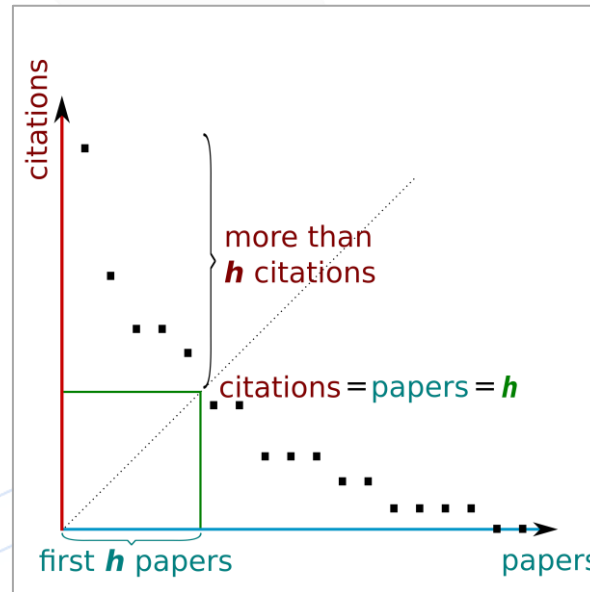
Codes Indicate Type of Source Item:
Blank articles, reports,
technical papers, etc.
B book reviews (from
The Scientist®, Science or
Nature)
C corrections, errata, etc.
E editorial material
I items about individuals
(tributes, obituaries, etc.)
L letters, communications, etc.
M abstracts from meetings
NI news items
R reviews
RFP reprints
RFP computer reviews (hardware
reviews, software reviews,
database reviews)

Consult the Source Index section of
the SCI for bibliographic informa-
tion on all citing items in the Cita-
tion Index. (See sample below)



- Pre – Internet era: Science Citation Index (SCI), Current Contents, Journal Citation Reports
- WOS: monopoly based on sole database focused on the “core” science, shared algorithms, proprietary tools
- Scopus: sold for having more content, rising questions about the coverage

Research evaluation and Open Science a transition in the making



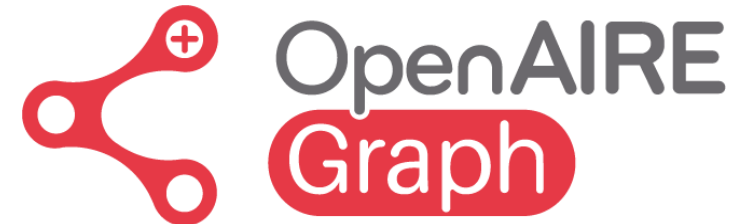
Citations	Per year	Rank	Authors	Title	Year	Publication
124	22.33	6	R Kop, A Hill	Connectivism: Learning theory of th...	2008	Review of Research
127	21.17	5	T Connell, S Henson, M Jensen, D Wiley	Open content and open educational ...	2008	Research in Open a
121	30.22	8	T Anderson, J Dixon	Three generations of distance educa...	2010	Review of Research
114	19.00	7	S Günter	Technology-enhanced learning in de...	2008	Review of Research
84	16.80	10	CS Cavanagh, MK Barbour, T Clark	Research and practice in K-12 online...	2009	International Review
74	24.57	15	Y Park	A pedagogical framework for mobile...	2011	Review of Research
73	24.33	18	R Kop	The challenges to connectivist learn...	2011	International Review
69	13.80	11	J B Hindley, LM Blachkie, C Valt	Creating effective collaborative lear...	2009	The International Revi
64	12.80	18	A Fari	The technological dimension of a ma...	2009	Review of Research
63	12.80	14	X. Hengren, R Cheng, P Jones	Virtual spaces: Employing a synchro...	2009	International Review
54	18.00	20	R Williams, R Karousou, J Madness	Emergent learning and learning tool...	2011	International Review
51	8.50	16	S Moltis	Mobile learning in developing nation...	2008	Review of Research
51	10.20	17	C Delgado, MF Paulsen	Transparency in cooperative online ...	2009	The International Rev
48	8.00	19	T Wilson	New Ways of Resolving Learning: In...	2008	Review of Research
47	11.75	23	34 Vall, AT Rashid, L Elder	Using mobile phones to improve edu...	2010	International Review
46	8.20	1	O Zeuch-Böckler, F Reuber, S Vost	Review of distance education resear...	2006	International Review

- Google Scholar + H-index + publish or perish: bibliometrics @ home
- Google Scholar researcher profiles
- Question about openness

Research evaluation and Open Science a transition in the making



I40C



OpenAIRE Graph

Putting research into context, making the connections

Foundations of a complete, open, and transparent scholarly publishing infrastructure



Reproducibility and transparency require tracking of all products of research, their “context”, and their semantic links

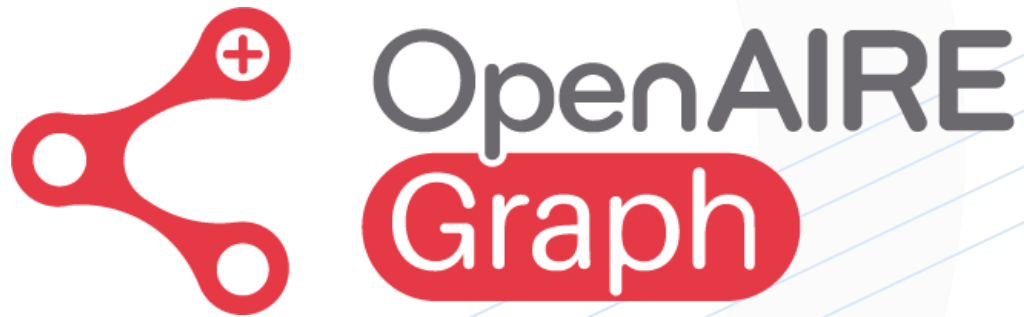


Monitoring and assessing quality, impact, and “open scienceness” of research must be a transparent, reproducible process, inclusive of research “context” and metrics

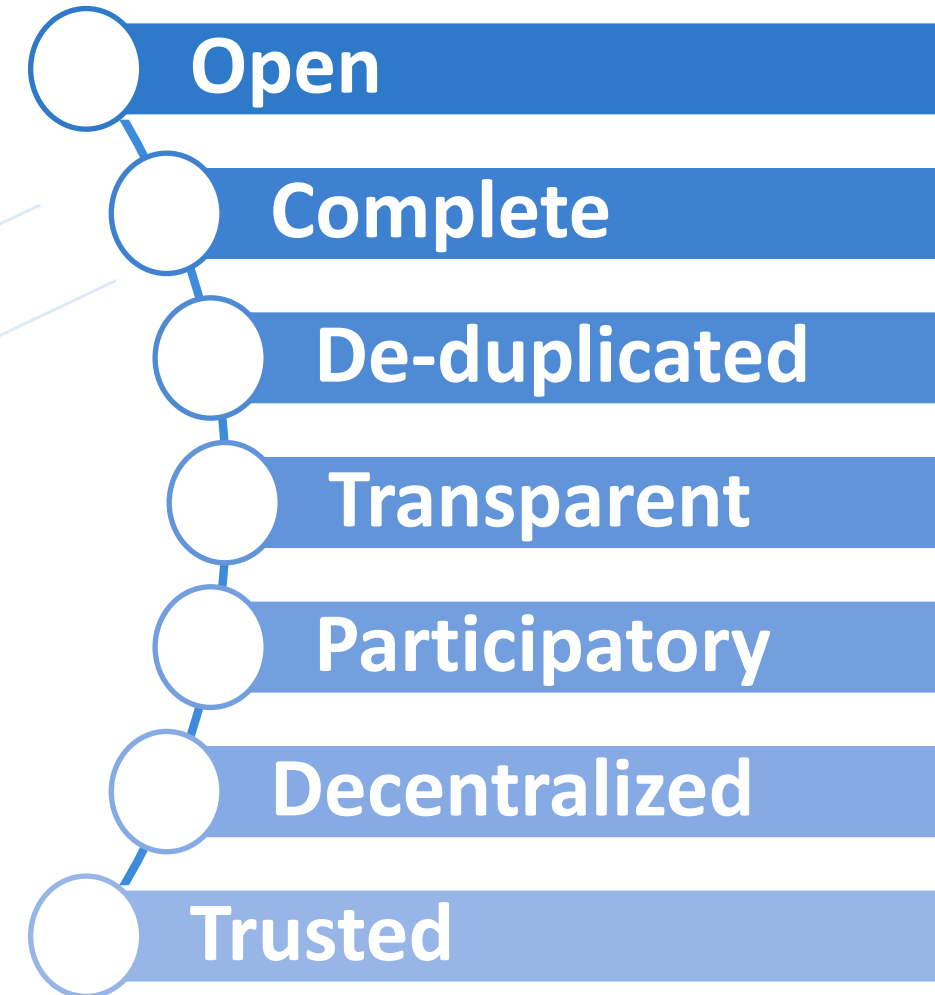


Discovery of reproducible research must find new ways, moving beyond the “article-driven” search, taking into account metrics and intent

Overview of the OpenAIRE Graph



“A collection of metadata describing **objects** in the research lifecycle and **relationships** among them”



graph.openaire.eu



OpenAIRE Graph

OpenAIRE Graph documentation 6.0.0 Search

Overview

- Data model >
- Public API ↗
- Downloads >
- Graph production workflow >
- Relevant publications
- License
- Versions & changelog
- Helpdesk ↗

Version: 6.0.0

Overview

The **OpenAIRE Graph** (formerly known as 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.

Imagine a vast collection of research products all linked together, contextualised and openly available. For the past years OpenAIRE has been working to gather this valuable record. It is a massive collection of metadata and links between scientific products such as articles, datasets, software, and other research products, entities like organisations, funders, funding schemes, projects, communities, and data sources.

The OpenAIRE Graph aggregates millions of metadata records collected from trusted data sources, including:

- Open Access journals registered in DOAJ
- Crossref
- Unpaywall
- ORCID
- Microsoft Academic Graph
- Datacite

graph.openaire.eu

OpenAIRE Graph

ABOUT RESOURCES SUPPORT

Open. Transparent. Interconnected.

OpenAIRE Graph is an open resource that aggregates a **collection of research data properties** (metadata, links) available within the OpenAIRE Open Science infrastructure for funders, organizations, researchers, research communities and publishers to interlink information by using a semantic graph database approach.

LEARN MORE

Data sources



GitHub Applications Database
Supporting

Software Heritage PRESERVING TECHNICAL KNOWLEDGE

elixir bio.tools

... and more tools and software sources



frontiers F1000 Faculty of 1000

PLOS Springer

... and more publishers



CORDIS Community Research & Development Information Service

NSF

DFG Deutsche Forschungsgemeinschaft

... and more European and international funders

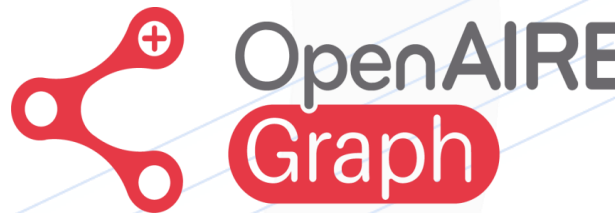


unpaywall

Microsoft

OpenCitations

... and more research graphs



OpenAIRE Graph



re3data.org REGISTRY OF RESEARCH DATA REPOSITORIES

OpenDOAR Crossref

FAIRsharing.org standards, databases, policies

ROR

ORCID

DataCite

... and more registries



LA Referencia Red de repositorios de acceso abierto a la ciencia

SciELO

DOAJ DIRECTORY OF OPEN ACCESS JOURNALS

... and more aggregators



Cornell University Library

arXiv.org

zenodo Research. Shared.

PubMed HAL archives-ouvertes.fr

RePEc

... and more thematic and institutional repositories



egi

DARIAH-EU

elixir

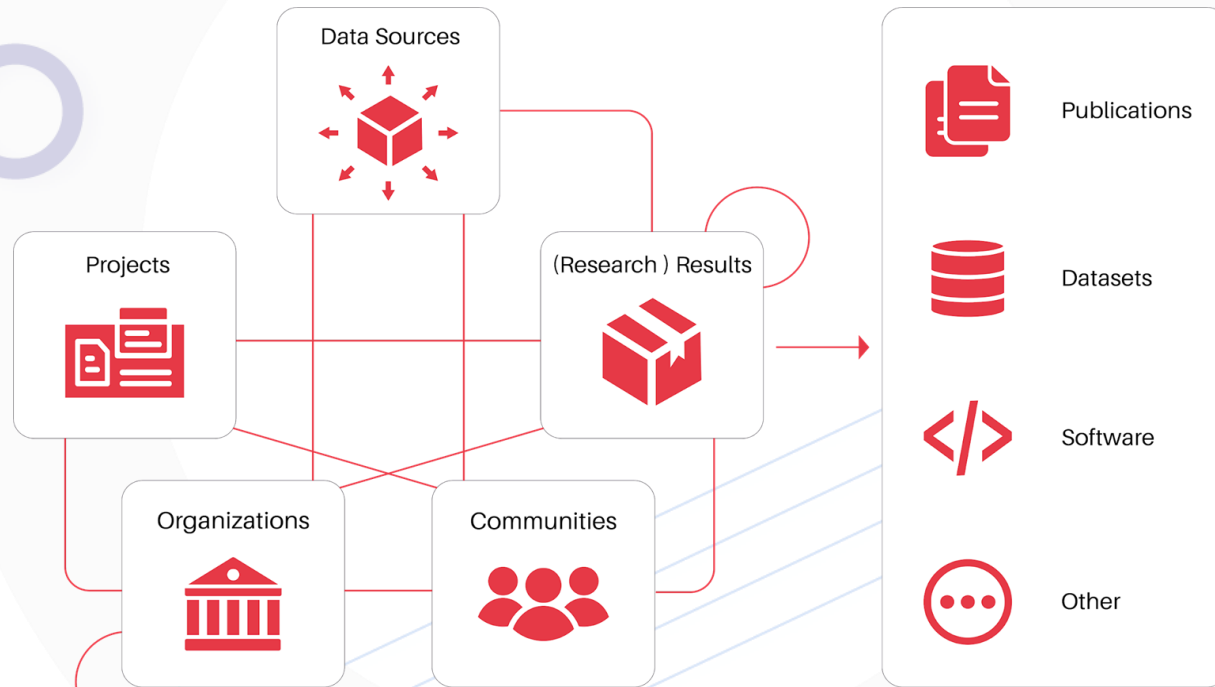
ECRIN EUROPEAN CLINICAL RESEARCH INFRASTRUCTURE NETWORK

EPOS EUROPEAN PLATE OBSERVING SYSTEM

EOSC-Life

... and more infra and RI sources

OpenAIRE Graph data model



OpenAIRE Graph documentation

Version: 6.0.0

Data model

The OpenAIRE Graph comprises several types of **entities** and **relationships** among them.

The latest version of the JSON schema can be found on the **Downloads** section.

The figure above, presents the graph's data model. Its main entities are described in brief below:

- **Results** represent the outcomes (or products) of research activities.
- **Data Sources** are the sources from which the metadata of graph objects are collected.
- **Organizations** correspond to companies or research institutions involved in projects, responsible for operating data sources or consisting the affiliations of Product creators.
- **Projects** are research project grants funded by a Funding Stream of a Funder.
- **Communities** are groups of people with a common research intent (e.g. research infrastructures, university alliances).

FURTHER READING

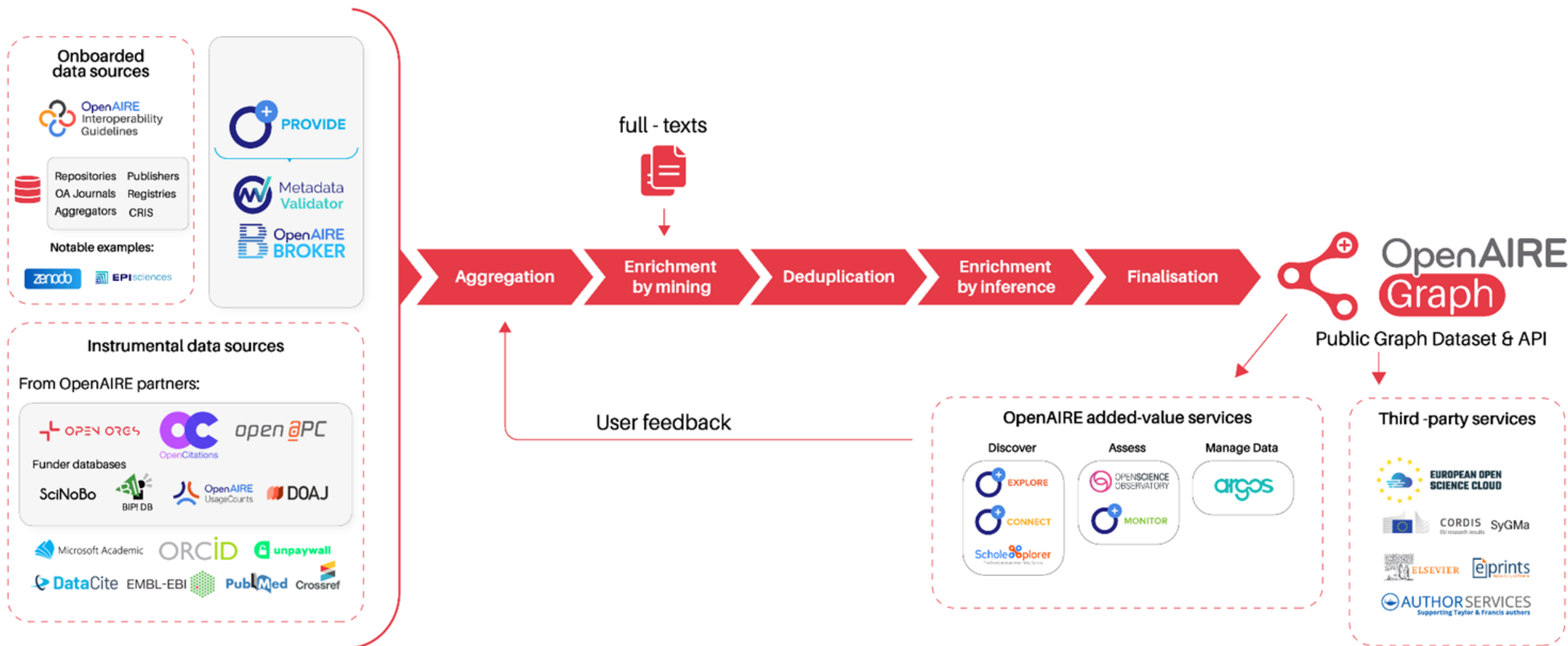
A detailed report on the OpenAIRE Graph Data Model can be found on Zenodo.

Previous « Overview

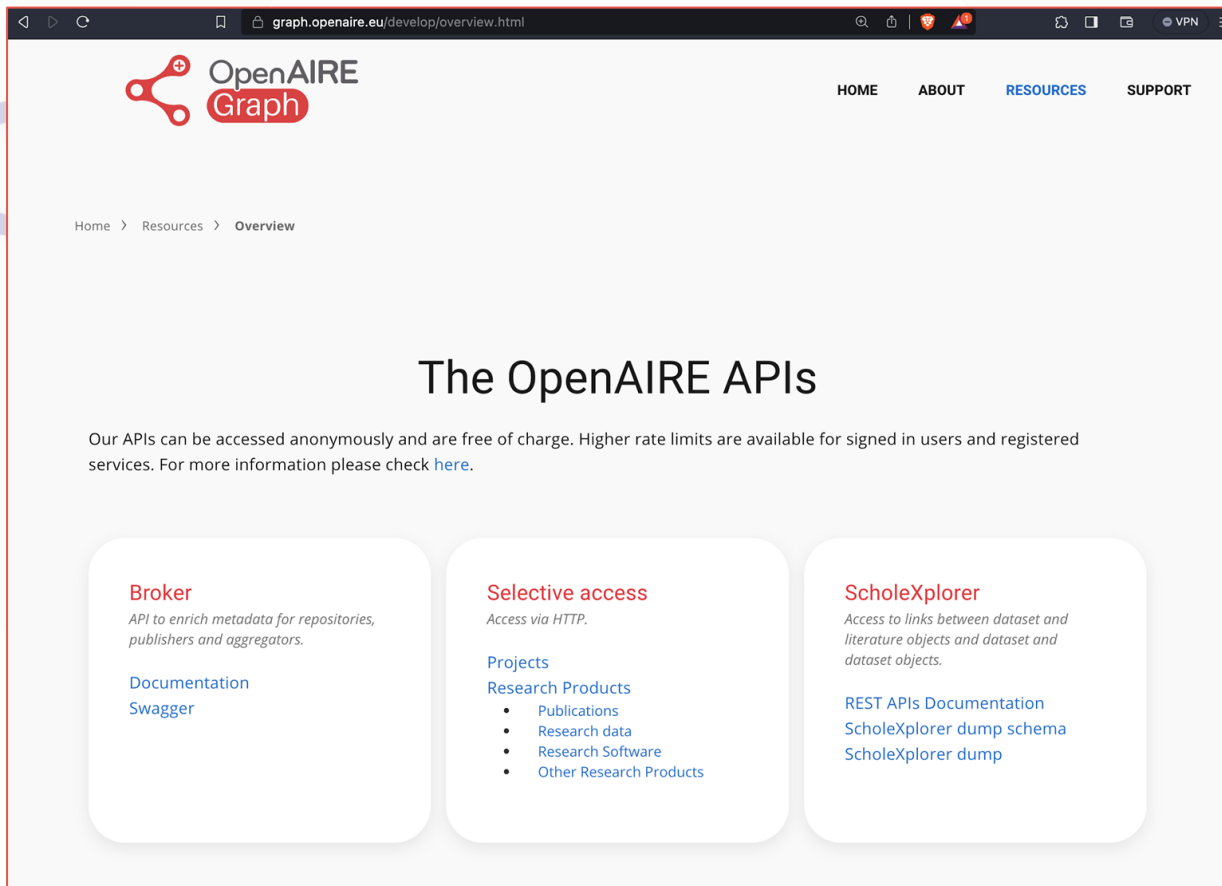
Next Entities »

more @ graph.openaire.eu/docs/data-model

OpenAIRE Graph: the supply chain



Access to the OpenAIRE Graph



The screenshot shows the OpenAIRE Graph website interface. At the top left is the OpenAIRE Graph logo. A navigation menu includes HOME, ABOUT, RESOURCES, and SUPPORT. Below the logo, a breadcrumb trail reads 'Home > Resources > Overview'. The main heading is 'The OpenAIRE APIs'. A paragraph states: 'Our APIs can be accessed anonymously and are free of charge. Higher rate limits are available for signed in users and registered services. For more information please check [here](#).' Below this are three API categories in white boxes with rounded corners:

- Broker**: API to enrich metadata for repositories, publishers and aggregators. Includes links for Documentation and Swagger.
- Selective access**: Access via HTTP. Includes a Projects section with Research Products: Publications, Research data, Research Software, and Other Research Products.
- ScholarXplorer**: Access to links between dataset and literature objects and dataset and dataset objects. Includes links for REST APIs Documentation, ScholarXplorer dump schema, and ScholarXplorer dump.

Datasets @

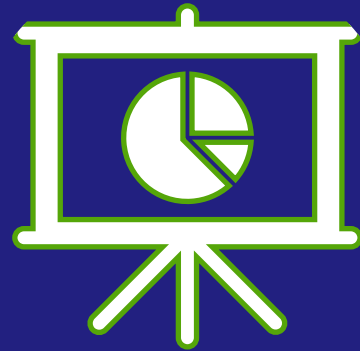
graph.openaire.eu/docs/category/downloads

- OpenAIRE Graph
- OpenAIRE Funded products
- OpenAIRE COVID-19
- OpenAIRE communities
- DOIBoost
- OpenAIRE ScholarXplorer

zenodo.org/communities/openaire-research-graph

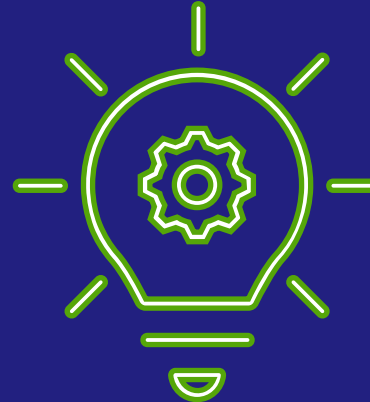
OpenAIRE MONITOR

WHY MONITOR?



Know Thyself

Resources
Research Output
Open Science Uptake
Collaborations
Visibility
Impact



Understand Thyself

Pathways
Insights
Opportunities



Position Thyself

Decision making
Reporting
Story telling

Why OpenAIRE MONITOR?

- **Relevance for the community**
 - Co-develop indicators that make sense to all
- **It's all about open science and open data**
 - Inclusiveness, transparency and replicability
- **Full coverage of Open Science**
 - Beyond publications: Research Data, Software, Other Research Products
 - Linked science
- **Fully embedded in EOSC infrastructure**
 - Starting from content providers to included metrics

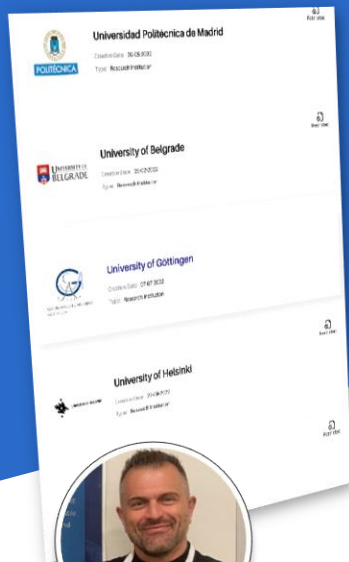
How? Methodological Principles

- **Openness & transparency:** Assumptions are openly and clearly presented
- **Coverage & accuracy:** Based on data from multiple authoritative data sources with proven AI-driven mechanisms
- **Clarity & replicability:** Indicators documented, verified and used by the scholarly communication community
- **Readiness & timeliness:** Big data infrastructure operational workflows to warrant timely results

What? Dashboard on Demand

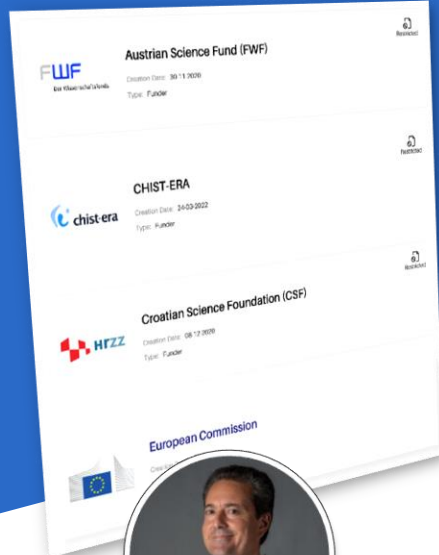


Institutions



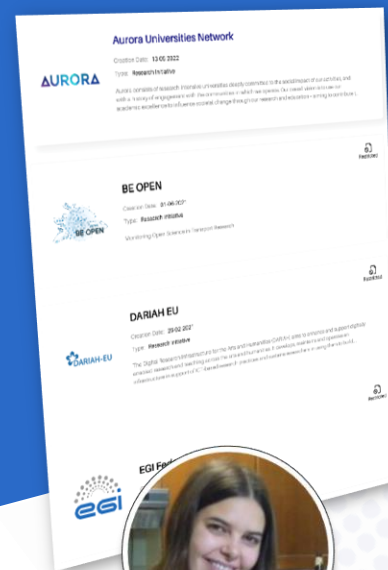
Your OpenAIRE expert
Leonidas Pispiringas

Funders



Your OpenAIRE expert
Harry Dimitropoulos

Research Initiatives



Your OpenAIRE expert
Alessia Bardi

Countries



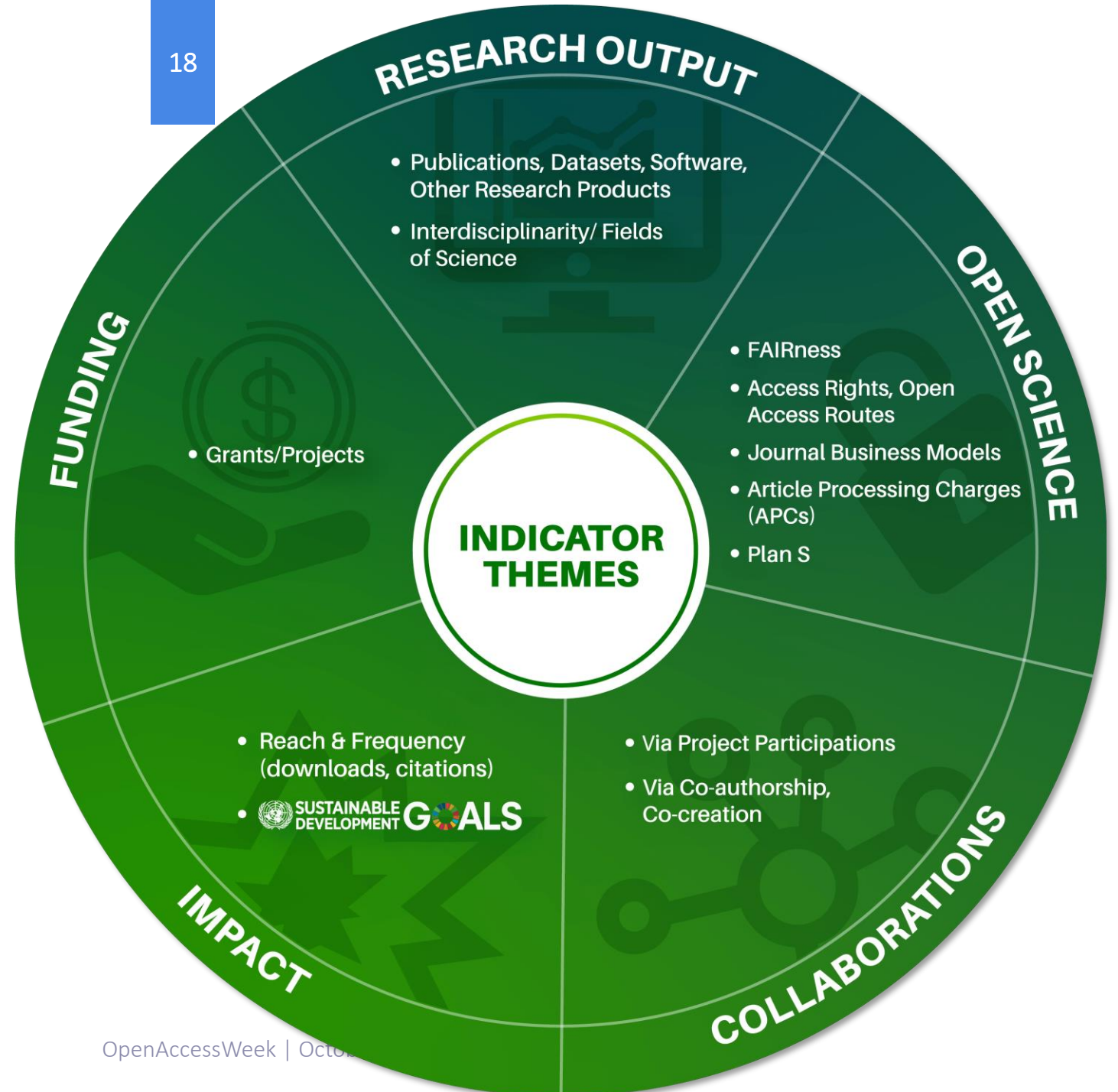
Your OpenAIRE expert
Ioanna Grypari

<https://monitor.openaire.eu>

<https://osobservatory.openaire.eu>

What?

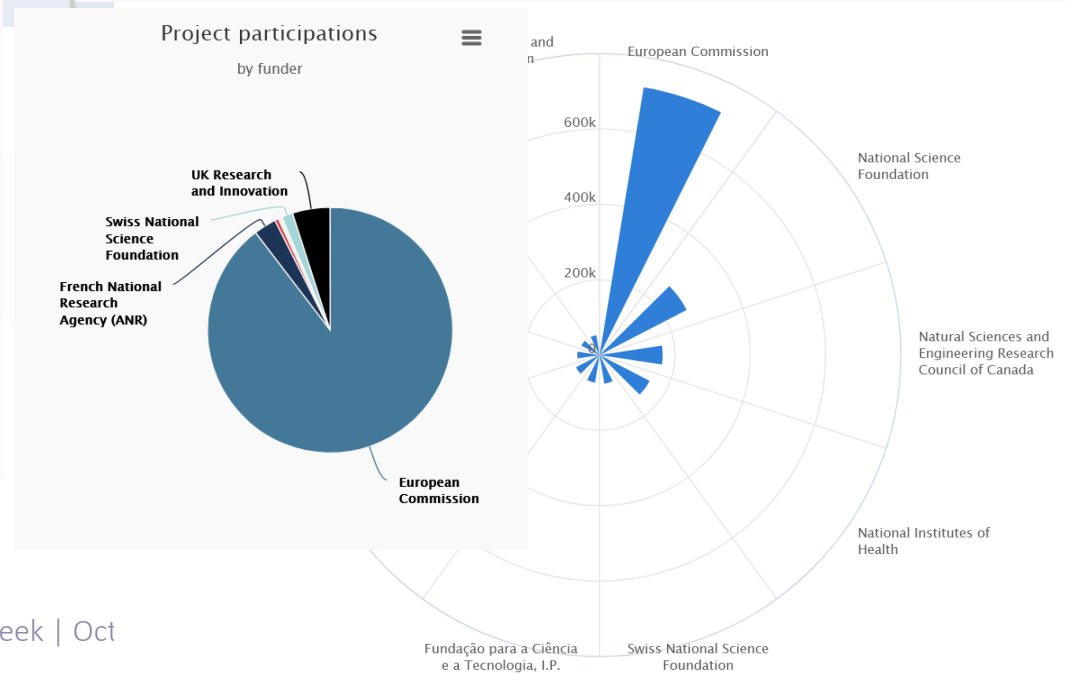
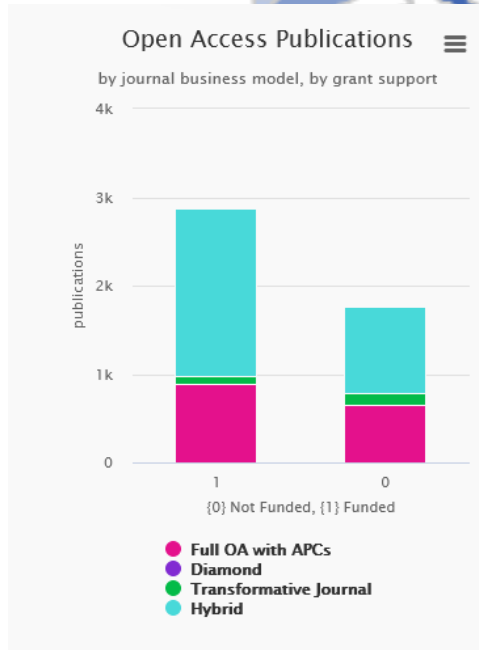
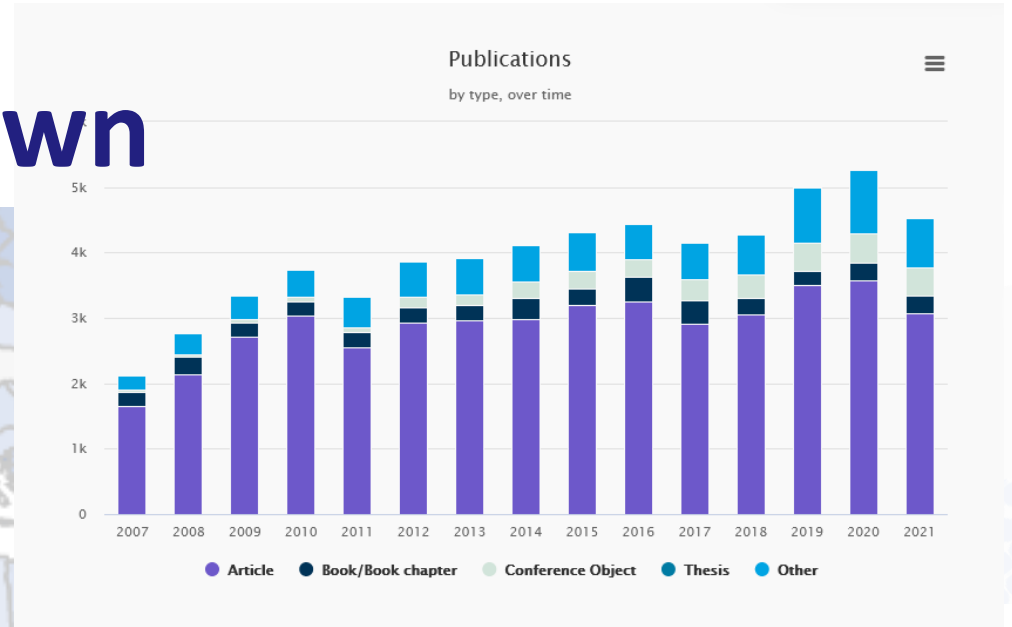
Indicator themes




What? Indicators Breakdown

By fields of interest

- research product type
- domains (FoS)
- time
- countries
- data sources
- funders
- ...



What? Features

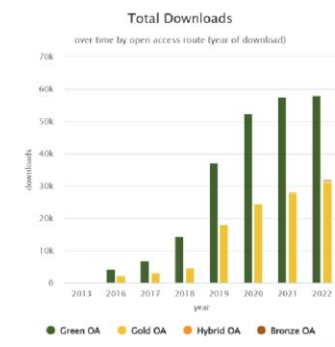
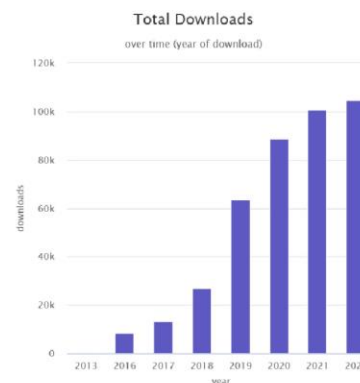
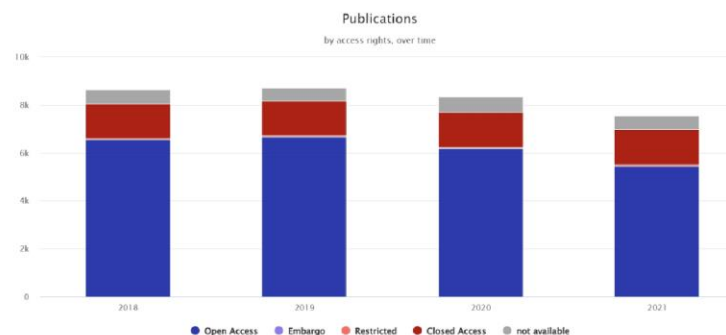
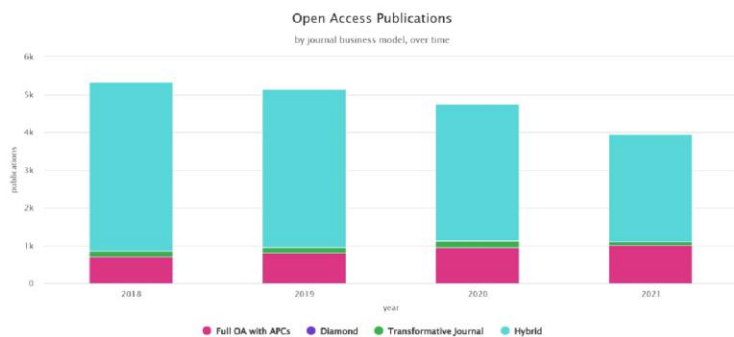
- **User-friendly** dashboards
 - interactive visualizations
 - exporting capabilities (download data & visualizations in different formats)
 - filtering
 - browsing via direct links to 
 - editing of visualizations
- **Control** how you share
 - **Public** indicators for external stakeholders – *Showcasing*
 - **Restricted** indicators for **team-members** – *Internal Monitoring*
 - **Private** indicators for “work in progress” - *Reviewing*
- **Customize & validate** in one-on-one sessions with our experts

<https://unimibox.unimi.it/index.php/s/9WsbKCCEzm7trri>

Future of scholarly communication



Si presentano qui alcuni dati tratti dall'Open science monitor di OpenAIRE. La dashboard dedicata all'ateneo (in versione beta) registra fra gli altri dati il modello di business delle pubblicazioni open access, le politiche di accesso e i download (anche per tipologia di file scaricato)



Can I trust the indicators?

a.k.a can I trust the processes for their calculation?

a.k.a can I trust the underlying data?

Challenges

- Data access / availability
- Data incompleteness, format inconsistency, default values
- Duplicate data
- Old / stale data
- Inconsistent record identification
- Coverage

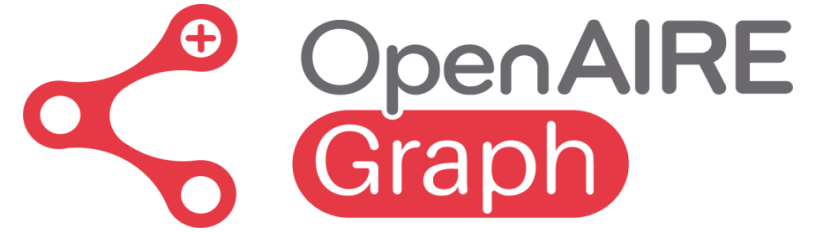
“Not everything that counts can be counted, and not everything that can be counted counts.”

The Graph as a trustable resource

- Vocabulary based cleaning
- Automation of the aggregation processes
- Provenance information
- Transparency of the processes
 - Documentation
- Repeatability

Supporting projects

23



Several extensions in the context of ongoing & future projects



FAIRCORE4EOSC

- Intelligent NL and impact-based search, community recommendation profiles, support for and inference of RAIDs
- Adopting the RDA SKG common data representation for Scientific Knowledge Graphs



SciLake

- metadata enhancements & indicators derived from community specific use case pilots leveraging SKGs



GraspOS

- Innovate the research assessment process leveraging the OpenAIRE Graph contents

CRAFT-OA

CraftOA

- Diamond institutional open access publishing & plugins for the OJS platform (broker and guidelines)



OSTrails

- Become part of a federation of cross-border and cross-discipline SKGs, interoperable with DMP and FAIR assessment platforms



Thank you

On behalf of the OpenAIRE Graph team

claudio.atzori@isti.cnr.it

info@openaire.eu