



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	Citing Item
cited author	VOL	PG	YR	citing author
ANSANELLI V				AM J SURG
87	148	117		BOLLER M
Both of these items by ANSARA I were references used by Wagner C in his article from Metallurgical Transactions—B.				AM J ROENTG
91	127	277	97	
MONATSHEFTE CHEMIE	102	1858		
SEMIN CHIM ETAT SOLI				WAGNER C
METALL T-B	7	485	97	
ANSARI A			year of publication, journal abbreviation, volume & page	
88	50	456		AM J GASTROENTEROL
ANDRESSO A	42	173	97	AMER SURG
REDDI K K	73	2308	97	P NAS US
88	81	888		S MED J
WAYNE KS	114	15	97	AM R RESP D
ANSARI AH			undated item	
89	103	511		AM J OBSTET GYNEC
PENTTLA M	8	299	97	NORMONE MET
90	21	873		FERTILITY STERILITY
STRUYE FA	33	741	97	OBSTET GYN
YOUNG JH	3	322	97	
ANSEAU MR			undated item	
IN PRESS				ACT METALL
CANTOR B	24	845	97	
ANSELIN F			undated item	
83	258	2818		OB HERODOMAD SE ACAD
PEZAT M	18	381	97	J SOL ST CH
85	20			T AM NUCL SOC
BLANCHARD P	23	151	97	T AM NUCL S

SOURCE INDEX ENTRY

PEZAT M
 * TANGUY B VLASSE M PORTIER J HAGENMUL P—(FR)
 RARE EARTH NITRIDE FLUORIDES
 J SOL ST CH 18(4):381-390 97 A4684 28R

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
 RLP reprints
 W computer reviews (hardware reviews, software reviews, database reviews)

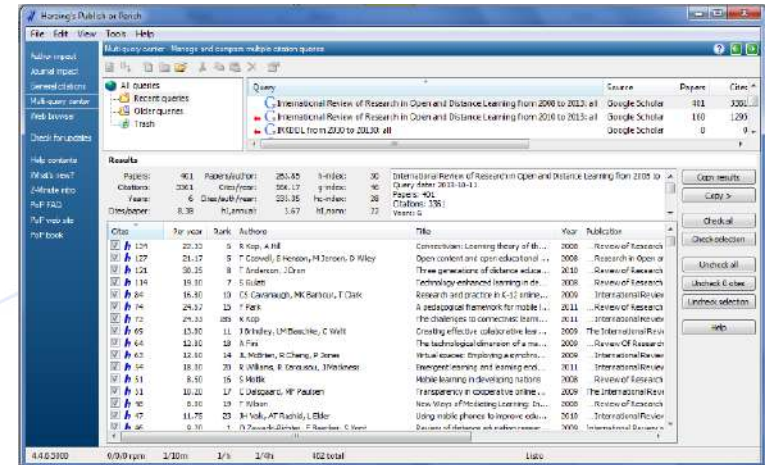
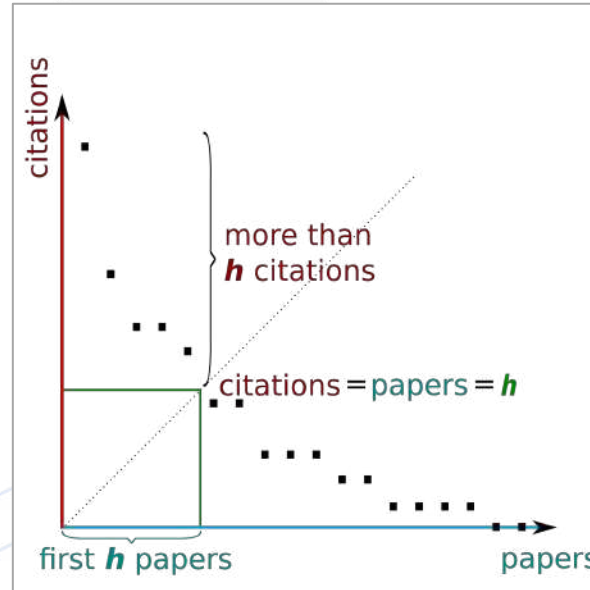
A complete description of each source item code appears in the SCI Codes & Conventions: Citation Index: section of the instructional material.

Consult the Source Index section of the SCI for bibliographic information on all citing items in the Citation 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



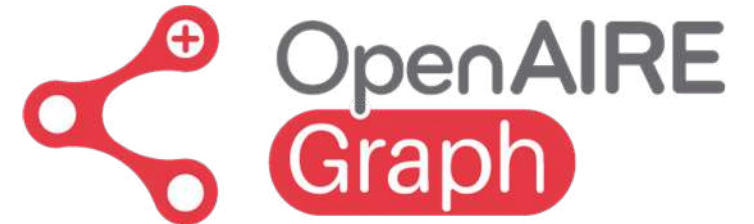
Citations	Per year	Rank	Authors	Title	Year	Publication
124	22.22	5	R Kipp, A Hill	Constructivism: Learning theory of Bl...	2008	Review of Research
127	21.17	5	T Connolly, E Hendry, M Jorosz, D Wiley	Open content and open educational r...	2008	Research in Open a
121	30.25	8	T Anderson, J Olan	Three generations of distance educat...	2010	Review of Research
114	18.10	7	S Gilbert	Technology-enhanced learning in dis...	2008	Review of Research
86	16.90	10	CS Gavrilakou, NK Bakouri, T Clark	Research and practice in C-3 online...	2009	International Review
84	24.52	13	F Park	A pedagogical framework for mobile l...	2011	Review of Research
72	25.23	103	K Kopp	The challenges in connective learnin...	2011	International Review
65	15.30	11	J M Bailey, LM Beachler, C Witt	Creating effective collaborative lear...	2009	The International Rev
64	12.10	18	A Finn	The technological dimension of a ma...	2009	Review of Research
63	12.10	14	S. Hildner, G Cheng, P Green	Virtual courses: Exploring a new dim...	2009	International Review
54	8.10	20	S Williams, B Gonzalez, M Schneider	Emerging learning and learning mod...	2011	International Review
51	8.10	15	S Mittle	Mobile learning in developing nations	2008	Review of Research
51	10.20	17	L Delgado G, M Paulsen	Transparency in cooperative online...	2009	The International Rev
40	8.10	19	T Wilson	New Vistas of Phishing Learning: Dis...	2008	Review of Research
37	11.70	23	B Hall, AP Achidi, L Elker	Using mobile phones to improve edu...	2010	International Review
36	6.10	1	O Zwaan-Balmer, F Baender, C West	Systems of distance education: review	2009	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

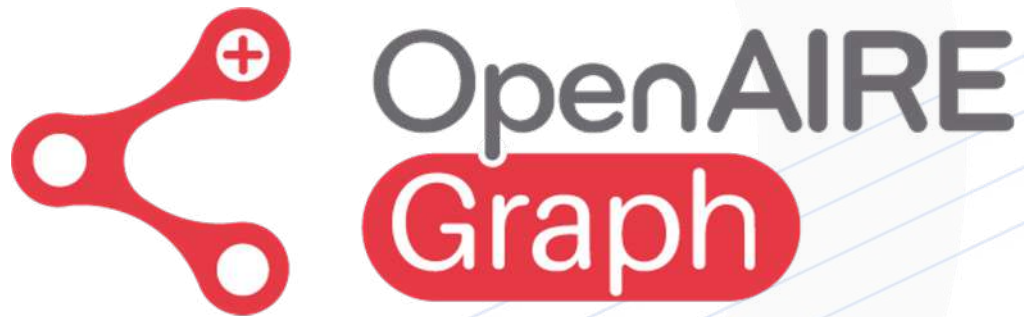


Monitoring and assessing quality, impact, and “open scienceness” of research must be a transparent, reproducible process, inclusive of research “context” and metrics

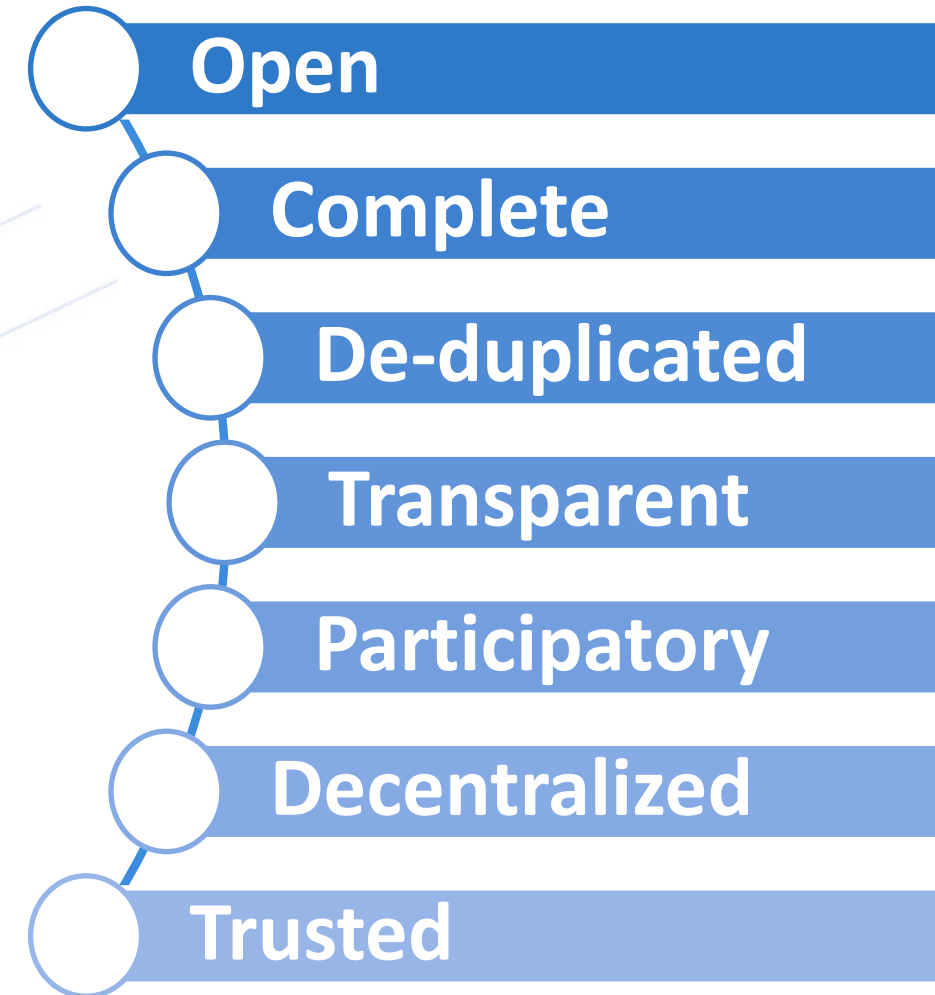


Discovery of reproducible research must find new ways, moving beyond the “article-driven” search, taking into account metrics and intent

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, 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**


 **OpenCitations**


 **Microsoft**


... 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

 **arXiv.org**

 **zenodo**
Research. Shared.

 **PubMed**

 **HAL**
archives-ouvertes.fr

... and more thematic and institutional repositories

 **RePEc**

 **egi**

 **DARIAH-EU**

 **elixir**

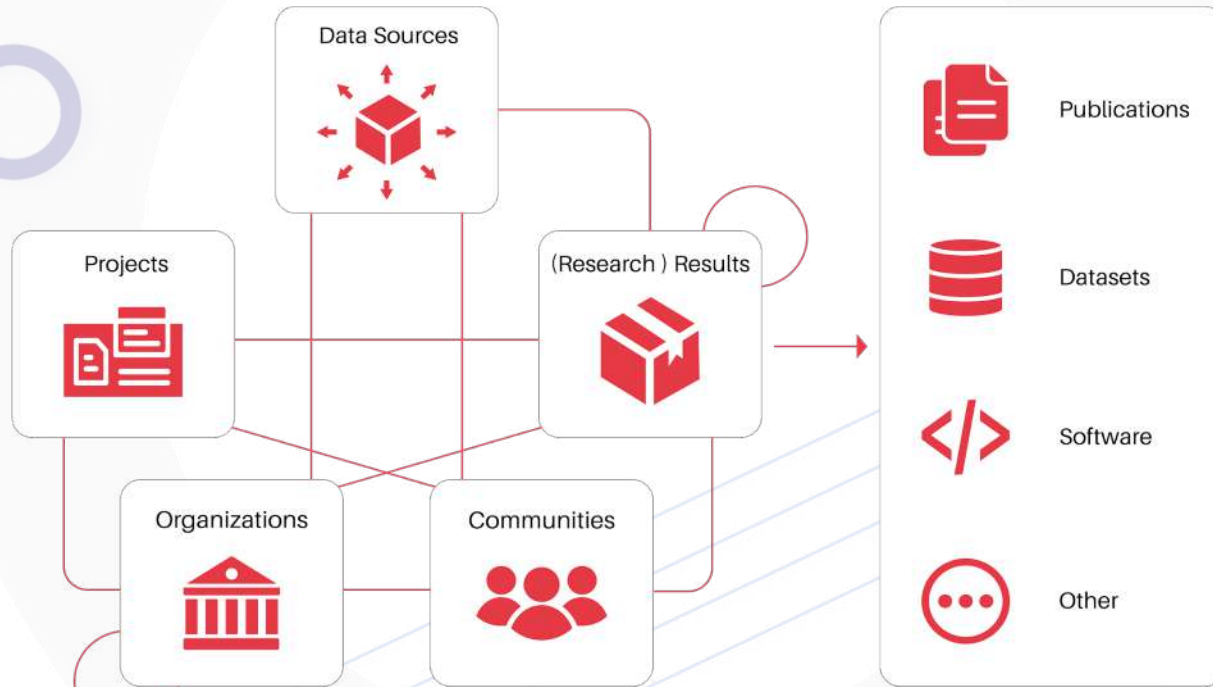
 **ECRIN**
EUROPEAN CLINICAL RESEARCH INFRASTRUCTURE NETWORK

 **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).

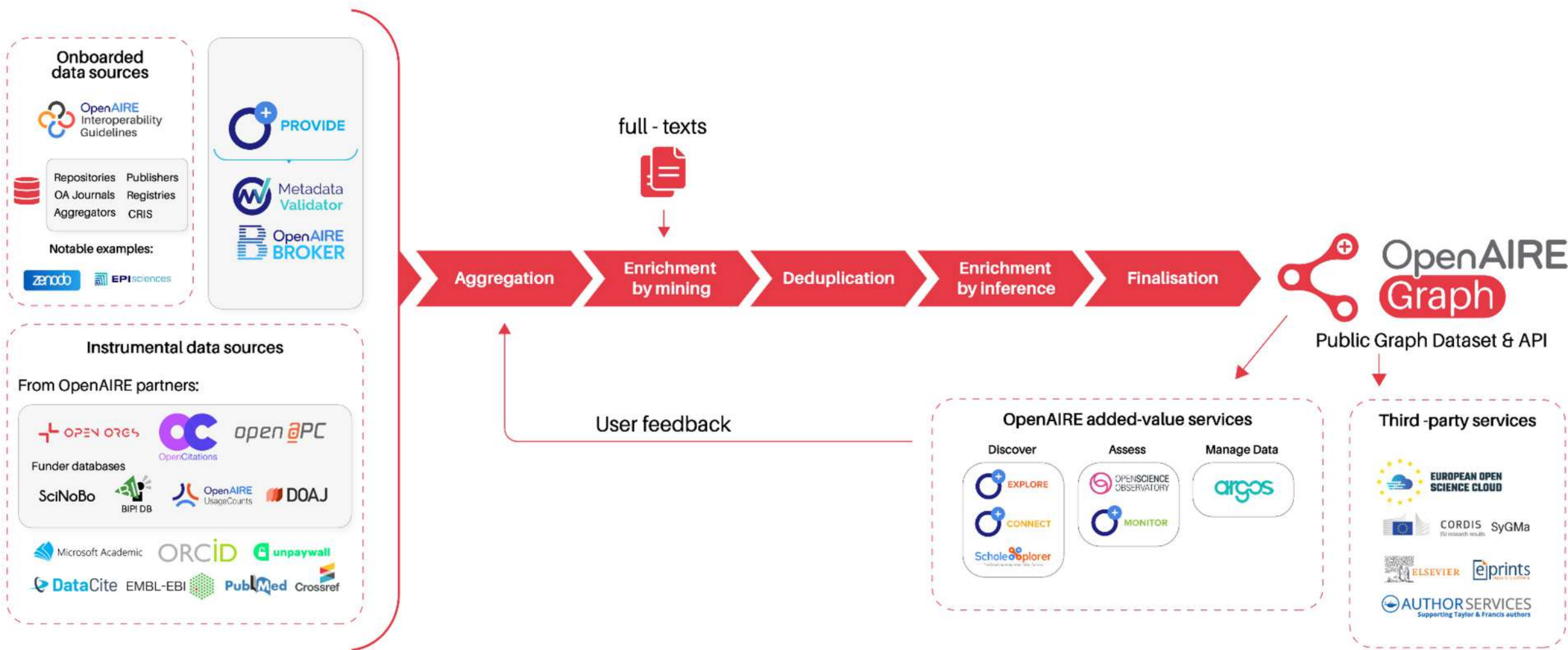
FURTHER READING
A detailed report on the OpenAIRE Graph Data Model can be found on Zenodo.

Previous: [« Overview](#)

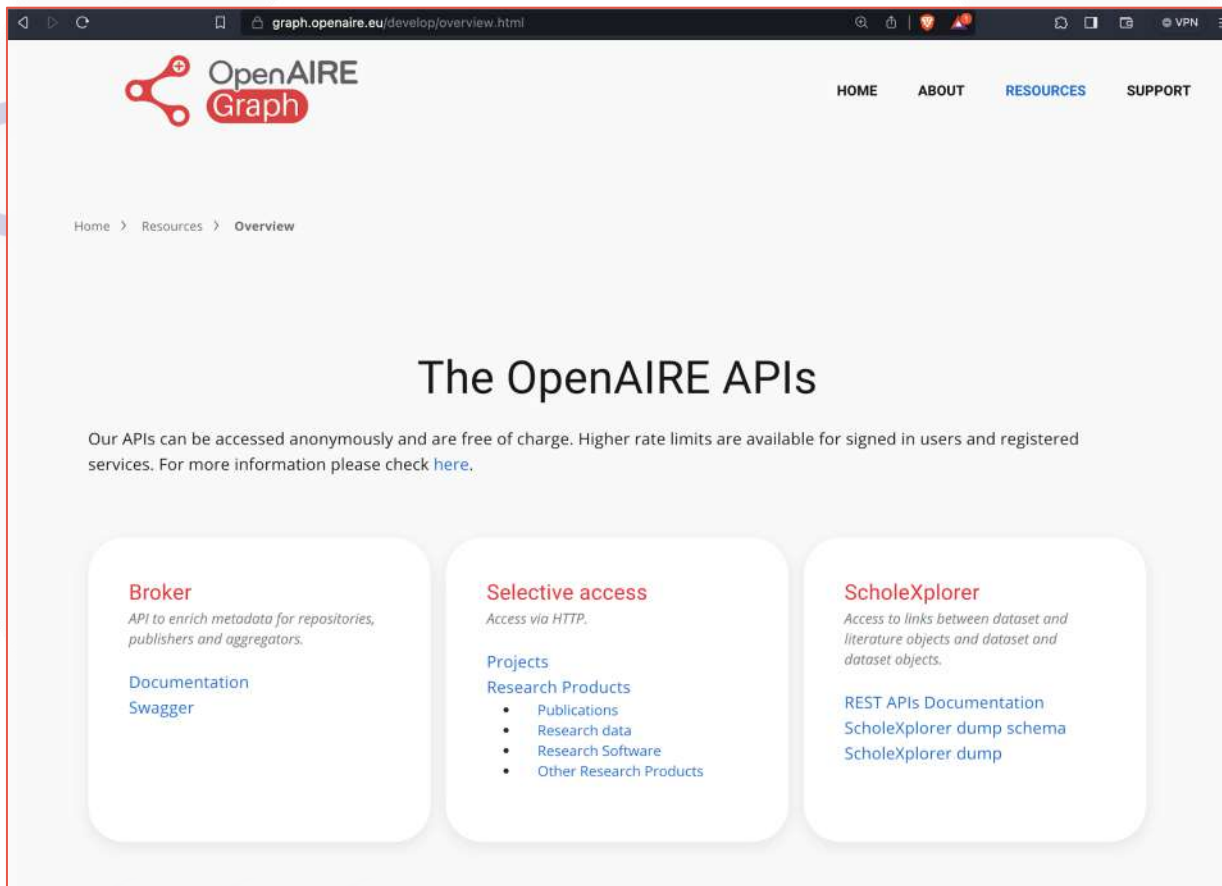
Next: [Entities »](#)

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

OpenAIRE Graph: the supply chain



Access to the OpenAIRE Graph



The screenshot shows the 'OpenAIRE Graph' developer overview page. The page title is 'The OpenAIRE APIs'. Below the title, it 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](#).' There are three main sections: 'Broker' (API to enrich metadata for repositories, publishers and aggregators), 'Selective access' (Access via HTTP, listing Projects and Research Products), and 'ScholeXplorer' (Access to links between dataset and literature objects and dataset and dataset objects, listing REST APIs Documentation, ScholeXplorer dump schema, and ScholeXplorer dump).

Datasets @

graph.openaire.eu/docs/category/downloads

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

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

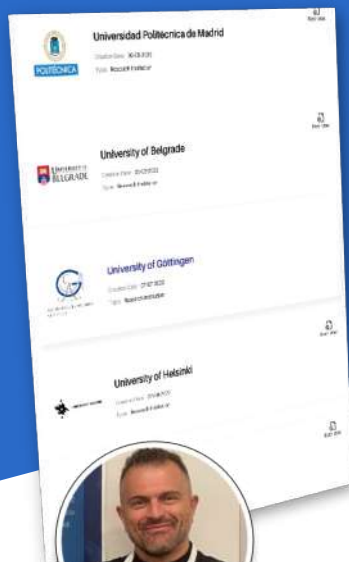
How? Methodological Principles

- **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

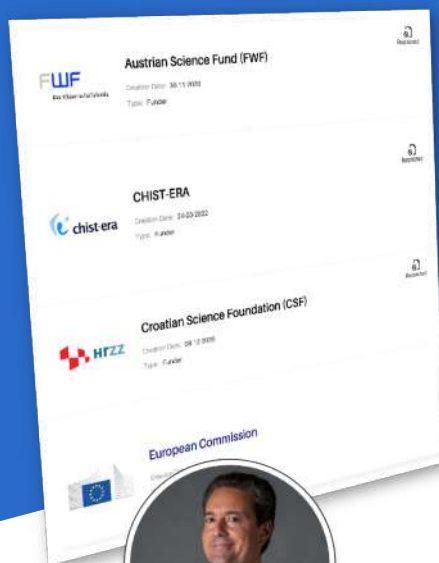


Institutions



Your OpenAIRE expert
Leonidas Pispiringas

Funders



Your OpenAIRE expert
Harry Dimitropoulos

Research Initiatives



Your OpenAIRE expert
Alessia Bardi



Countries



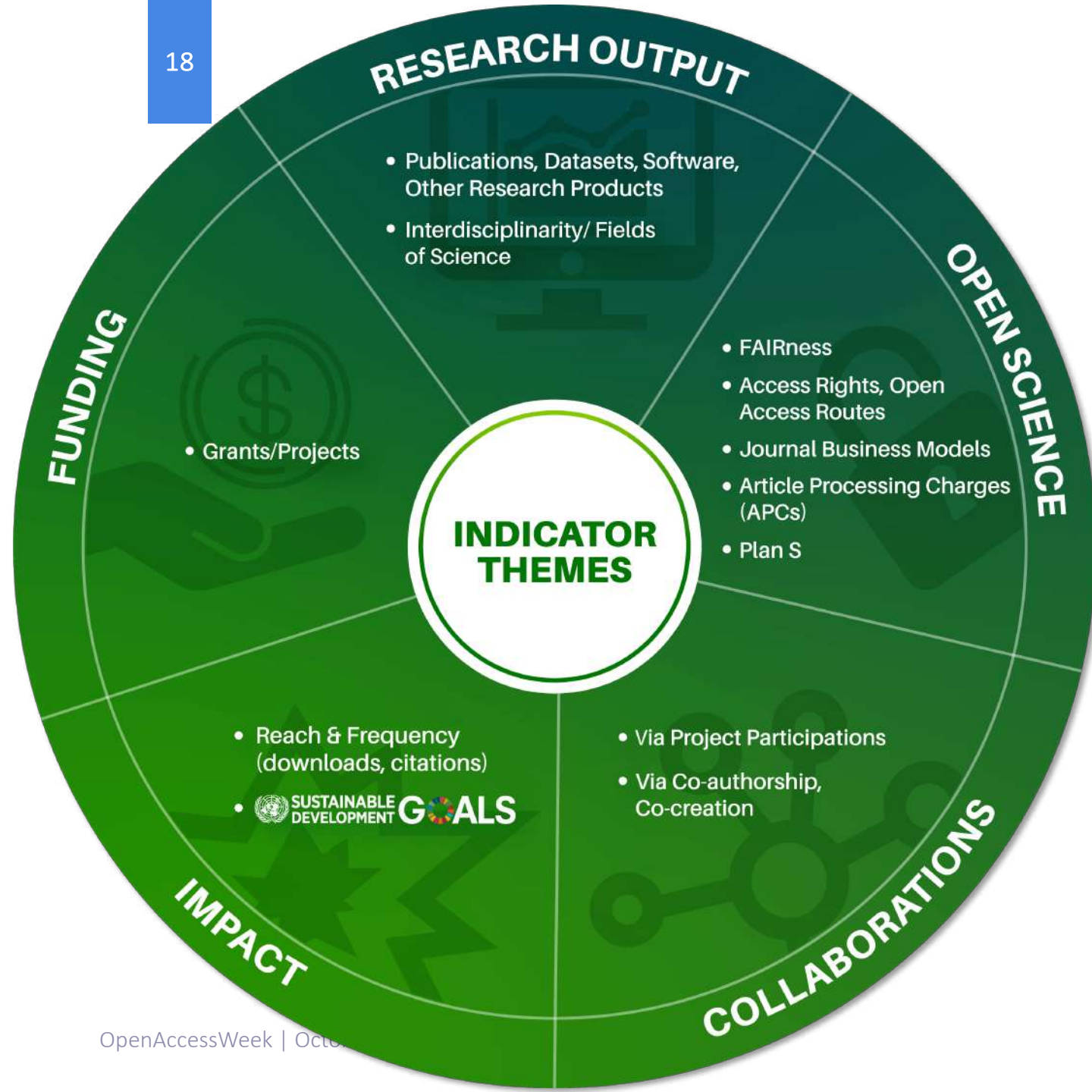
Your OpenAIRE expert
Ioanna Grypari

<https://monitor.openaire.eu>

<https://osobservatory.openaire.eu>

What?

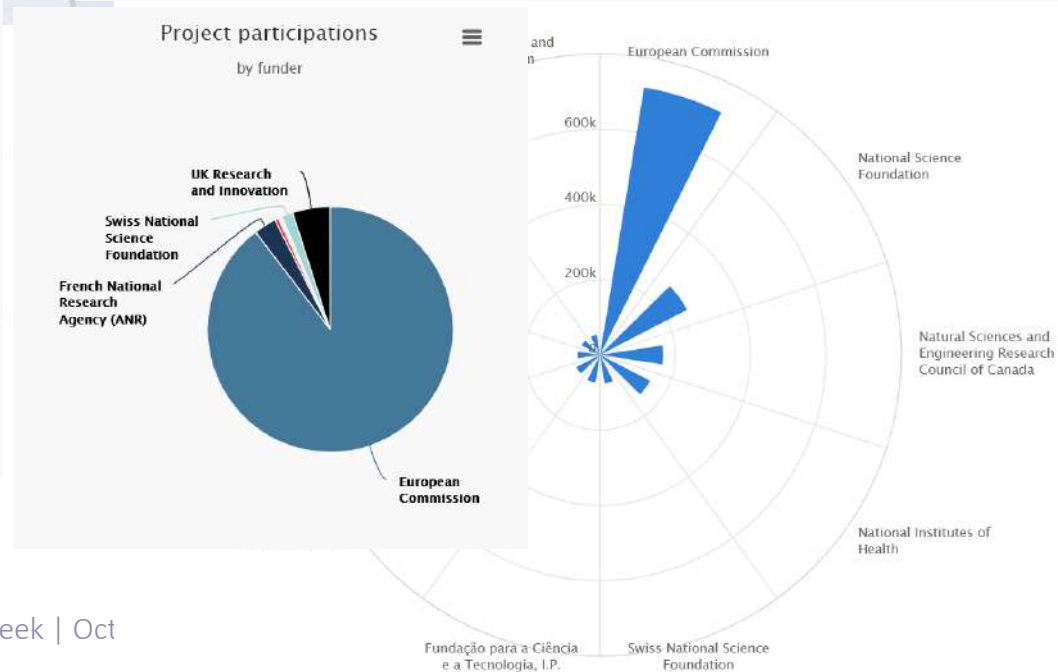
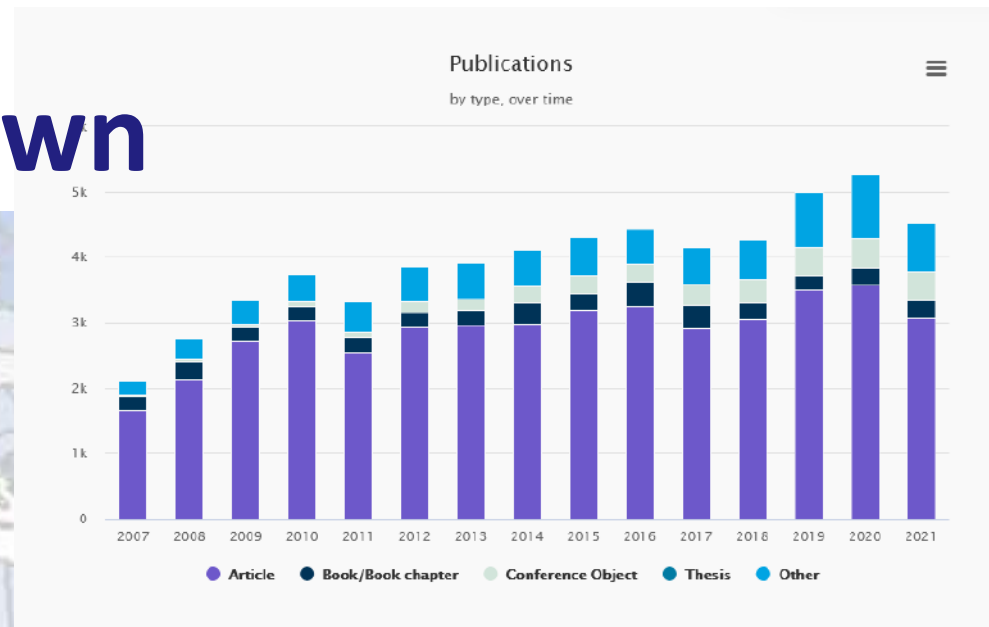
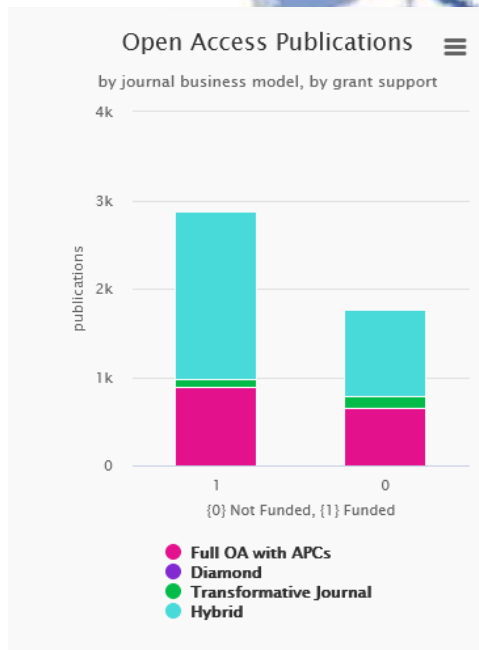
Indicator themes




What? Indicators Breakdown

By fields of interest

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



What? Features

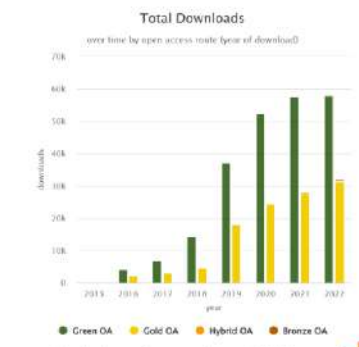
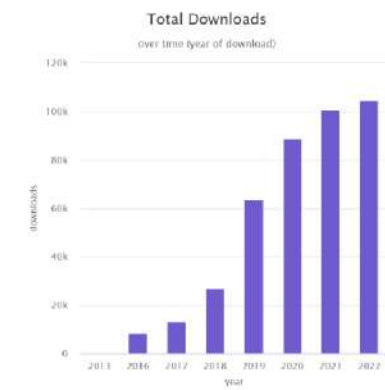
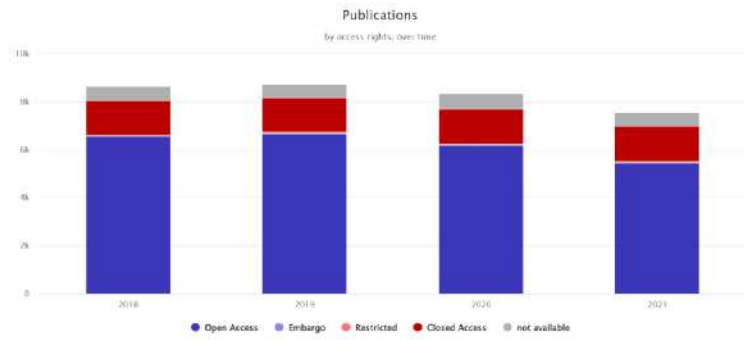
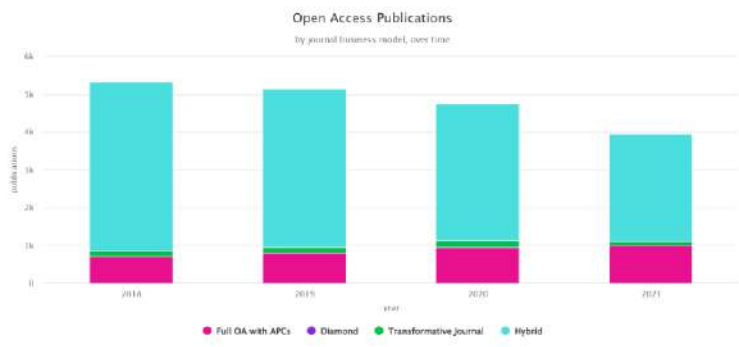
- **User-friendly** dashboards
 - interactive visualizations
 - exporting capabilities (download data & visualizations in different formats)
 - filtering
 - browsing via direct links to  EXPLORE
 - editing of visualizations
- **Control** how you share
 - **Public** indicators for external stakeholders – *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

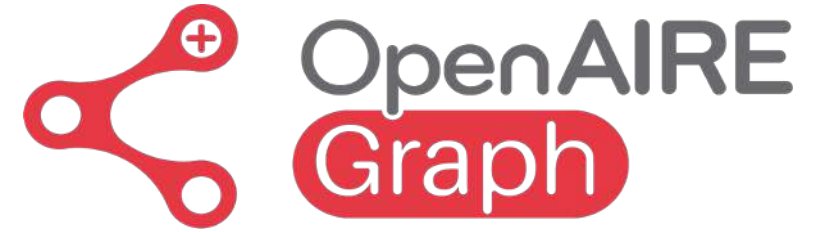
*“Not everything that counts can be counted,
and not everything that can be counted counts.”*

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

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info@openaire.eu