

# OpenAIRE Explore

## The OpenAIRE Research Graph

- Institute of Information Science and Technologies - CNR
- Paolo Manghi
- Iryna Kuchma
- EIFL

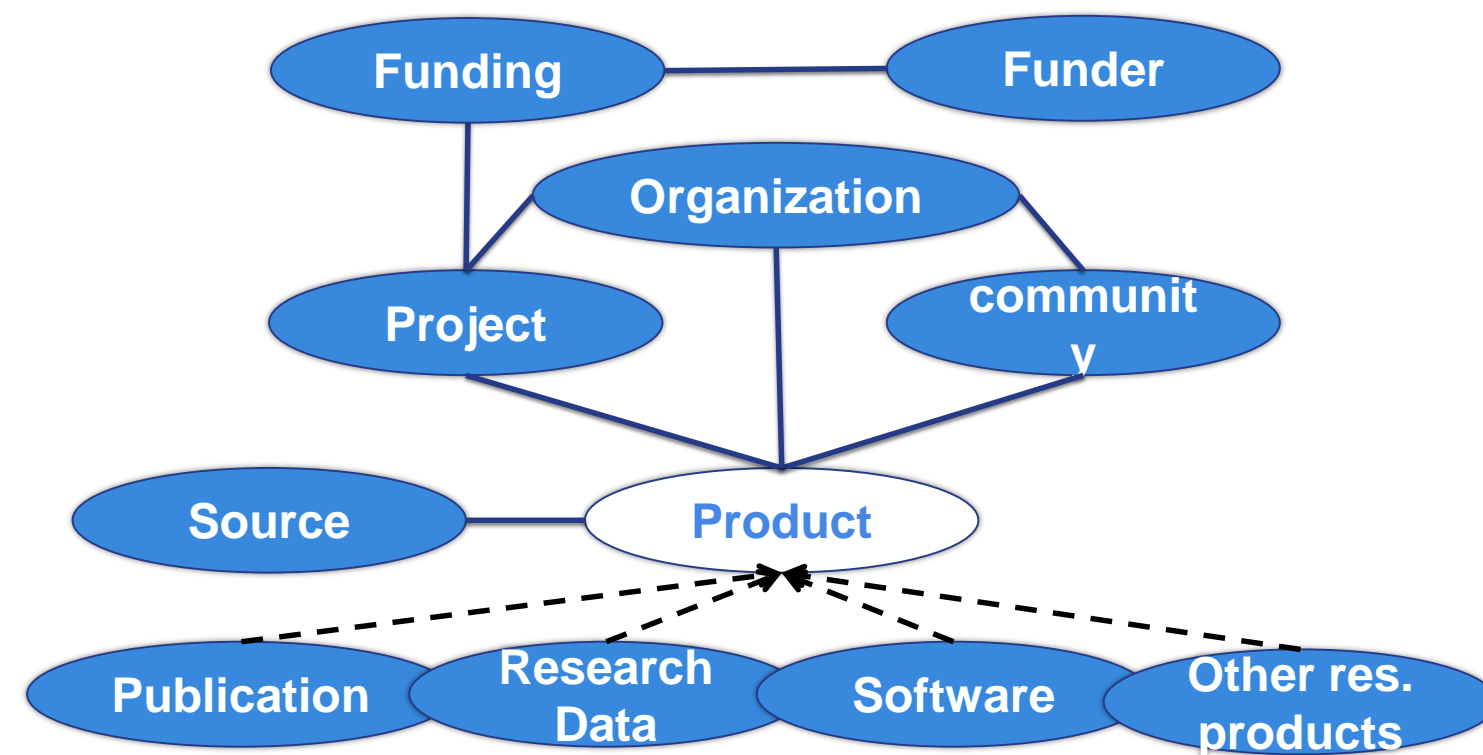
# OpenAIRE e-infrastructure

Materializing the Open Science graph

CONNECT PROVIDE EXPLORE

DEVELOP MONITOR

- Harvested data sources
  - 10K +
- Harvested records
  - 500Mi +
- Publication full-texts
  - 7.5Mi (soon 10.5Mi+)
- Harvested/mined links
  - 60Mi +



Deduplication



Harvesting

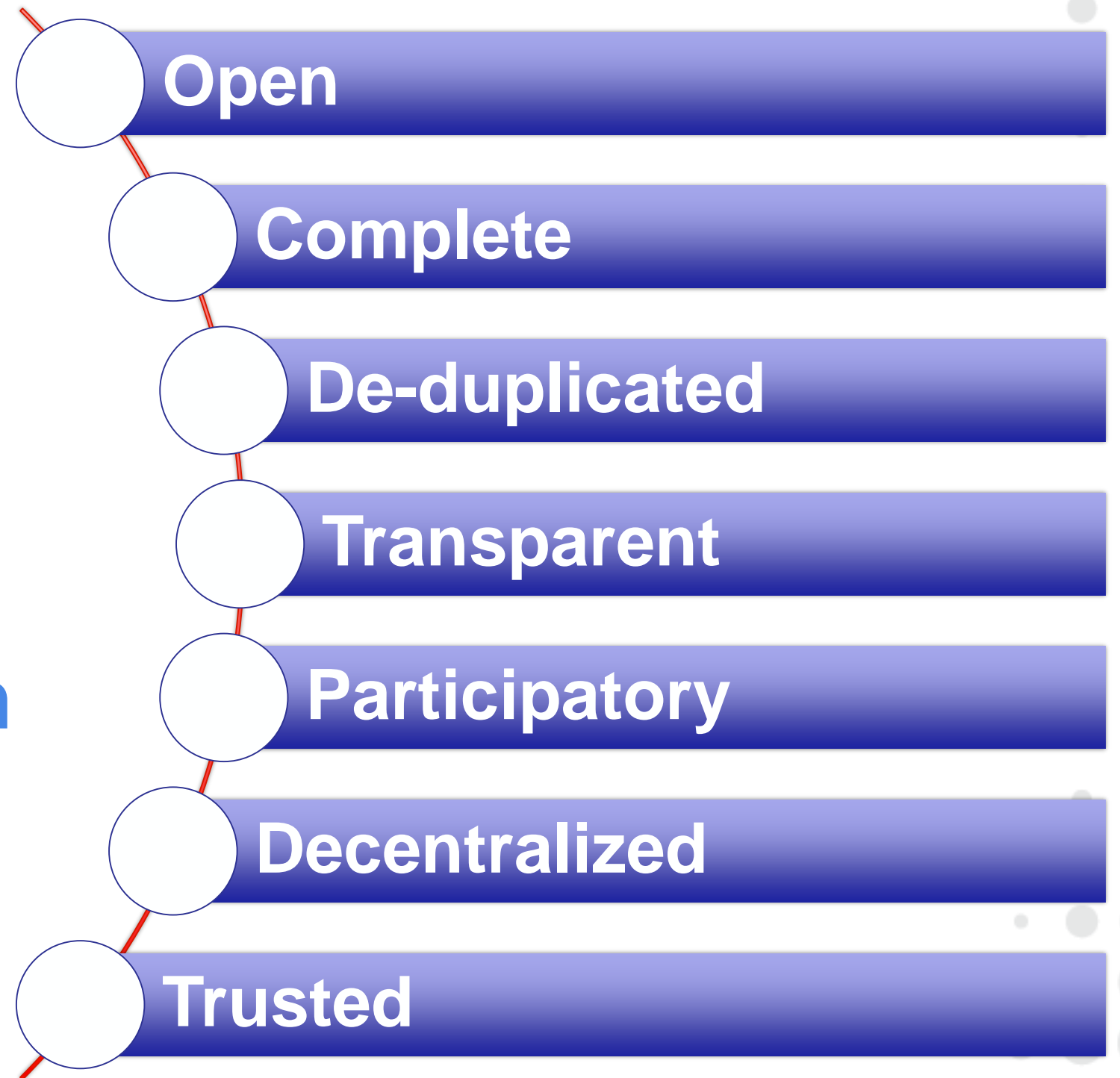


Mining



# The OpenAIRE research graph

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



# Strategic for Open Science



Making the research graph  
an **EOSC** resource

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

## Actors

Institutions, research organizations, funders,  
content providers, researchers, SMEs, etc.



## Added value services

e.g. discovery services, monitoring services



# Open metadata

Repositories

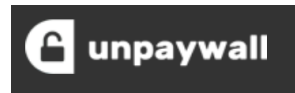
Archives

Springer

Microsoft



# Complete aggregation coverage



... and more



... and more

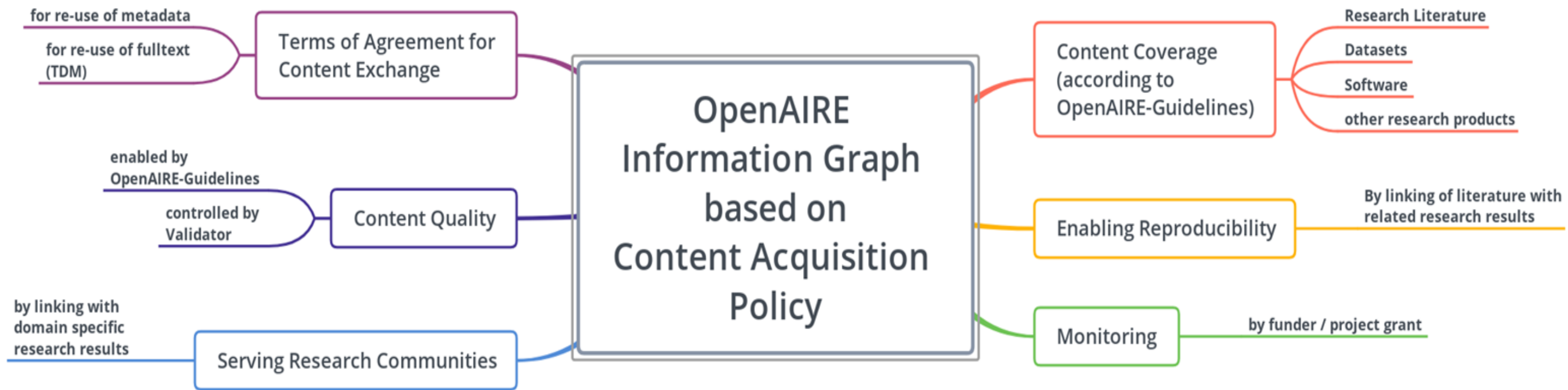


OpenDOAR



... and more

# Objectives of OpenAIRE's Aggregation Policy



Content Acquisition Policy released 05-Oct-2018, <https://doi.org/10.5281/zenodo.1446408>

# Graph construction: harvested publications (before deduplication)

Source	Property	# Publication records collected
ORCID	author IDs (ORCID)	7,340,990
MAG	DOIs	120,000,000
	affiliation (GRID.AC)	
	affiliation (Microsoft)	
	abstract	
	author ID (Microsoft)	
Unpaywall	OA URLs	90,254,461
CrossRef	all fields	95,567,407
Repositories/publishers/journals/aggregators	all fields	30,732,345



# De-duplicated

Entity type	# Collected records	# Records after cleaning and de-duplication	# Identified duplicates
Publications	~ 343M	~ 94M	~ 249 millions
Data	~ 5,2M	~4,6M	~ 600K
Software	~150K	~ 134 K	~ 20K
Other	~ 5M	~ 4,5M	~ 500K
Organisations	~ 380K	~220K	~ 160K

More information about the de-duplication framework used by OpenAIRE can be found searching on Zenodo for :

- [“De-duplicating the OpenAIRE Scholarly Communication Big Graph”](#) (poster)
- [“GDup: De-Duplication of Scholarly Communication Big Graphs”](#)



# Participatory

- Rely on quality scholarly communication sources of different kinds
- Include **solutions and content** from any interested and **known** content provider in scholarly communication

Institutional repositories  
Aggregators  
Data archives  
Software repositories  
Research infrastructure sources  
Funder grant databases  
Authors & Orgs entity registries  
Publishers & journals



# Transparent

- Metadata in the graph includes **provenance** when harvested and **reliability indicators** when obtained from mining



# Decentralized

- **Preservation** and **ownership** beyond OpenAIRE
  - Exchanged with other graph initiatives
  - Redistributed via subscription and notification to contributing data sources ([provide.openaire.eu](https://provide.openaire.eu))
- Openly accessible via APIs ([develop.openaire.eu](https://develop.openaire.eu))



# Trusted (in progress)

- Authors in the loop to enrich their ORCID record
- Validation of end-user "claims"

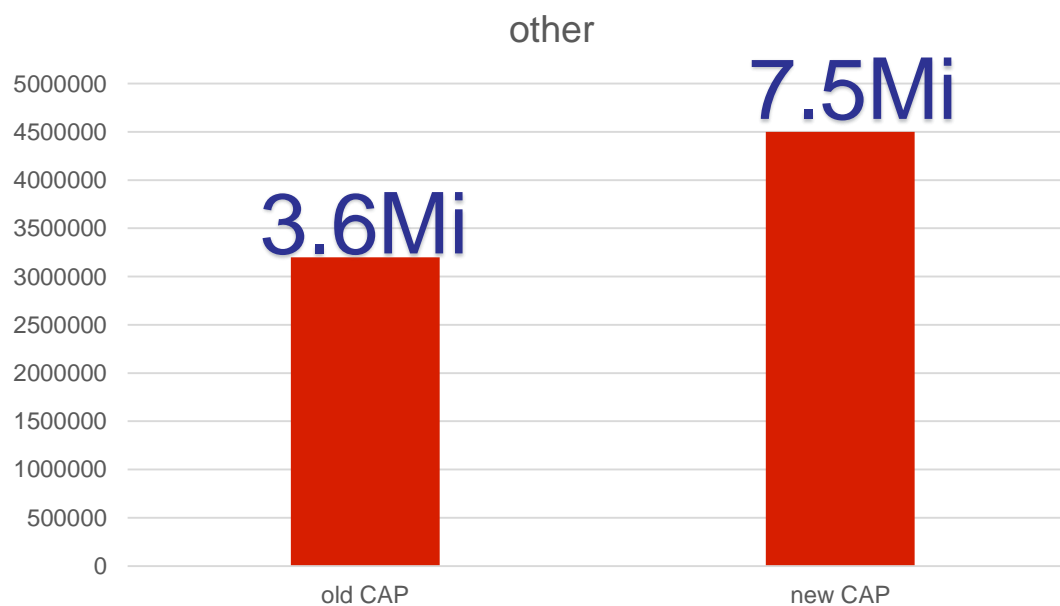
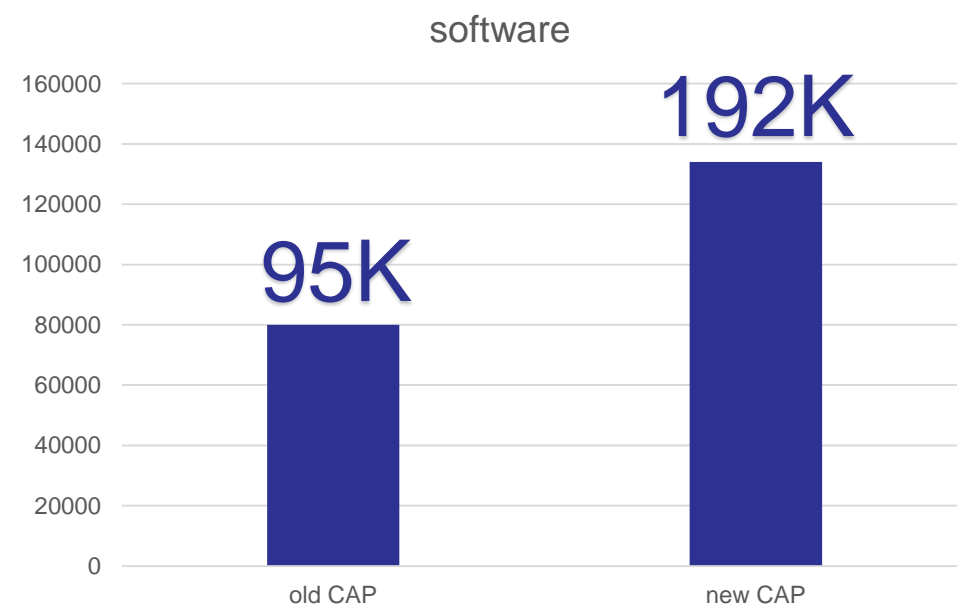
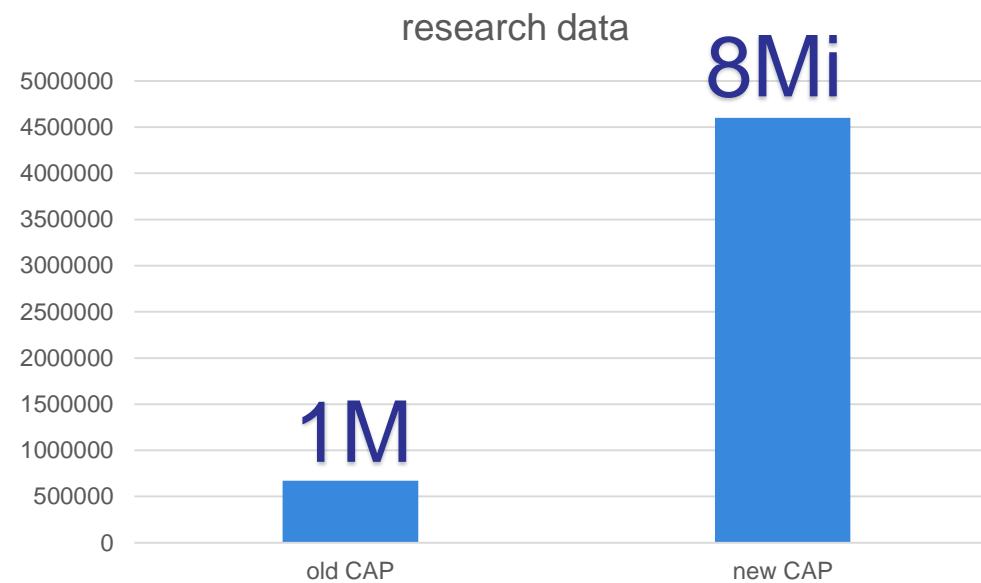
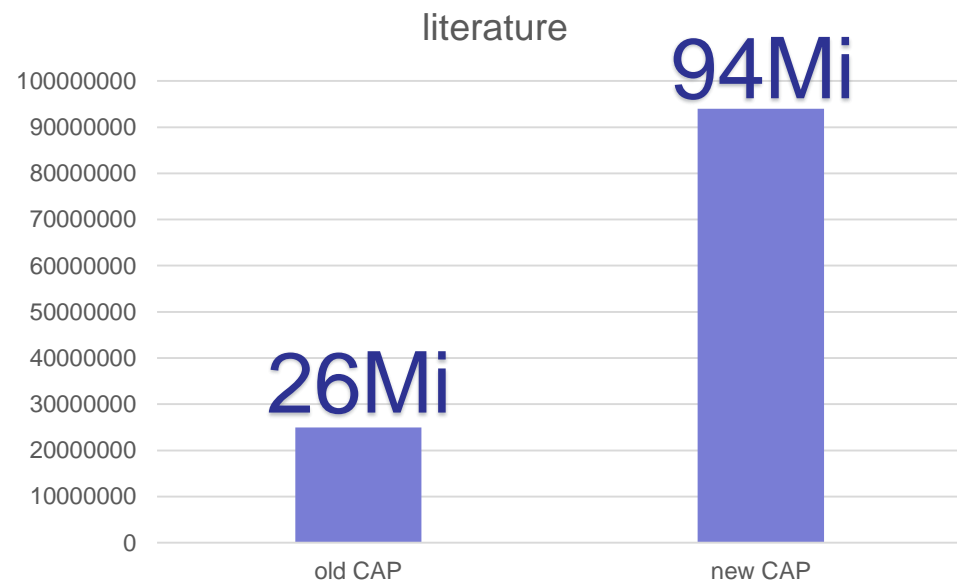
ORCID

Connecting Research  
and Researchers




# Transition from OA content acquisition policies to OS content acquisition policies

numbers from: [explore.openaire.eu](https://explore.openaire.eu) and [beta.explore.openaire.eu](https://beta.explore.openaire.eu)



120Mi  
literature-research  
data links  
**Scholar Explorer**  
The Data Literature Interlinking Service

 7.5Mi  
(10Mi+)  
Open Access PDFs  
for mining

OpenAIRE | EXPLORE

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Search in OpenAIRE for scholarly works

27 mi publications, 1 mi research data  
from 15 K content providers and 18 funders  
linked together for an integrated research  
search

<https://explore.openaire.eu>

<https://beta.explore.openaire.eu>

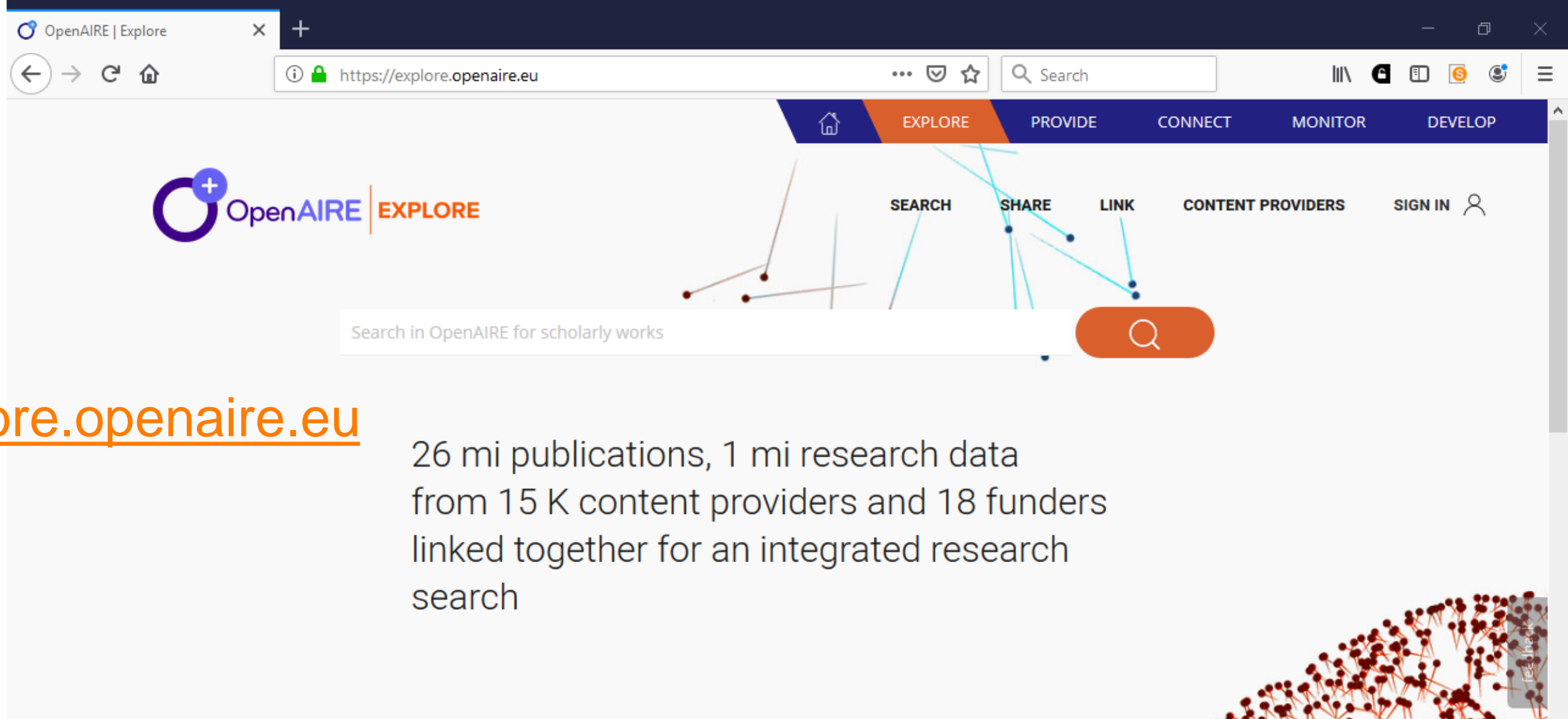
OpenAIRE | EXPLORE

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Search in OpenAIRE for scholarly works

94 mi publications, 8 mi research data  
from 9,800 content providers and 28 funders  
linked together for an integrated research  
search



<https://explore.openaire.eu>

26 mi publications, 1 mi research data from 15 K content providers and 18 funders linked together for an integrated research search



### Explore

Discover linked open research

Search for publications, datasets, software and other research products. See how these are linked together and



### Share

Deposit in a repository of your choice

Select an OpenAIRE compatible repository (2.0 +) so that your research is linked to your funding information.



### Link

Connect all your research

If you can't find your research results in OpenAIRE, don't worry!  
Use our **LINK OUT service**, that reaches out to many external



OpenAIRE | Search publications X +

https://explore.openaire.eu/search/find?keyword=armenia

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

OpenAIRE EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

armenia

Publications (5,883)

Research Data (42)

Software (0)

Other Research Products (538)

Projects (86)

Content Providers (1)

Organizations (32)

[View all 5,883 results →](#)

### Armenia : World Bank Country Survey FY 2013

REPORT ENGLISH OPEN

*World Bank; (2012)*

This country survey for FY2013 in Armenia was designed to achieve the following objectives: assist the World Bank in gaining a better understanding of how stakeholders in Armenia perceive the Bank; obtain syste...

### Empowering Armenia: Implementation of collaborative diabetes outreach project in Armenia

ARTICLE ENGLISH OPEN

*Wright, H.Z.; Hinckley, P.; Steffens, L.; Hovhannisyan, M.; (2014)*

### Armenia Country Opinion Survey Report (July 2013 - June 2014)

BOOK OPEN

feedback



# NANOMAT-EPC

Deployment of Societally Beneficial Nano- and Material Technologies in European Partnership Countries (608906)

PROJECT EC

**Funding:** FP7 | SP1 | NMP

**Start Date:** 2013-11-01

**End Date:** 2015-10-31

**Open Access mandate for Publications:** no

**Open Access mandate for Research Data:** no

**Organization:** UB | CCB | LZH | UPSud | Georgian Technical University | Intelligentsia  
IPR NAS RA | IPMS of NASU | BSUIR

[Detailed project information \(CORDIS\) →](#)

Publications (1)	+
Research Data (0)	+
Software (0)	+
Other Research Products (0)	+
Statistics	+
Metrics	+

Share - Bookmark



## Application Box

Publications Research Data

- <> Include in your site (HTML)
- ≡ Get EC report (HTML)
- ↓ Get EC report (CSV)
- ↑ Deposit

[Link this project to...](#)

feedback



# NANOMAT-EPC

Deployment of Societally Beneficial Nano- and Material Technologies in European Partnership Countries (608906)

PROJECT EC

**Funding:** FP7 | SP1 | NMP

**Start Date:** 2013-11-01

**End Date:** 2015-10-31

**Open Access mandate for Publications:** no

**Open Access mandate for Research Data:** no

**Organization:** UB | CCB | LZH | UPSud | Georgian Technical University | Intelligentsia | IPR NAS RA | IPMS of NASU | BSUIR

[Detailed project information \(CORDIS\)](#) →

Publications (1)

[Influence of reduction conditions of NiO on its mechanical and electrical properties](#)

OTHER LITERATURE TYPE ENGLISH OPEN

*Brodnikovskiy, Yehor; Vasyliv, Bogdan; Podhurska, Viktoriya; Andrzejczuk, Mariusz; McDonald, Nikkia; Kyrpa, Oleksandr; Ostash, Orest; Vasylyev, Oleksandr; Steinberger-Wilckens, Robert; Lewandowska, Malgorzata; (2016)*

Project: [EC | NANOMAT-EPC \(608906\)](#)

Share - Bookmark



## Application Box

Publications Research Data

- < > [Include in your site \(HTML\)](#)
- ≡ [Get EC report \(HTML\)](#)
- ↓ [Get EC report \(CSV\)](#)
- ↑ [Deposit](#)

[Link this project to...](#)

feedback



# Influence of reduction conditions of NiO on its mechanical and electrical properties

OTHER LITERATURE TYPE ENGLISH OPEN

*Brodnikovskiy, Yehor; Vasyliv, Bogdan; Podhurska, Viktoriya; Andrzejczuk, Mariusz; McDonald, Nikkia; Kyrpa, Oleksandr; Ostash, Orest; Vasylyev, Oleksandr; Steinberger-Wilckens, Robert; Lewandowska, Malgorzata; (2016)*

**Publisher:** International Association of Physical Chemists  
**Journal:** Journal of Electrochemical Science and Engineering, volume 6, issue 1 (eissn: 1847-9286)

[Link to Sherpa/RoMEO](#)

**Subject:** NiO; Ni; RedOx; SOFC anode

Yttria stabilized zirconia with a nickel catalyst (Ni-YSZ) is the most developed, widely used cermet anode for manufacturing Solid Oxide Fuel Cells (SOFCs). Its electro-catalytic properties, mechanical durability and performance stability in hydrogen-rich environments m... [View more](#)

- References (14) +
- Similar Research Results (2) +
- Metrics +

### Share - Bookmark



### Download from

[HRČAK - Portal of scientific journals of Croatia](#) via [HRČAK - Portal of scientific journals of Croatia](#) (Other literature type, 2016)

### Funded by

EC | NANOMAT-EPC

### Cite this publication

select a citation style

[Link this publication to...](#)

feedback

OpenAIRE | Search publications X +

https://explore.openaire.eu/search/find?keyword=Azerbaijan 110% Search

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Azerbaijan

Publications (5,463)

[View all 5,463 results →](#)

Research Data (28)

## AZƏRBAYCAN XALQ YARADICILIĞININ ÖYRƏNİLMƏSİNDƏ "AZƏRBAYCANI TƏDQIQ VƏ TƏTƏBBÖ CƏMİYYƏTİ" (ATTCY)NİN ROLÜ

ARTICLE OPEN

*XƏLİLOVA, Akifə; (2011)*

In the article is investigated the history of studing Azerbaijan folklore. The role of "Azerbaijan Investigation and Study Society" of studing Azerbaijan folklore is investigated from that point of view. The action of this "Society" studing Azerbaijan folklore is given ...

Software (0)

Other Research Products (309)

Projects (34)

Content Providers (0)

Organizations (12)

## XX ƏSR AZƏRBAYCAN ELMİ: REALLIQLAR VƏ PERSPEKTİVLƏR

ARTICLE OPEN

*KERİMOV, Mahmud; (2011)*

In the article it is said about the real position, the existing structure of Azerbaijan science, especially the main

feedback



# HP-SEE

## High-Performance Computing Infrastructure for South East Europe's Research Communities (261499)

PROJECT EC OPEN ACCESS MANDATE FOR PUBLICATIONS SPECIAL CLAUSE 39

**Funding:** FP7 | SP4 | INFRA

**Start Date:** 2010-09-01

**End Date:** 2013-08-31

**Open Access mandate for Research Data:** no

**Organization:** IPB | AZRENA | INSTITUTE OF INFORMATION AND COMMUNICATION TECHNOLOGIES | RENAM | NIIFI | GRNET | Ss.Cyril and Methodius University, Skopje | NIMRD | GRENA | IIAP NAS RA | MREN | UPT | UBL | TUBITAK

[Detailed project information \(CORDIS\)](#) →

- Publications (94) +
- Research Data (0) +
- Software (0) +
- Other Research Products (4) +
- Statistics +
- Metrics +

Share - Bookmark



### Application Box

Publications Research Data

< > [Include in your site \(HTML\)](#)

≡ [Get EC report \(HTML\)](#)

↓ [Get EC report \(CSV\)](#)

↑ [Deposit](#)

[Link this project to...](#)

feedback

OpenAIRE | Search publications X +

https://explore.openaire.eu/search/find?keyword=Belarus 110% Search

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Belarus

Publications (10,840)

[View all 10,840 results →](#)

Research Data (65)

### Belarus Country Opinion Survey Report (July 2013 - June 2014)

[BOOK](#) [OPEN](#)

*World Bank Group;*

The Country Opinion Survey for FY2013 in Belarus assists the World Bank Group (WBG) in gaining a better understanding of how stakeholders in Belarus perceive the WBG. It provides the WBG with systematic feedback from national and local governments, multilateral/bilatera...

Software (2)

Other Research Products (876)

Projects (84)

Content Providers (14)

Organizations (26)

### Baltarusijos užsienio saugumo politikos dinamika 2010 - 2016 metais

[BACHELOR THESIS](#) [LITHUANIAN](#) [OPEN](#)

*Mazolevskis, Mykolas; (2016)*

Belarus Foreign Security Policy Dynamics in 2010 - 2016. Belarus is a highly unpredictable country with a very diverse foreign security policy. This country is perceived as a strong Russian ally in almost all matters, especially security. But the truth is quite different.

feedback



SEARCH

SHARE

LINK

CONTENT PROVIDERS

SIGN IN 

Research Data (65)

Software (2)

Other Research  
Products (876)

Projects (84)

Content Providers (14)

Organizations (26)

## Belarus Synthetic Ecosystem

DATASET OPEN

*Richardson, Lee; Gallagher, Shannon; Ventura, Samuel; Eddy, Bill;***Publisher:** Zenodo

Belarus synthetic ecosystem dataset consisting of tables for persons and households. This dataset was created by the SPEW R Package using the following input data sources: GeoHive counts and IPUMS-I shapefiles and microdata.

## Cause-specific mortality data for Belarus

DATASET UNKNOWN

*Grigoriev, Pavel;***Publisher:** Figshare

Continuous time series of mortality by cause of death for Belarus (1965-2010): Data and Documentation  
For more details please refer to MPIDR WORKING PAPER WP 2012-23 "Reconstruction of continuous time series of mortality by cause of death in Belarus,...

## Results of ultrasound screening programs for thyroid nodules and thyroid cancer in Belarus after the Chernobyl accident.

DATASET UNKNOWN

*M. Drozd, Valentina; A. Saenko, Vladimir; V. Brenner, Alina; Drozdovitch, Vladimir; I. Pashkevich, Vasili; V. Kudelsky, Anatoliy; E. Demidchik, Yuri; Branovan, Igor; Shiglik, Nikolay; I. Rogounovitch, Tatiana; Yamashita, Shunichi; Biko, Johannes; Reiners, Christoph;*



OpenAIRE | Search publications X

https://explore.openaire.eu/search/find?keyword=Belarus 110%

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Belarus

Publications (10,840)

Research Data (65)

Software (2)

Other Research Products (876)

Projects (84)

Content Providers (14)

Organizations (26)

### maskrc-svg software on GitHub

SOFTWARE OPEN SOURCE

Masks recombination as detected by ClonalFrameML or Gubbins and draws an SVG

### VCFannotator software on SourceForge

SOFTWARE OPEN SOURCE

Download VCFannotator for free. Annotate SNPs in the context of Gene Annotations. A VCF file is parsed to identify genomic variations, and these variations are placed in the context of genome feature annotations. In the case that a mutation is coding, the type of coding...

feedback



SEARCH

SHARE

LINK

CONTENT PROVIDERS

SIGN IN 

Research Data (65)

Software (2)

Other Research  
Products (876)

Projects (84)

Content Providers (14)

Organizations (26)

## Informatika

JOURNAL COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [The United Institute of Informatics Problems of the National Academy of Sciences of Belarus](#)

Country: Belarus

Website URL: <http://inf.grid.by>

## Цифровая трансформация

JOURNAL COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [Establishment «The Main Information and Analytical Center of the Ministry of Education of the Republic of Belarus»](#)

Country: Belarus

Website URL: <https://dt.giac.by/>

## BSU Digital Library

INSTITUTIONAL REPOSITORY OPENAIRE BASIC (DRIVER OA)

Organization: [BSU](#)

Country: Belarus

Website URL: <http://elib.bsu.by/>OAI-PMH URL: <http://oai.elib.bsu.by/request>

## Electronic library of Belarusian State Technological University

INSTITUTIONAL REPOSITORY OPENAIRE 3.0 (OA, FUNDING)

Organization: [BSTU](#)

OpenAIRE | Search publications X +

https://explore.openaire.eu/search/find?keyword=Georgi 110% Search

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Georgia

Publications (24,269)

[View all 24,269 results →](#)

Research Data (1,102)

### Tamika "Georgia Me" Harper

CONFERENCE OBJECT ENGLISH OPEN

*Harper, Tamika "Georgia Me"; Harper, Tamika "Georgia Me"; Harper, Tamika "Georgia Me"; (2014)*

Black Student Alliance

Software (23)

Other Research Products (1,913)

Projects (12,211)

Content Providers (3)

Organizations (154)

### Georgia Country Opinion Survey Report (July 2013 - June 2014)

BOOK OPEN

*World Bank Group;*

The Country Opinion Survey for FY2013 in Georgia assists the World Bank Group (WBG) in gaining a better understanding of how stakeholders in Georgia perceive the WBG. It provides the WBG with systematic feedback from national and local governments, multilateral/bilatera...

feedback

OpenAIRE | Search publications X

https://explore.openaire.eu/search/find?keyword=Moldov 110% Search

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Moldova

Publications (7,147)

Research Data (22)

Software (0)

Other Research Products (249)

Projects (105)

Content Providers (24)

Organizations (41)

[View all 7,147 results →](#)

### Information Guide: Moldova [Romanian] - Ghidul Informativ: Moldova

BOOK ENGLISH OPEN

*EDC, Cardiff; (2016)*

Un ghid către sursele de informare despre Republica Moldova.

### Moldova Country Opinion Survey Report (July 2013 - June 2014)

BOOK OPEN

*World Bank Group;*

The Country Opinion Survey for FY2013 in Moldova assists the World Bank Group (WBG) in gaining a better understanding of how stakeholders in Moldova perceive the WBG. It provides the WBG with systematic feedback from national and local governments, multilateral/bilatera...

feedback



SEARCH

SHARE

LINK

CONTENT PROVIDERS

SIGN IN 

Research Data (22)

Software (0)

Other Research  
Products (249)

Projects (105)

Content Providers (24)

Organizations (41)

## Computer Science Journal of Moldova

JOURNAL

COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova](#)Country: [Moldova \(Republic of\)](#)Website URL: <http://www.math.md/en/publications/csjm/>

## Stiinta Agricola

JOURNAL

COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [Moldova State Agrarian University](#)Country: [Moldova \(Republic of\)](#)Website URL: <http://sa.uasm.md>

## Studia Universitatis Moldaviae: Stiinte Sociale

JOURNAL

COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [Moldova State University](#)Country: [Moldova \(Republic of\)](#)Website URL: <http://studiamsu.eu/stiinte-sociale/>

## The Moldovan Medical Journal

JOURNAL

COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: [Scientific Medical Association of Moldova](#)Country: [Moldova \(Republic of\)](#)Website URL: <http://www.moldmedijournal.md>

OpenAIRE | Search publications X

https://explore.openaire.eu/search/find?keyword=Ukraine 110%

EXPLORE PROVIDE CONNECT MONITOR DEVELOP

EXPLORE

SEARCH SHARE LINK CONTENT PROVIDERS SIGN IN

Advanced search

Ukraine

Publications (76,473)

[View all 76,473 results →](#)

Research Data (139)

### Algorithms of Mobile Network Development Using Software-Defined Radio Technology

PART OF BOOK OR CHAPTER OF BOOK ENGLISH OPEN

*Globa, Larysa; Kurdecha, Vasyl; (2012)*

Software (0)

Other Research Products (3,256)

Projects (452)

### Sustainable Development Global Simulation: Analysis of Quality and Security of Human Life

PART OF BOOK OR CHAPTER OF BOOK ENGLISH OPEN

*Zgurovsky, Michael; (2012)*

Content Providers (230)

Organizations (174)

### Enhancement of Heat Transfer in the Bundles of Transversely-Finned Tubes

PART OF BOOK OR CHAPTER OF BOOK ENGLISH OPEN

feedback



SEARCH

SHARE

LINK

CONTENT PROVIDERS

SIGN IN 

Research Data (139)

Software (0)

Other Research  
Products (3,256)

Projects (452)

Content Providers (230)

Organizations (174)

## Наукова електронна бібліотека періодичних видань НАН України (Vernadsky National Library of Ukraine)

PUBLICATION REPOSITORY

OPENAIRE BASIC (DRIVER OA)

Organization: Vernadsky National Library of Ukraine

Country: Ukraine

Website URL: <http://dspace.nbu.gov.ua/>OAI-PMH URL: <http://dspace.nbu.gov.ua/oai/request>

## Рукописна та книжкова спадщина України

JOURNAL

UNDER VALIDATION

Organization: Vernadsky National Library of Ukraine

Country: Ukraine

Website URL: <http://rksu.nbu.gov.ua>OAI-PMH URL: <http://rksu.nbu.gov.ua/identify.xml>

## Biotechnologia Acta

JOURNAL

COLLECTED FROM A COMPATIBLE AGGREGATOR

Organization: National Academy of Sciences of Ukraine and Palladin Institute of Biochemistry of the National Academy of Sciences of Ukraine.

Country: Ukraine

Website URL: <http://biotechnology.kiev.ua/>

## Ukrainian Biochemical Journal

feedback

# WHAT COMES NEXT



# EXPLORE

- Integration with ORCID «Search and Link Wizard»
- Product user groups to gather feedback and improve usability
  - Moving from keyword search to semantic search



# Thank you!

**Iryna Kuchma**

[iryna.kuchma@eifl.net](mailto:iryna.kuchma@eifl.net)

