Connecting Science and Business

Prof. Paweł Rowiński

Professor of Earth Sciences at the Institute of Geophysics, Polish Academy of Sciences, Poland

Poland–Canada Conference
New Economic Opportunities and Transatlantic Partnership
Greater Toronto Area
November 27 2025

CANADA POLAND Chamber of Commerce

Bliżej Polski Fundacja

The project is co-financed under the patronage of the Senate of the Republic of Poland in support of the Polish diaspora and Poles abroad in 2025.

Zadanie dofinansowane w ramach sprawowania opieki Senatu Rzeczypospolitej Polskiej nad Polonią i Polakami za granicą w 2025 roku.

Connecting Science and Business: Insights from Poland

Examples from Earth Sciences

Prof. Paweł M. Rowiński

Director of Institute

President of ALLEA, the European Federation of Academies of Sciences and Humanities

Chair of European Division of IAHR, The International Association for Hydro-Environment Engineering and Research

Institute of Geophysics
Polish Academy of Sciences

From overall picture to specific examples

Institute of Geophysics
Polish Academy of Sciences

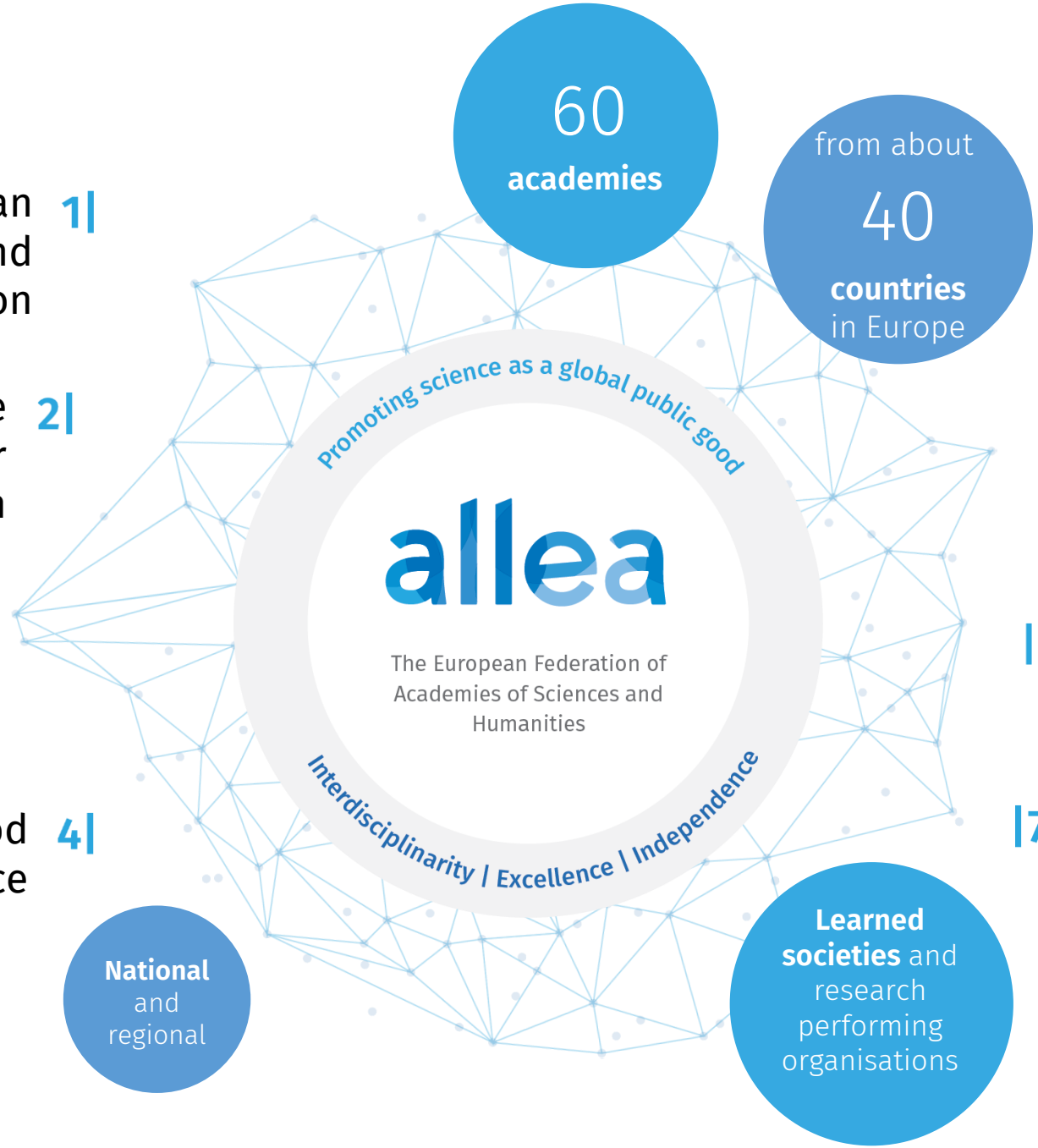
ALLEA AT A GLANCE

Serving European Academies and Facilitating Cooperation 1|

Shaping the Conditions for Research 2|

Providing Scientific Advice to Policy and Society 3|

Facilitating Good Research Practice 4|



|5 **Defending** Academic Freedom and Trustworthy Science

|6 **Strengthening** Diversity and Inclusivity

|7 **Thinking** and Acting Globally

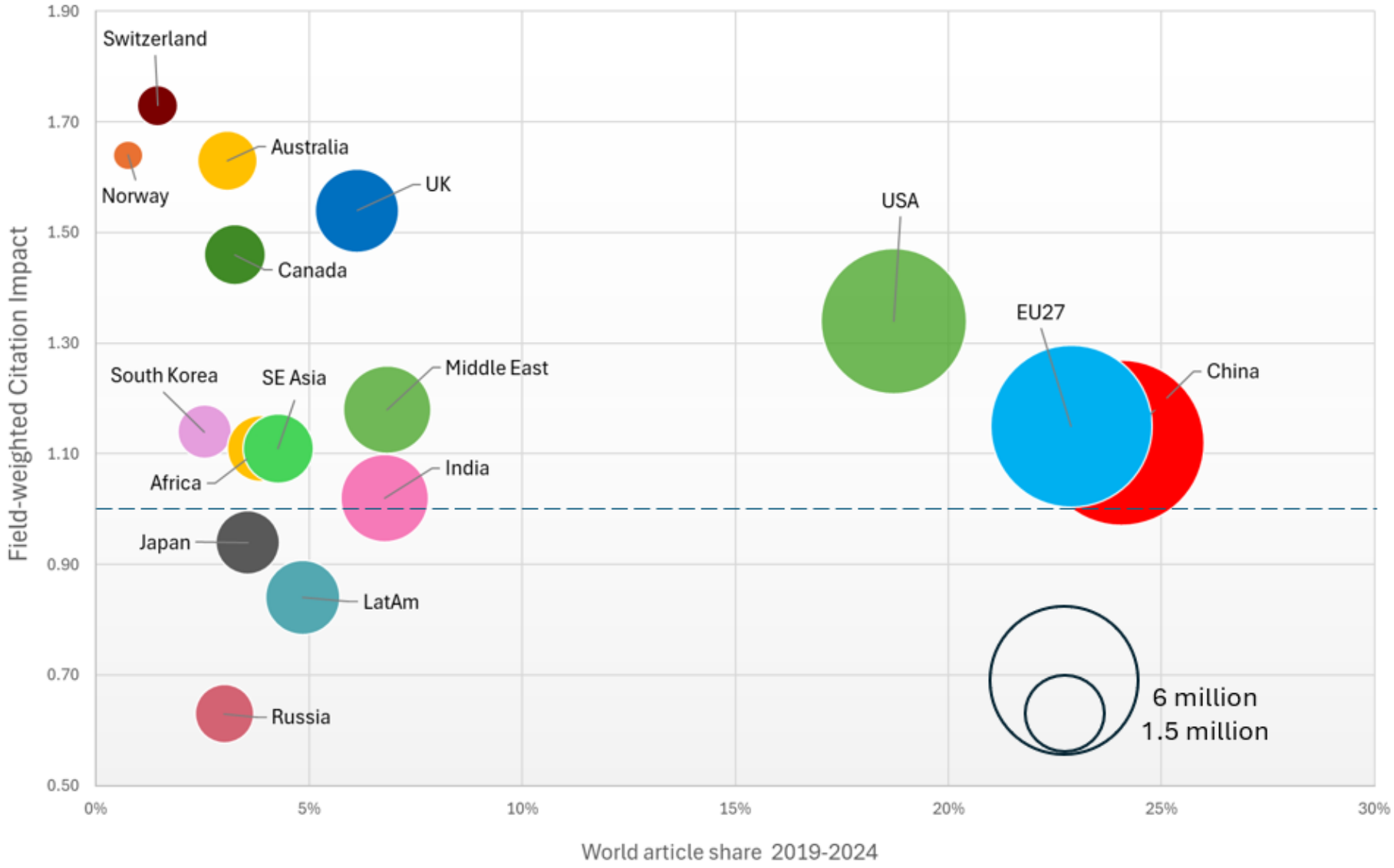
Institute of Geophysics
Polish Academy of Sciences

Science/Innovation in Europe

in Poland

Institute of Geophysics
Polish Academy of Sciences

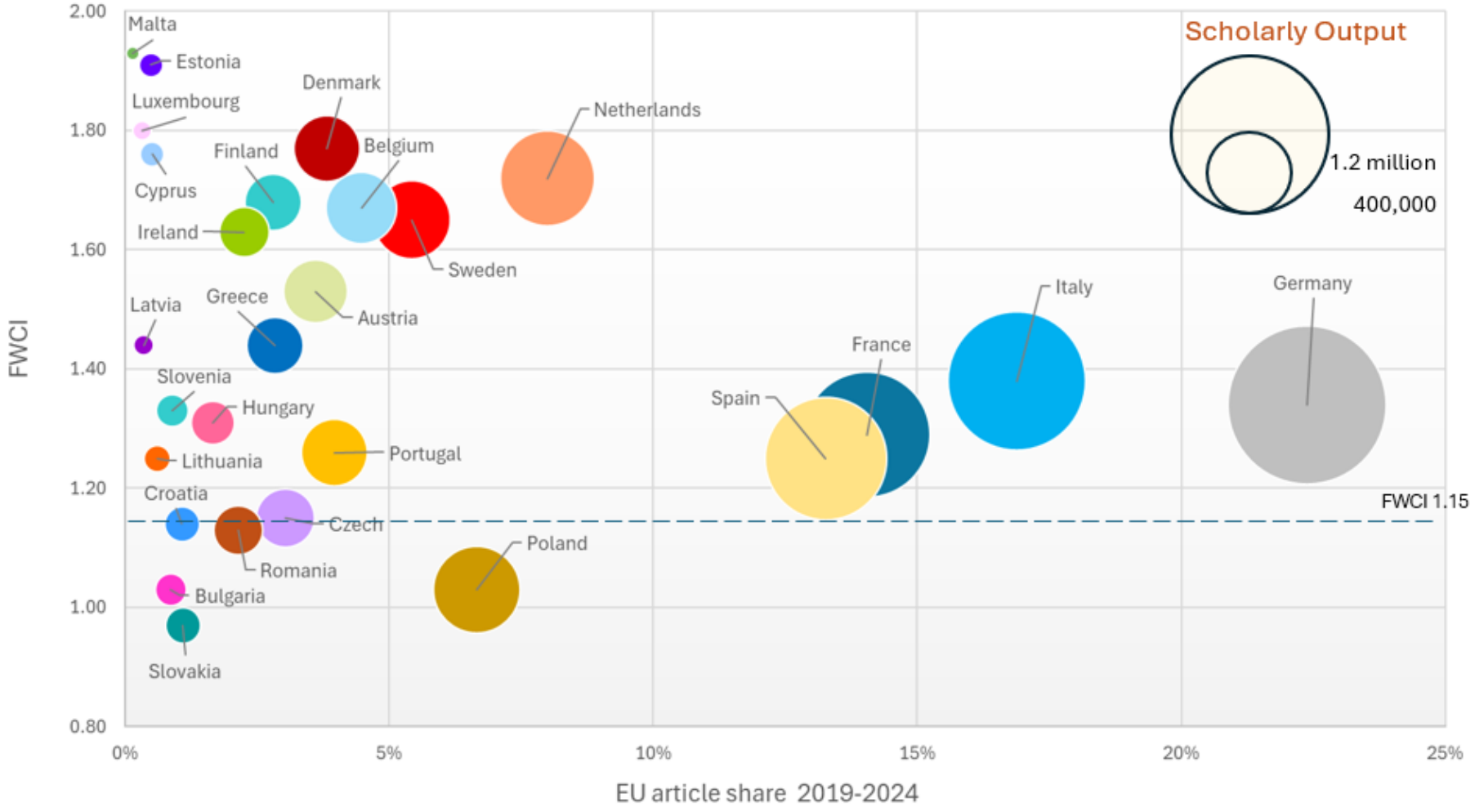
Europe in the World



Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

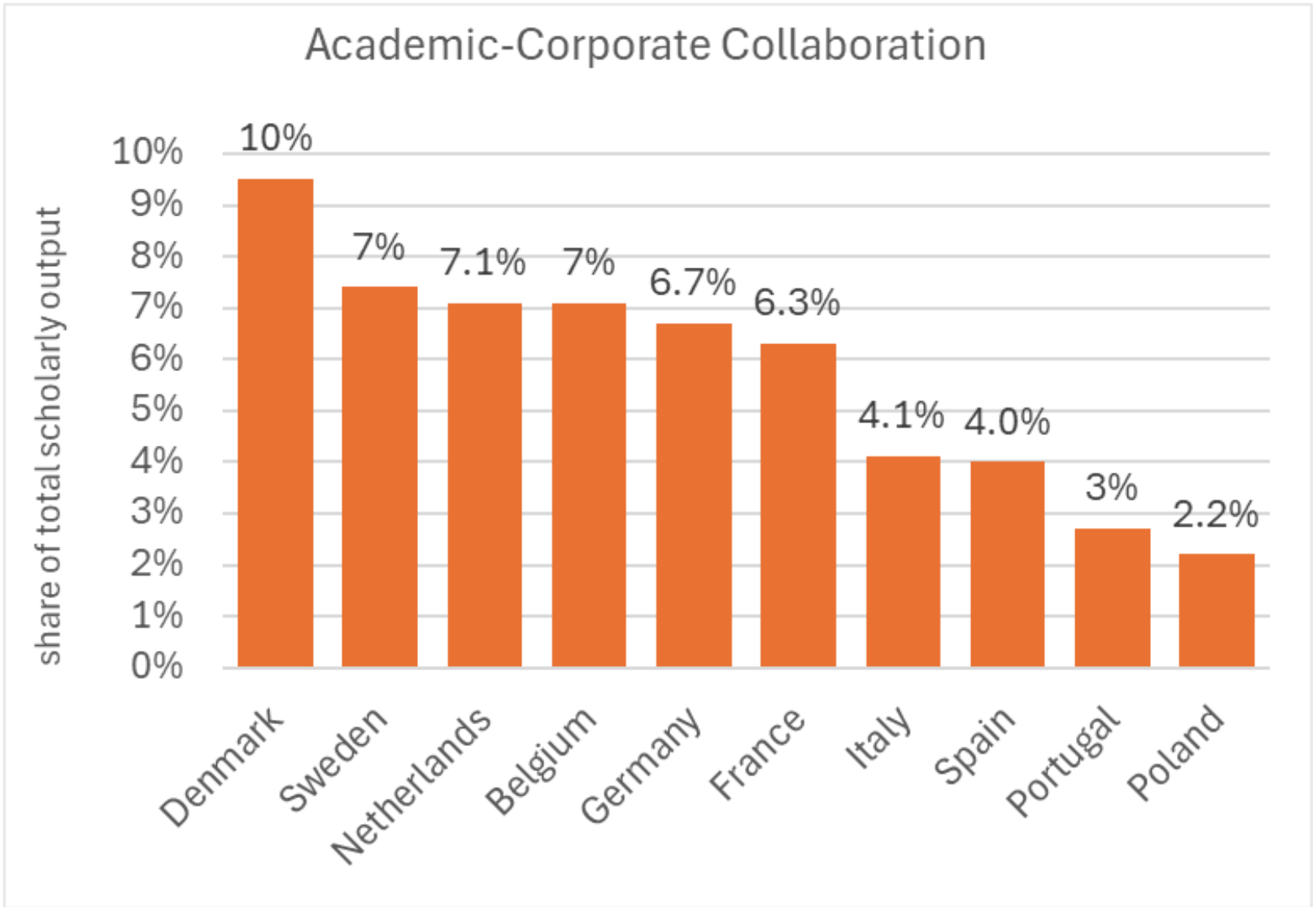
The Output and FWCI of EU27 countries, 2019-2024



Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

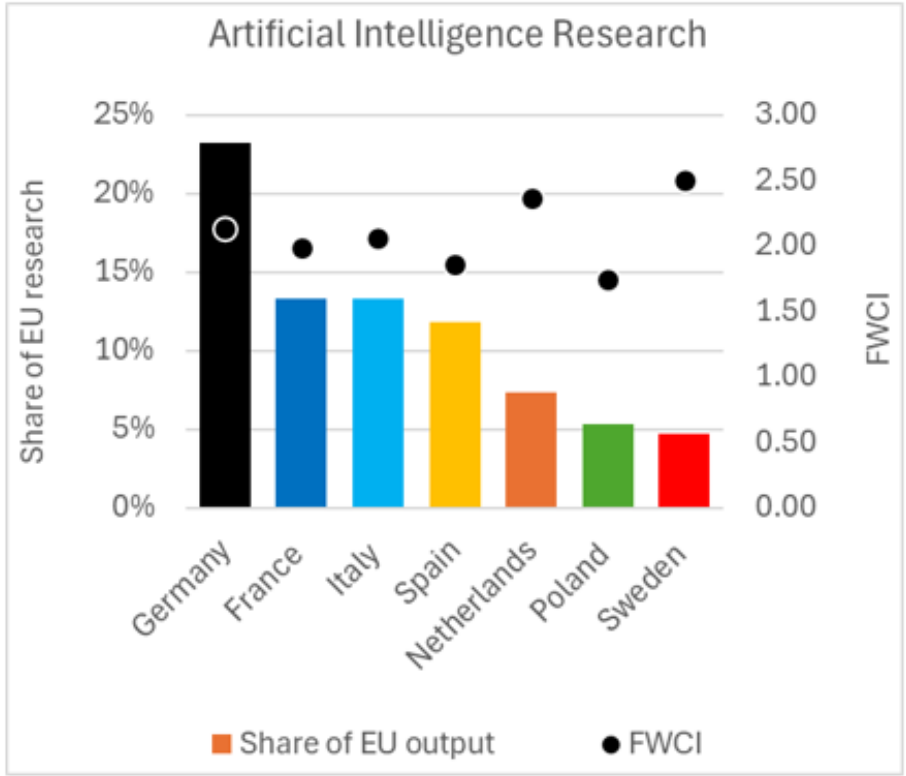
10 most prolific countries in the EU: Academic-Corporate Collaboration.



Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

7 most prolific countries, universities and industries in Artificial Intelligence in the EU.

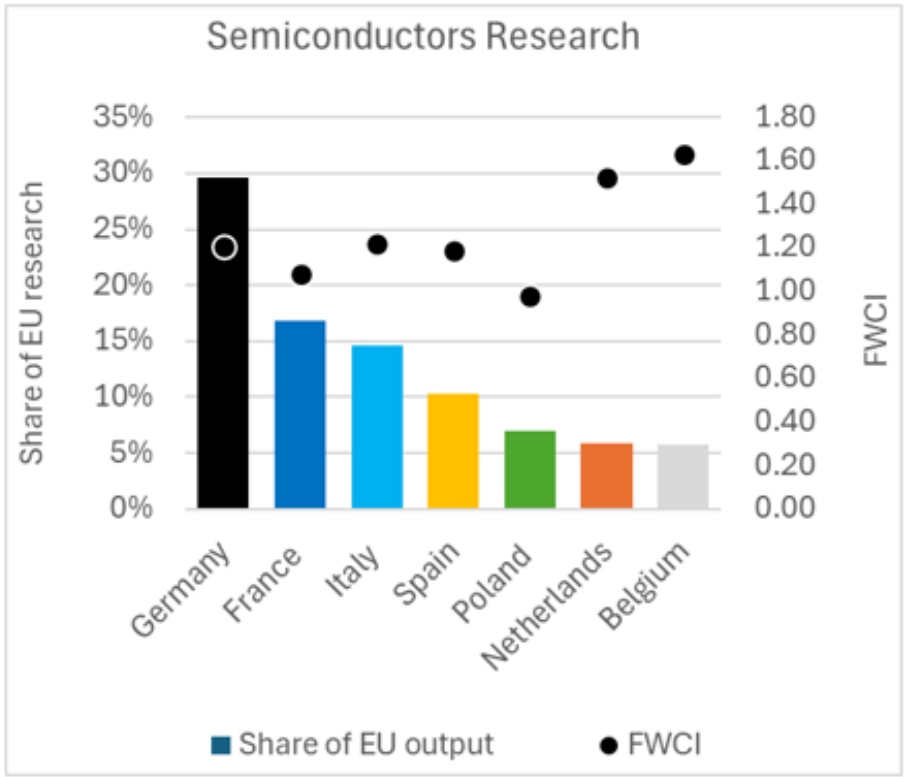


Universities		Scholarly Ouptut	FWCI
DEU	Technical University of Munich	4,205	2.96
FRA	Université Paris-Saclay	2,690	1.98
NDL	Delft University of Technology	2,443	2.28
ITA	Polytechnic University of Milan	2,304	2.00
BEL	KU Leuven	2,214	2.55
DEU	RWTH Aachen University	2,133	2.41
FRA	Sorbonne Université	2,054	2.30

Corporates		Scholarly Ouptut	FWCI
DEU	Siemens	892	1.93
NDL	Koninklijke Philips N.V.	542	2.24
FIN	Nokia	526	2.16
SWE	Ericsson AB	435	1.58
DEU	Robert Bosch GmbH	416	2.12
ESP	TECNALIA	273	3.72
DEU	Volkswagen AG	265	1.53

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

most prolific countries, universi/es and industries in Semiconductors in the EU



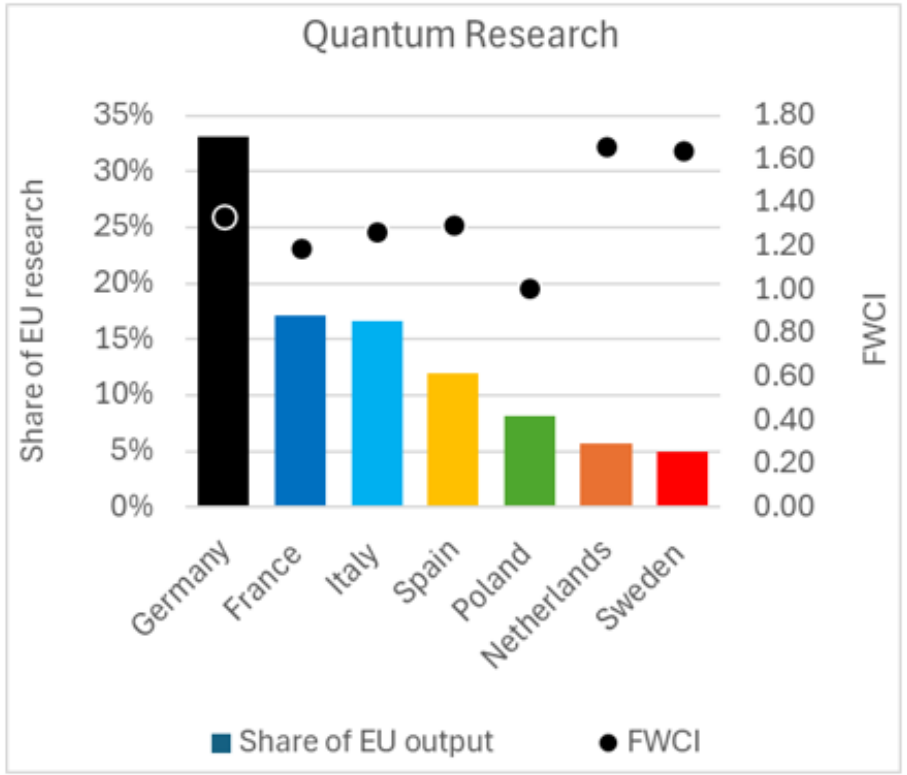
Universities		Scholarly Ouptut	FWCI
FRA	Université Grenoble Alpes	2,832	1.19
BEL	Interuniversitair Micro-Elektronica Centrum	2,530	1.82
FRA	Université Paris-Saclay	2,492	1.10
POL	Polish Academy of Sciences	1,798	0.93
DEU	Technische Universität Dresden	1,791	1.39
NDL	Delft University of Technology	1,525	1.85
BEL	KU Leuven	1,512	1.59

Corporates		Scholarly Ouptut	FWCI
DEU	Infineon Technologies AG	1,071	1.21
FRA	Thales	667	1.56
FIN	Nokia	317	1.40
NDL	NXP Semiconductors	230	0.88
DEU	Robert Bosch GmbH	212	0.91
DEU	Siemens	172	1.02
AUT	Silicon Austria Labs GmbH	172	1.03

Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

7 most prolific countries, universi/es and industries in Quantum in the EU.



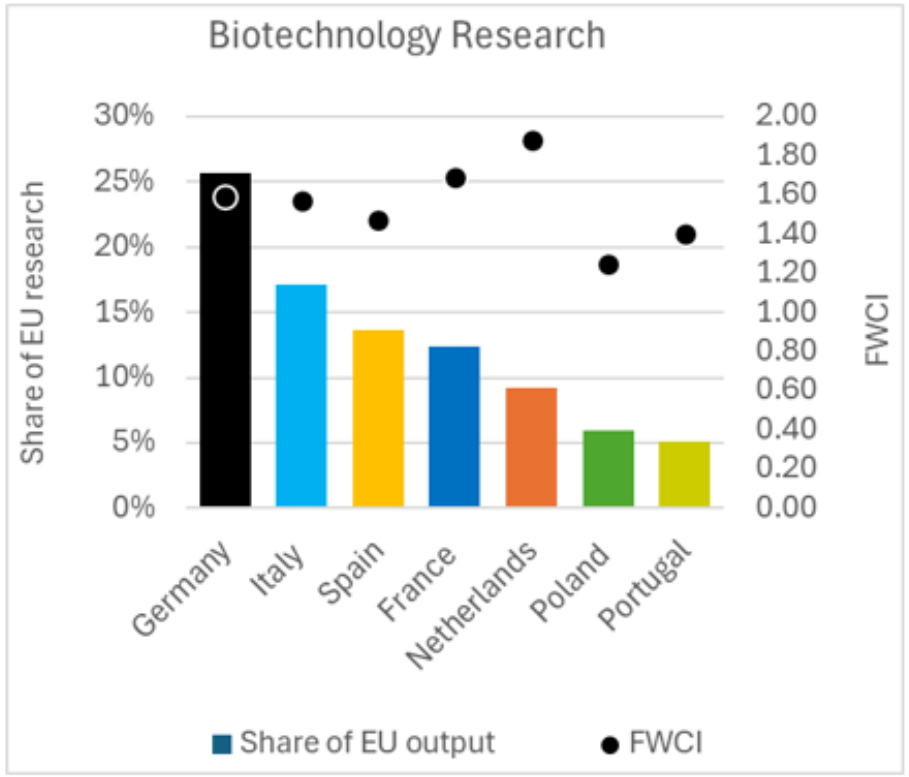
Universities		Scholarly Ouptut	FWCI
FRA	Université Paris-Saclay	2,973	1.32
FRA	Sorbonne Université	2,642	1.37
DEU	Technical University of Munich	2,276	1.69
FRA	Université PSL	1,992	1.43
POL	Polish Academy of Sciences	1,839	1.01
DEU	Ludwig Maximilian University of Munich	1,814	1.76
FRA	Université Grenoble Alpes	1,752	1.33

Corporates		Scholarly Ouptut	FWCI
FRA	Thales	203	1.62
DEU	Siemens	74	3.15
FIN	Nokia	70	1.28
DEU	Deutsche Telekom	59	1.62
DEU	BASF	55	12.82
DEU	Infineon Technologies AG	55	1.74
ESP	TECNALIA	49	1.26

Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

7 most prolific countries, universi@es and industries in Quantum in the EU



Universities		Scholarly Ouptut	FWCI
ESP	Instituto de Salud Carlos III	1,802	1.60
FRA	Université Paris Cité	1,488	2.35
DKN	Technical University of Denmark	1,339	1.88
FRA	Université Paris-Saclay	1,271	1.61
DEU	Technical University of Munich	1,210	1.62
FRA	Sorbonne Université	1,181	1.81
NLD	Utrecht University	1,118	2.55

Corporates		Scholarly Ouptut	FWCI
AUT	Austrian Centre of Industrial Biotechnology GmbH	256	1.03
DEU	Boehringer Ingelheim GmbH	252	1.85
DNK	Novo Nordisk Foundation	238	1.75
FRA	Sanofi-Aventis	170	2.23
DEU	Merck KGaA	153	1.57
DEU	Bayer AG	143	2.29
DEU	Roche Diagnostics GmbH	116	1.19

Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

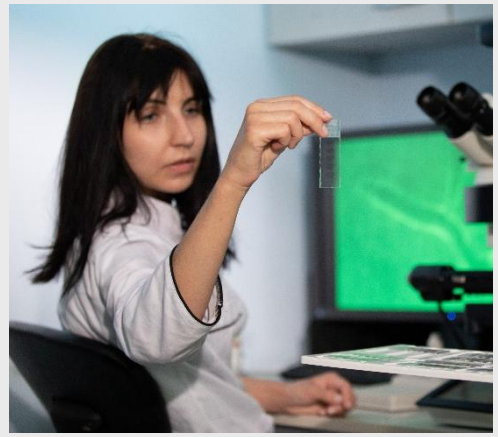
Conclusions from Report

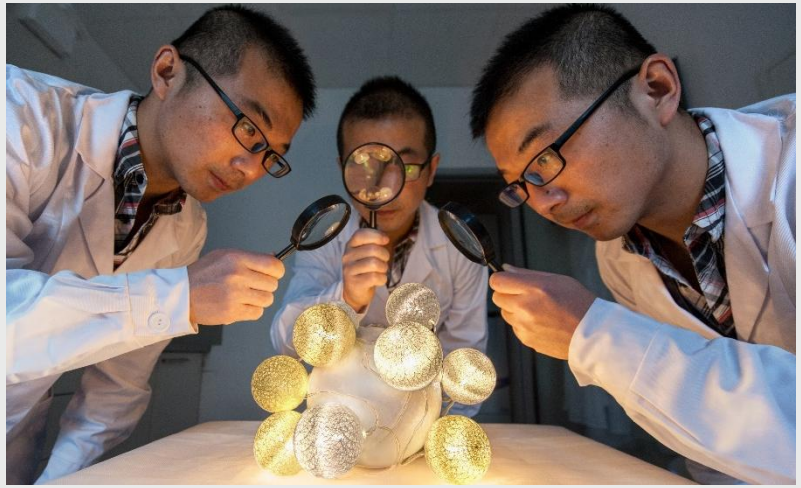
Europe’s technological strengths reflect its diversity and the distributed“pockets of excellence” that underpin the European Research Area. Semiconductors and microelectronics support advanced manufacturing, while artificial intelligence and data technologies enable smart systems and predictive analytics. Biotechnology and life sciences drive health innovation and sustainable agriculture, complemented by advanced materials and nanotechnology for breakthroughs in energy storage and industrial processes. Quantum technologies promise next-generation computing, clean energy and hydrogen solutions advance 46 climate goals, and cybersecurity safeguards Europe’s digital economy. Associated, and potentially associated, countries amplify these capabilities.

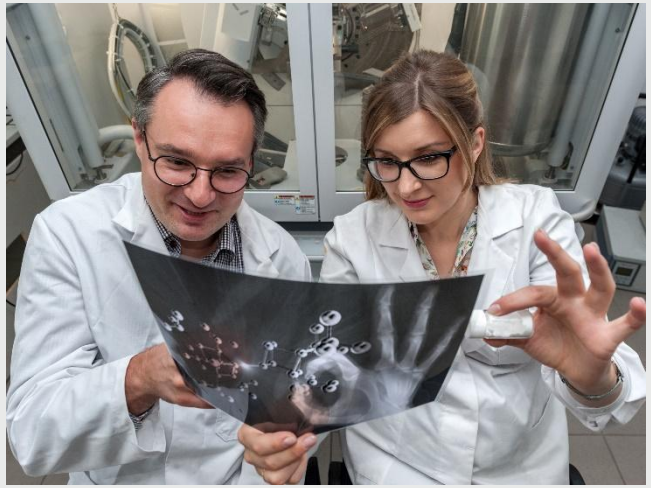
Institute of Geophysics
Polish Academy of Sciences

Elsevier Report: EU as a Science Innovator powered by the European Research Area – to be published soon

Polish Acdemy of Sciences – major research network in Poland







Institute of Geophysics
Polish Academy of Sciences

PAN

Scientific divisions

Corporation of scientists

Academy of Young Scientists

PAN
POLSKA AKADEMIA NAUK

Committees

Research Institutes

Regional divisions

Other units

Foreign centers

Institute of Geophysics
Polish Academy of Sciences

Modern infrastructure

Earth and space sciences collaboration with private sector – *succes stories*

Institute of Geophysics
Polish Academy of Sciences

Research & Development

Critical Infrastructures

Technological Activity	Long-term Seismic Monitoring	Seismic Hazard Assessment
Copper Ore exploatation, ***KGHM SA RM***	■	■
Copper Ore exploatation & Waste Repository, ***KGHM SA ZH***	■	■
Hard Coal exploitation, ***LW Bogdanka***	■	
Seismic Monitoring in Poland, ***PIG-PIB***	■	
Big Nuclear Power Plant, ***PEJ, ZEPAK/PGE***	■	
Small Modular Reactors ***Orlen Synthos Green Energy***	■	■
Natonal Recomendations for nuclear power plant implementation ***National Atomic Energy Agency (PAA)***	■	■

Institute of Geophysics
Polish Academy of Sciences

The Digital Europe Programme

DestinE is the European Commission's flagship initiative to develop a global digital model of the Earth. This model will be the basis for monitoring, simulating, and predicting interactions between natural phenomena and human activities. It will contribute to achieving the goals of the green and digital transformations, as part of the Green Deal and the European Commission's digital strategy.

TOWARDS A GREEN & DIGITAL FUTURE

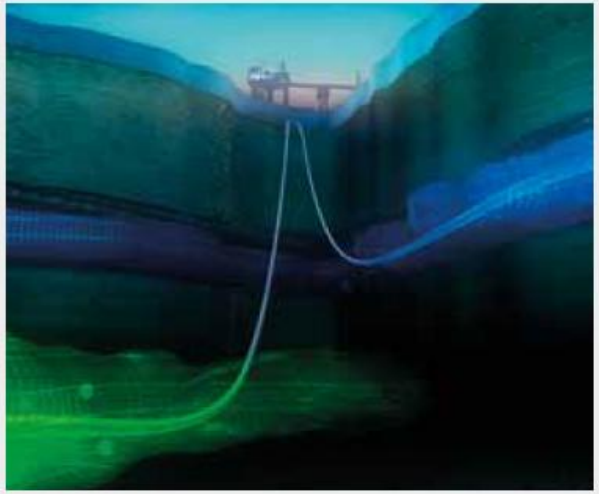
Partnership: European Commission (EC), European Space Agency (ESA), European Centre for Medium-Range Weather Forecasts (ECMWF), European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)

DESTINATION EARTH

GOING WITH THE SUBSURFACE FLOW

Much of the energy sector depends on monitoring and understanding processes in the subsurface: extraction of coal, oil, gas and shale gas, carbon capture and storage, nuclear waste storage and geothermal energy. Low-carbon options for energy supply, carbon capture and storage schemes in particular, rely on long-term management of subsurface processes to keep greenhouse gases out of the atmosphere.

All these energy supply options depend on new research infrastructure allowing sustained monitoring on human timescales. This will act as a bridge between research and application in the energy sector and build connections between research and industry. It will include EPOS and the European Carbon Dioxide Capture and Storage Laboratory Infrastructure (ECCSEL), for example, together with *in situ* monitoring including deep boreholes, combined with satellite measurements. WWW.ECCSEL.ORG



Ludden, J. et al., (2020) **Earth Science Europe:** *Earth Science Europe: Developing Earth Science for Europe*. www.earthscienceeurope.eu

Towards a European Digital future

Project number: 101058129
Project name: **A Digital Twin for GEOphysical extremes**
Project acronym: **DT-GEO**
Call: HORIZON-INFRA-2021-TECH-01, Topic: HORIZON-INFRA-2021-TECH-01-01
Type of action: HORIZON Research and Innovation Actions
Granting authority: European Research Executive Agency
Project duration: 36 months, 1 September 2022 - 31 August 2025

WP8: Anthropogenic geophysical extremes

IGF PAN, CNRS, ACK CYFRONET, GFZ, INGV & TCS AH

Project funded by Horizon Europe under the grant agreement No 101058129.

Follow us

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N° 676564

DT - Anthropogenic Geophysical Extremes

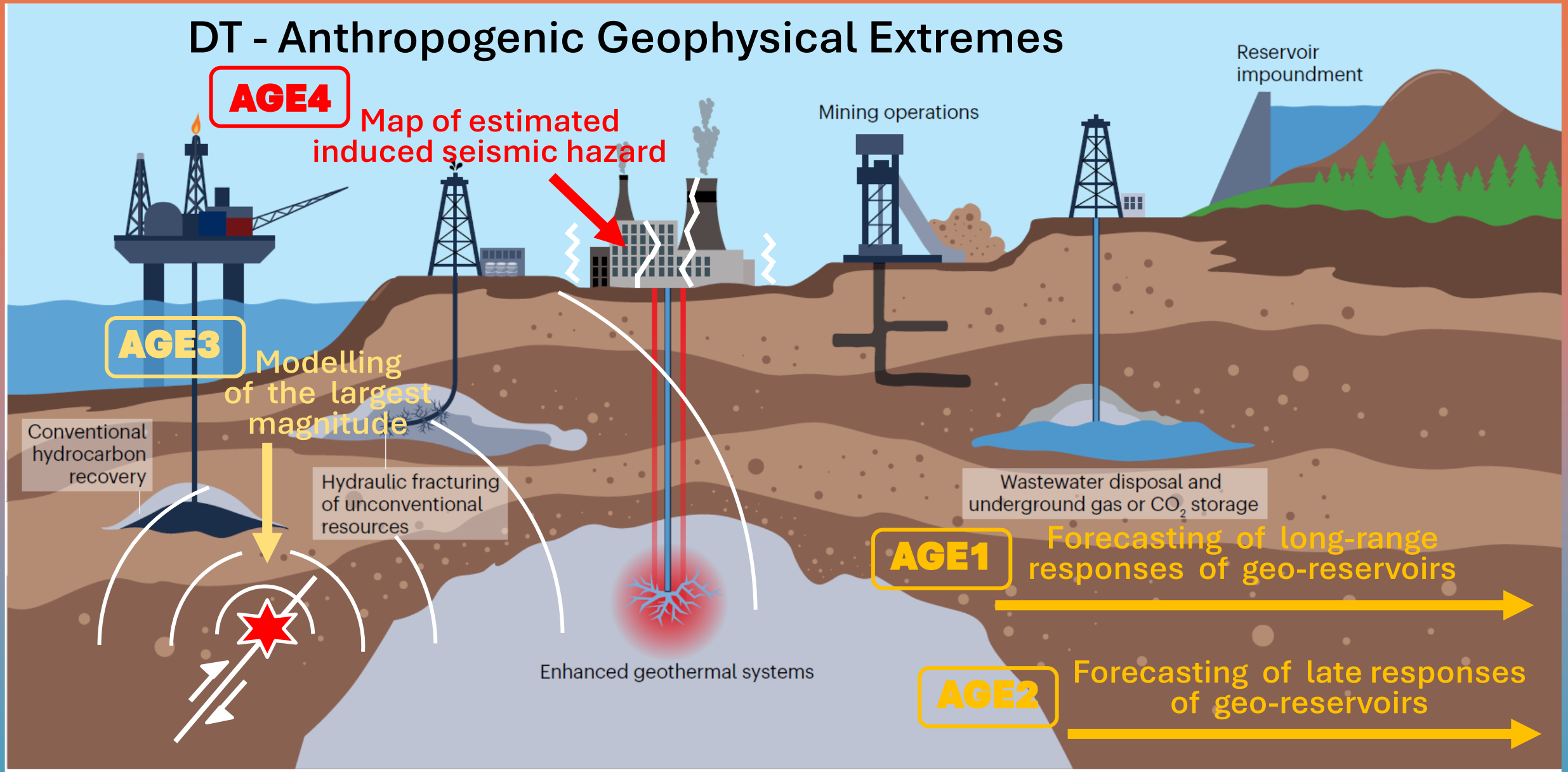
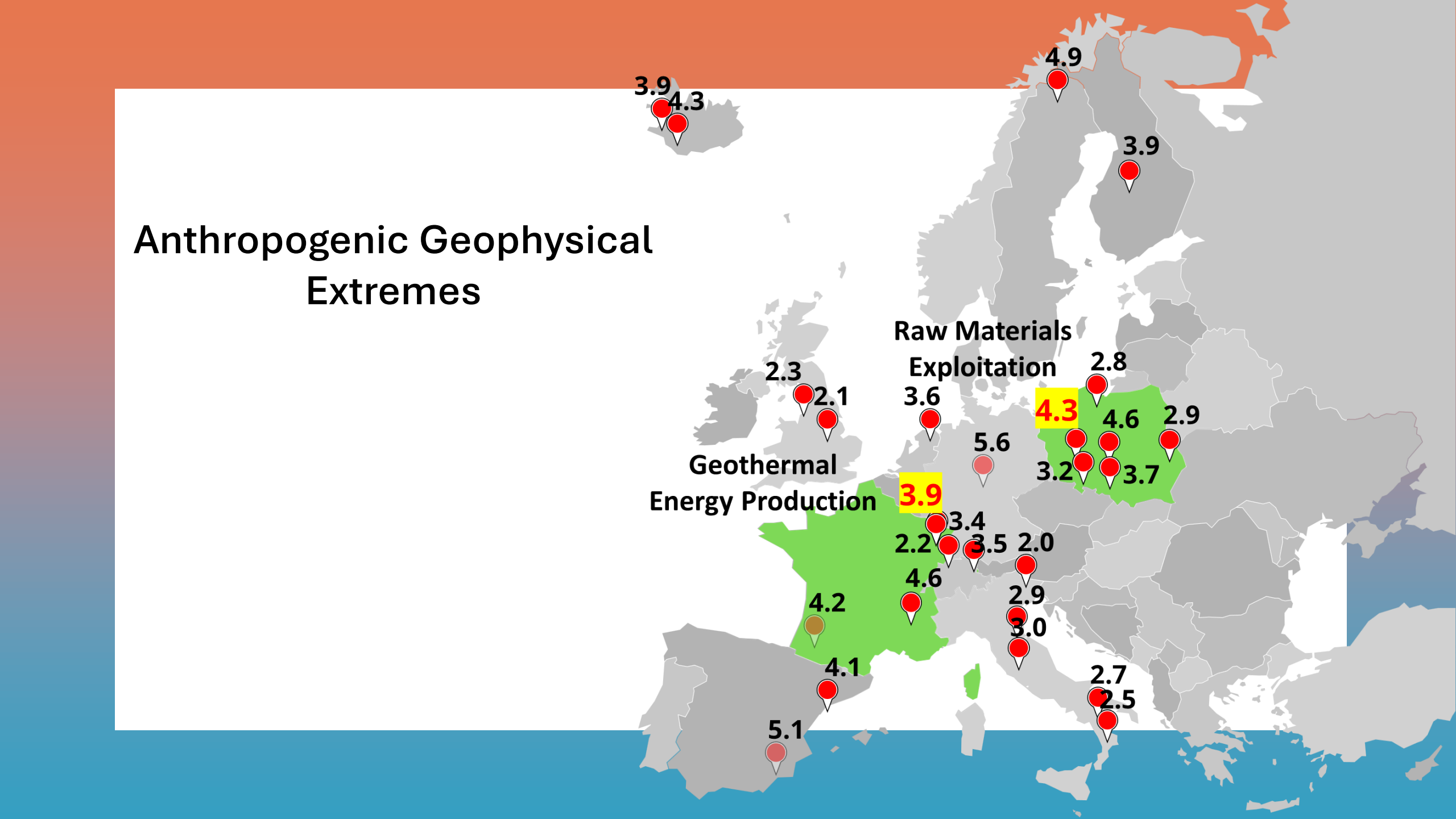


Fig. 1 | Industrial activities that can cause induced seismicity. Induced earthquakes can occur during conventional hydrocarbon recovery, hydraulic fracturing of unconventional resources, enhanced geothermal systems, mining operations, wastewater disposal, underground gas or CO_2 storage operations and reservoir impoundment. Figure adapted with permission from ref. 16, Wiley.

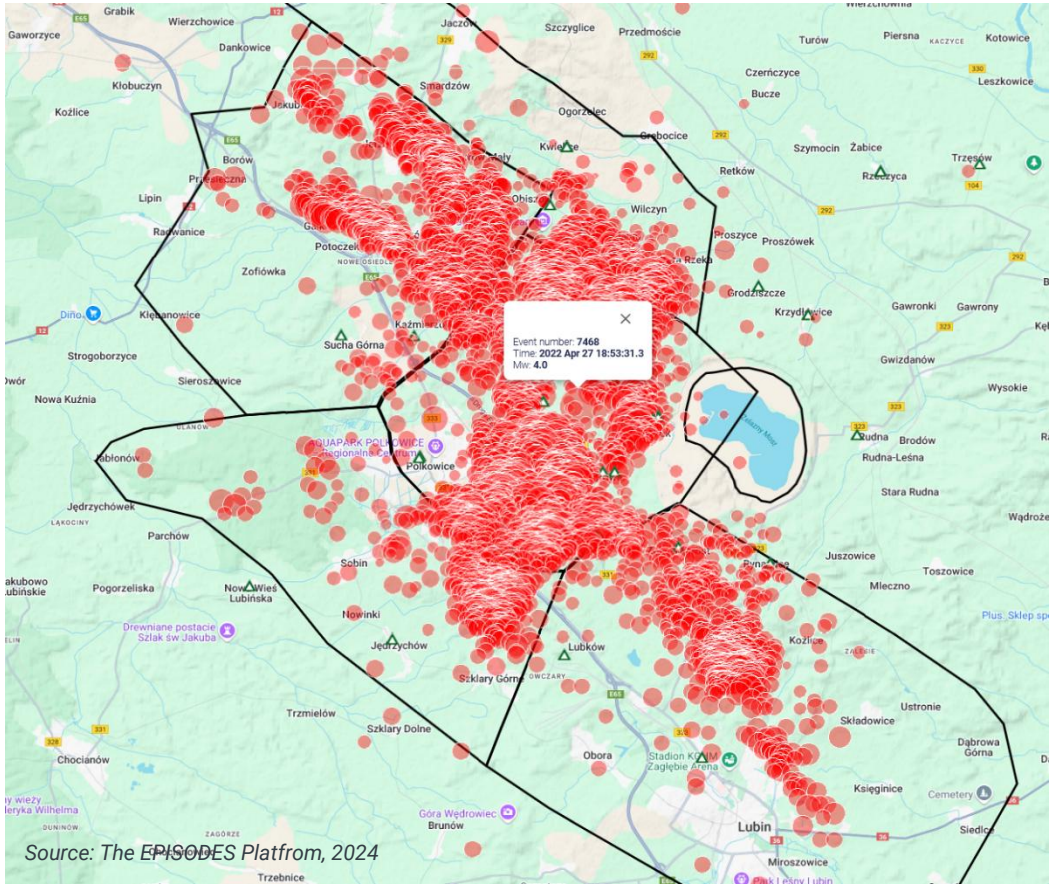
Figura from Moein et al., Nature Reviews Earth & Environment | Volume 4 | December 2023 | 847–863

Anthropogenic Geophysical Extremes

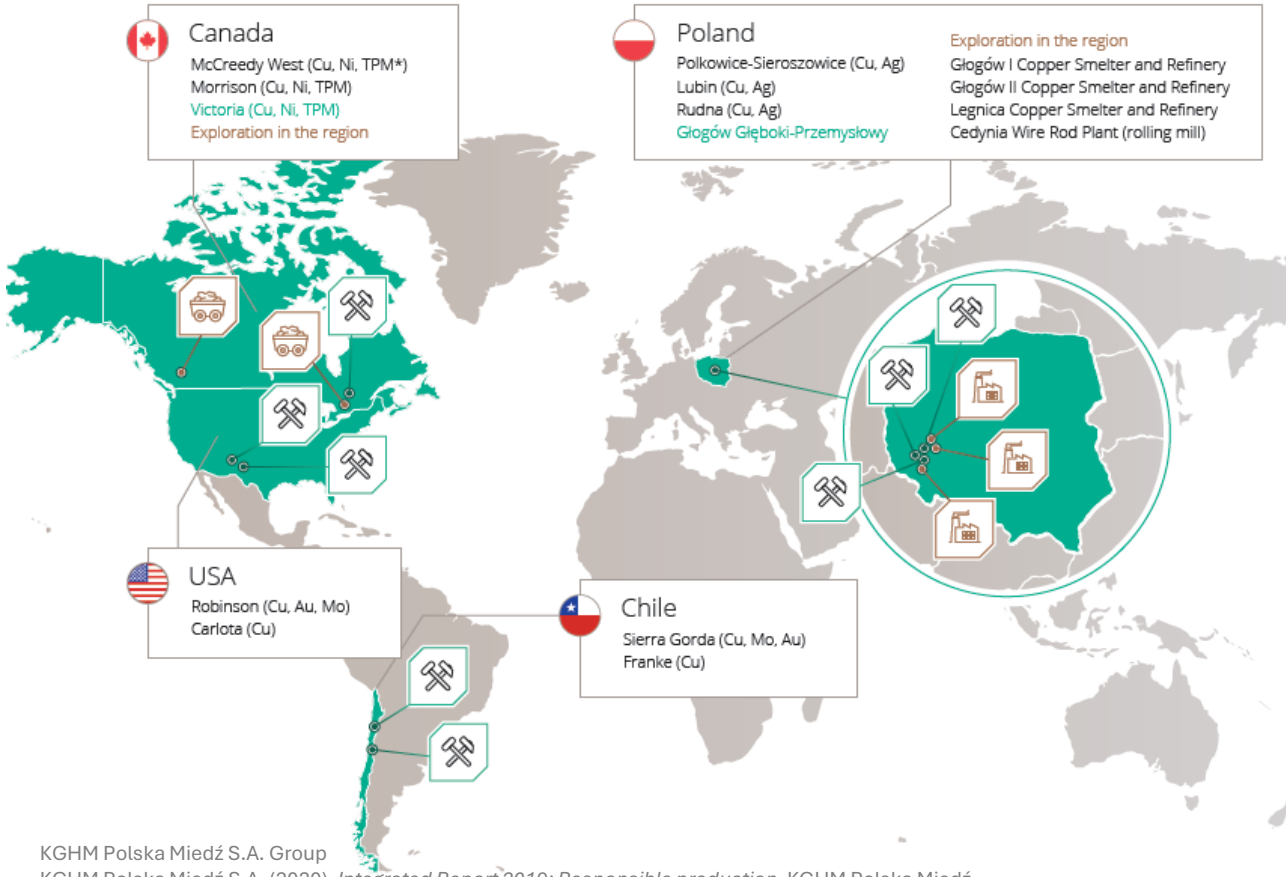


Site Demonstrator: Legnica Głogów Copper District - Cooper Ore Mines, Poland

The ore extraction is carried out by 13 mining sections at depths of 900-1200m using the room-and-pillar method. The ore seam of the Rudna mine is on average 5m - 26m.



Source: The EPISODES Platfrom, 2024



KGHM Polska Miedź S.A. Group

KGHM Polska Miedź S.A. (2020). *Integrated Report 2019: Responsible production*. KGHM Polska Miedź S.A. (2019). Sustainability Report for 2018. Lubin, Poland: KGHM Polska Miedź S.A. Retrieved from https://kghm.com

Water

Institute of Geophysics
Polish Academy of Sciences

Other examples – space research

Institute of Geophysics
Polish Academy of Sciences

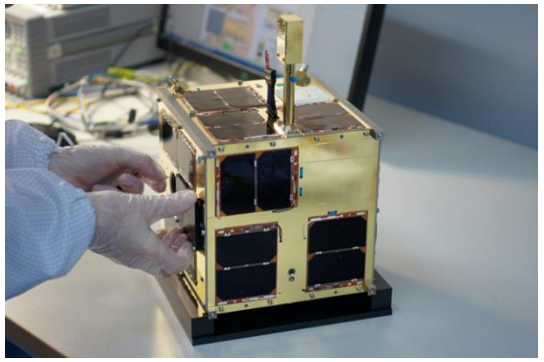
CENTRUM BADAŃ KOSMICZNYCH
Polskiej Akademii Nauk

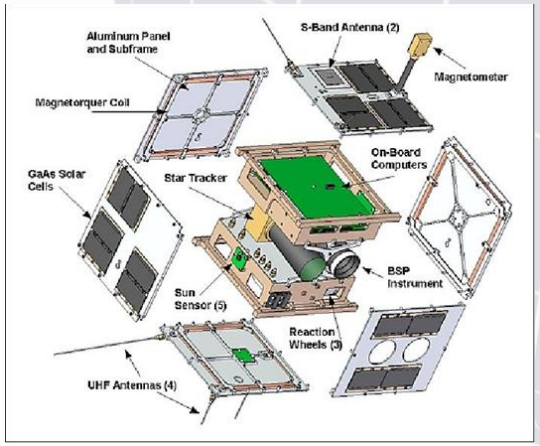
- The Space Research Centre (CBK PAN) is a Polish research institute focused on space technologies, including satellite instruments and space robotics.

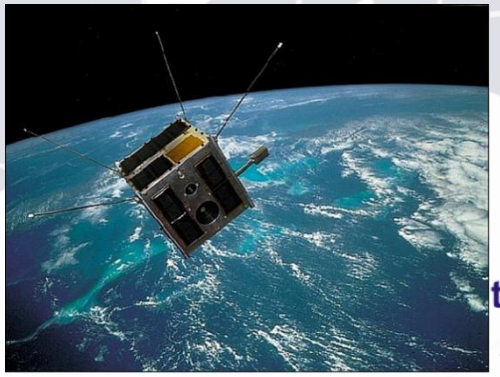
- One of the key areas of cooperation with Canada is the BRITE-Constellation star-gazing mission, conducted by a Canada–Austria–Poland consortium. The constellation composed of satellites observes massive stars in our galaxy

- The Canadian side — mainly the University of Toronto Institute for Aerospace Studies – Space Flight Laboratory (UTIAS/SFL) — worked on satellite construction and modules.

- The Polish side — CBK PAN and related partners — contributed to the BRITE-PL project, which includes the Lem and Heweliusz satellites (Heweliusz is still operating!)







te of Geophysics
Academy of Sciences

Results and Benefits of the CBK PAN–Canada Collaboration

- Technology and knowledge transfer: CBK PAN gained experience through cooperation with Canadian teams on nanosatellite design and operations — particularly in the BRITE project.
- Shared scientific data and publications: Within BRITE-Constellation, data are made publicly available, and the Polish-Canadian consortium contributes to joint research papers.
- Enhanced international visibility: Participation in nanosatellite missions with Canada and other partners strengthens CBK PAN's global reputation.
- Future prospects: This partnership opens opportunities for new joint missions, instrument development, and technology exchange between Poland and Canada.

Polish – Canadian Partnership in Advanced Science and Technology

- Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences (CAMK PAN) – leading research institution in astrophysics and detector technologies.
- Active in projects connecting science and industry, with focus on detection technologies in medicine and energy.
- Collaboration with partners across Europe, Canada, and associated countries within international research frameworks.
- **“Scientific excellence and technology transfer – building a transatlantic innovation bridge.”**

Institute of Geophysics
Polish Academy of Sciences

AstroCeNT (CAMK PAN) – Polish Node in the Transatlantic Astroparticle Research Network

- Partnership with the McDonald Institute (Queen's University, Canada) – Canada's hub for astroparticle physics.
- Joint research on dark matter detection, light detection systems, and silicon photomultipliers (SiPMs).
- Researcher and student exchange, joint grant applications, and technology development initiatives.
- Since January 2025, McDonald Institute is the only non-European member of Astrocent Plus – a six-year €30M project led by CAMK PAN.
- **"AstroCeNT and McDonald Institute – strengthening transatlantic cooperation in frontier physics."**

Institute of Geophysics
Polish Academy of Sciences

Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

Innovative Technologies for Medicine and Industry

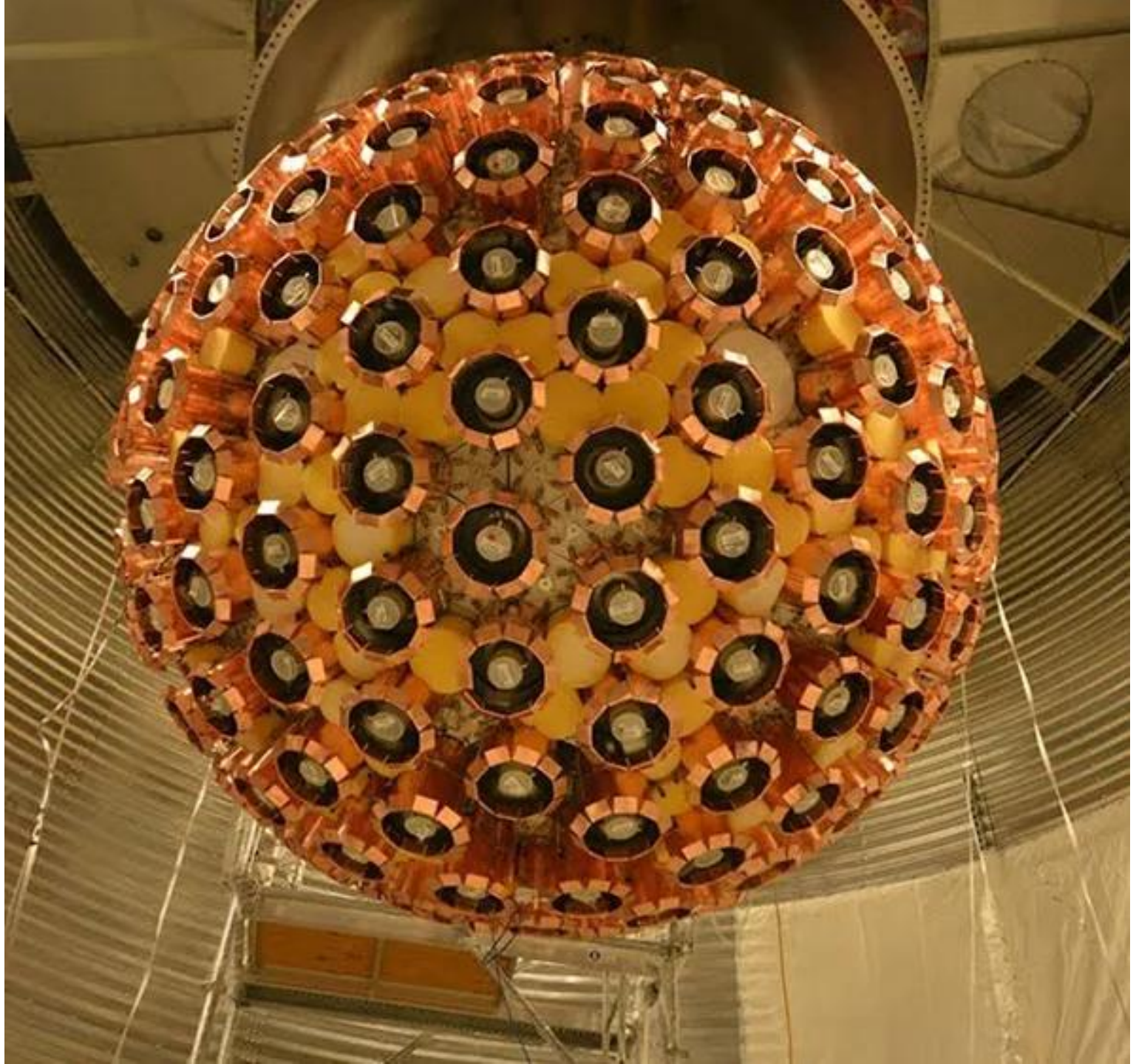
- UPGRADE Project (EU): development of hybrid PET/PG detector module for proton therapy and medical diagnostics.
- Industrial partners: Muontek (Turkey) and INEDet (Azerbaijan) – design, assembly, and calibration of detector prototypes.
- Knowledge transfer from nuclear physics to clinical applications.

Institute of Geophysics
Polish Academy of Sciences

Innovative Technologies for Medicine and Industry

- DEAP-3600 Experiment (SNOLAB, Canada): dark matter detection using liquid argon.
- AstroCeNT contributions: data analysis and optical component development with potential uses in PET imaging, radiation therapy, and radiation safety.
- **“From dark matter detection to medical innovation – science serving people.”**

Institute of Geophysics
Polish Academy of Sciences



Overview of sample R&D programmes that allow Polish–Canadian cooperation

Programme	Description & How it Enables Polish–Canadian R&D Collaboration
Horizon Europe (Pillar II)	Canada has been officially associated with Pillar II of Horizon Europe since July 2024, allowing Canadian institutions to participate in EU research consortia on equal terms with EU members. This enables joint Polish–Canadian R&D projects across a wide range of fields, including health, climate, energy, digital technologies, and industry. Both Polish and Canadian researchers can jointly apply for funding as part of multinational consortia.
Eureka – Network Projects	Eureka supports industry-driven international R&D and innovation. Canada participates through the National Research Council (NRC) and Poland through the National Centre for Research and Development (NCBR). Consortia must include at least two entities from two Eureka member states — meaning Polish–Canadian consortia are fully eligible.
POLAR International Partnership Research Development Program (Polar Knowledge Canada)	A Canadian federal programme supporting international collaboration in ongoing Arctic and Antarctic research projects. The Principal Investigator (PI) must be based at a Canadian institution, but Polish institutions may join as international research partners. Suitable for teams involved in climate, oceanography, polar ecosystems, traditional knowledge, and Arctic communities research.
Sustainable Blue Economy Partnership (SBEP)	A major Horizon Europe partnership in which NCBR acts as a national funder. Focuses on: marine spatial planning, maritime infrastructure, sustainable seafood production, coastal resilience, ocean observation technologies and Digital Twins of the Ocean (DTO). Supports industrial research and experimental development (R&D). Canadian partners can participate via Horizon Europe association mechanisms.
Water4All Partnership (JPI Water)	A Horizon Europe partnership focused on water resources, water management, monitoring technologies, governance and innovation. Funds industrial research and experimental development. While Canada is not formally part of Water4All, Canadian institutions may join via Horizon Europe international collaboration rules, enabling Polish–Canadian cooperation when consortia include eligible EU partners.
JPI Oceans – Blue Carbon Ecosystems	JPI Oceans is a European intergovernmental initiative on marine and ocean research. The 2025 joint call “Blue Carbon Ecosystems” includes Canada as a funding country via MEOPAR. Supports basic research, industrial research and experimental development. This call directly supports Polish–Canadian R&D collaboration because both countries provide funding within the same joint call.

European Commission

eureka

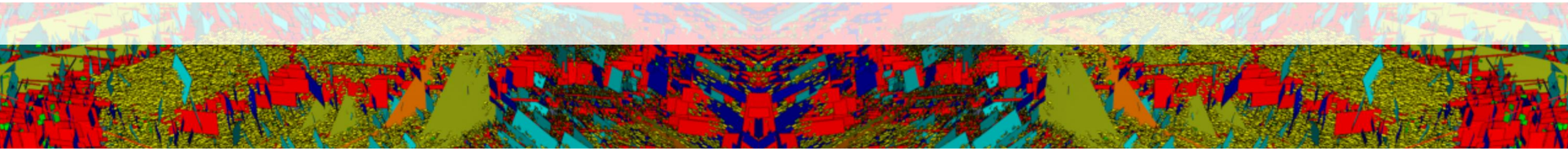
Government of Canada / Gouvernement du Canada

Sustainable Blue Economy Partnership

NCBR

National Centre for Research and Development

JPI OCEANS



Thank you for your attention

Institute of Geophysics
Polish Academy of Sciences