Answering big questions with big data:

Using analytics across the research ecosystem

Research Analytics Summit
Albuquerque 2024

Ann Beynon, Clarivate

Agenda

- **Research Office survey results**
- **Broader impacts-**

  How do we measure the true impact of research?
- **Research Security-**

  How do we safeguard our research from security threats?
- **Open Science-**

  How do we track and promote the openness of research?
- **Sustainable Development Goals-**

  How do we know if we are contributing to the world's biggest challenges?
- **Horizon scanning-**

  How do we know what the latest and emerging research topics are?
- **Q&A**

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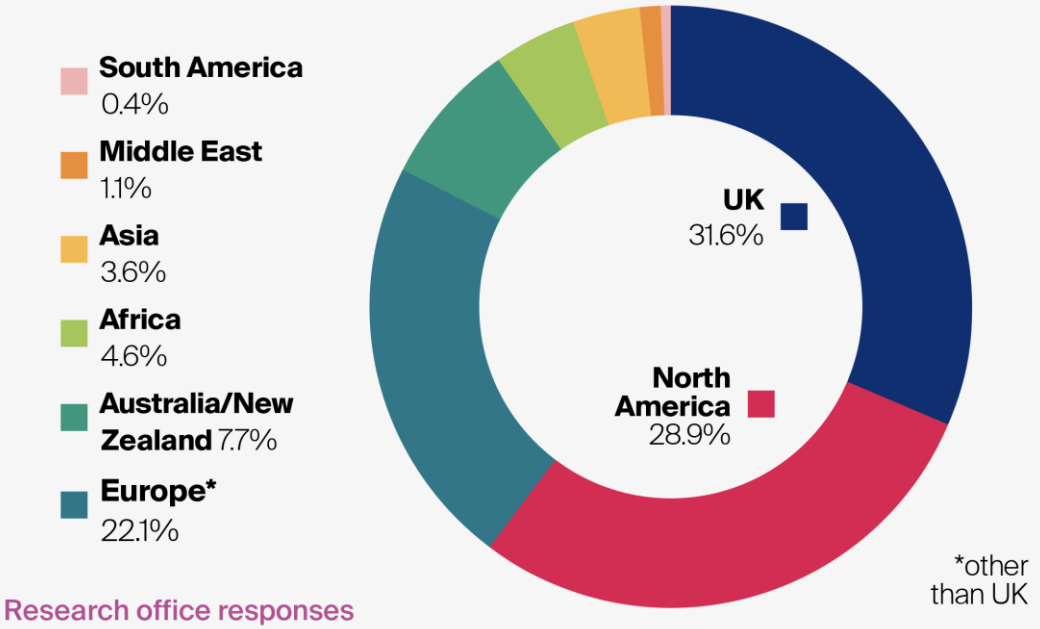
Research Offices of the Future
Insights from a Research Professional News survey into the evolving landscape for research services around the world

Methodology

- Findings of two international surveys carried out by Research Professional News in 2023
- One was conducted on research office staff and those performing other academic research services roles
- The second was targeted at researchers at universities and institutes
- Each survey received more than 800 responses

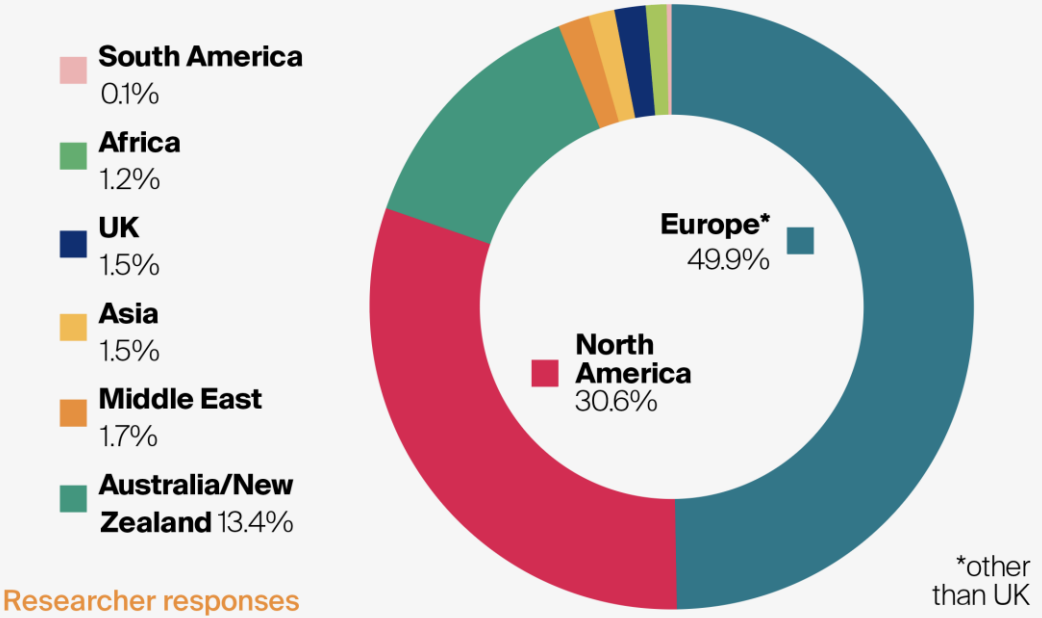
The purpose of this report is to provide a detailed overview of the current state of the vital services that support research, and to identify areas where improvement is needed.

Fig 1 Geographical breakdown of university research office respondents



Research office responses

Fig 2 Geographical breakdown of university researcher respondents



Researcher responses

Key findings

- Research offices are focused on obtaining more funding, demonstrating research impact and improving research quality. Barriers include ensuring effective engagement between researchers and the research office
- Cost pressures, demonstrating research impact, and research assessment exercises are the main change drivers for research offices
- Traditional publications are still the most common way to measure research impact, but others are becoming more important
- Artificial intelligence is not yet a major concern for many research offices, but has potential pros and cons

Research Offices of the Future

Insights from a Research Professional News survey into the evolving landscape for research services around the world

- Evolving priorities and change drivers
- Research Assessment Exercises
- Identifying impact
- AI in focus
- Research office challenges
- Winning funding
- Threats to integrity
- Library collaboration

https://discover.clarivate.com/Research_Offices_of_the_Future_survey_report_2023

Fig 4 What are your institution's three main priorities with regards to academic research for the next year?

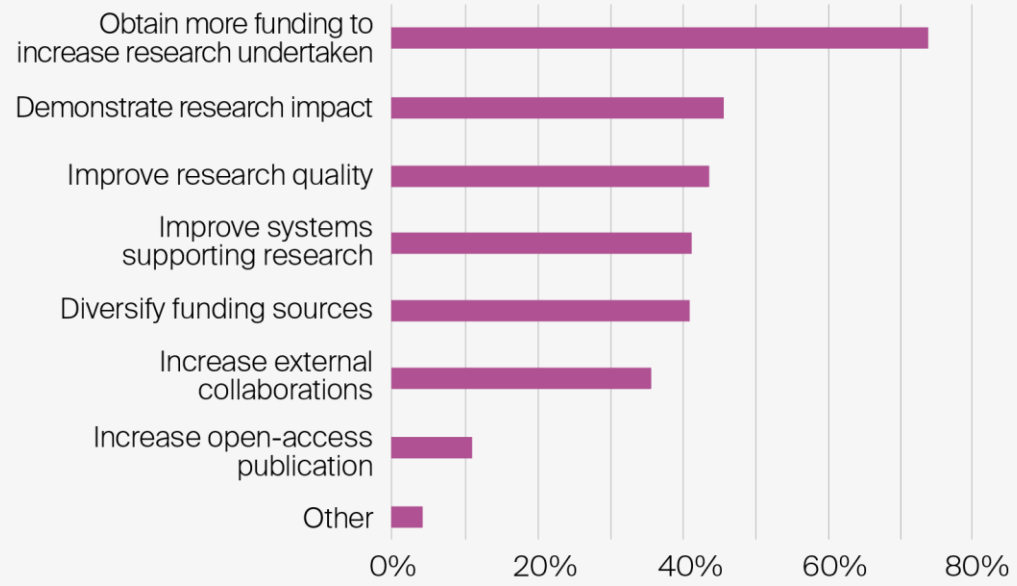
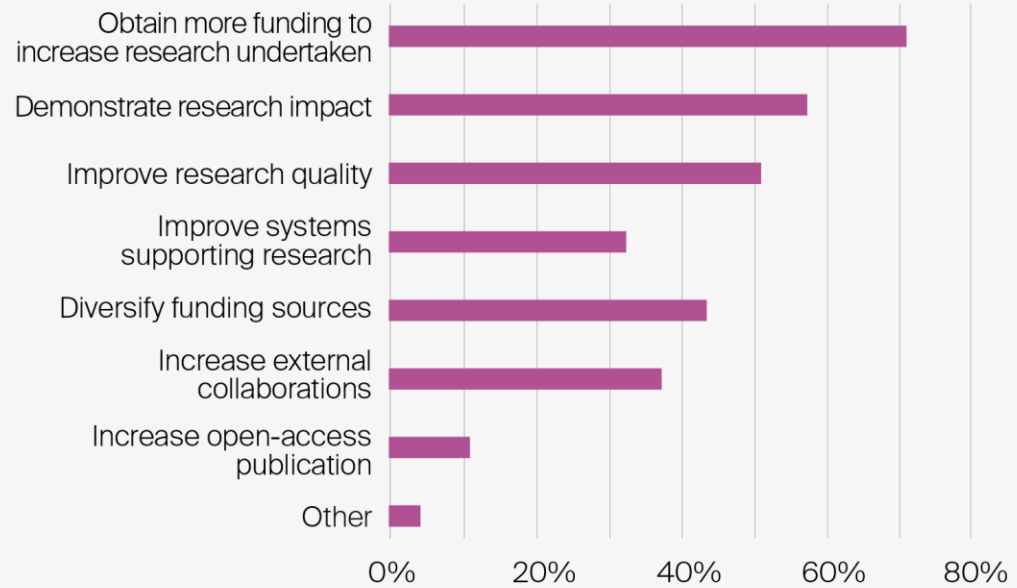


Fig 5 What are your institution's three main priorities with regards to academic research for the next five years?



Research office responses

Priorities

- **Research office:** The most important areas were obtaining more funding to increase the volume of research (73.9 per cent), demonstrating research impact (45.9 per cent) and improving research quality (43.6 per cent)

- Priorities over five years: less likely to mention obtaining increasing amounts of funding (71.4 per cent) and more likely to mention demonstrating research impact (57.6 per cent) and improving research quality (51.3 per cent)

- **Researchers:** Asked what they expect their research office to do to support, researchers were most likely to mention the facilitation of access to funding opportunities (73.2 per cent) and support with research proposals and bids (70.2 per cent)

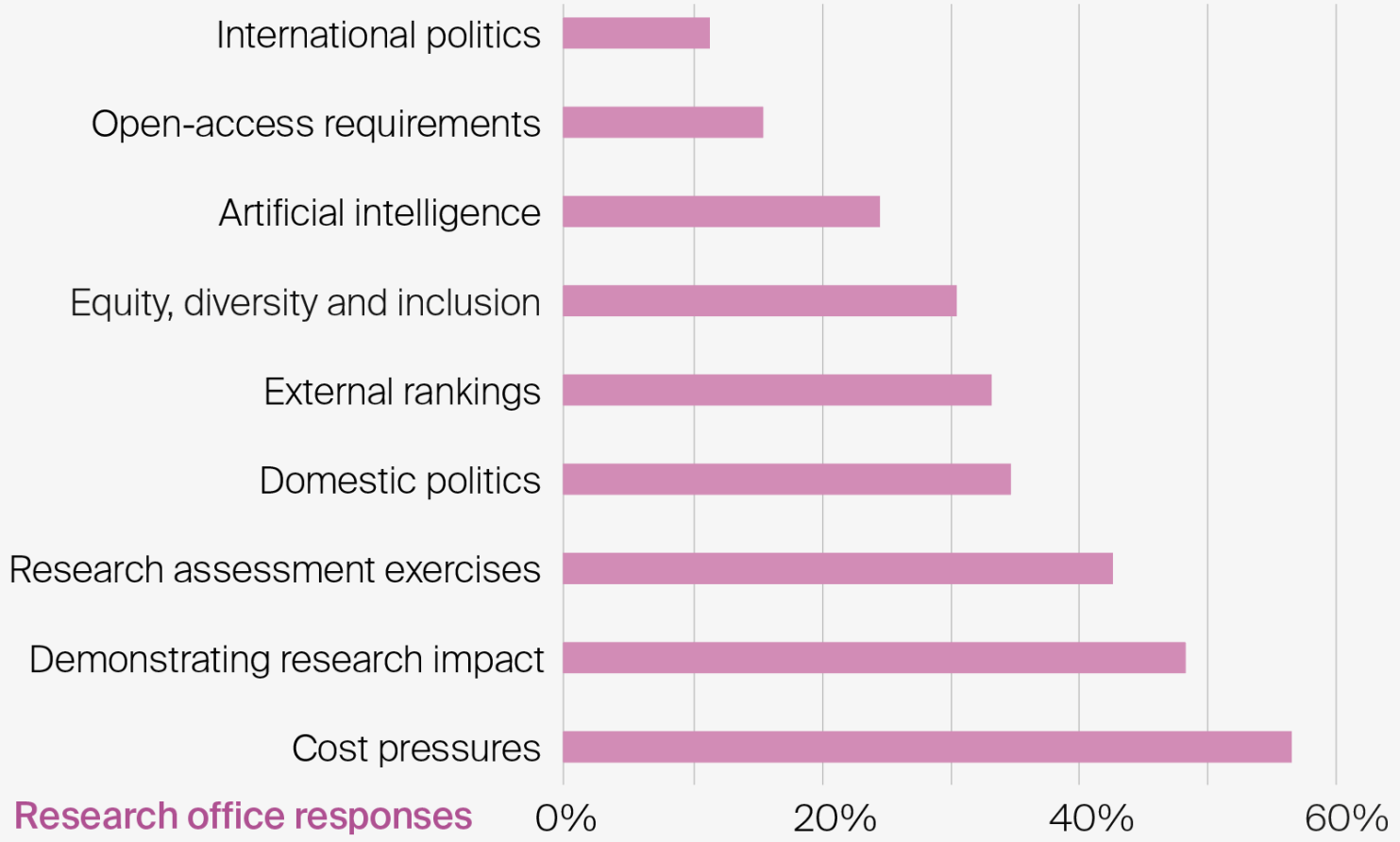
- Only 18.0 per cent expected assistance with measuring and reporting impact, which was the lowest-scoring option in the survey

What is driving change?

- Cost pressures (56.4 per cent) and demonstrating research impact (48.3 per cent) the two change drivers most referenced

- Research assessment exercises were the next most frequently mentioned potential drivers of change (mentioned by 42.6 per cent of those surveyed), while domestic politics (34.8 per cent) and external rankings (33.3 per cent) also scored highly

Fig 7 What do you think will be the three biggest drivers of change in your institution's research operations over the next five years?



Impact measures

- **Research Office:** Traditional publications still reign supreme when it comes to the way in which research offices measure impact

- **Researchers:** Researcher respondents' opinions were strikingly different from research offices. Their top two were still publications and citation impact of published research, but these were far more dominant than in the research office survey, selected by 87.5 per cent and 81.8 per cent of respondents respectively

- In five years' time, they felt the most tracked impact metrics would still be citation impact (79.6 per cent) and publications (76.1 per cent). Societal benefit (26.7 per cent) was the third choice, up from 15.6 per cent currently

- Just 14.1 per cent said they felt equity, diversity and inclusion would be among the most measured aspects of impact

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Research Office responses

Fig 10 What forms of impact do you think research offices will need to measure now and in five years' time? (top three selected)

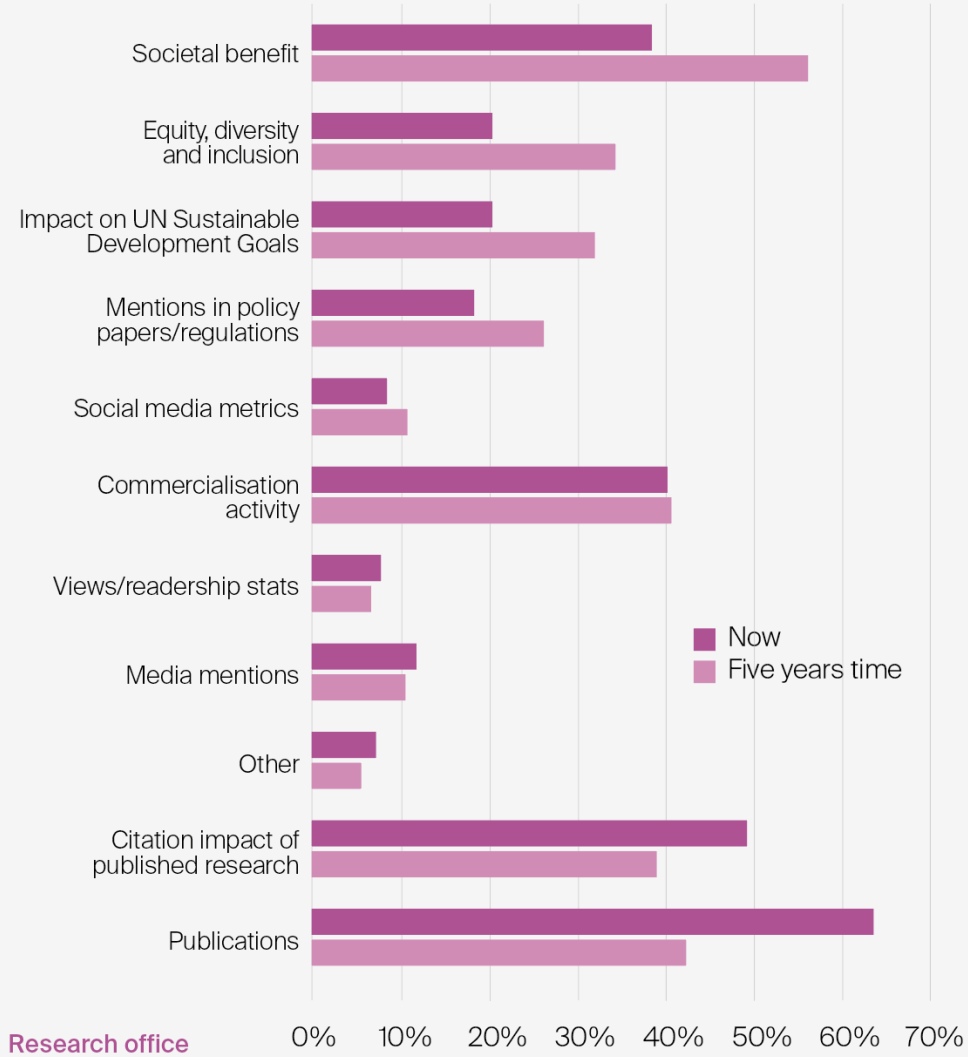


Fig 11 Which types of impact do you find it difficult to measure?

Impact found most difficult

1	Societal benefit	69.9%
2	Equity, diversity and inclusion	48.8%
3	Impact on UN Sustainable Development goals	43.6%
4	Mentions in policy papers/regulations	28.4%
5	Commercialisation activity	25.5%

Impact found least difficult

6	Social media metrics	20.4%
7	Media mentions	19.0%
8	Views/readership stats	13.1%
9	Citation impact of published research	10.1%
10	Publications	6.7%
11	Other	5.3%

Research office responses

Integrity threats

Which threats to integrity do research office staff feel currently pose the biggest risks?

- Pressure to publish most highest, with 63.2 per cent highlighting this as one of the three biggest threats to research

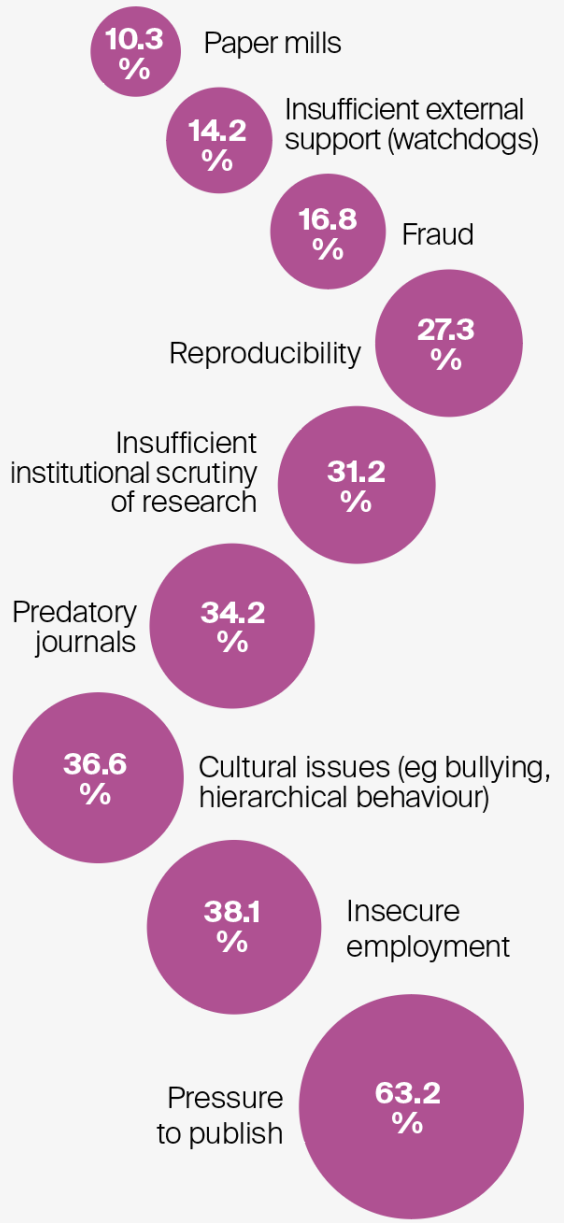
Participants were also concerned about insecure employment practices (38.1 per cent), cultural issues such as bullying (36.6 per cent) and the activities of predatory journals (34.2 per cent).

What are universities and institutes doing about it?

Offering training (mentioned by 64.4 per cent), developing research integrity policies (63.5 per cent).

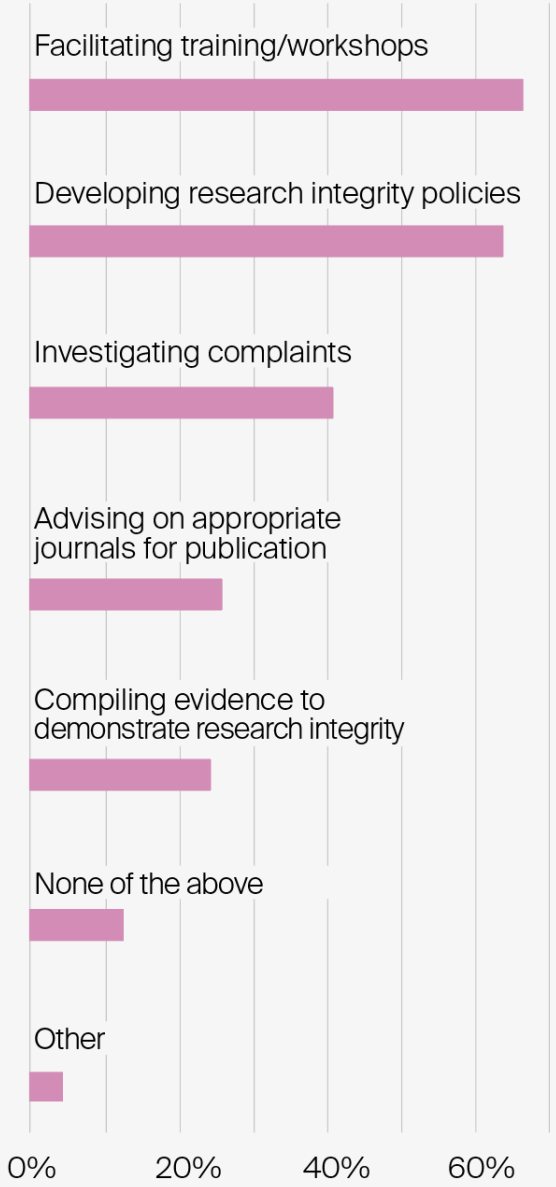
More than one in 10 (12.9 per cent) could not identify any steps that their research office was taking to mitigate concerns about research integrity.

Fig 16 Which of the following do you believe pose the biggest risk to research integrity? (top three selected)



Research office responses

Fig 17 What is your research office doing around research integrity?



Research office responses

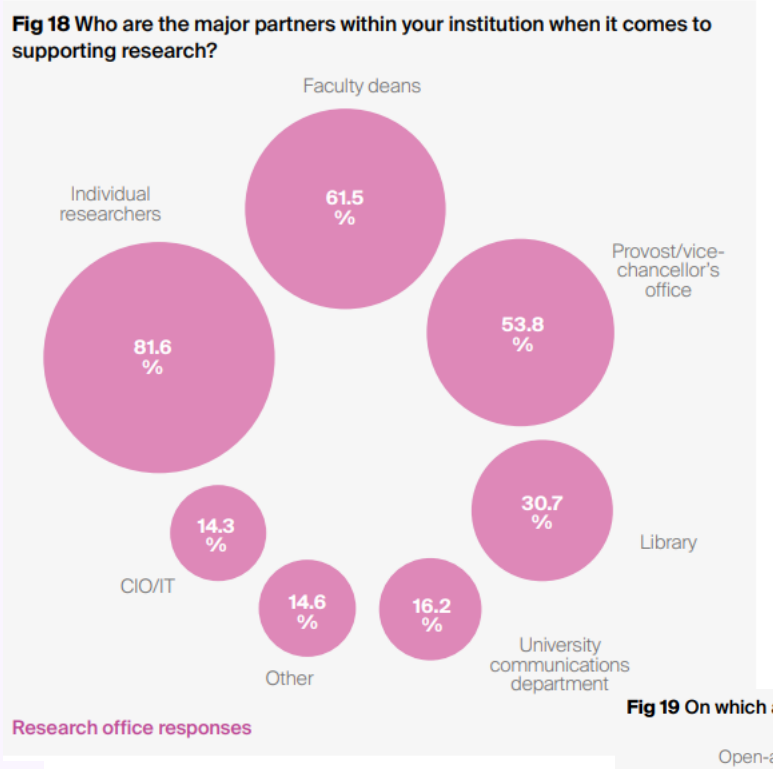
Library Collaboration

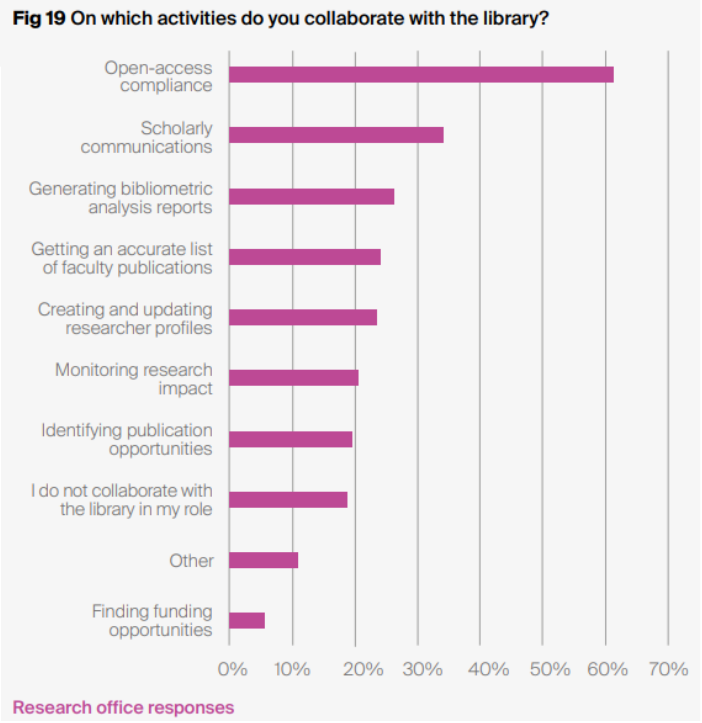
Researcher offices view individual researchers (81.6 percent) and faculty deans (61.5 percent) as their major partners in supporting research.

The library came in at 30.7 percent.

By far the most cited area in which research offices collaborate with their institution's library was open-access compliance, with 61.7 per cent of respondents naming this as an area of collaboration.

There was a large drop-off to the next most cited area, which was scholarly communications (34.7 per cent), followed by the creation of bibliometric analysis reports (26.7 per cent) and getting accurate lists of faculty publications (24.5 per cent).

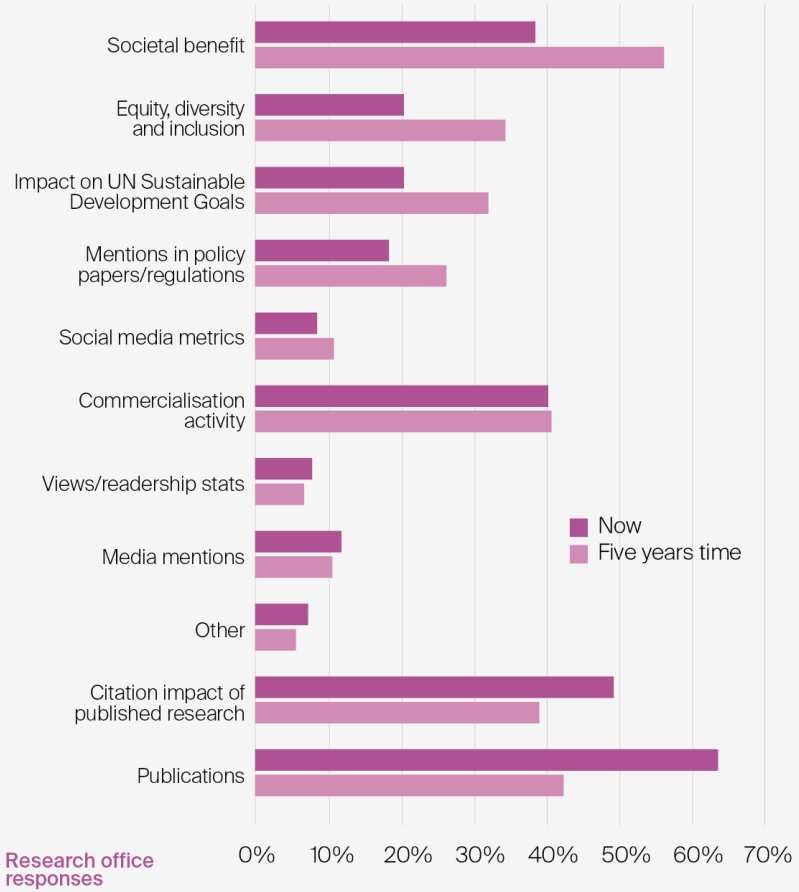




Broader impacts

Broader impacts- measuring research impact beyond traditional publications

Fig 10 What forms of impact do you think research offices will need to measure now and in five years' time? (top three selected)



The Web of Science ecosystem

On the horizon:

- Clinical trials
- Policy documents

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Web of Science Researcher Profiles

Free to view and update

Pradeep Natarajan

(Natarajan, Pradeep)

Harvard Medical School

Web of Science ResearcherID: H-9764-2019

Published names Natarajan, Pradeep Natarajan, P Natarajan, P. Nataranjan, Pradeep Ly, Nghi
Show more

Published Organizations Northwestern University, VA Boston Healthcare System, Massachusetts Institute of Technology (MIT)
Show more

Subject Categories BETA Cardiovascular System & Cardiology; Science & Technology - Other Topics; Hematology; Genetics & Heredity; General & Internal Medicine

Other Identifiers https://orcid.org/0000-0001-8402-7435

Verify your Author Record

Get your own verified author record. Enter your name in Author Search, then click "Claim My Record" on your author record page.

Go to author search

Metrics Open dashboard

Profile summary

385	Total documents
354	Web of Science Core Collection publications
29	Preprints
0	Dissertations or Theses
188	Verified peer reviews
1	Verified editor records

5

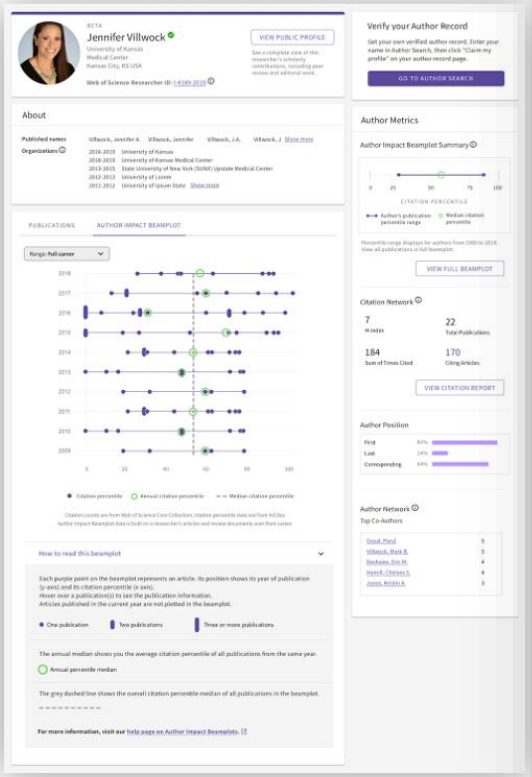
55	H-Index
354	Publications in Web of Science
21,038	Sum of Times Cited
17,026	Citing Articles
71	Sum of Times Cited by Patents
69	Citing Patents

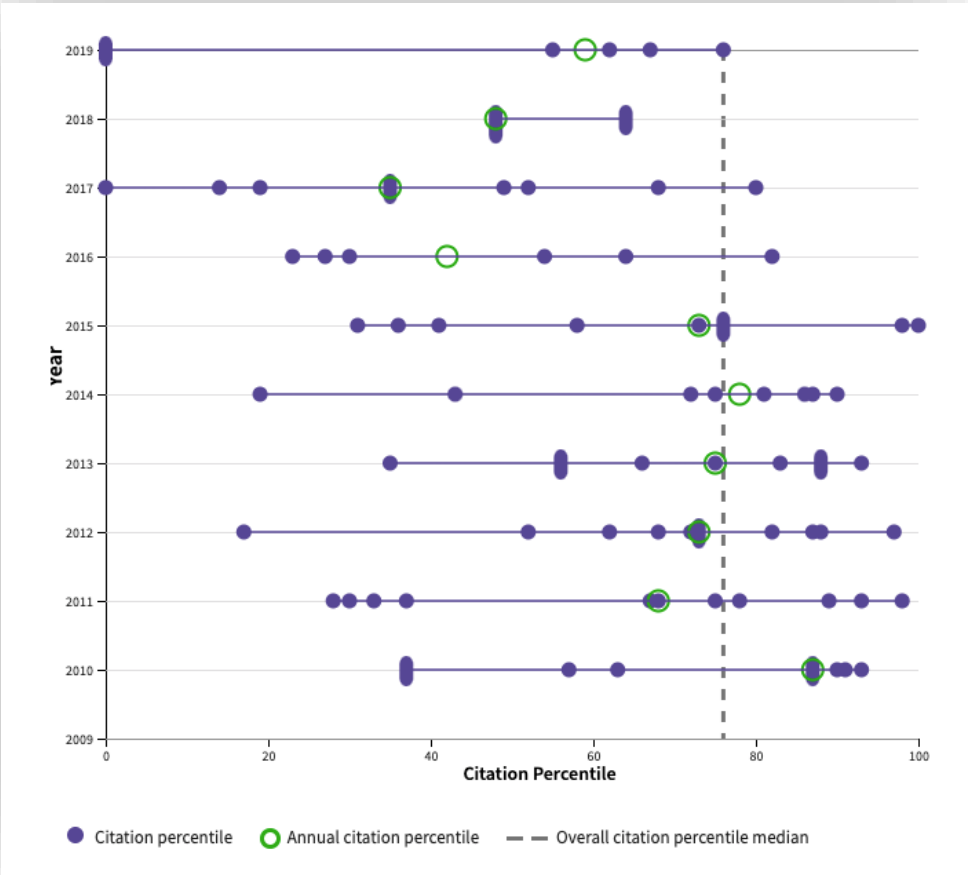
View citation report

https://www.webofscience.com/wos/author/record/1785913

Profiles, not metrics

Author Impact Beamplots





- Get beyond single point metrics with new visualizations that help you see the context of each researcher's scholarly influence over time.
- Quickly obtain multidimensional data to support promotion, tenure and funding applications, and help your researchers tell the story of their careers.

Learn more in the ISI whitepaper, video and guide

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National competitiveness and security

US and China research output

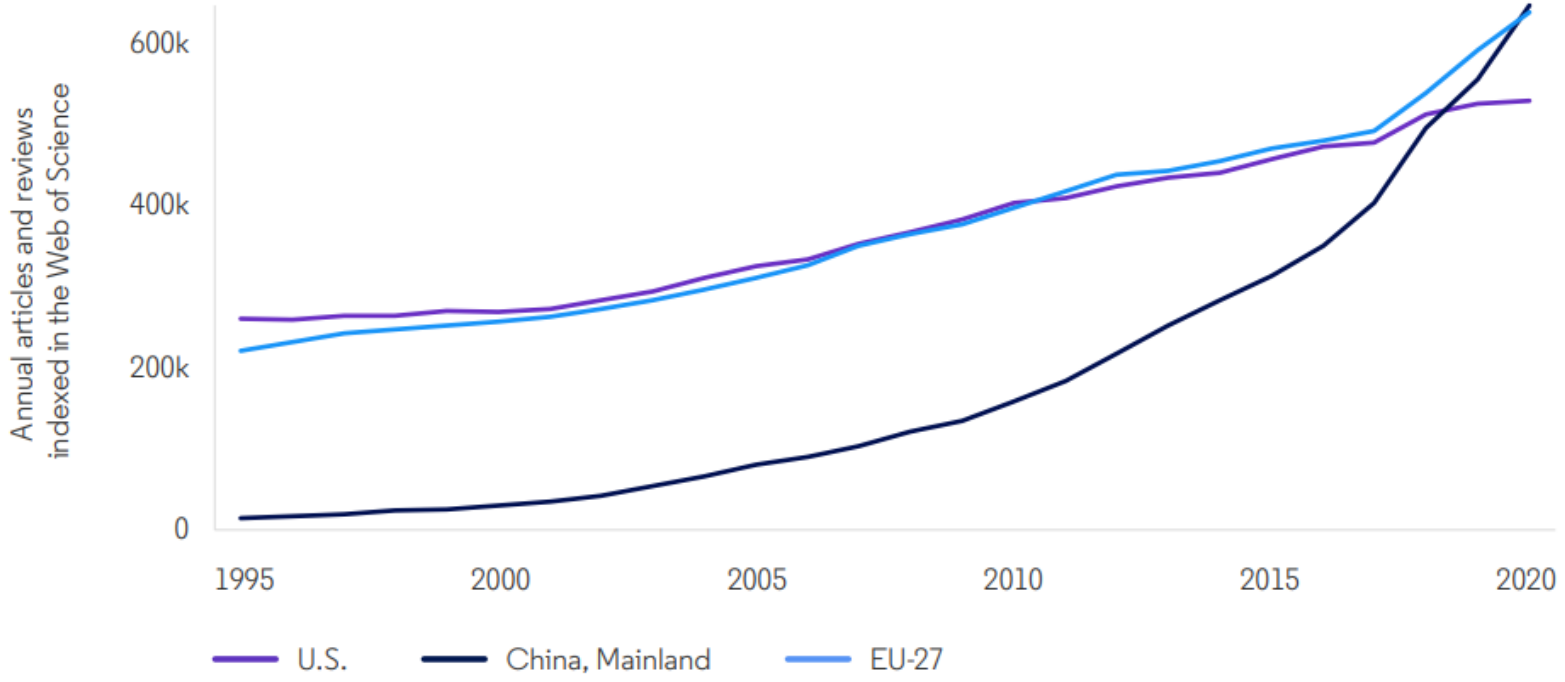
The phenomenal increase in China's output over the last 25 years has disrupted conventional balances in regional status.

This increase is due to:

(1) a shift from directed research underpinning industry and the military towards a more conventional portfolio, with parallel shifts in institutional structures and

(2) an expansion of university researcher numbers and activity.

Figure 2.
Annual total output of research papers in all research fields for the U.S., the European Union (EU-27) and Mainland China published in journals indexed in the Web of Science, 1995-2021.



Source: ISI report Global Research Report U.S. research trends: The impact of globalization and collaboration; Web of Science, articles and reviews

https://clarivate.com/lp/us-research-trends-the-impact-of-globalization-and-collaboration/

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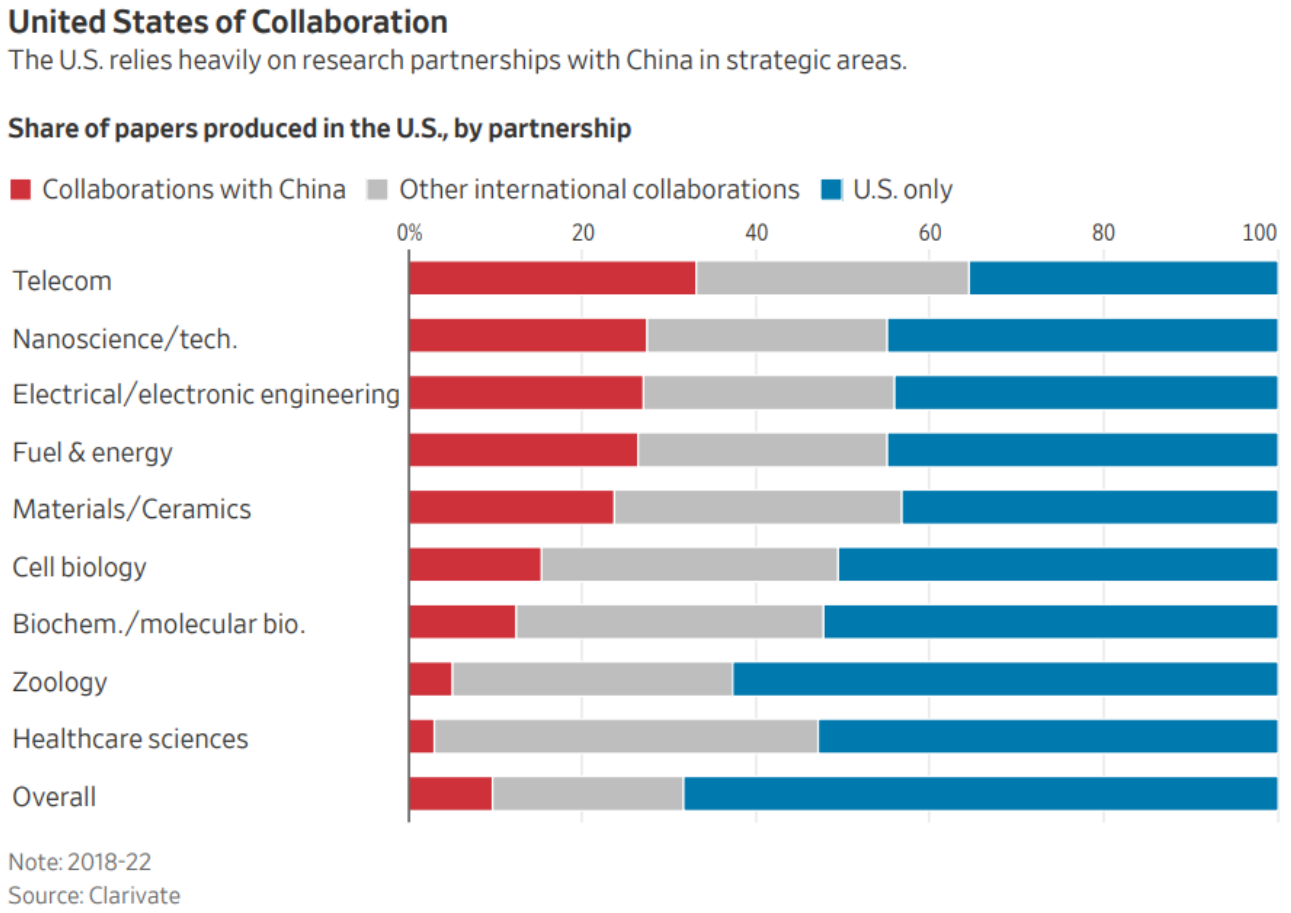
Some research fields have higher levels of international collaboration than others



Source: Web of Science, The U.S. Is Turning Away From Its Biggest Scientific Partner at a Precarious Time, Wall Street Journal, August 15, 2023

A Changing Global Landscape –Researcher Mobility

Example: Brazil

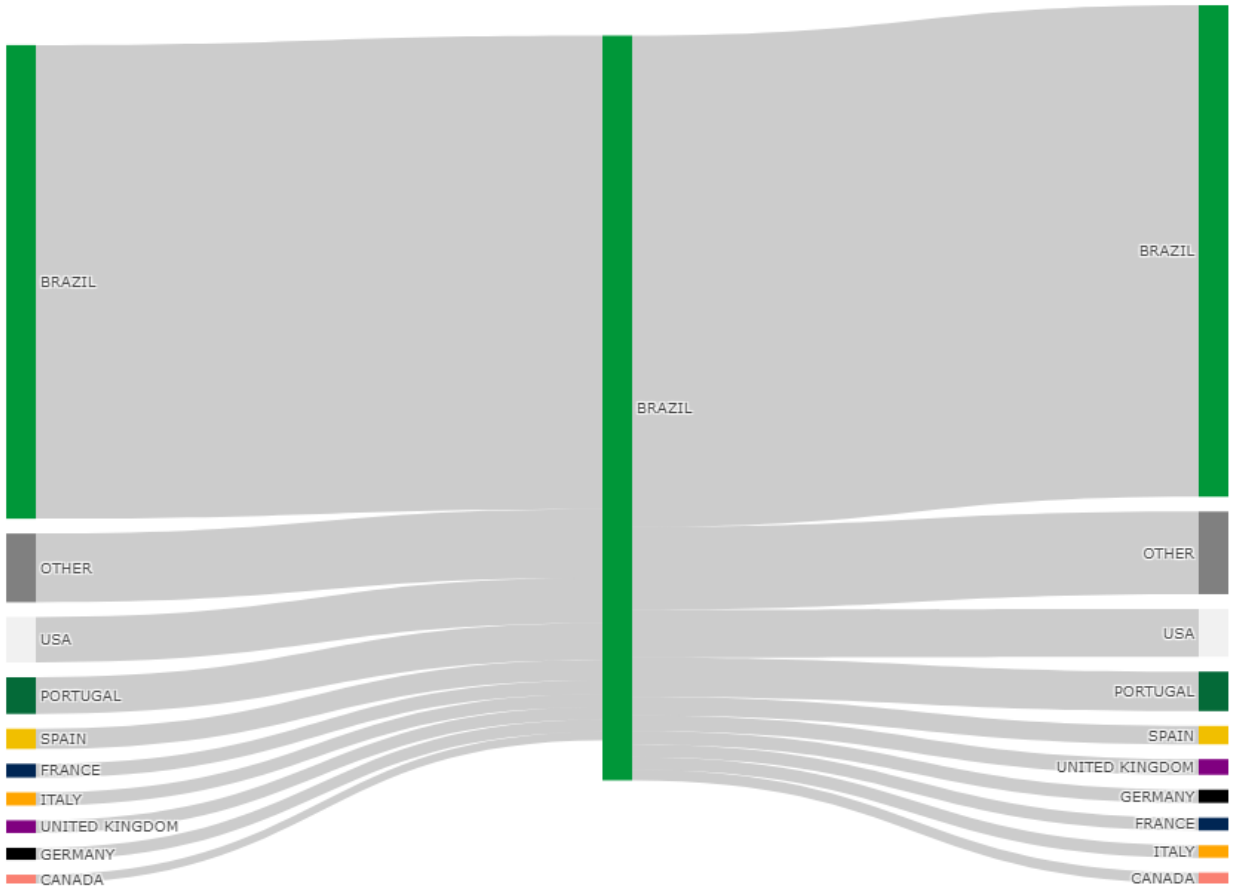


Figure 1. Country affiliations of Brazilian researchers before (left) and after 2017 (right). The middle is the data for 2017. Source: Web of Science Core Collection

- Mobility patterns of researchers can help research funders and administrators understand workforce dynamics
- Analysis of Web of Science Brazilian authors from 2017 whose career publications included more than one country (42,000 authors)
- The US is the top country for inbound and outbound researchers, followed by Portugal.
- Brazilian researchers are generally less mobile than some countries like US and China.

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Open Science

Analyzing Open Access publishing by type


THE WHITE HOUSE

Administration Priorities The Record Briefing Room

NOVEMBER 22, 2023

Report to Congress on Financing Mechanisms For Open Access Publishing of Federally Funded Research

OSTP › NEWS & UPDATES › REPORTS AND DOCUMENTS

Report to Congress on Financing Mechanisms For Open Access Publishing of Federally Funded Research can be found here.

https://www.whitehouse.gov/wp-content/uploads/2023/11/Open-Access-Publishing-of-Scientific-Research.pdf

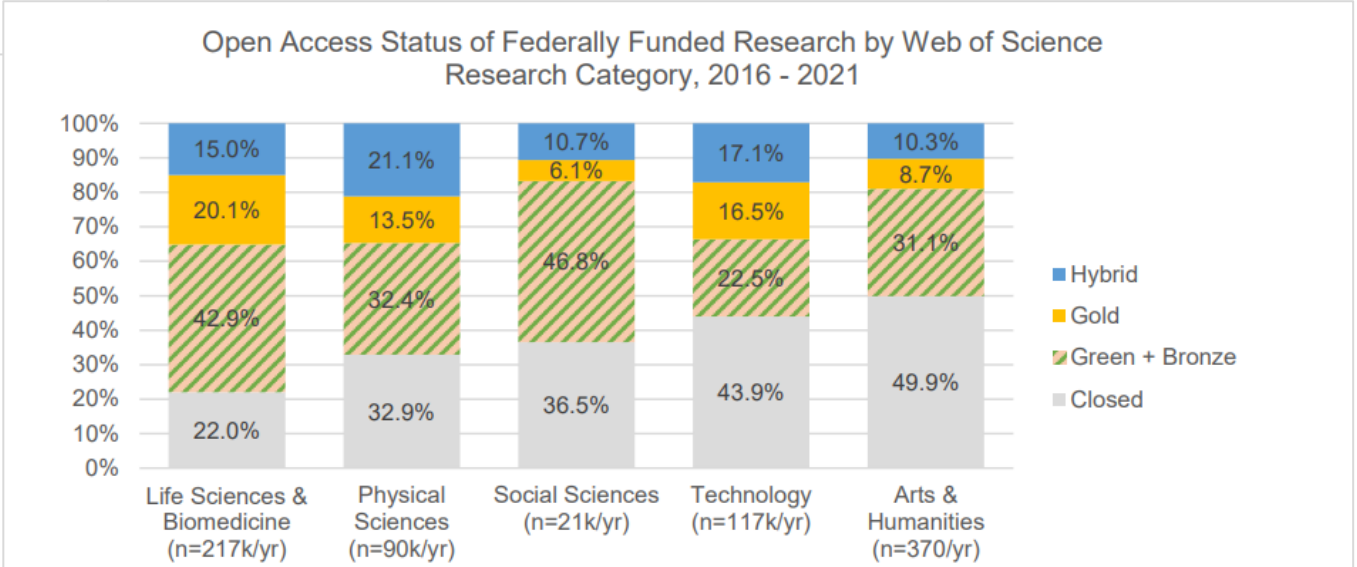

Figure 12. OA status of federally funded publications published between 2016 to 2021 by research category. Research resulting from funding from only agencies covered by the 2013 Memorandum were included in this analysis. The number of articles published per year for each category is provided in parentheses in the x-axis.

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Analyzing Open Access APCs by type


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Administration Priorities The Record Briefing Room

NOVEMBER 22, 2023

Report to Congress on Financing Mechanisms For Open Access Publishing of Federally Funded Research

OSTP › NEWS & UPDATES › REPORTS AND DOCUMENTS

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https://www.whitehouse.gov/wp-content/uploads/2023/11/Open-Access-Publishing-of-Scientific-Research.pdf

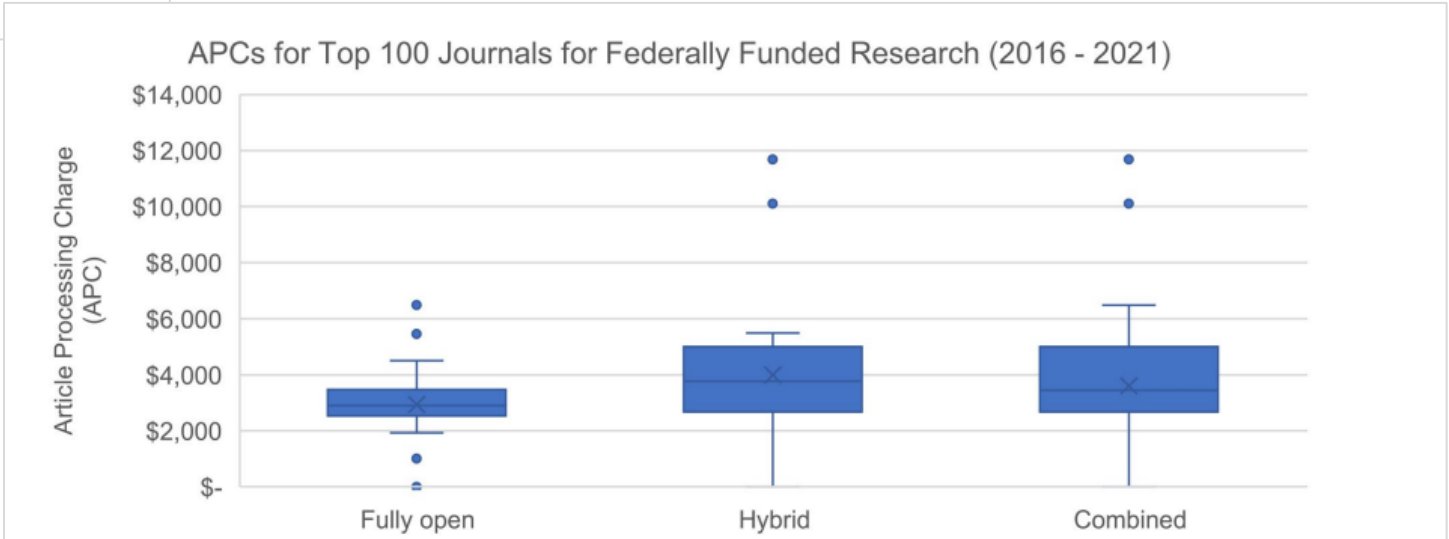
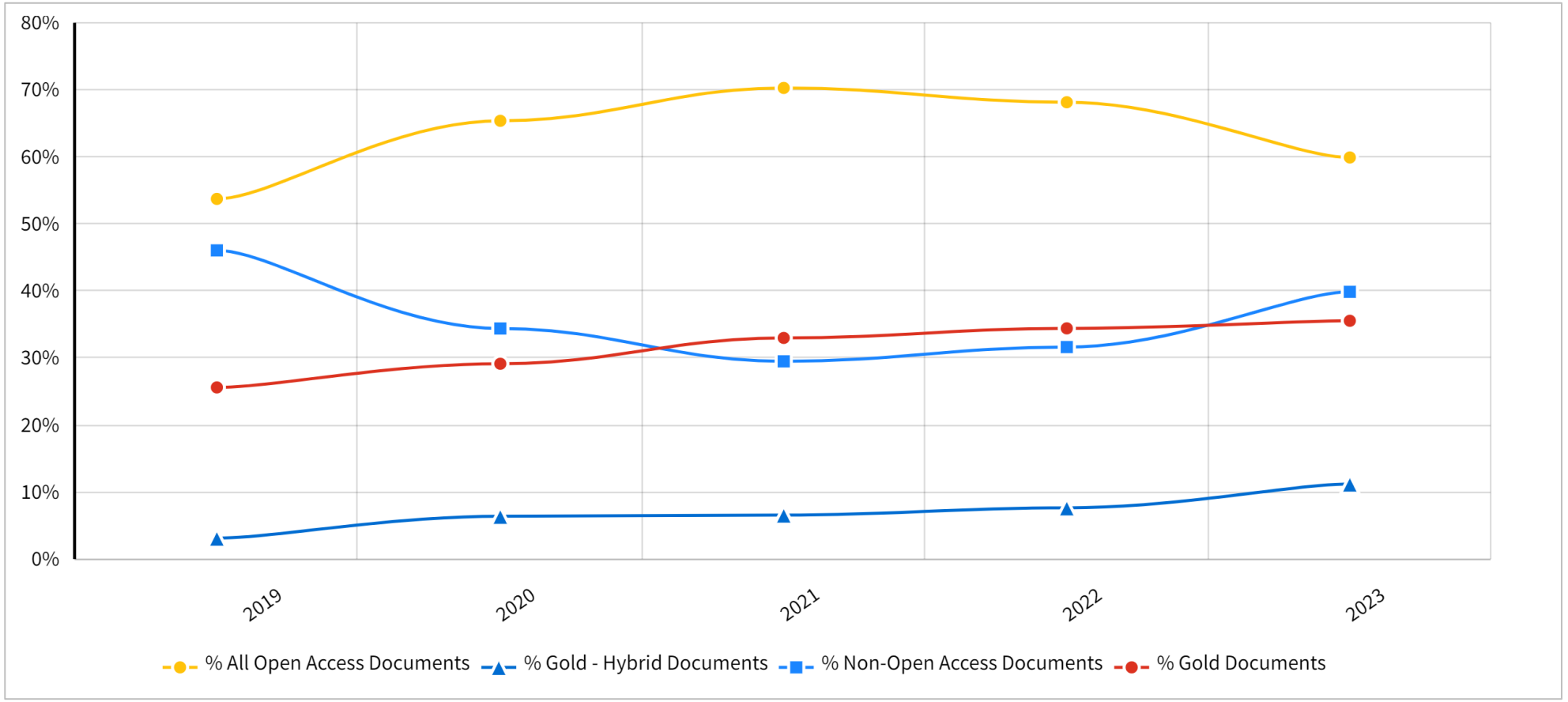


Figure 5. Distribution of APCs associated with the top 100 journals for federally funded research from 2016 to 2021, based on data from Web of Science. Journals were separated by Fully Open and Hybrid journals. APCs reflect fees posted in August 2023, which are likely higher than those charged from 2016-2021.

InCites- Analyzing growth in OA, by type
Institutional level analysis for library collection development

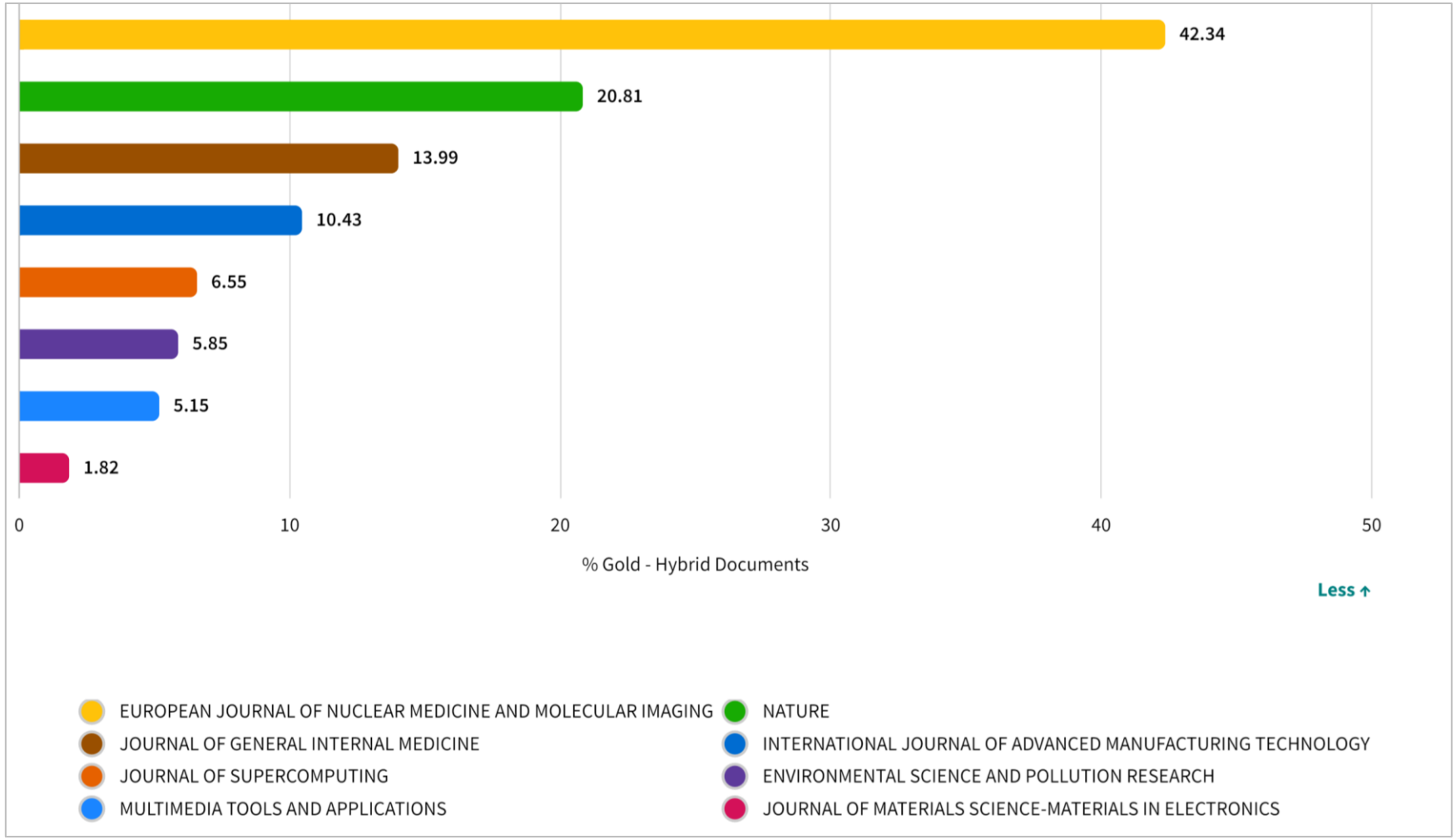
Penn State Univ, 2019-2023, Springer Nature journals



Source: InCites, article/reviews, 2019-2023 Exported March 8, 2024

InCites- Analyzing growth in OA, by type
Publisher level analysis for library collection development

Springer Nature hybrid journals, % open access, 2019-2023



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Source: InCites, article/reviews, 2019-2023 Exported March 8, 2024

UN Sustainable Development Goals

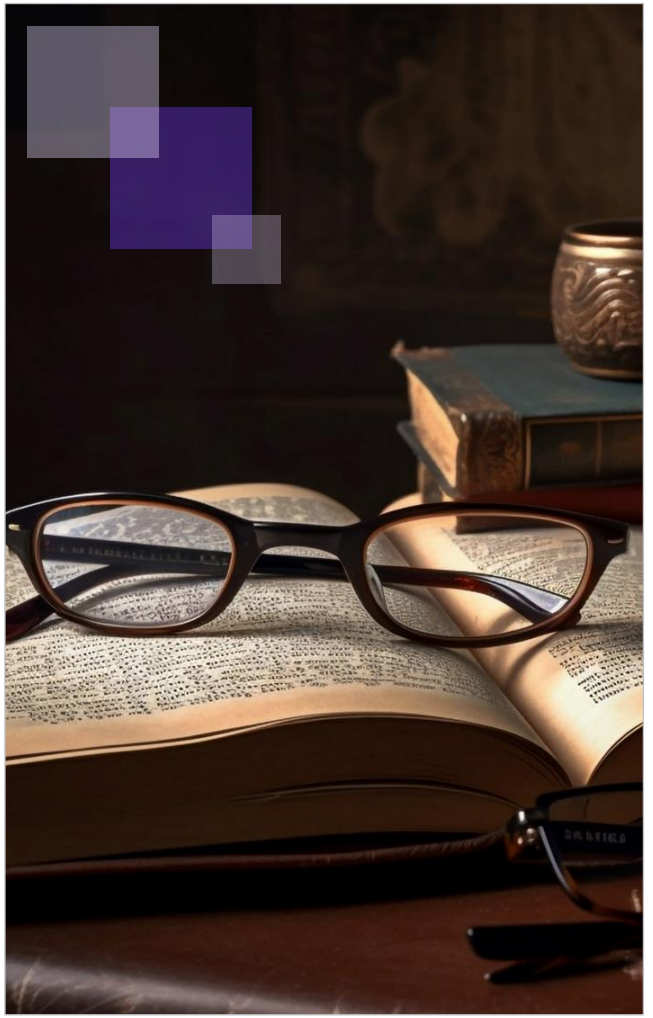
Mapping UN Sustainable Development Goals (SDGs) to Research Articles

Web of Science Core Collection articles are mapped to the SDGs.

- This categorization can be found in **Web of Science Core Collection** and **InCites.**

Methodology:

- The SDG categories are aggregations of Micro Citation Topics. A combination of keyword searching and micro citation topics is used to assign papers to an SDG.
  - Citation Topics-algorithmically derived citation clusters of articles using an algorithm developed by CWTS/Leiden.
  - One citation topic can be mapped to multiple SDGs; therefore, one paper can be mapped to multiple SDGs .
  - SDG 17 is coming soon.



InCites

Identify top organizations working on an SDG

e.g. SDG 2 Zero Hunger

Organization Name	Country or Region	Web of Science Documents	Category Normalized Citation Impact	Times Cited	% Documents Cited	% International Collaborations
5 groups added Show group(s)						
Vrije Universiteit Amsterdam	NETHERLANDS	688	2.33	21,577	87.5%	69.33%
Catholic University of the Sacred Heart	ITALY	581	2.28	15,605	84.68%	42.51%
University of California Berkeley	USA	1,060	2.2	20,658	83.87%	59.34%
Tsinghua University	CHINA MAINLAND	804	2.18	19,052	85.07%	47.39%
University of Zurich	SWITZERLAND	773	2.12	15,724	86.29%	77.88%
Free University of Berlin	GERMANY (FED REP GER)	689	2.12	12,049	84.47%	58.93%
University of Pennsylvania	USA	600	2.1	10,908	78%	41.5%

Institutions with at least 500 documents, 2019-2023, ranked by CNCI

InCites

For one organization, view its SDG contributions

e.g. University of Toronto, last 5 years

Research Area	Web of Science Documents	Times Cited	% Documents Cited	% Documents in Top 1%	% International Collaborations	% Industry Collaborations
1 groups added — Show group(s)						
03 Good Health and Well-being	71,496	1,109,172	79.35%	2.8%	58.55%	4.62%
05 Gender Equality	5,541	43,878	72.51%	2.27%	48.62%	0.94%
13 Climate Action	3,582	62,822	83.42%	3.46%	66.19%	1.76%
11 Sustainable Cities and Communities	3,421	46,543	79.71%	1.32%	55.77%	4.18%
04 Quality Education	3,241	19,139	69.42%	1.64%	40.82%	0.52%
15 Life on Land	2,132	28,702	83.68%	2.44%	65.95%	0.56%
07 Affordable and Clean Energy	1,533	44,259	85.78%	5.15%	67.45%	3.39%
02 Zero Hunger	1,403	17,867	79.9%	2.28%	58.16%	1.14%
01 No Poverty	1,356	10,276	71.17%	1.92%	52.29%	0.59%

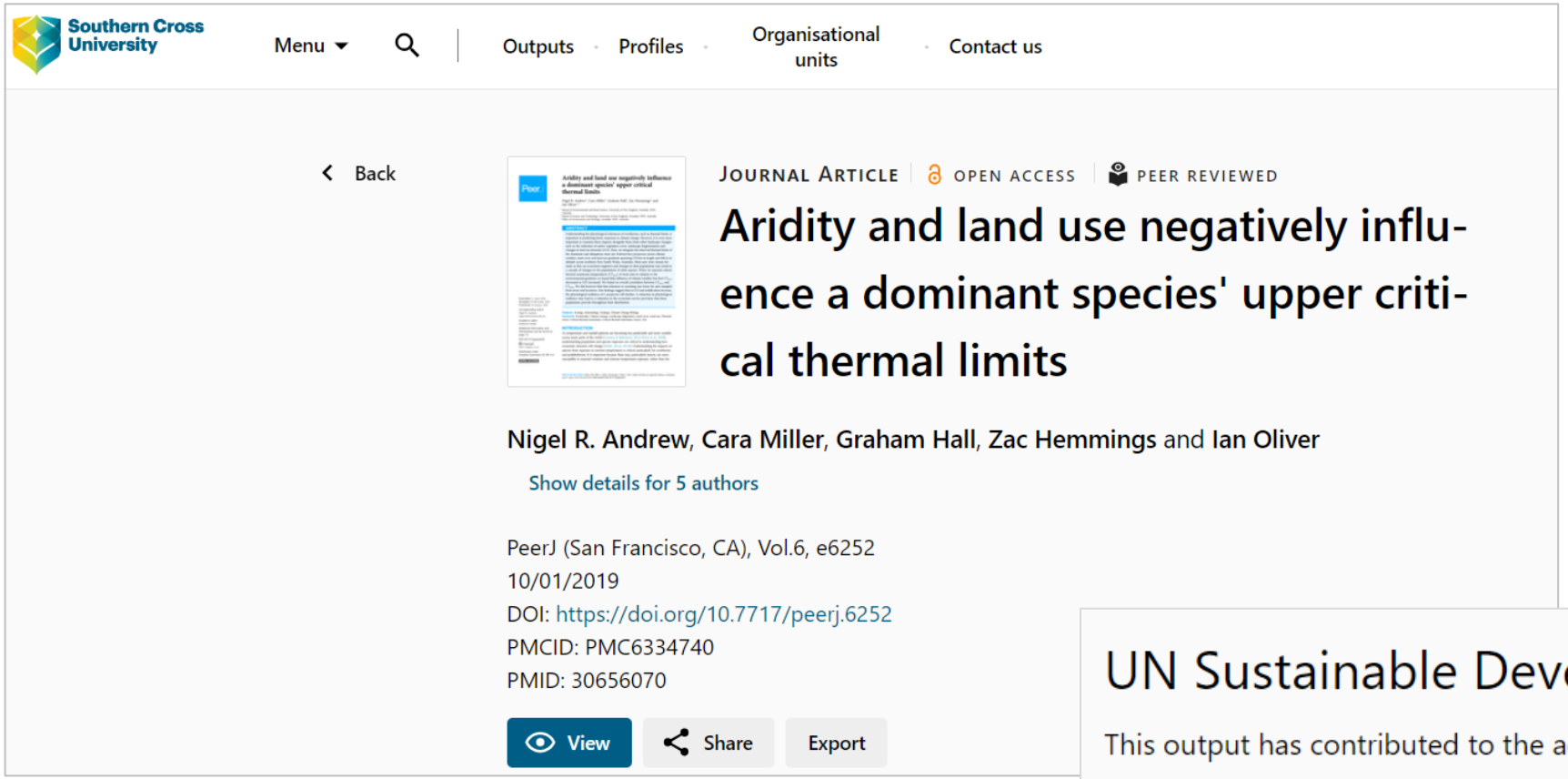
InCites

For one organization, view its SDG contributions

e.g. University of Toronto, last 5 years

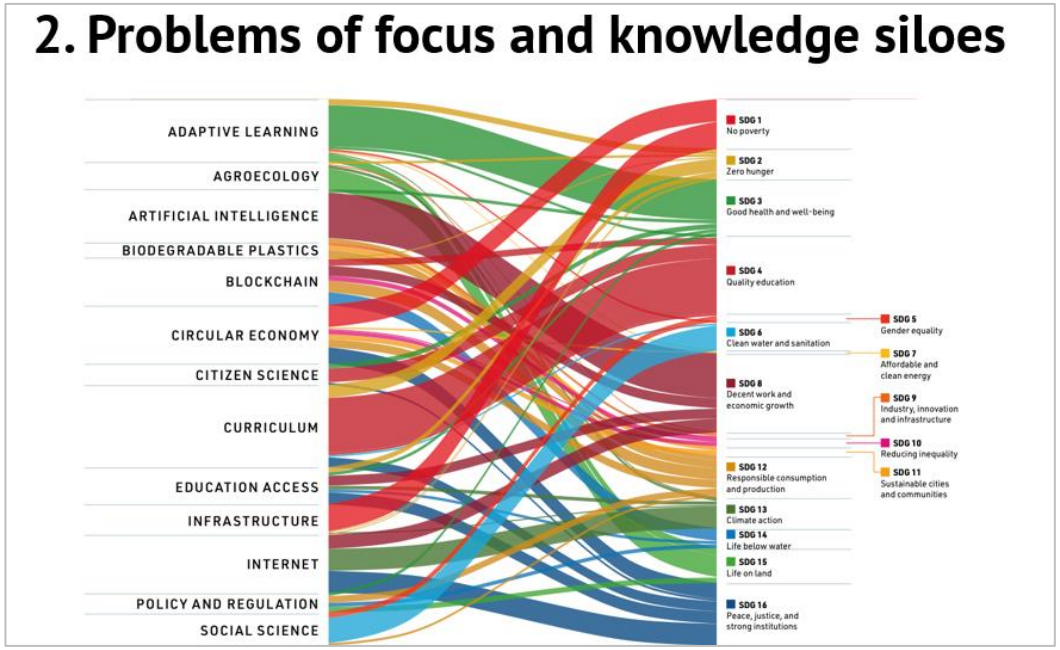
Box size indicates number of Web of Science Documents ⓘ

Esploro displays SDGs on public research profiles



Aridity and land use negatively influence a dominant species' upper critical thermal limits - Southern Cross University (scu.edu.au)

For more on SDGs, watch this recent recorded webinar



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https://clarivate.com/webinars/advancing-sustainable-development/

Horizon scanning

Key Fields, Hot and Emerging areas of research in 2023

Research Fronts 2023: Annual Report

Clarivate and the Chinese Academy of Sciences (CAS) released *Research Fronts 2023*, their 10th annual joint report. The report unveiled the latest progress and the evolving direction of scientific fields by identifying the significant research specialties in sciences and social sciences

https://discover.clarivate.com/Research_Fronts_2023_EN

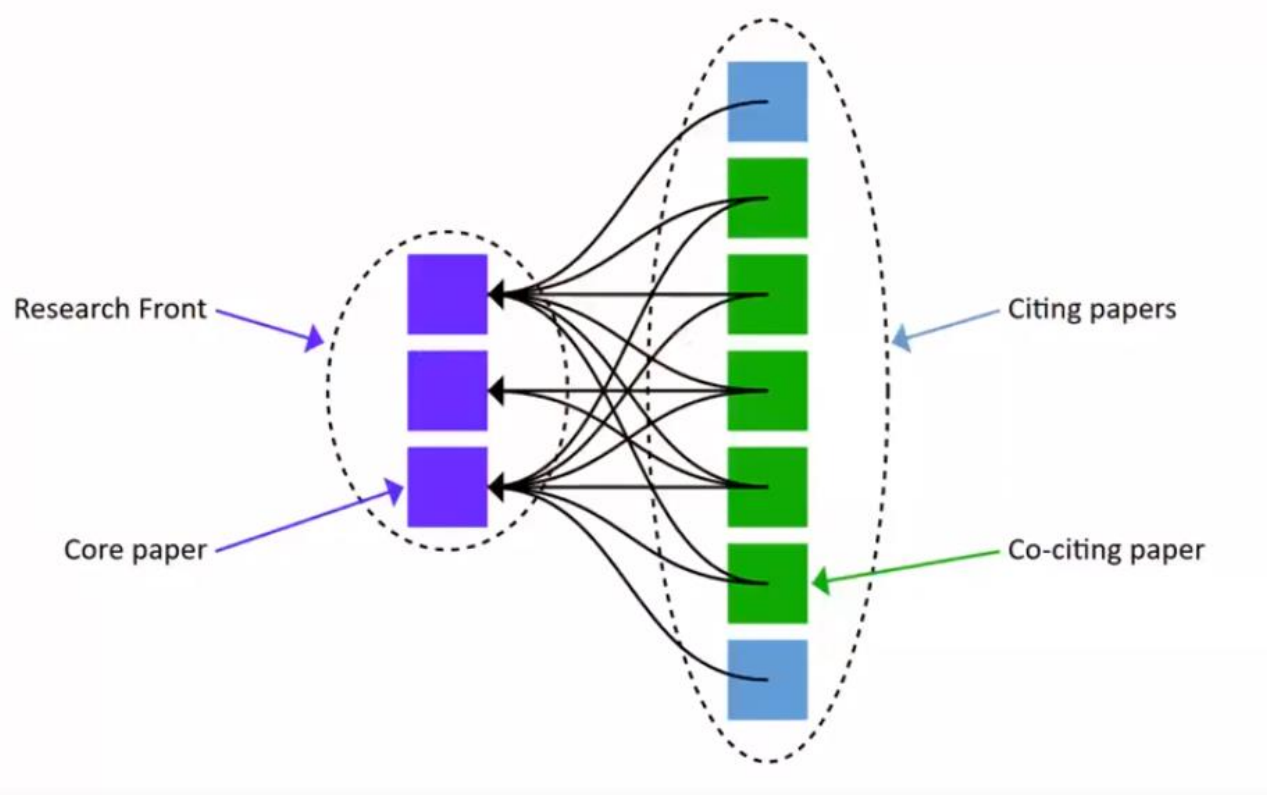
What are Research Fronts?

Methodology

- **'Research Front**' is now a recognized term, often associated with trends in research, growth areas and emerging fields or topics.

- **Research Fronts** are specialties discovered when clusters of highly cited papers are frequently cited together, reflecting a specific commonality in the research. These clusters can be formed around experimental data, a method, a concept, or a hypothesis.

- **Research Fronts** are defined as the most promising ideas and developments that are important for the further development of science and technology.



Research Fronts 2023 presents a total of:
128 Research Fronts,
including 110 hot and 18 emerging ones.

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11 Broad Areas of 128 Research Fronts

- AGRICULTURAL, PLANT AND ANIMAL SCIENCES
- ECOLOGY AND ENVIRONMENTAL SCIENCES
- GEOSCIENCES
- CLINICAL MEDICINE
- BIOLOGICAL SCIENCES
- CHEMISTRY AND MATERIALS SCIENCE
- PHYSICS
- ASTRONOMY AND ASTROPHYSICS
- MATHEMATICS
- INFORMATION SCIENCE
- ECONOMICS, PSYCHOLOGY AND OTHER SOCIAL SCIENCES

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THE TOP RESEARCH FRONTS IN ECOLOGY AND ENVIRONMENTAL SCIENCES

The Hot Research Fronts in environmental-science subfield mainly focus on emerging environmental issues such as microplastics, climate change, ozone pollution, as well as innovative solutions or new research area such as new water pollution control technologies and environmental epidemiology.

Key Research Fronts here are:

- "Environmental fate and eco-toxicity of microplastics in soils"
- "Theory and application of 'Nature-based Solutions'"
- "Detection and exposure of microplastics in human tissue"

Rank	Hot Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Activation of peroxymonosulfate with single-atom catalysts	16	1825	2021.0
2	Detection of SARS-CoV-2 in wastewater and COVID-19 epidemiological surveillance based on wastewater	30	6050	2020.3
3	Techno-economic assessment of CO_2 direct air capture	6	1011	2020.0
4	Adsorption of pollutants on microplastics particles	39	5732	2019.6
5	Environmental fate and eco -toxicity of microplastics in soils	48	9518	2019.5
6	The current status of insect declines, extinctions, and driving factors	12	4449	2019.4
7	Ozone pollution and its health risks in China	23	5898	2019.1
8	The global freshwater biodiversity crisis and the impacts of dams	14	3577	2019.1
9	Theory and application of "Nature-based Solutions"	10	1836	2018.9
10	Trends and sources of global methane emissions	9	1835	2018.9

Rank	Emerging Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Detection and exposure of microplastics in human tissue	2	216	2022.0

More in the report > Research Fronts 2023: Annual Report to Identify 128 Research Fronts

THE TOP RESEARCH FRONTS IN ECONOMICS, PSYCHOLOGY AND OTHER SOCIAL SCIENCES

The Top 10 hot Research Fronts in economics, psychology and other social sciences reflect the trend of the digital and "green" transitions currently transforming many aspects of economic and social life.

Unlike previous years, when hot Research Fronts in psychology dominated, three of the current hot fronts are related to digital and intelligent transformation, including "Supply chain risk management and the application of blockchain technology", "Research on consumers' use and acceptance of online meal ordering services", and "Artificial Intelligence (AI) ethics".

Rank	Hot Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Research on the uncertainty of green energy consumption and economic policy	39	1961	2021.4
2	Land use efficiency and sustainable development issues	17	1339	2020.8
3	Supply chain risk management and the application of blockchain technology	25	3377	2020.5
4	Application of two-way fixed effects regression model in causal relationship and inverse relationship	10	1854	2020.5
5	Research on consumers' use and acceptance of online meal ordering services	42	2783	2020.4
6	Green innovation and environmental performance	3	585	2020.3
7	Research on physical exercise interventions for children and adolescents	16	5386	2019.8
8	Analysis of selection factors of asset pricing model	13	1586	2019.5
9	Research on sports psychology	7	6864	2019.4
10	Artificial Intelligence (AI) ethics	4	738	2019.3

Rank	Emerging Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Development of the human-centric, sustainable, and resilient Industry 5.0	10	416	2021.6

More in the report > Research Fronts 2023: Annual Report to Identify 128 Research Fronts

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Q&A

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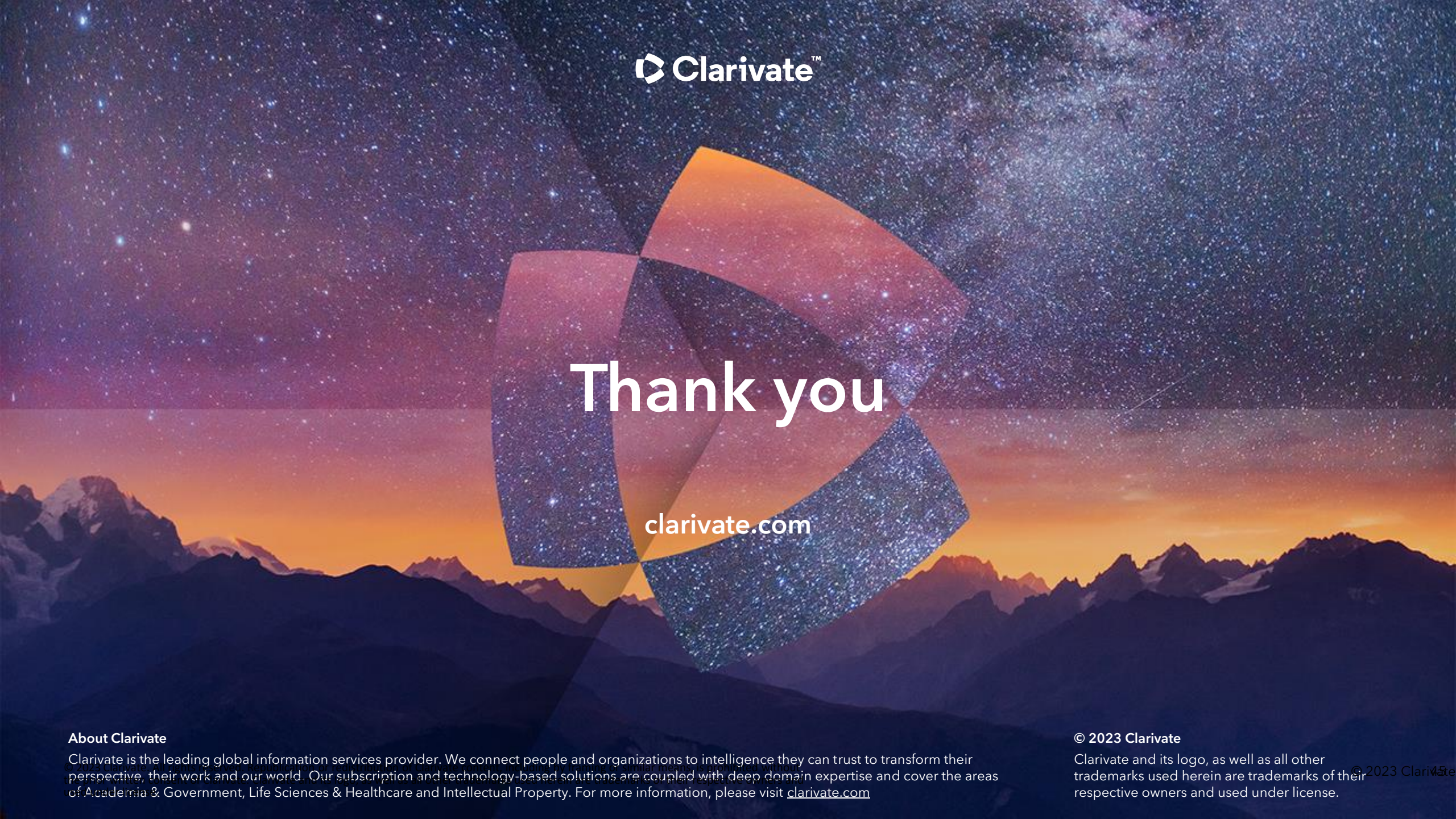

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Research Fronts 2023 methodology

Hot and Emerging Research Fronts

- **Research Fronts 2023** presents a total of **128** Research Fronts, including **110 hot** and **18 emerging** ones classified into 11 broad research areas in the sciences and social sciences.
- Starting from variety of Research Fronts the objective was to discover which Research Fronts were **most active** or **developing most rapidly.**
- This finally led to identifying **Hot** and **Emerging Research Fronts**

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SELECTING THE **HOT RESEARCH FRONTS**

The **Research Fronts** in each of 22 ESI fields are ranked by total citations, and the Top 10% of the fronts in each ESI field were extracted. These Research Fronts were then merged into **11 broad areas** and re-ranked according to **the average (mean) year** of their core papers to produce the **"youngest"** ones in each broad area.
Based on these data, the strategic information professionals with domain knowledge adjusted and merged some Research Fronts.

SELECTING THE **EMERGING RESEARCH FRONTS**

For the 11 broader areas, to identify **emerging specialties**, extra preference, or weight, was given to the currency of the foundation literature. These were then sorted in descending order, by their total citations in each ESI field corresponding to the 11 broader areas.

The **top 10% Research Fronts** were selected and delivered to the Institute for Scientific Information, where information professionals with domain knowledge made the final selection of **18 Emerging Research Fronts** for each field.

Research Fronts 2023 methodology
Key Research Fronts

- Based on the core papers and citing papers of **128 Research Fronts** provided by Clarivate, information professionals at the Institute of Strategic Information, conducted a detailed analysis and interpretation to highlight 31 **Key Research Fronts** of particular interest, including both hot and emerging fronts.

- To identify the key Research Fronts was applied the indicator known as CPT

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SELECTING THE **KEY RESEARCH FRONTS**

CPT is the ratio of the **average citation impact** of a Research Front to the **age/occurrence** of its citing papers, meaning the higher the number, **the hotter** or **the more impactful** the topic.

It measures how extensive and immediate a Research Front is and can be used to explore the emerging or developing aspects of Research Fronts and to forecast future possibilities. The degree of citation influence can be seen from the amount of citing papers, while it also takes the publication years of citing papers into account and demonstrates the trend and extent of attention on certain Research Fronts across years

$$CPT = (C / P) / T = \frac{C}{P \cdot T}$$

C represents the number of citing articles

P is the number of core papers

T indicates the age of citing articles, which is the number of citing years, from the earliest year of a citing paper to the latest one.