



Unraveling and Demystifying the SDGs

The Quest

June 16, 2022

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SUSTAINABLE DEVELOPMENT GOALS

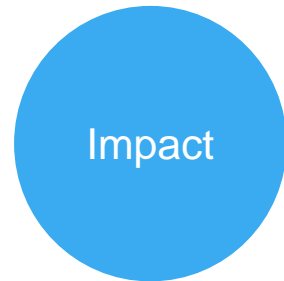


Research can play an integral role in achieving the Goals



Why is Mapping Research to the SDGs A Quest?

SDGs capture language of needs and impact

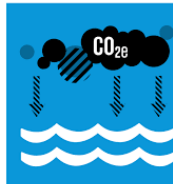


14 LIFE BELOW WATER



Conserve and sustainably use the oceans, seas and marine resources

TARGET 14-3



REDUCE OCEAN ACIDIFICATION

TARGET 14-1



REDUCE MARINE POLLUTION

TARGET 14-6



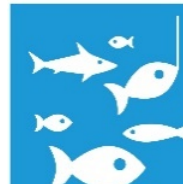
END SUBSIDIES CONTRIBUTING TO OVERFISHING

TARGET 14-5



CONSERVE COASTAL AND MARINE AREAS

TARGET 14-4



SUSTAINABLE FISHING

Why is Mapping Research to the SDGs a Quest?


Actions use industry language



Patents



- **Process for conversion of organic, waste, or low-value materials into useful products**

 **MAYA Holding ...** First filing in family 11/17/2003
First publication in family 9/29/2004

The present invention addresses the processing of waste and low-value products to produce useful materials in reliable purities and compositions, at acceptable cost, without producing malodorous emissions and with high energy efficiency. To facilitate the invention...

- **Bioretention system and method**

 **SUSTAINABLE WATER INFRA...** First filing in family 4/15/2009
First publication in family 10/21/2009

A bioretention system and method are provided for removing phosphorus, nitrogen and other materials from effluent such as wastewater and stormwater. The system and method can include a filtration media comprising water treatment residuals and other fill such as soil. Plants can be growing in the soil. The system can also include a drainage

Research



A tradeoff between physical encounters and consumption determines an optimal droplet size for microbial degradation of dispersed oil

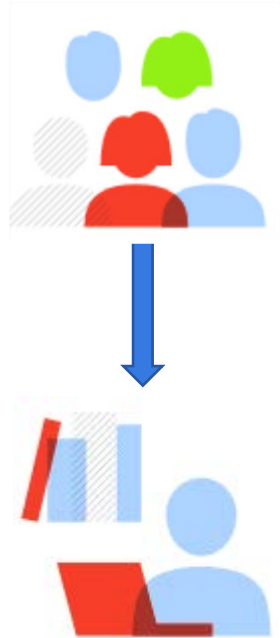
Vicente I. Fernandez¹, Roman Stocker^{1,2} & Gabriel Juarez^{2,3}

Termination of the 2018 Florida red tide event: A tracer model perspective

Yonggang Liu^a, Robert H. Weisberg^a, Lianyuan Zheng^a, Cynthia A. Heil^b, Katherine A. Hubbard^c



Step 1: Understanding the SDGs



TARGET 1-1



ERADICATE EXTREME POVERTY

TARGET 1-3



IMPLEMENT SOCIAL PROTECTION SYSTEMS

TARGET 1-2



REDUCE POVERTY BY AT LEAST 50%

TARGET 1-4



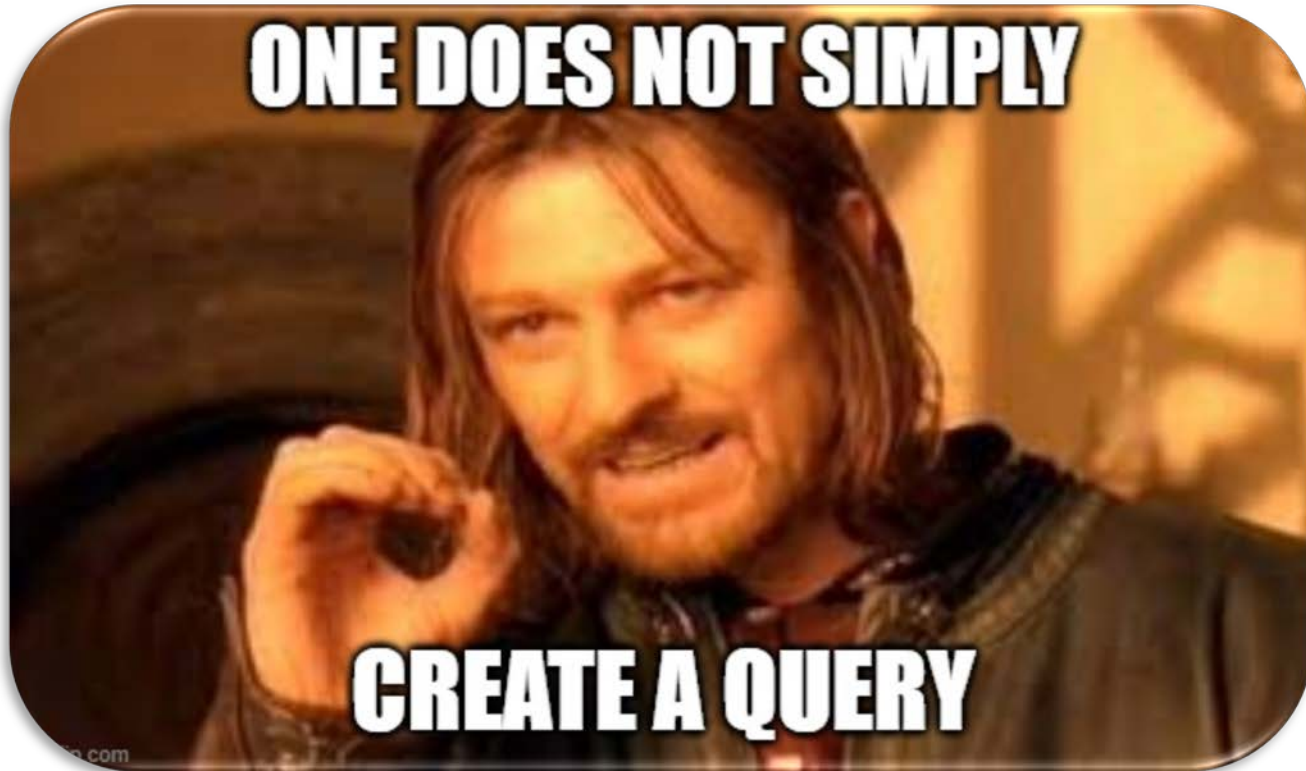
EQUAL RIGHTS TO OWNERSHIP, BASIC SERVICES, TECHNOLOGY AND ECONOMIC RESOURCES

TARGET 1-5



BUILD RESILIENCE TO ENVIRONMENTAL, ECONOMIC AND SOCIAL DISASTERS

Step 2: Build queries



Step 2: Build queries. Evaluate the terms based on results

Metrics
✔ 0.00 %
☰ 240119
👍 0.00 %
👎 0.00 %
👍 100.00 %
Loaded project:

Carbon Capture X

Show sample: 1803 # of docs: 1895 Search here :)

Show 1 to 10 of 100 entries First Previous **1** 2 3 4 ... Next Last

ID	Title	Keywords	Abstract	Journal title	Rating
filter	filter	filter	filter	filter	filter
2-s2.0-9244221615	Greenhouse gas growth rates	Methane , Priority Journal, Article, Fossil Fuels, Trace Element, Greenhouse Effect, Atmospheric Dispersion, Carbon Dioxide , Controlled Study, Climate Change, Global Climate , Greenhouse Gas, Growth Rate, Nitrous Oxide, Air Pollution Control, Nitrous Oxide	We posit that feasible reversal of the growth of atmospheric CH ₄ and other trace gases would provide a vital contribution toward averting dangerous anthropogenic interference with global climate . Such trace gas reductions may allow stabilization of atmospheric CO ₂ at an achievable level of anthropogenic CO ₂ emissions , even if the added global warming constituting dangerous anthropogenic interference is as small as 1°C. A 1°C limit on global warming with associated climate sensitivity requires	Proceedings of the National Academy of Sciences of the United States of America	👍 👎 👍
2-s2.0-9344267135	Compressed air storage-gas turbines-power plants to balance fluctuating wind energy production	NA	can also supply surplus energy. The result is less use of fossil fuel and fewer CO₂ emissions . The coastal regions with large amounts of wind energy and numerous salt formations suitable for compressed air storage facilities are especially attractive locations. CAES power plants reduce the cost of electricity from wind energy under consideration of all cost factors. The discussion covers the need for compressed air storage because of the increased use of wind energy in countries such as	DGMK Tagungsbericht	👍 👎 👍

Step 2: Build queries. Evaluate the terms based on results

Metrics 16.00 % 0 0.00 % 0.00 % 100.00 % **Loaded project:**

Carbon Capture X

Show 10 sample: 50 # of docs: 1000

Show 1 to 10 of 280 entries

Search here :)

First Previous **1** 2 3 4 ... Next Last

Recall function. X

SRCTITLE ("Journal Of Cleaner Production")

Keyword	Term frequency	tfidf
filter	filter	filter

Step 2: Build queries. Evaluate the terms based on results

Carbon Capture

X

QUERY

RECALL FUNCTION

Show 10 ▾



sample

Search here :)

Show 1 to 10 of 94 entries

Previous 1 2 3 4 ... Next Last

Keyword

filter

TEMPERATE GRASSLAND
 ELEVATED CO2
 CARBON SEQUESTRATION
 C SEQUESTRATION
 MANAGEMENT PRACTICES
 SIMULATION MODELLING.
 C SEQUESTRATION RATE
 CARBON SEQUESTER
 INCREASING CO2 CONCENTRATION
 ECOSYSTEMS



tfidf

filter

23.49831397824485
 22.375106745878057
 18.238848483209672
 17.347948528249397
 14.172260196877659
 13.386514952445916
 12.89921982609012
 12.121643965913384
 12.087231968315654
 11.894854712273407

2

74685



Elsevier BV

Improving the Scopus and Aurora queries to identify research that supports the United Nations Sustainable Development Goals (SDGs) 2021

Published: 26 August 2021 | Version 4 | DOI: 10.17632/9sxdykm8s4.4

Contributors: Maxime Rivest, Yury Kashnitsky, Alexandre Bédard-Vallée, David Campbell, Paul Khayat, Isabelle Labrosse, Henrique Pinheiro, Simon Provençal, Guillaume Roberge, Chris James

[Download All 29 MB](#)



Files



SDG Machine Learning Methodology & Samples



SDG Query and Methodology

Evaluating the SDG Queries

- Analysis showing the overlap between four different queries for SDG 13
- No more than 25% of common publications for the different queries related to a given SDG

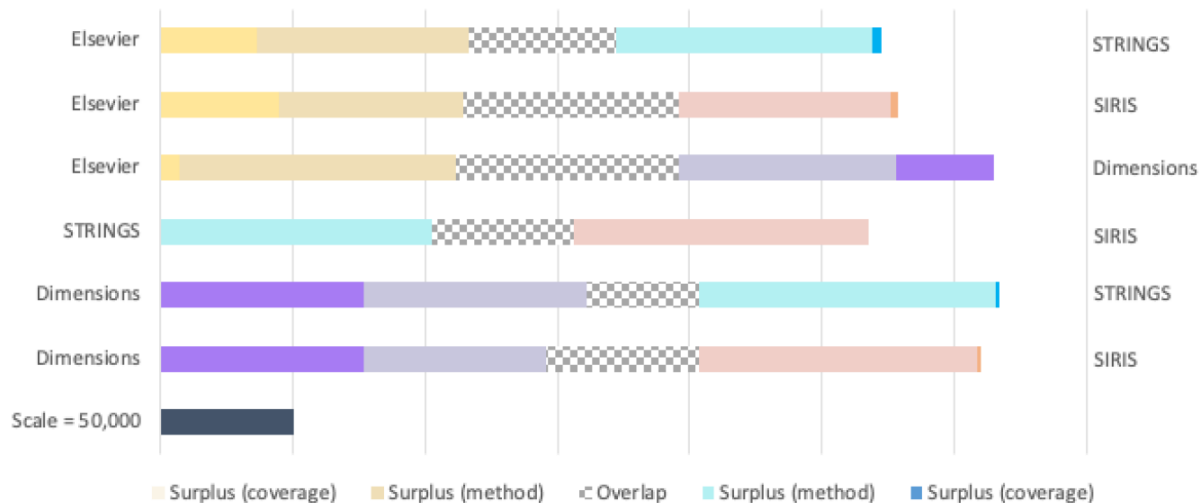


Figure 2. Number of overlapping and surplus publications between methods

A comparison of different methods of identifying publications related to the United Nations Sustainable Development Goals: Case Study of SDG 13: Climate Action.
Philip James Purnell <https://doi.org/10.48550/arXiv.2201.02006>

World output in the SDGs



People

Prosperity

Planet

Health

SDG 3
(45 %)

Food

SDG 2
(4 %)

10 %

Education

SDG 4
(3.5 %)

11 %

Gender Equal.

SDG 5
(2.7 %)

9 %

Poverty

SDG 1 (1.5 %)

9 %

7 %

Energy

SDG 7
(18 %)

16 %

Infrastructure

SDG 9
(8 %)

12 %

Cities

SDG 11
(7 %)

13 %

Economy

SDG 8
(5 %)

11 %

Inequality

SDG 10
(4 %)

12 %

Institutions

SDG 16
(4 %)

10 %

Water

SDG 6
(6 %)

10 %

Sustainable
production

SDG 12
(5 %)

12 %

Climate

SDG 13
(5 %)

16 %

Biodiversity

SDG 15
(4 %)

9 %

Oceans
SDG 14 (2.5 %)

9 %

Step 3: Continue to evaluate with diverse gold sets



Montreal-based research analysts

- manual review of publications based on defined inclusion/exclusion criteria.
- 9,500 publications



Western European university researchers

- Survey data from 244 researchers from different universities in Europe and US filled in a survey.
- 6,741 publications



Chilean researchers; self assessment.

- Self-assessment of publications by university researchers at Pontificia Universidad Católica (PUC) based in Chile
- 1,200 publications

Solution 3: Build and collect gold sets to test precision

- Crowd source a gold set



Resources Research News Events Partners Links

Help identify research that advances the SDGs



← Show previous page

1 NO
POVERTY

2 ZERO
HUNGER

Advancing the 17 sustainable development goals (SDGs) is vital to the success of the United Nations' 2030 Agenda for Sustainable Development. Research and funding institutions have a vital supportive role in this historic task. Here, individual researchers like you can also play a part by helping to identify publications relevant to each SDG.

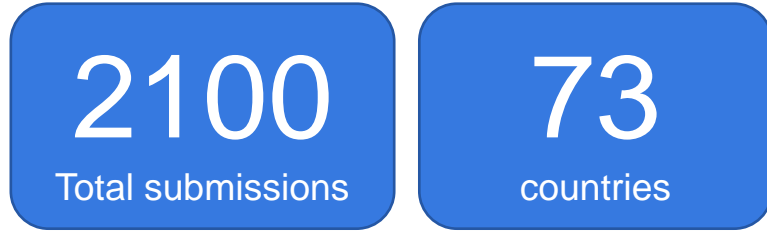
Why it is important to identify relevant publications

This task will show which of the SDGs are supported by a strong body of research and ensure this knowledge is available for reference. It will also highlight any gaps in the knowledge base, helping inform decisions about future lines of investigation.

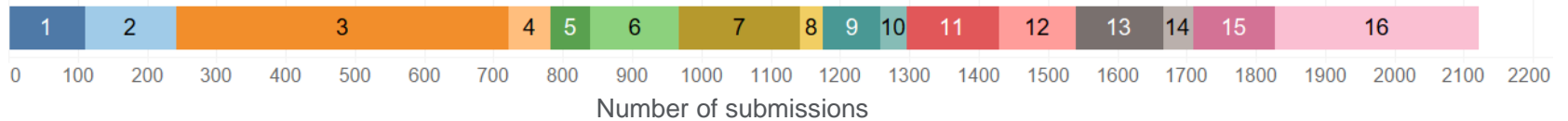
How you can help

Help us qualify relevance based on a given publication's relationship to the SDG indicators, which were developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs) as a way of showing progress towards a target. Here's how:

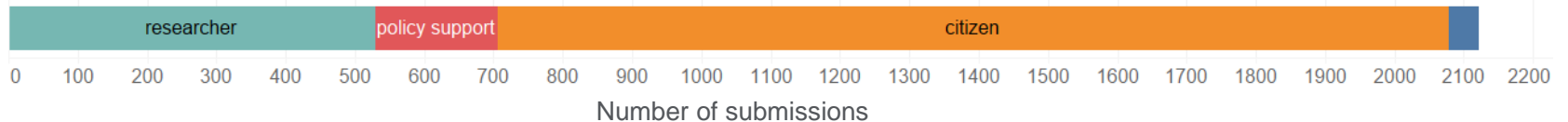
Summary of submissions



Breakdown by SDG



Breakdown by submitter



Learnings for a way forward

- SDG queries and results are subjective by nature
- Continued development involves diversifying the gold set to further refine queries
- Machine learning can increase recall

SDG queries provide a toolkit for customization depending on needs





Case study 1: Defining Engineering's role in addressing Climate Change

*“Research aimed at
mitigating climate change
or its impacts”*



Climate Science Themes included



- Sustainably enhancing food and agricultural productive capacity to meet climate change challenges



- Reliable, efficient, clean, and renewable energy
- Clean and environmentally sound technologies and industrial processes, and increasing their use



- Sustainable transportation, settlement planning, and urbanization



- Reduction of the environmental impact of cities
- Mitigation of effects caused by natural disasters



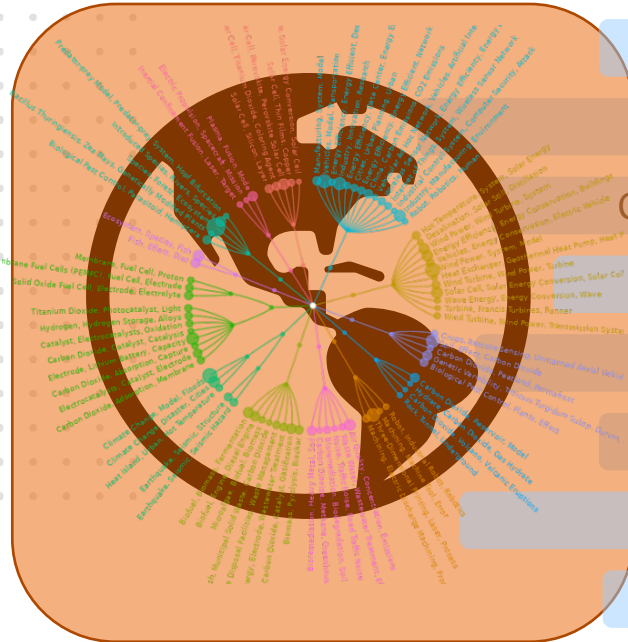
- Oceanic changes and their causes and effects
- Environmental changes (e.g. deforestation, desertification) and their causes and consequences



- Conserving and sustainably using biodiversity and the ecosystem

~4,000,000 publications

Issues in Climate Change: *Identifying the Relevant Research*



Solar & Renewable Energy

Energy Storage

Carbon Sequestration & GHG Capture

Decarbonizing Industries

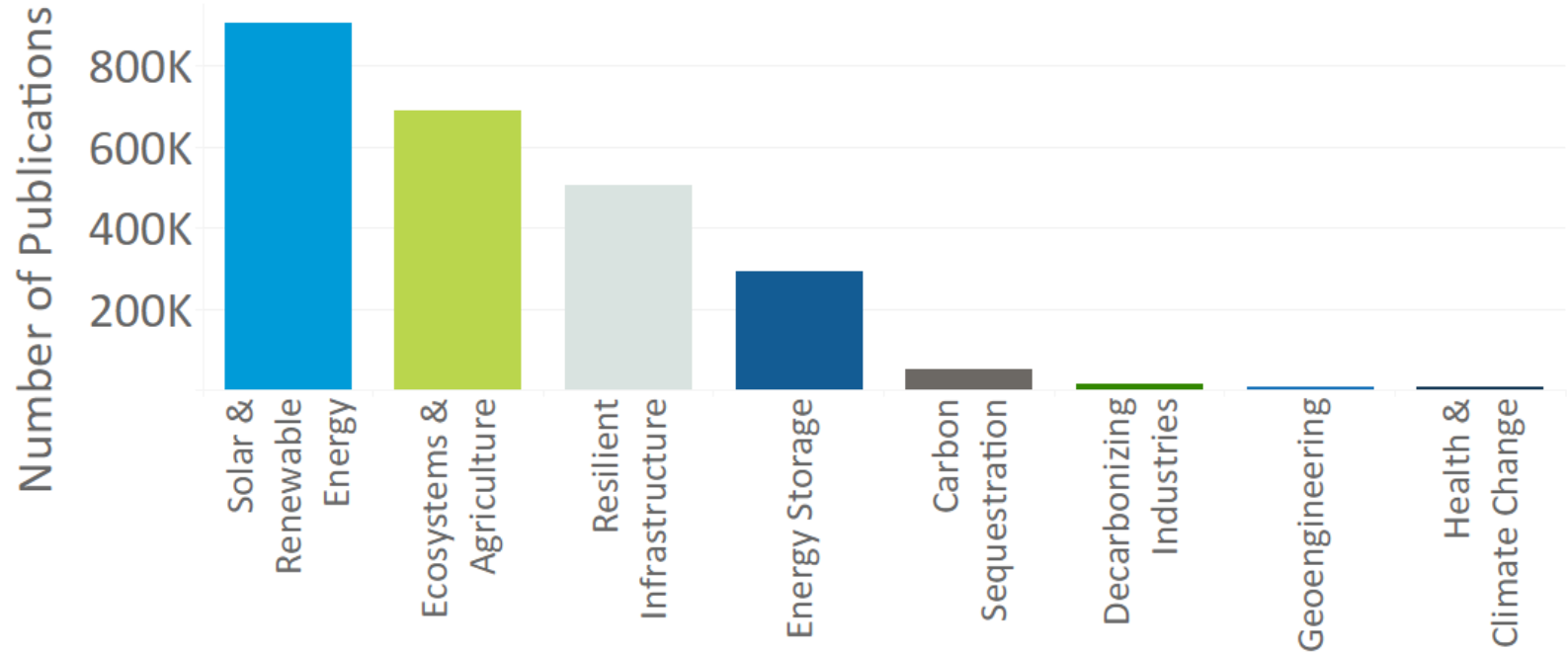
Ecosystems & Agriculture

Resilient Infrastructure, Buildings and
Transportation

Geoengineering

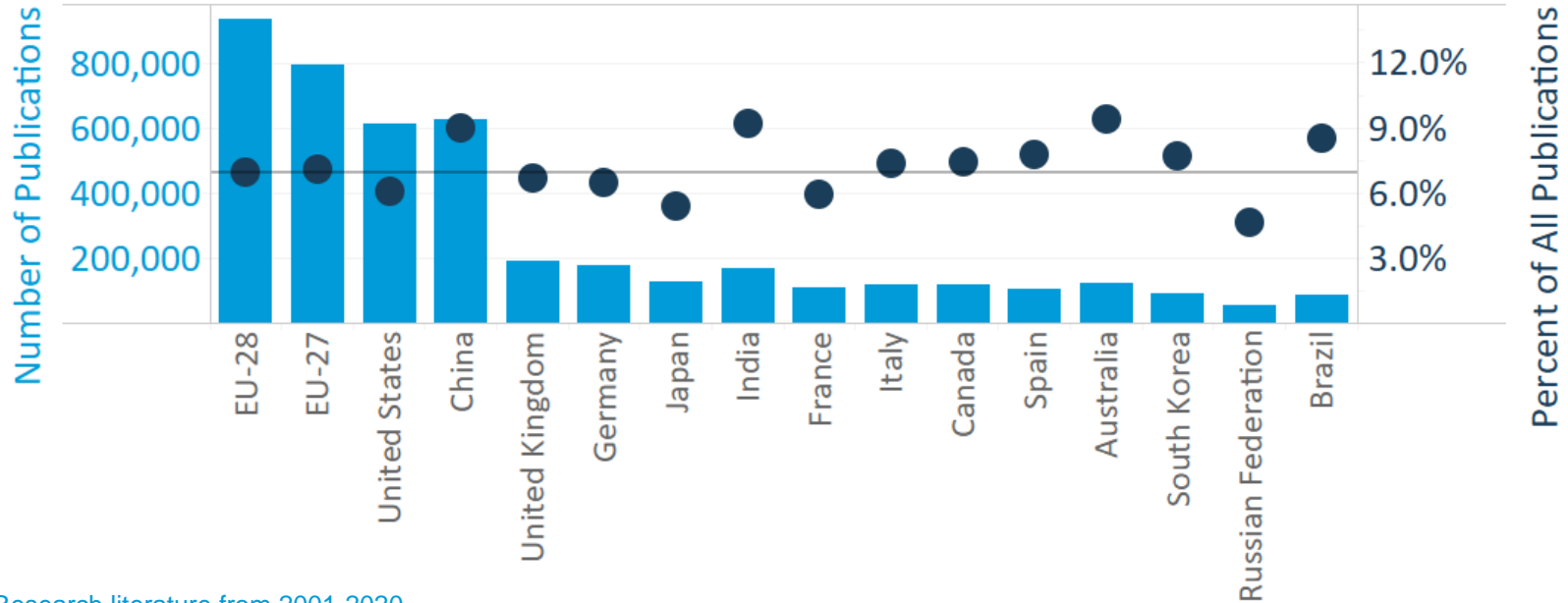
Health & Climate Change

Distribution of Research Across Climate Issues



Global research, 2001-2020

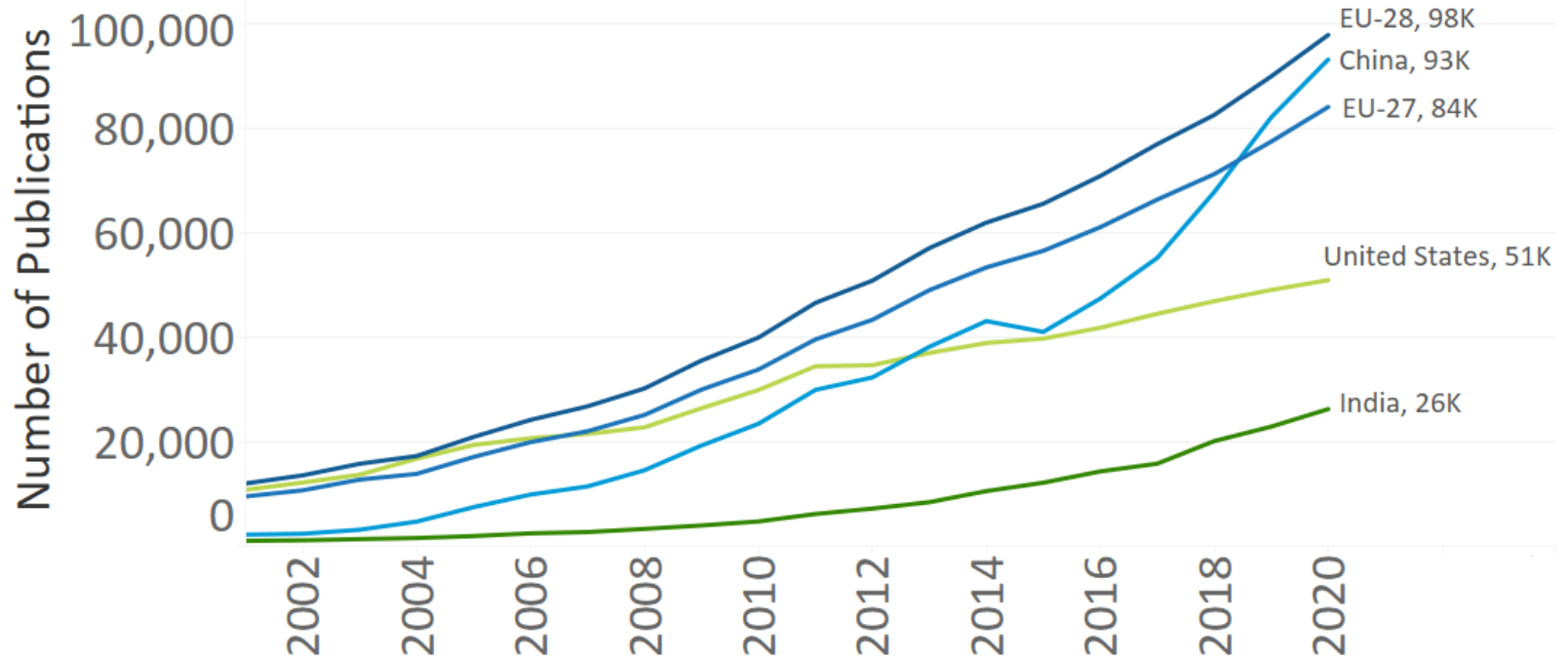
Leading Contributors to Climate Change Research: *Contributions by Region*



Research literature from 2001-2020

- Regions leading in contributions to the literature: EU, United States, China
- Regions with highest percent of entire research portfolio focused on climate change research: China, India, Australia, Brazil

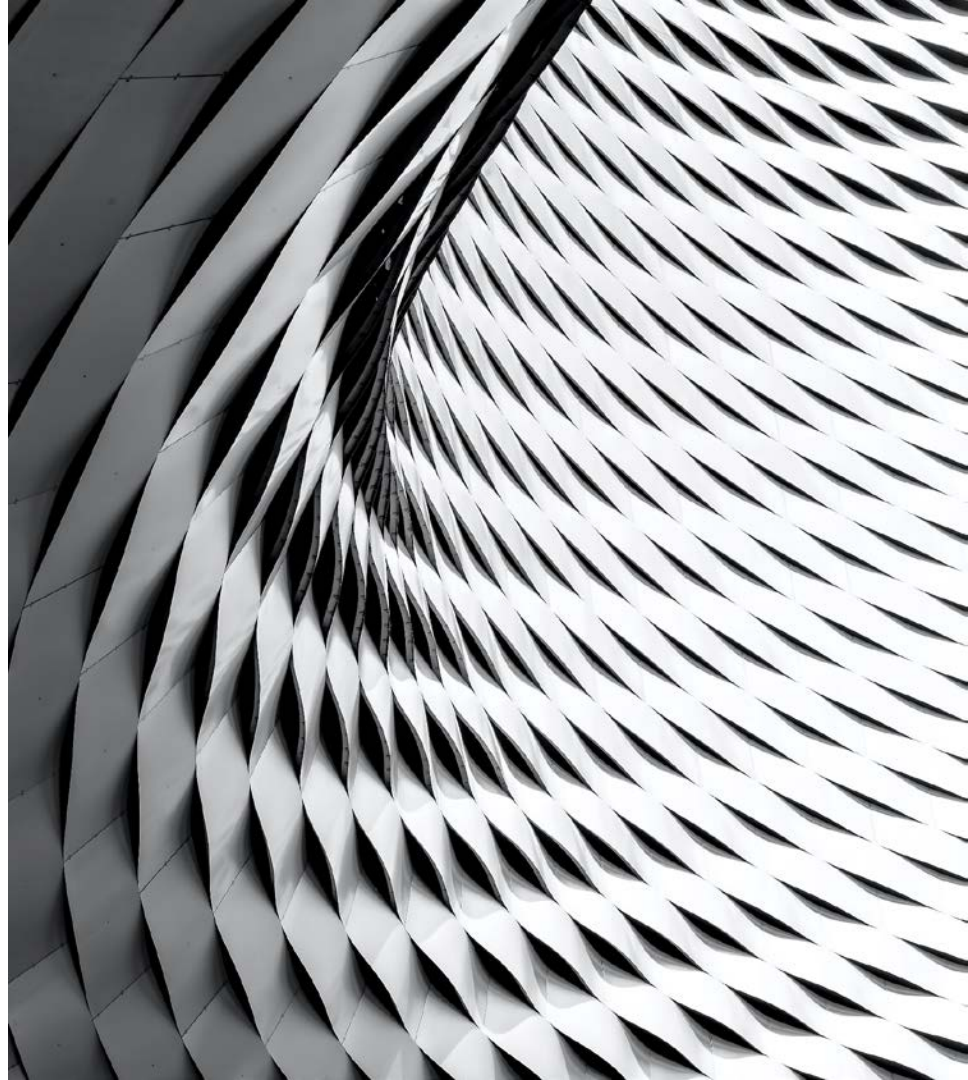
Leading Contributors to Climate Change Research: *Changes Over Time*



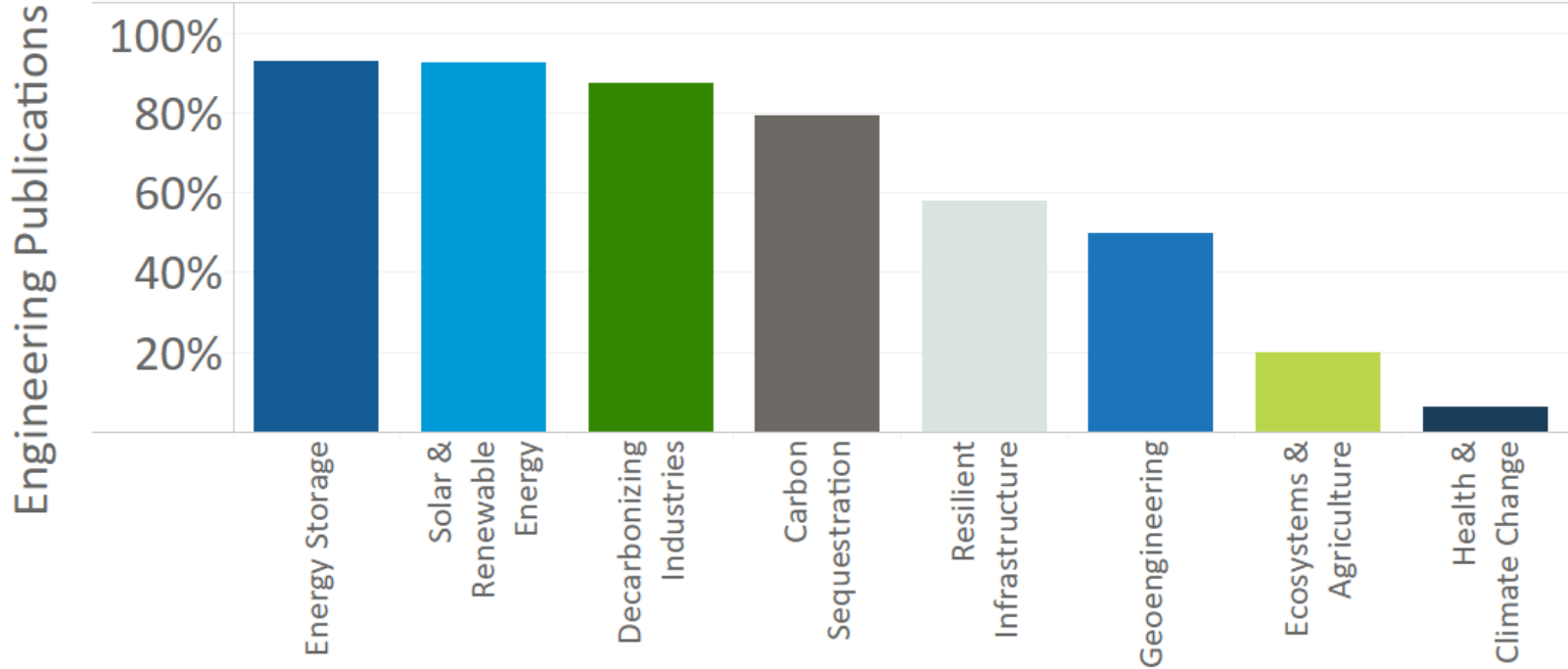
Defining Engineering Research:

Research from 1996 to 2021 was categorized as Engineering research based on:

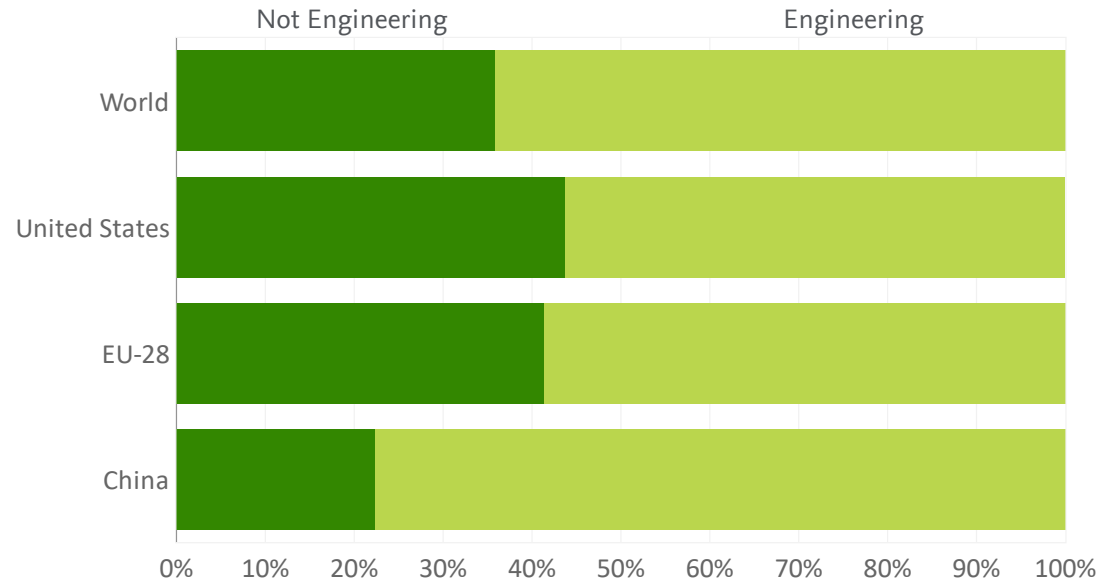
1. the **journal it was published in**, which captured approximately 20,000,000 documents, and
2. a **machine learning approach** to capture publications from multidisciplinary journals such as *Nature* and *Science*, which captured more than 2,000,000 additional documents.



Representation of Engineering in Research Across Climate Change Issues



Distribution of Climate Change Research: *Engineering Approach*



Engineering research represents 65% of climate change research globally with variations across regions:

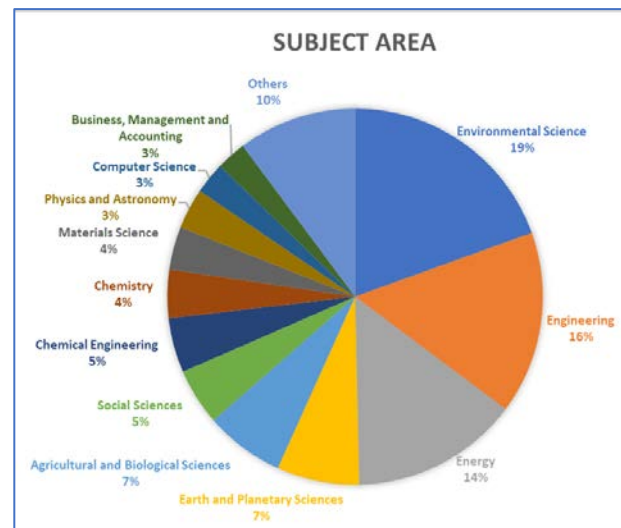
- 57% of climate change research in the US
- 78% of climate change research in China

Research literature from 2010-2019, categorized as engineering or not engineering.

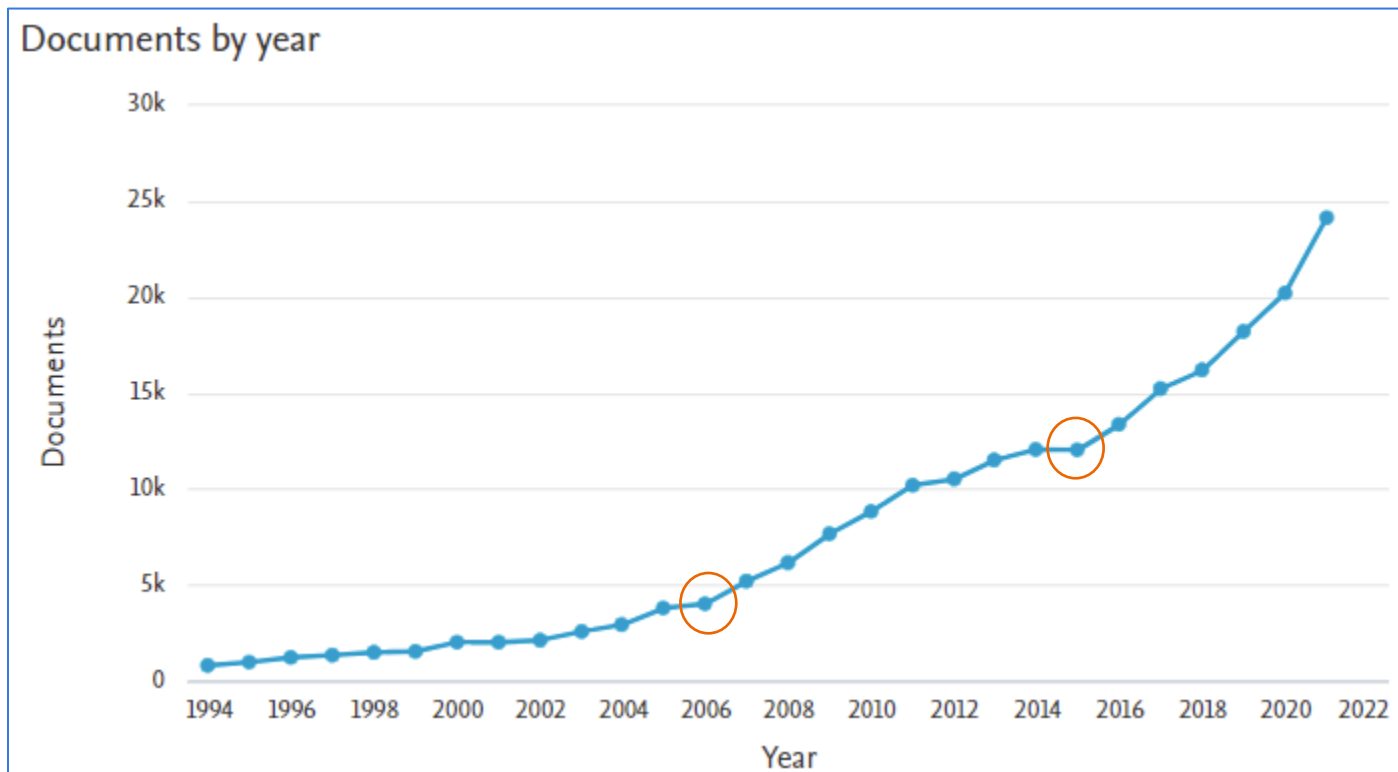
Deep Dive Analysis – Carbon Capture (part of SDG 13)

Over 236K documents captured starting 1922 onwards globally

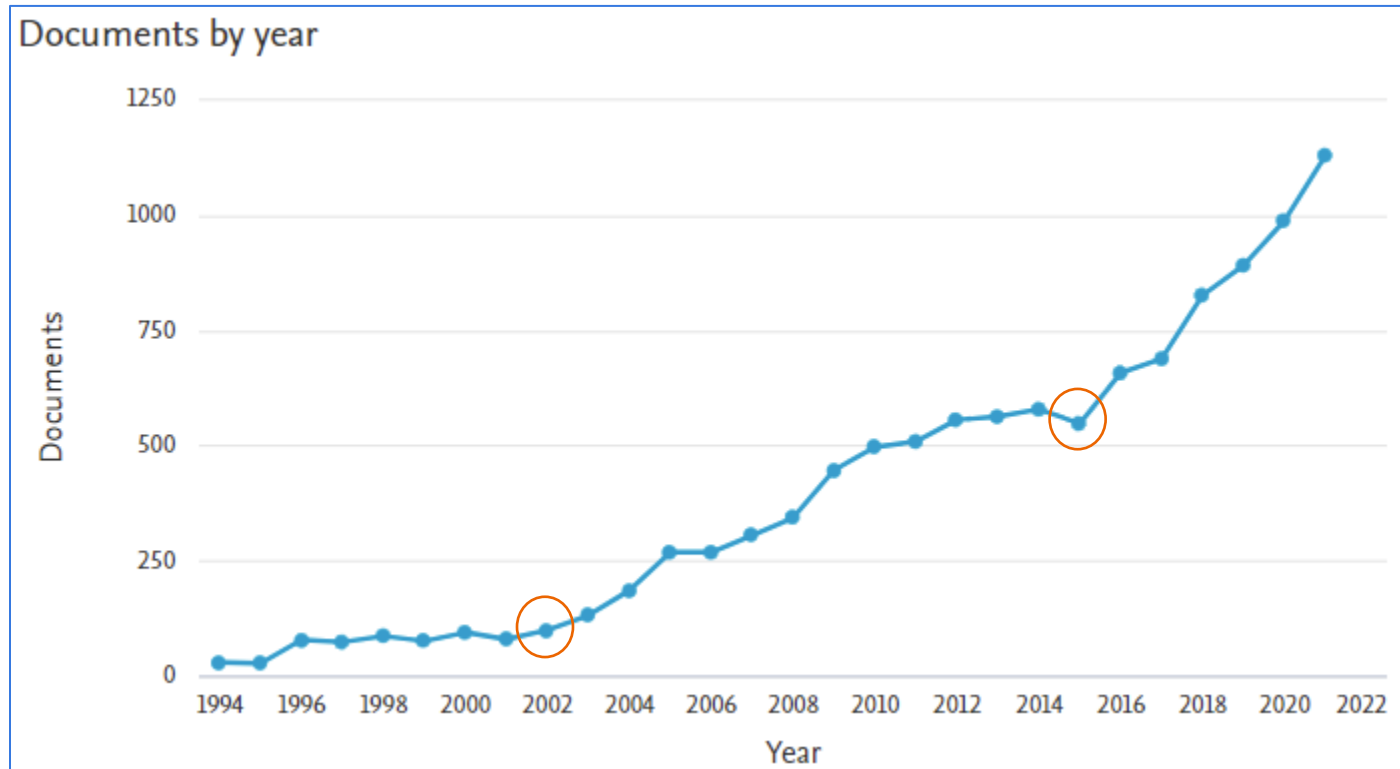
Country	Total Publication
United States	50163
China	35801
United Kingdom	20201
Germany	16684
India	13238
Canada	11732
Japan	11450
Australia	11115
Italy	10285
France	8939



Global Publication Trend



Publication Trend in Canada



Publications from 1952 captured in Scopus for Canada

Carbon Capture - Canada




Funding Sponsor	Count
Natural Sciences and Engineering Research Council of Canada	1899
National Natural Science Foundation of China	439
National Science Foundation	337
European Commission	218
Natural Resources Canada	207
Natural Environment Research Council	176
Agriculture and Agri-Food Canada	175
Social Sciences and Humanities Research Council of Canada	170
U.S. Department of Energy	162
UK Research and Innovation	162
Canada Foundation for Innovation	143
Canada Research Chairs	127
Mitacs	121
National Key Research and Development Program of China	117

Carbon Capture – Canada (2016 to 2021)

5,177 Scholarly Output ⓘ 39.4% All Open Access View list of publications	19,529 Authors	1.80 Field-Weighted Citation Impact ⓘ Yearly breakdown
97,780 Citation Count ⓘ	18.9 Citations per Publication ⓘ	

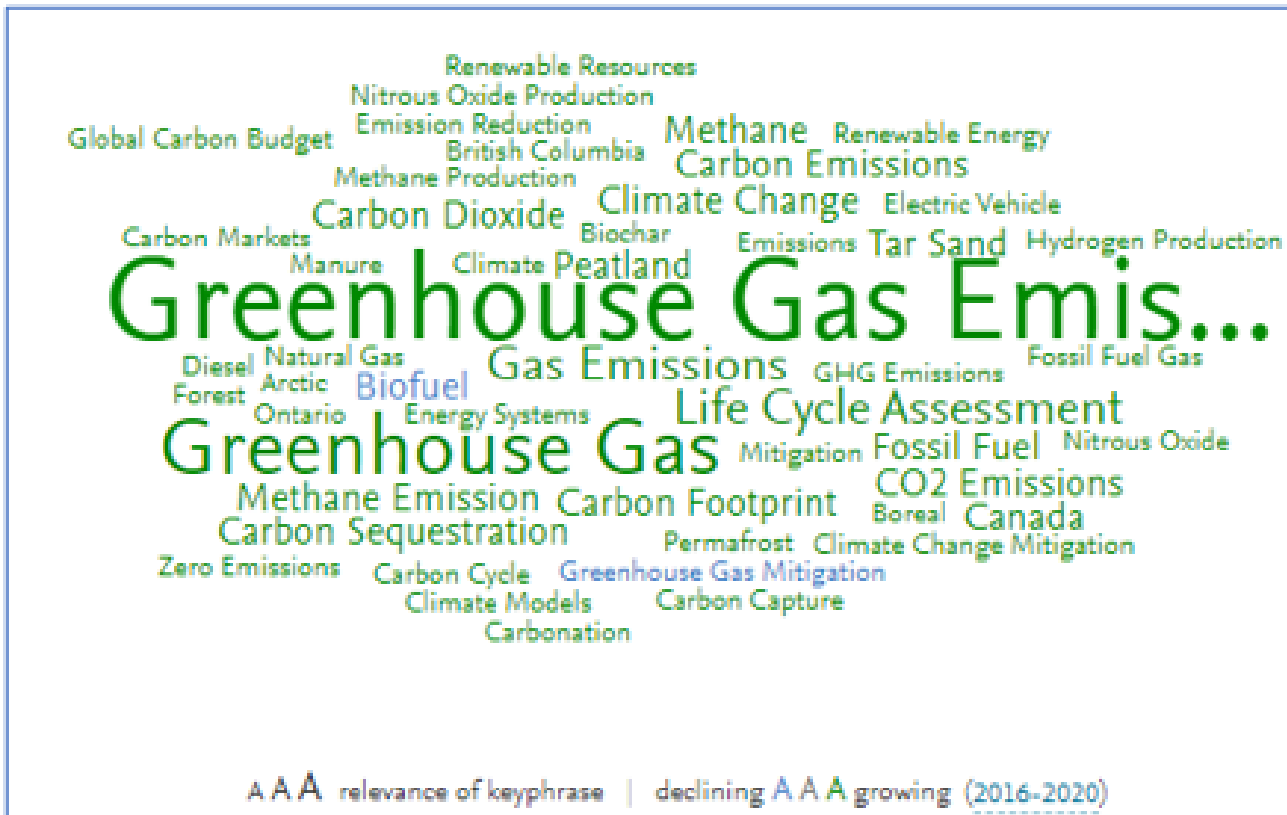
Collaboration ⓘ

Scholarly Output in Carbon Capture, by amount of international, national and institutional collaboration



Metric	Scholarly Output	Citations	Citations per Publication	Field-Weighted Citation Impact	
International collaboration	56.7%	2,935	70,414	24.0	2.27
Only national collaboration	14.9%	772	8,979	11.6	1.17
Only institutional collaboration	24.1%	1,248	16,479	13.2	1.19
Single authorship (no collaboration)	4.3%	222	1,908	8.6	1.35

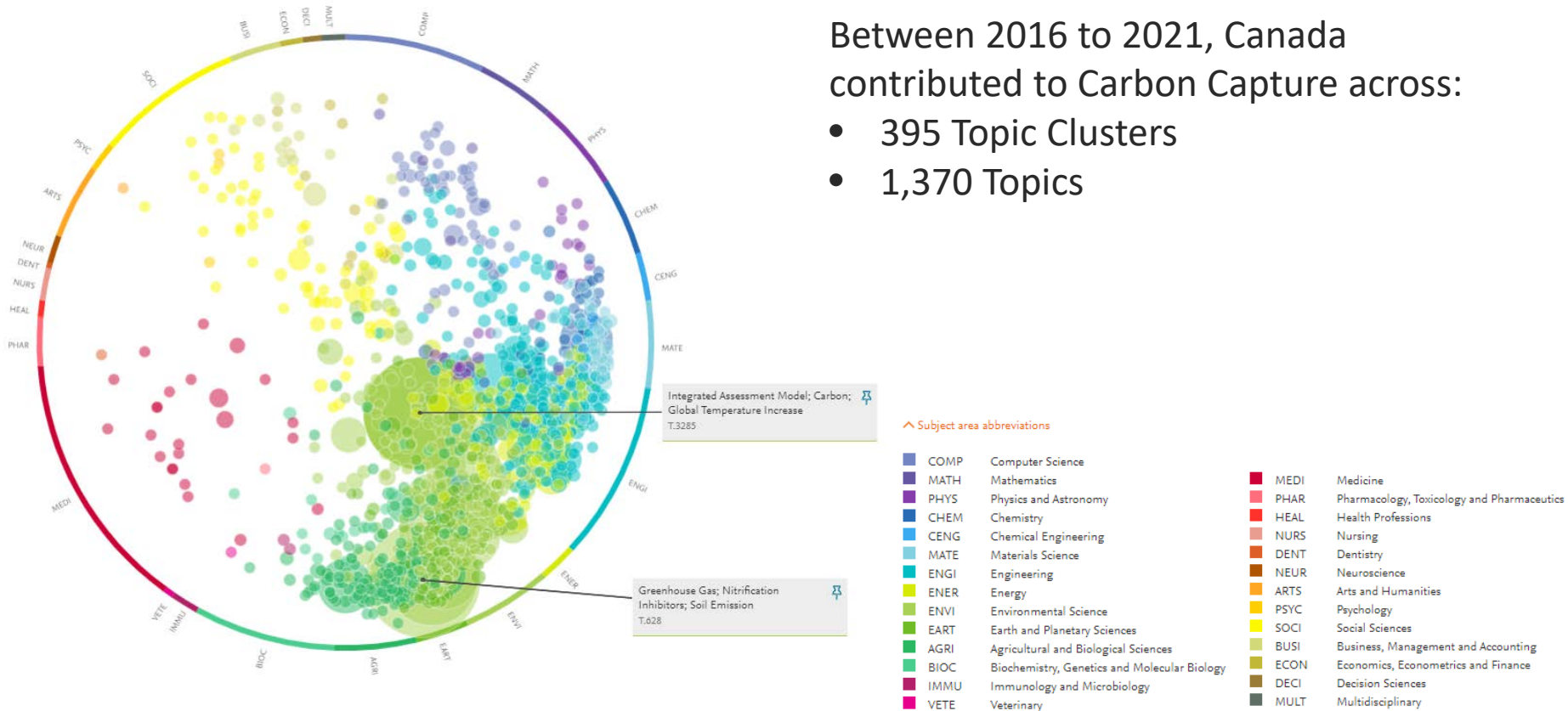
Key Research Phrases



Focus Topics in Canada for Carbon Change

Between 2016 to 2021, Canada contributed to Carbon Capture across:

- 395 Topic Clusters
- 1,370 Topics



Topics

Topics & Topic Clusters

Between 2016 to 2021, Carbon Capture has contributed to:

- 395 Topic Clusters
- 1,370 Topics

Table Wheel Scatter All Topics Search

Add to panel Create Research Area Analyze as Group in Grants Prominence percentile over time

Topic	In this Publication Set			Worldwide
	Scholarly Output	Publication Share	Field-Weighted Citation Impact	Prominence percentile
Greenhouse Gas; Nitrification Inhibitors; Soil Emission T.628	121	5.20% ▲	1.31	99.23%
Integrated Assessment Model; Carbon; Global Temperature Increase T.3285	119	3.29% ▲	2.97	99.82%
Carbon Dioxide; Methane Emission; Fens T.1385	93	5.89% ▲	1.41	98.03%

Topic preview (worldwide)

Greenhouse Gas; Nitrification Inhibitors; Soil Emission T.628

2,325 publications (2016 to 2021)

Most cited publications

Pursuing sustainable productivity with millions of smallholder farmers.
Cui, Z., Zhang, H., Chen, X. and 43 more (2018)

Greenhouse gas emissions from soils—A review.
Oertel, C., Matschullat, J., Zurba, K. and 2 more (2016)

A comprehensive quantification of global nitrous oxide sources and sinks.
Tian, H., Xu, R., Canadell, J.G. and 54 more (2020)

Liming impacts on soils, crops and biodiversity in the UK: A review.
Holland, J.E., Bennett, A.E., Newton, A.C. and 7 more (2018)

The role of nitrifier denitrification in the production of nitrous oxide revisited.
Wrage-Mönnig, N., Horn, M.A., Well, R. and 3 more (2018)

Publications

Within: Greenhouse Gas; Nitrification Inhibitors; Soil Emission T.628 | Year range: 2016 to 2021

Export

Authors 121 publications | Save as Publication Set

Title	Authors	Year	Scopus Source	Citations
Global soil nitrous oxide emissions since the preindustrial era estimated by an ensemble of terrestrial biosphere models: Magnitude, attribution, and uncertainty Open Access View abstract View in Scopus	Tian, H., Yang, J., Xu, R. and 21 more	2019	Global Change Biology	118
Nitrous oxide emissions and biogeochemical responses to soil freezing-thawing and drying-wetting Open Access View abstract View in Scopus	Congreves, K.A., Wagner-Riddle, C., Si, B.C. and 1 more	2018	Soil Biology and Biochemistry	85
A comparison of methods to quantify greenhouse gas emissions of cropping systems in LCA Open Access View abstract View in Scopus	Goglio, P., Smith, W.N., Grant, B.B. and 9 more	2018	Journal of Cleaner Production	53
Elevated temperature shifts soil N cycling from microbial immobilization to enhanced mineralization, nitrification and denitrification across global terrestrial ecosystems Open Access View abstract View in Scopus	Dai, Z., Yu, M., Chen, H. and 8 more	2020	Global Change Biology	51

Top Contributing Institutes in Canada



Institution	Scholarly Output	Citations per Publication	Field-Weighted Citation Impact
University of British Columbia	460	20.3	1.76
University of Alberta	433	20.4	1.91
University of Toronto	408	26.5	2.29
University of Waterloo	308	18.5	1.55
Agriculture and Agri-Food Canada	286	16.9	1.58
McGill University	270	19.8	1.6
University of Calgary	251	9.8	1.17
Environment and Climate Change Canada	207	47	4.34
University of Guelph	200	20.8	1.74
University of Montreal	198	16.1	1.93
Natural Resources Canada	197	14.9	1.65
Ontario Tech University	169	19.4	2.07
Université du Québec à Montréal	166	28.6	2.76
University of Saskatchewan	156	16	1.69
Université Laval	154	13	1.63

Top Contributing Authors in Canada



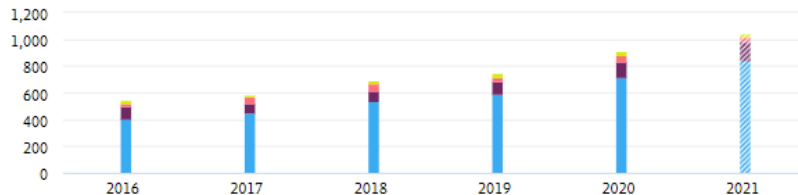
Name	Scholarly Output	Institute	Citations	Citations per Publication	Field-Weighted Citation Impact	h-index
Dincer, Ibrahim	91	Ontario Tech University	2026	22.3	2.29	106
Kumar, Amit	65	University of Alberta	1568	24.1	1.52	43
Huang, Gordon	63	University of Regina	1208	19.2	1.52	77
Peng, Changhui	56	Université du Québec à Montréal	2109	37.7	3.24	71
Rosen, Marc A.	44	Ontario Tech University	1273	28.9	2.92	87
Wagner-Riddle, Claudia	43	Agriculture and Agri-Food Canada	644	15	1.31	38
Beauchemin, Karen Anne Beauchemin	43	Lethbridge Research and Development Centre	714	16.6	2	71
Elkamel, Ali	41	University of Waterloo	328	8	0.71	44
Chang, Scott X.	41	University of Alberta	734	17.9	2.02	54
VanderZaag, A. C.	39	Agriculture and Agri-Food Canada	425	10.9	0.97	23
Fowler, Michael W.	39	University of Waterloo	724	18.6	1.51	56
MacLean, Heather L.	38	University of Toronto	612	16.1	1.48	38
Bergerson, Joule A.	35	University of Calgary	316	9	0.92	20
Sadiq, Rehan	33	The University of British Columbia	591	17.9	1.17	55
Hewage, Kasun N.	33	The University of British Columbia	591	17.9	1.17	36

Publication Analysis

Scopus Source	Publications	CiteScore 2020
Journal of Cleaner Production	182	13.1
Science of the Total Environment	90	10.5
Applied Energy	86	17.6
Renewable and Sustainable Energy Reviews	79	30.5
Energy	75	11.5
Environmental Research Letters	75	8.6
Sustainability	64	3.9
Environmental Science & Technology	58	13.8
Global Change Biology	57	15.5
International Journal of Hydrogen Energy	54	9

Publications by Journal quartile

Share of publications per Journal quartile by CiteScore Percentile



Quartiles	Publications [?]	Publication share (%)
Q1 (top 25%)	3,555	78.7
Q2 (26% - 50%)	577	12.8
Q3 (51% - 75%)	245	5.4
Q4 (76% - 100%)	143	3.2

Conclusions

- SDG query development is a subjective exercise.
- Continued development can help make the queries reflect more perspectives.
- Subqueries provide a toolkit for zooming out and zooming in on particular areas of interest.



Thank you

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