Dimensions

Discover and analyse research in context of the United Nations Sustainable Development Goals

Juergen Wastl
j.wastl@digital-science.com

Part of **DIGITAL** science

Agenda

Why are Sustainable Development Goals important to Digital Science?

Dimensions and SDG - A new Research Classification and how we got there

Reports & Analysis, Use cases

How can Digital Science contribute to the achievement of the Sustainable Development Goals?

Questions we might ask include:

- What does research contribute to underpin the SDGs?
- How have, and how can we use the research available in Dimensions to help to tackle the challenges?
- What light does the available research shed on where SDG research is focused?

Following the recent implementation of SDGs as a classification system in Dimensions, Digital Science is well placed to provide some answers and further insights, providing critical information that is essential to measuring progress.

The role that Dimensions can play in tracking the progress of the SDGs

- Identifying and classifying SDG associated research in Dimensions is now possible with the implementation of the UN Sustainable Development Goals (SDGs) as a classification scheme. It covers areas of research associated with one or more SDGs. The scheme uses automated allocation of the 17 SDGs and their associated targets and indicators to all fitting documents in Dimensions thereby addressing research areas aligned to the Goals.

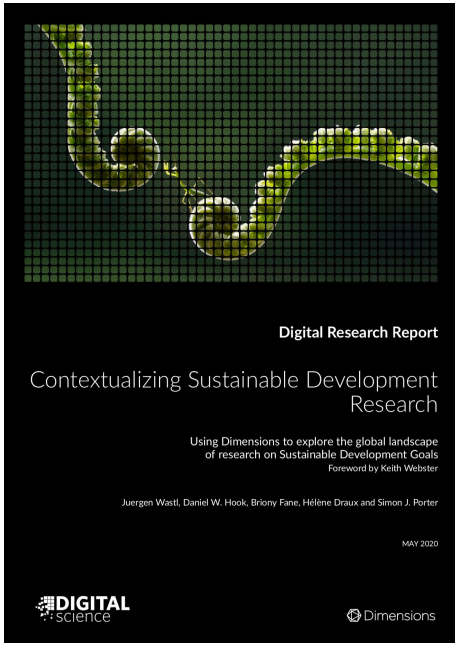
- Dimensions allows users who have a role to play in achieving the SDGs through their research, to see the contribution they and others are making.

- The Dimensions database is home to a vast array of research and **contextualised linked datasets,** providing evidence relating to the SDGs which can play a role in their implementation.

Dimensions

Digital Research Report (7th May 2020)

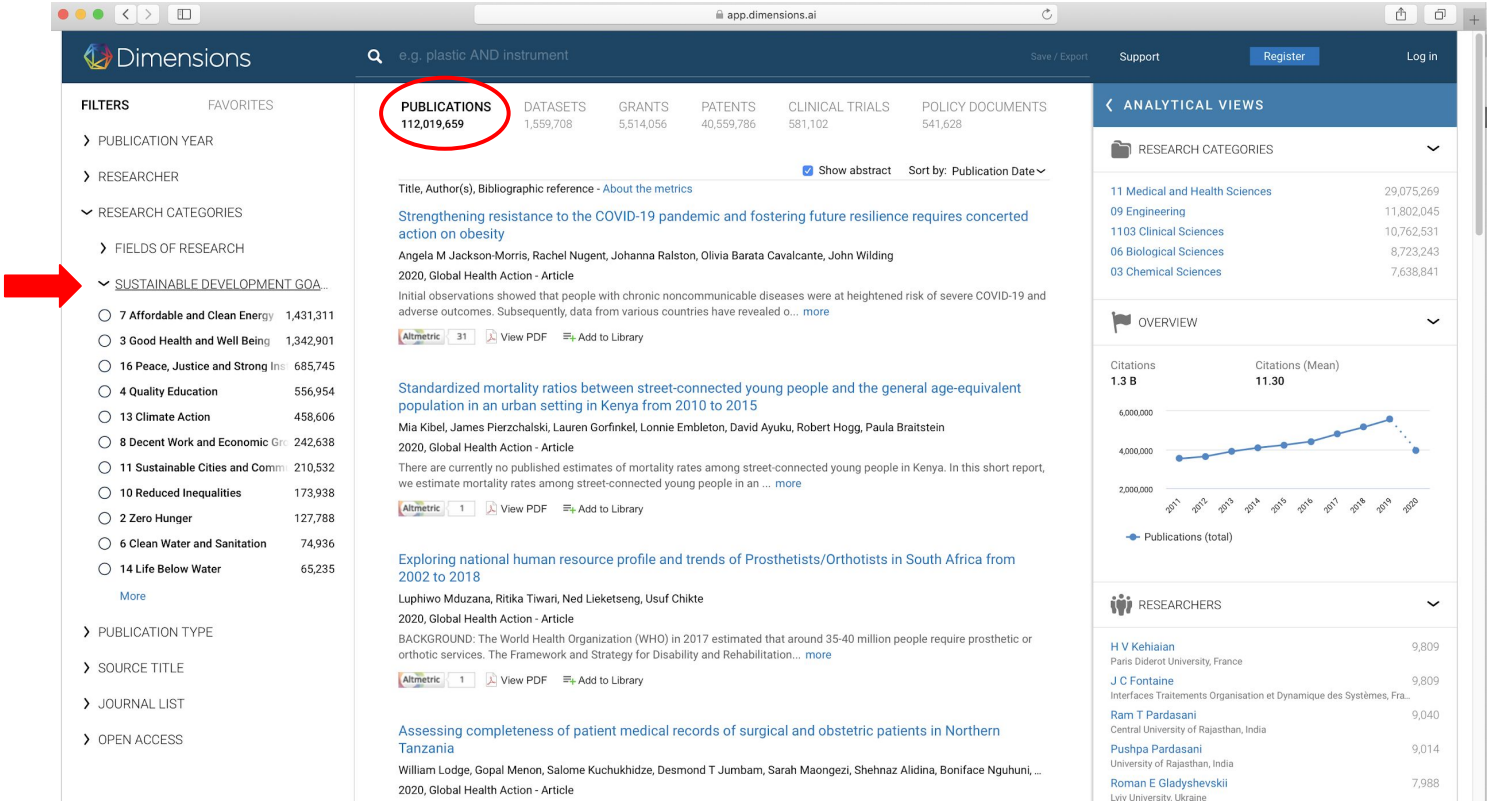
Contextualising Sustainable Development Research



https://figshare.com/articles/Contextualizing_Sustainable_Development_Research/12200081

Results accessible via **app.dimensions.ai**

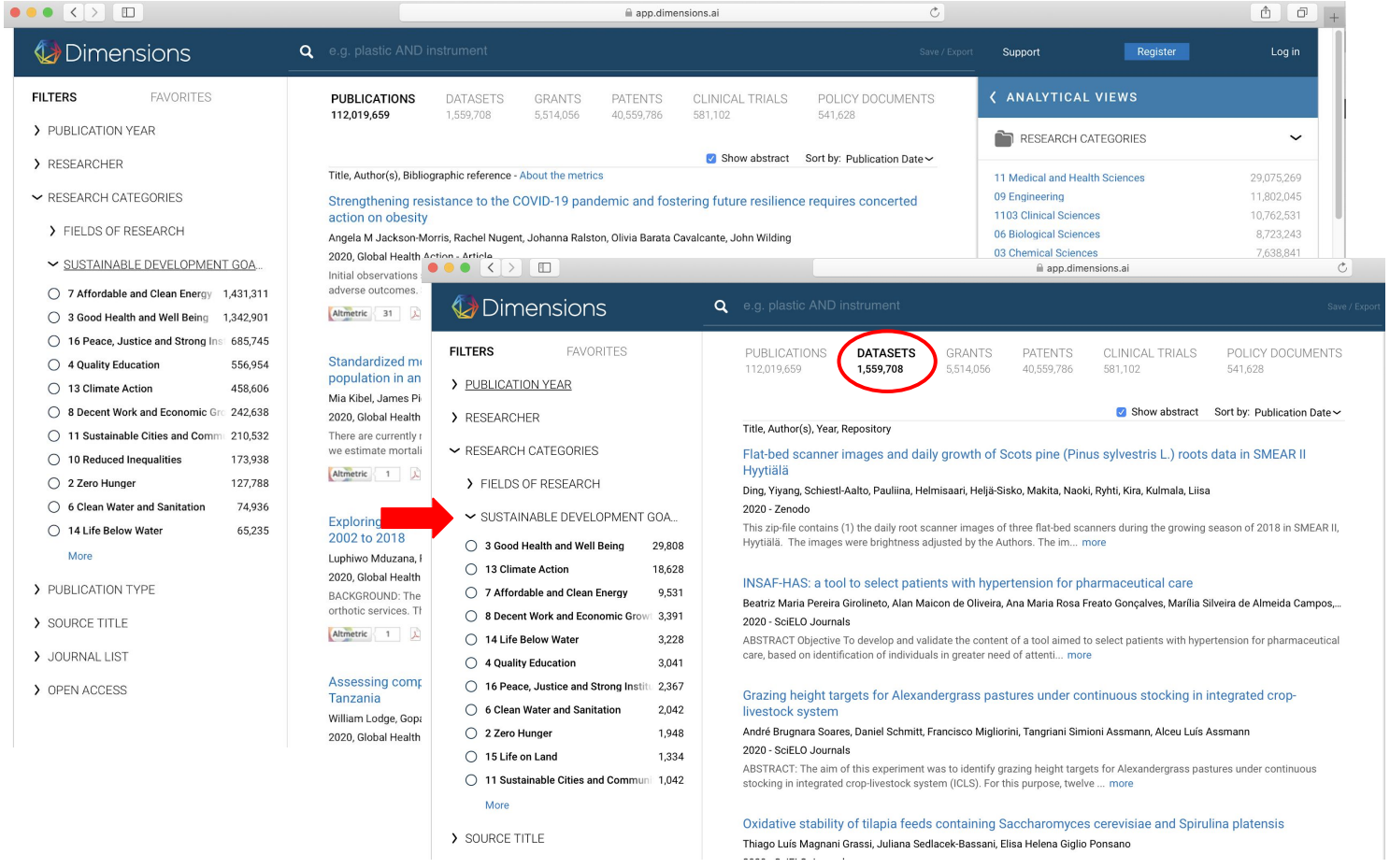
Publications



Results accessible via **app.dimensions.ai**

Publications

Datasets



Creating an SDG Classification

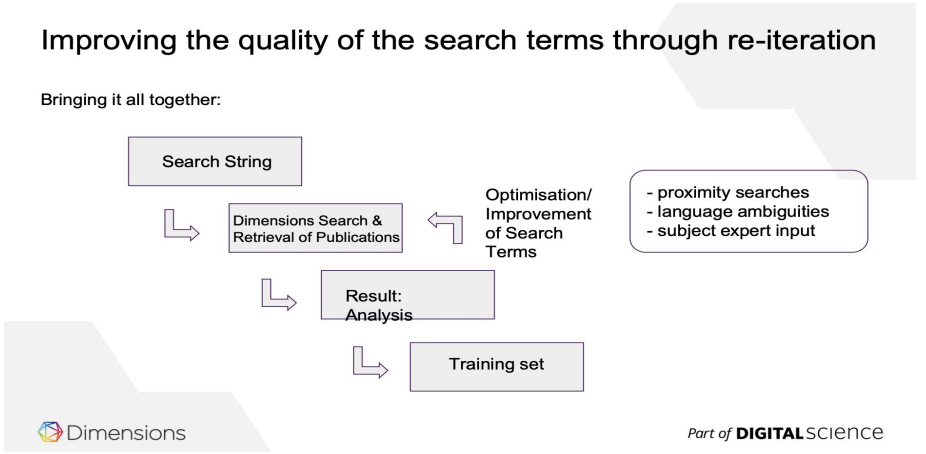
Creating an SDG classification is conceptually and technologically challenging:

No well-tagged data exist, SDGs are diverse, defined broadly & are multi-faceted

Building a training set

Supervised Machine Learning

Establishing the SDG classification



https://media.springernature.com/full/springer-cms/rest/v1/content/17488894/data/v4

Extract Search terms

Key phrases and terminology based on UN definitions of SDGs, including target and indicator definitions and narratives

NB: One training set per goal; no differentiation into targets or indicators

https://sustainabledevelopment.un.org/sdg16

QA process for generating the training sets

Basic Process

Search strings

Acknowledge ***language ambiguities*** (i.e. American English vs British English)
Implement ***proximity searches***
Involve ***subject matter experts*** and add/deduct additional term/phrases

Quality assurance

Minimising false positives

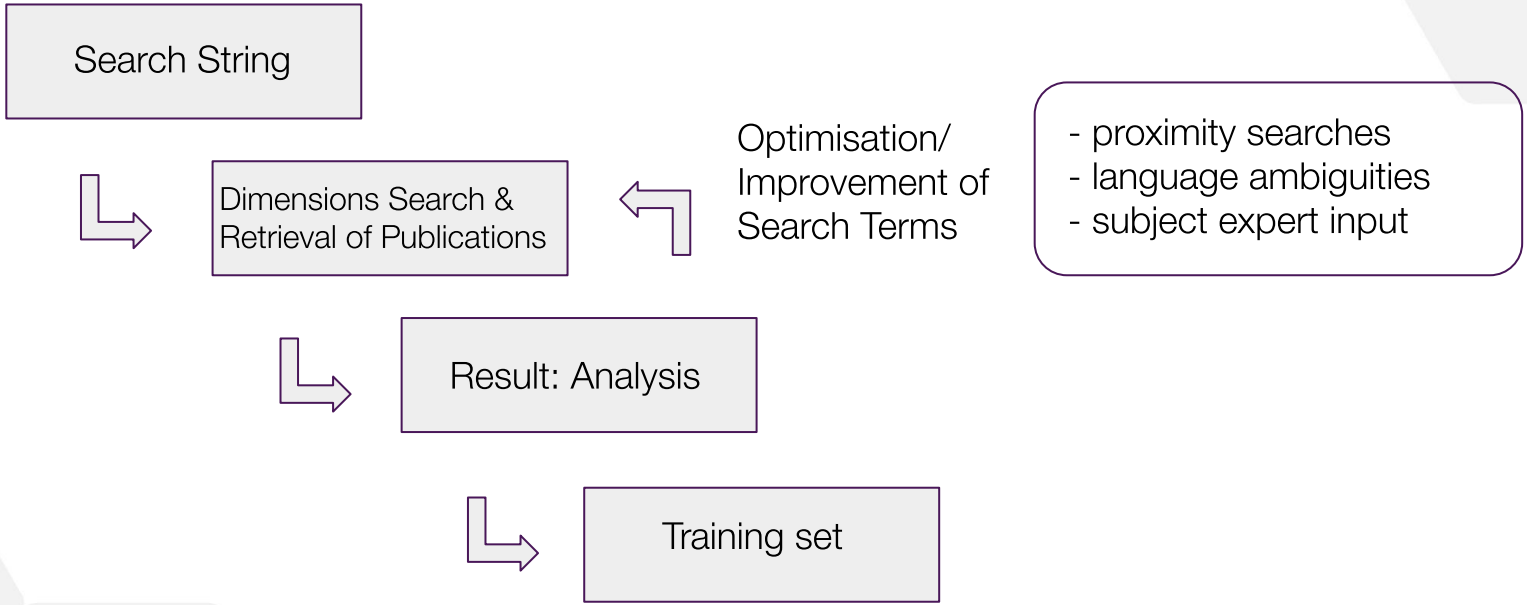
Additional fine tuning, e.g. improving of proximity searches
Check against existing categorisations FoR (Fields of Research)

Challenge

The creation of training sets comprising perfect search strings as a golden standard for Phase 2 (supervised Machine Learning) is knowingly not possible therefore the aim was to create the best training set possible

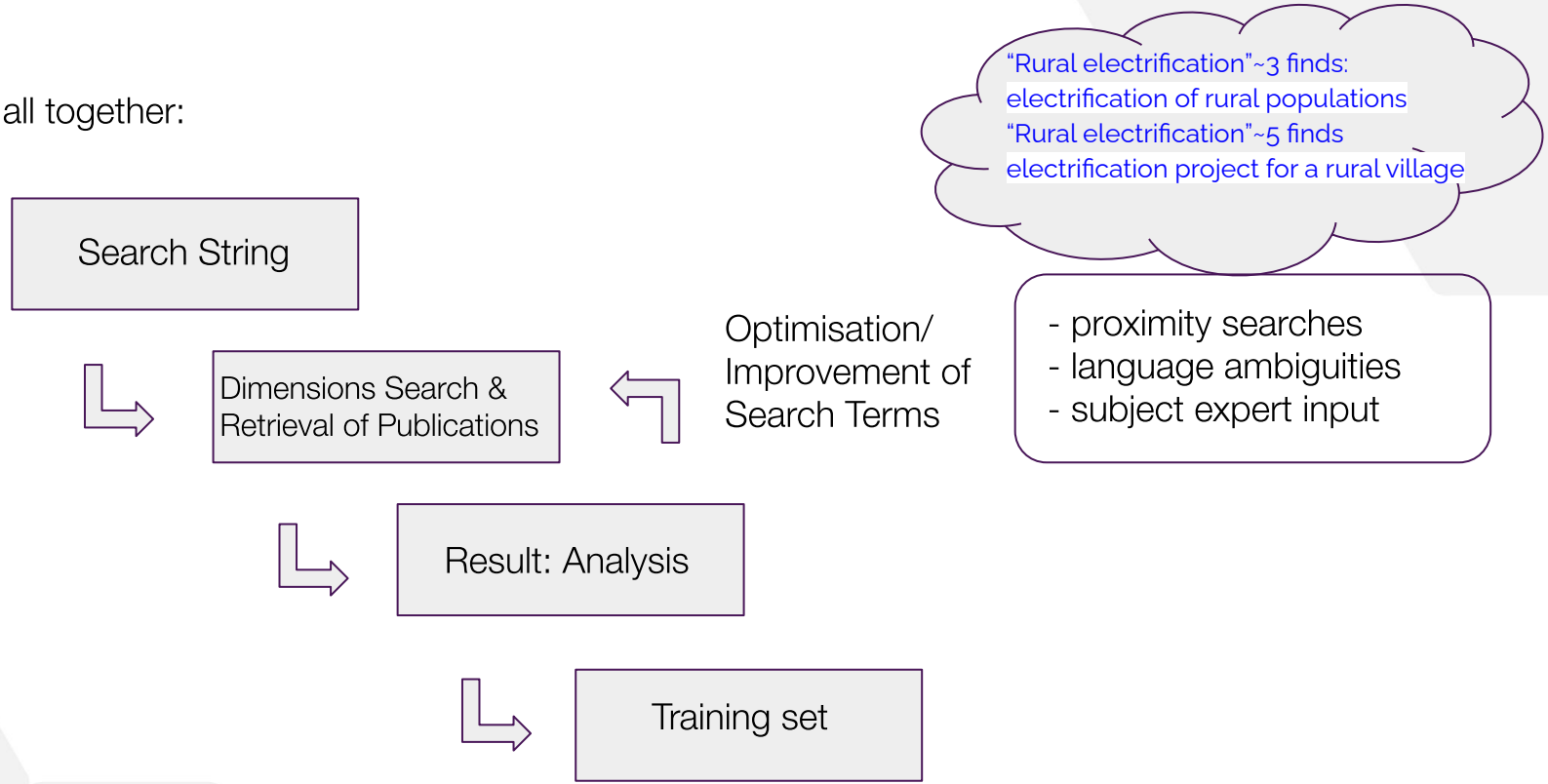
Improving the quality of the search terms through re-iteration

Bringing it all together:



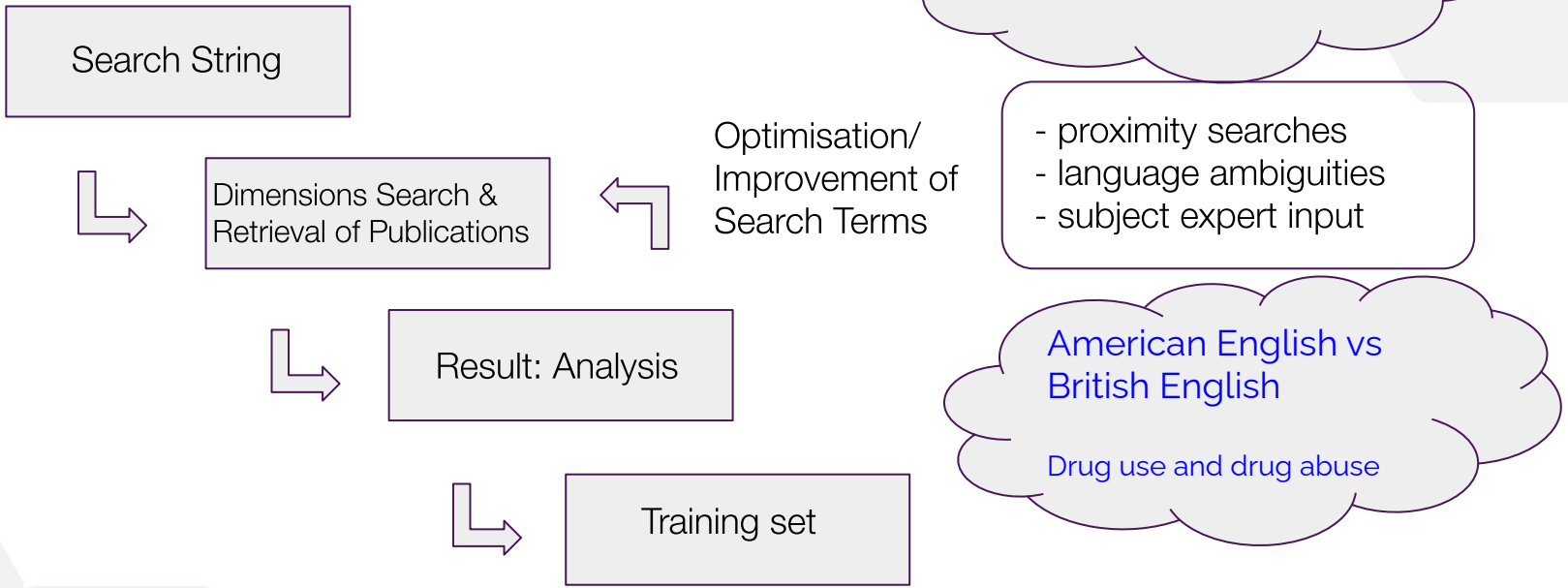
Improving the quality of the search terms through re-iteration

Bringing it all together:



Improving the quality of the search terms through re-iteration

Bringing it all together:



Machine Learning Results

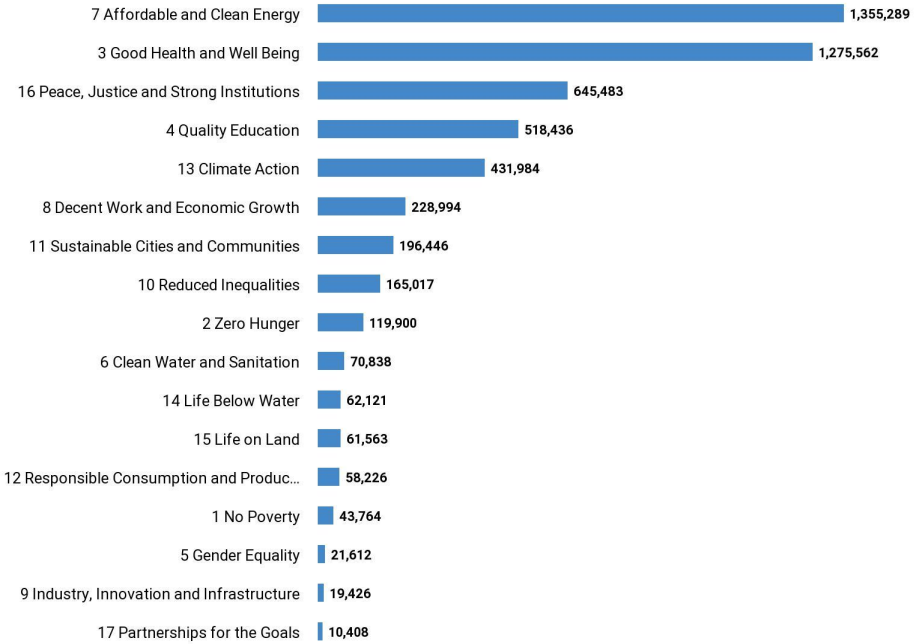
- Classifier cross-validation on the training data
  - F1 of ~96% when cross-validated on the in-domain-only data
  - F1 of ~87% when cross-validated on all the training data (incl random publications)
  - The effectiveness values should serve only as a rough guide due to the training data not being manually annotated, they are assumed to be correct based on the complex but limited keyword search

Goal	precision	recall	F1
3	0.90	0.84	0.87
4	0.83	0.72	0.77
7	0.94	0.92	0.93
11	0.79	0.61	0.69
16	0.90	0.83	0.86
Overall	0.90	0.84	0.87

https://media.springernature.com/full/springer-cms/rest/v1/content/17488894/data/v4

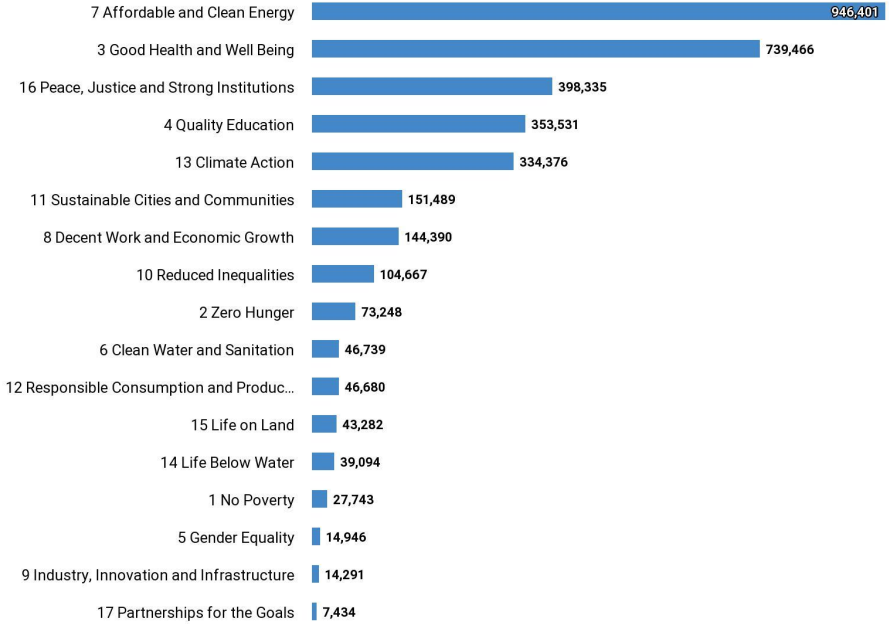
SDG coverage in Dimensions: All vs 2010 onwards

number of publications in each research category. (Criteria: see below)



Source: https://app.dimensions.ai
Exported: April 17, 2020
Criteria: none.

number of publications in each research category. (Criteria: see below)

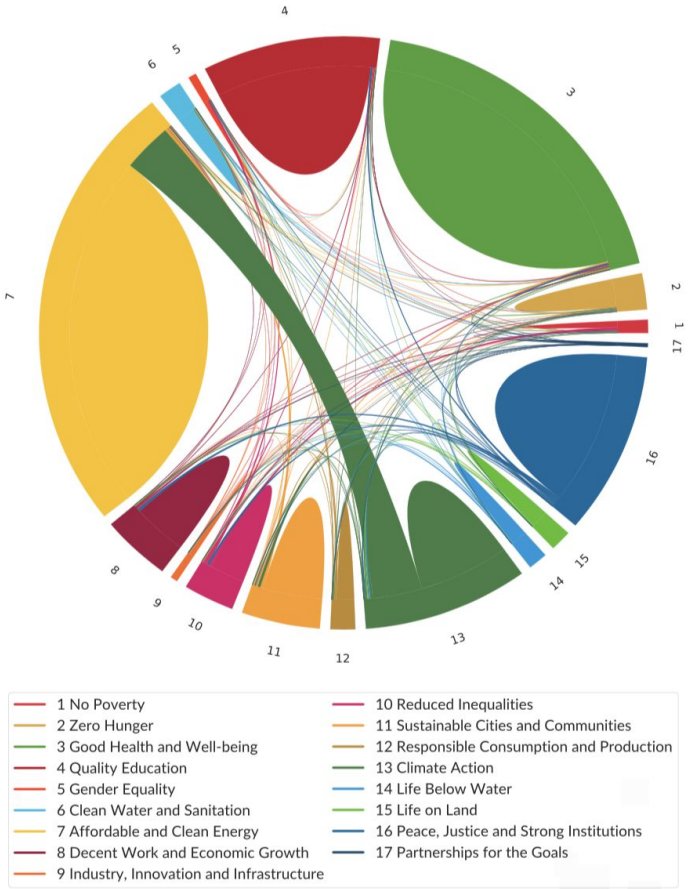


Source: https://app.dimensions.ai
Exported: April 17, 2020
Criteria: My groups is SDG time frame (2010 onwards).

Results

Number of results per SDG vary considerably

Interrelatedness between the SDGs

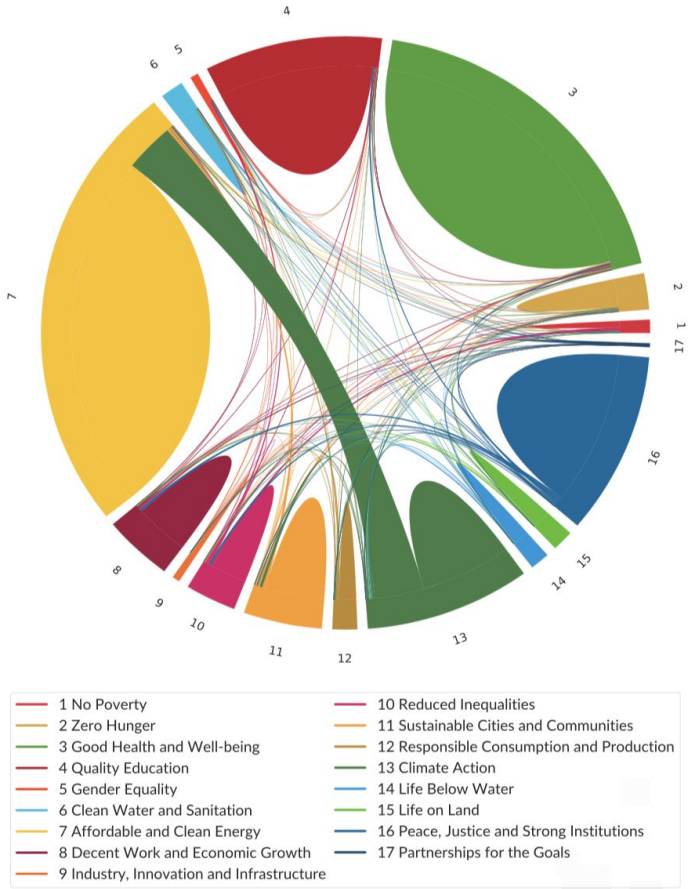


Results

Number of results per SDG vary considerably

Interrelatedness between the SDGs

Closest tie between SDG 7 and 13:



Use cases...

… answering the question:

What does the academic sector demand?

Integrate SDGs throughout the institution

Collaborate and partner in research endeavours/networks

Demonstrate the institution’s contribution to society

Demand for SDG education

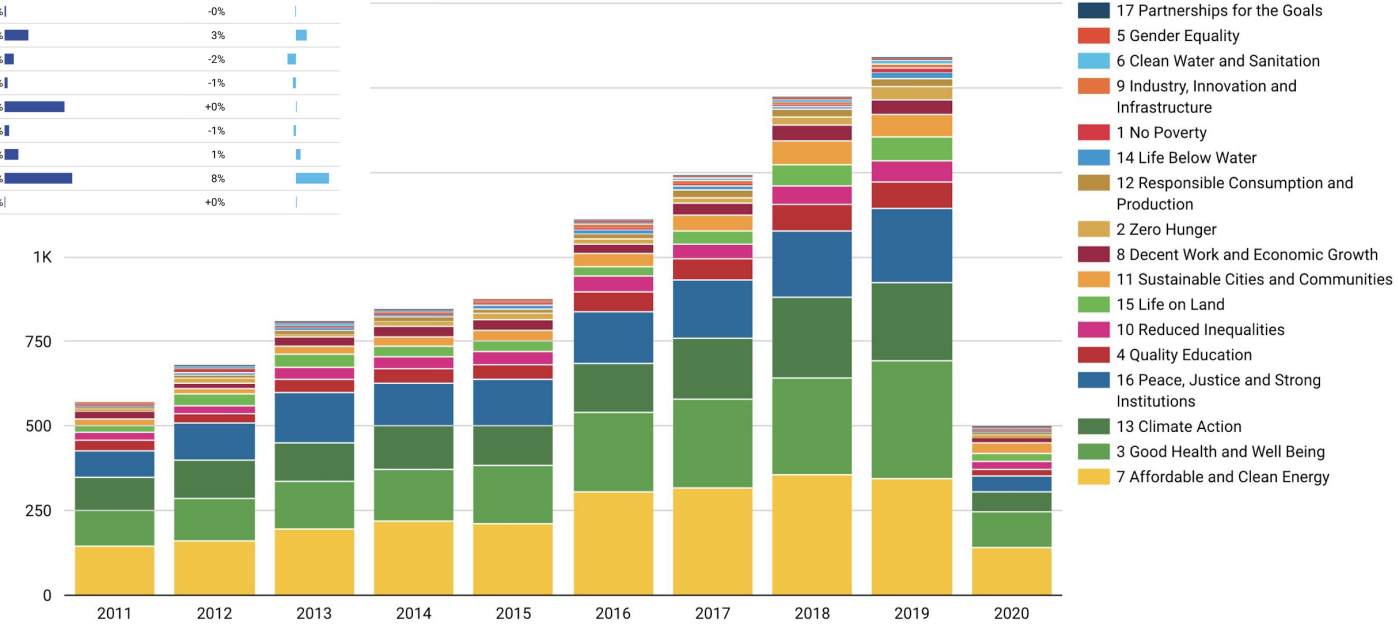
Use case: SDG reporting

Publications per SDG and deviation from global average

Sustainable Development Goal	Number of publications	in %	Delta from global avg
1 No Poverty	185	1%	1%
2 Zero Hunger	354	3%	+0%
3 Good Health and Well Being	5,180	37%	9%
4 Quality Education	576	4%	-2%
5 Gender Equality	74	1%	+0%
6 Clean Water and Sanitation	147	1%	-0%
7 Affordable and Clean Energy	1,666	12%	-16%
8 Decent Work and Economic Growth	513	4%	1%
9 Industry, Innovation and Infrastructure	37	+0%	-0%
10 Reduced Inequalities	679	5%	3%
11 Sustainable Cities and Communities	254	2%	-2%
12 Responsible Consumption and Production	78	1%	-1%
13 Climate Action	1,712	12%	+0%
14 Life Below Water	129	1%	-1%
15 Life on Land	391	3%	1%
16 Peace, Justice and Strong Institutions	1,930	14%	8%
17 Partnerships for the Goals	23	+0%	+0%

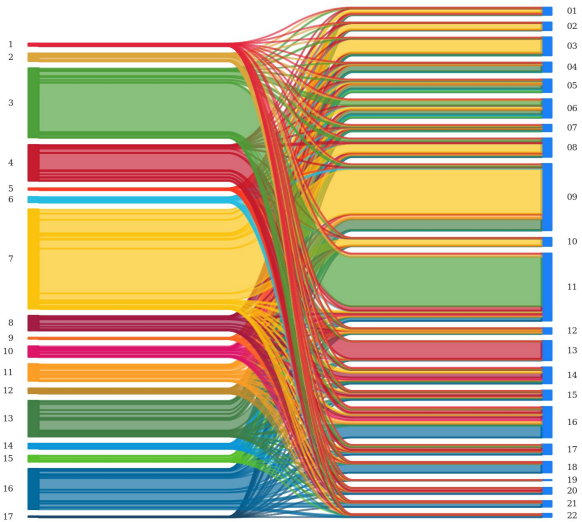
Recent publications with SDG published by analyzed organization

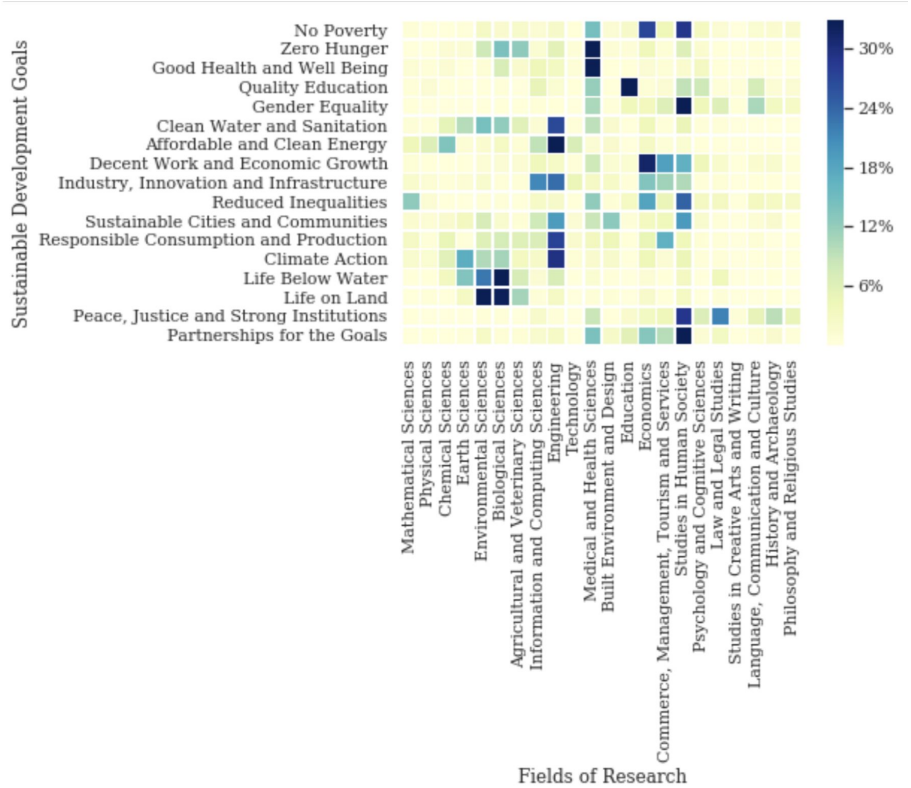
	Title	SDG	Publication year
1.	What does women's empowerment have to do with malnutrition in Sub-Saharan Africa? Evidence fro...	2 Zero Hunger	2020
2.	Agroforestry boosts soil health in the humid and sub-humid tropics: A meta-analysis	2 Zero Hunger	2020
3.	Conservation prioritization can resolve the flagship species conundrum	15 Life on Land	2020
4.	A scoping review into the impact of animal imagery on pro-environmental outcomes	15 Life on Land	2020
5.	Predictive mapping of the global power system using open data	13 Climate Action	2020
6.	Radiocarbon chronology and environmental context of Last Glacial Maximum human occupation in ...	13 Climate Action	2020
7.	Identifying a human signal in the North Atlantic warming hole	13 Climate Action	2020
8.	Illuminating homes with LEDs in India: Rapid market creation towards low-carbon technology transiti...	13 Climate Action	2020
9.	Renewable energy and household economy in rural China	13 Climate Action	2020
10.	Evidence of groundwater vulnerability to climate variability and economic growth in coastal Kenya	13 Climate Action	2020
11.	Bioenergy in China: Evaluation of domestic biomass resources and the associated greenhouse gas ...	13 Climate Action	2020
12.	The potential for coral reefs to adapt to a changing climate - an eco-evolutionary modelling perspecti...	13 Climate Action	2020



Analysis: Publication Mapping & Interdisciplinary Research

Mapping of SDG classified publications to the Fields of Research (FOR; ANZSRC)





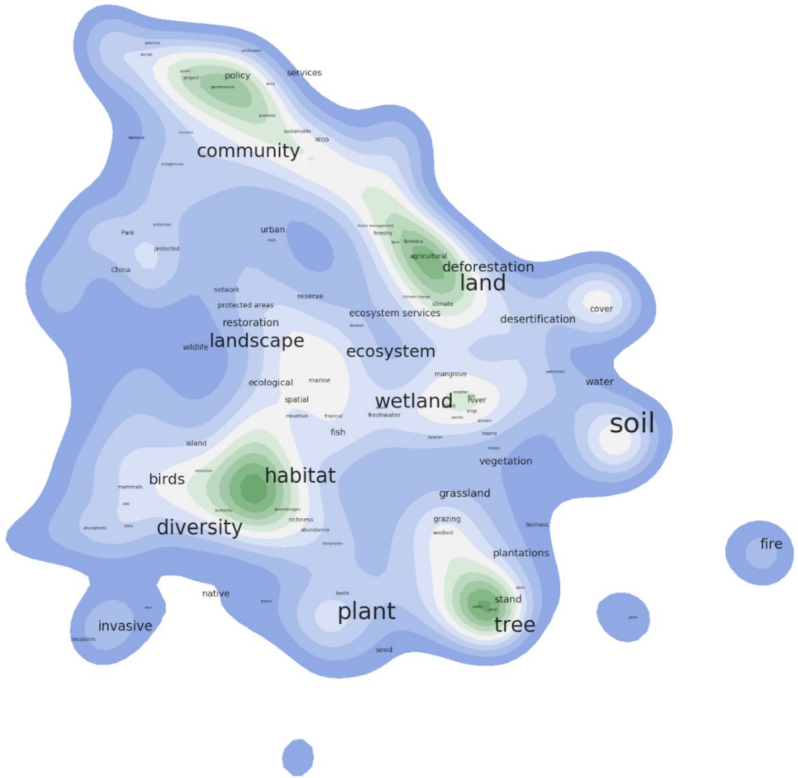
Heat map normalized by percentage of SDG

Analysis: topics & concepts

heat maps,

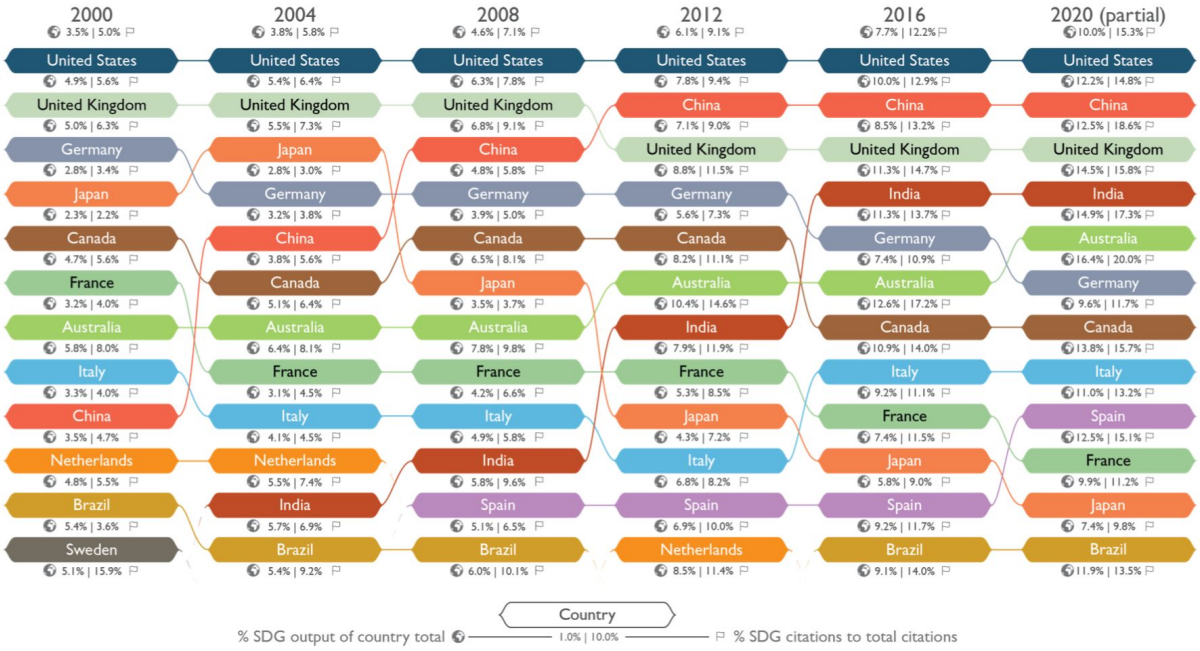
Topic analysis

Network analysis



Analysis: geography (i) - country SDG research over time

Relative proportions of SDG publications
and
Relative proportion of SDG citations



https://figshare.com/articles/Contextualizing_Sustainable_Development_Research/12200081

Analysis: geography (ii)

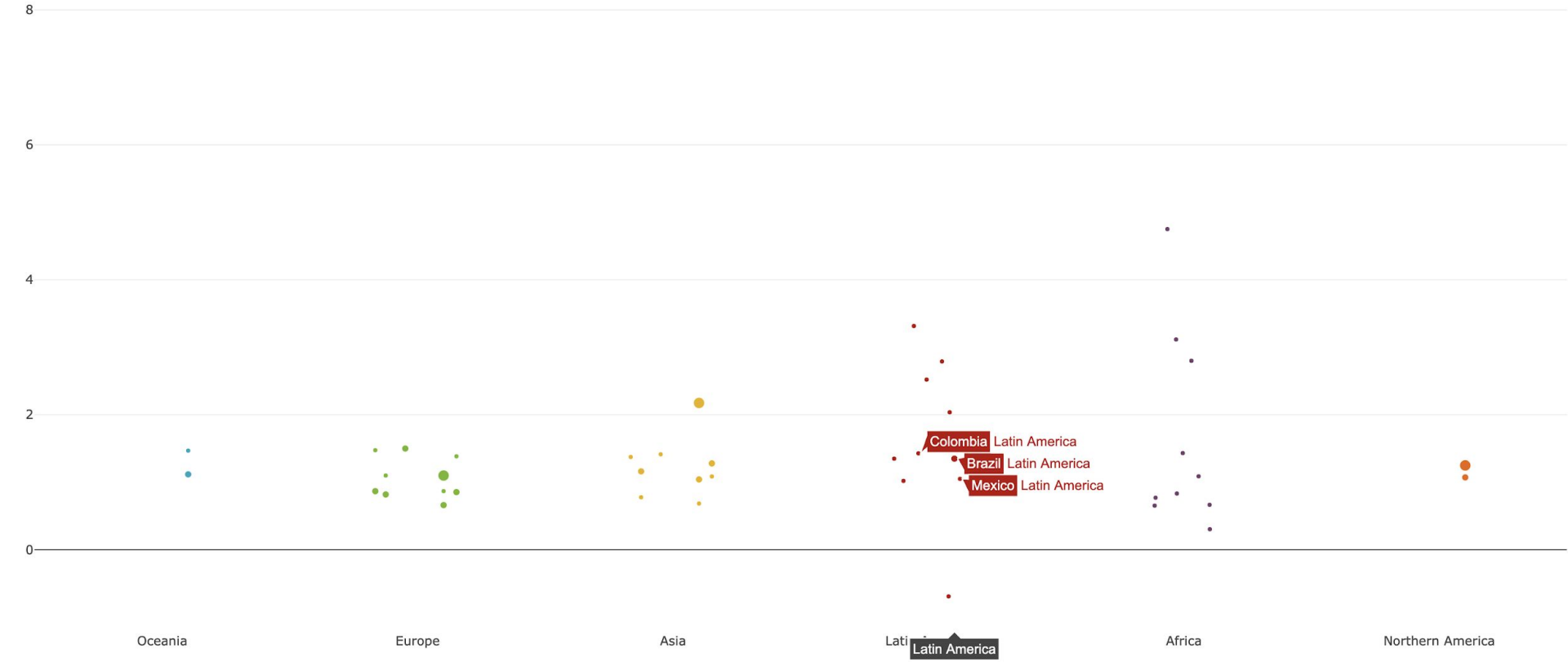
Analysis by country

Country specific patterns in (type of) SDG research

Global South vs Global North

https://figshare.com/articles/Contextualizing_Sustainable_Development_Research/12200081

Analysis: geography (iii) - regional SDG research output growth



International collaboration

Domestic focus throughout

SDG14 and SDG15
more international

SDG4, SDG5 and SDG16
domestically centred

Goal	Domestic %	Bilateral %	Multilateral %
1. No Poverty	79.42	15.79	4.79
2. Zero Hunger	74.97	17.67	7.36
3. Good Health and Well-being	77.47	15.60	6.93
4. Quality Education	87.35	10.18	2.48
5. Gender Equality	83.31	13.30	3.39
6. Clean Water and Sanitation	73.56	19.53	6.91
7. Affordable and Clean Energy	77.33	17.97	4.69
8. Decent Work and Economic Growth	80.66	15.38	3.96
9. Industry, Innovation and Infrastructure	79.15	15.89	4.96
10. Reduced Inequalities	78.60	16.64	4.75
11. Sustainable Cities and Communities	78.92	16.44	4.64
12. Responsible Consumption and Production	75.88	18.45	5.67
13. Climate Action	70.03	21.09	8.88
14. Life Below Water	67.12	22.40	10.47
15. Life on Land	64.61	22.95	12.44
16. Peace, Justice and Strong Institutions	87.57	10.00	2.43
17. Partnerships for the Goals	75.93	16.92	7.15

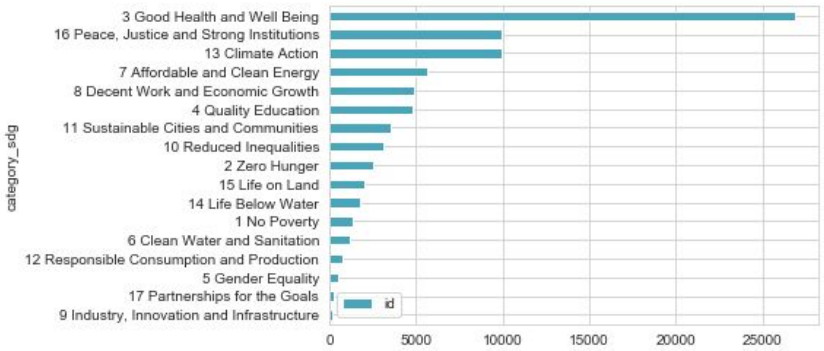
(publications 2015- 2020)

https://figshare.com/articles/Contextualizing_Sustainable_Development_Research/12200081

Policy documents: cited publications' SDG tags

SDG	Number of pubs
3 Good Health and Well Being	26,875
16 Peace, Justice and Strong Institutions	9,962
13 Climate Action	9,907
7 Affordable and Clean Energy	5,611
8 Decent Work and Economic Growth	4,922
4 Quality Education	4,829
11 Sustainable Cities and Communities	3,506
10 Reduced Inequalities	3,073
2 Zero Hunger	2,540
15 Life on Land	2,052
14 Life Below Water	1,768
1 No Poverty	1,372
6 Clean Water and Sanitation	1,152
12 Responsible Consumption and Production	768
5 Gender Equality	484
17 Partnerships for the Goals	234
9 Industry, Innovation and Infrastructure	198

- Policy documents published after 2015: 28,766 documents.
- Citing 487,642 publications (articles, books, chapters)
- Of these publications, 79,253 publications had an SDG



The role that Dimensions can play in tracking the progress of the SDGs

- Identifying and classifying SDG associated research in Dimensions is now possible with the implementation of the UN Sustainable Development Goals (SDGs) as a classification scheme. It covers areas of research associated with one or more SDGs. The scheme uses automated allocation of the 17 SDGs and their associated targets and indicators to all fitting documents in Dimensions thereby addressing research areas aligned to the Goals.

- Dimensions allows users who have a role to play in achieving the SDGs through their research, to see the contribution they and others are making.

- The Dimensions database is home to a vast array of research and contextualised linked datasets, providing evidence relating to the SDGs which can play a role in their implementation.

Summary

- >5m (of a total of 108.7m) publications are classified as SDG research
- discoverable & browsable (UI/API) and available for advanced analyses, dynamic reporting and integration
- SDG classification scheme in Dimensions provides a lens through which research can be viewed to better understand the research contribution, collaborative aspects
- Aimed at Researchers, Universities, Research Managers and Policy Makers and Strategists to assess the presence of SDG-related content in their own domains

Thank you very much for your attention!

Questions?

j.wastl@digital-science.com
consultancy@digital-science.com