

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



Juergen Wastl  
[j.wastl@digital-science.com](mailto: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.



# Digital Research Report (7th May 2020)

## Contextualising Sustainable Development Research



[https://figshare.com/articles/Contextualizing\\_Sustainable\\_Development\\_Research/1220081](https://figshare.com/articles/Contextualizing_Sustainable_Development_Research/1220081)

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

Publications



The screenshot shows the Dimensions app interface. The search bar contains 'e.g. plastic AND instrument'. The 'PUBLICATIONS' tab is selected and circled in red, showing a count of 112,019,659. The left sidebar has a 'SUSTAINABLE DEVELOPMENT GOALS' filter selected, with a red arrow pointing to it. The main content area displays three search results, each with a title, author(s), and a brief description. The right sidebar shows 'ANALYTICAL VIEWS' including 'RESEARCH CATEGORIES' and 'OVERVIEW' with a line graph of citations from 2011 to 2020.

**PUBLICATIONS** 112,019,659

**RESEARCH CATEGORIES**

11 Medical and Health Sciences	29,075,269
09 Engineering	11,802,045
1103 Clinical Sciences	10,762,531
06 Biological Sciences	8,723,243
03 Chemical Sciences	7,638,841

**OVERVIEW**

Citations: 1.3 B  
Citations (Mean): 11.30

Publications (total)

**RESEARCHERS**

H V Kehalian Paris Diderot University, France	9,809
J C Fontaine Interfaces Traitements Organisation et Dynamique des Systèmes, Fra...	9,809
Ram T Pardasani Central University of Rajasthan, India	9,040
Pushpa Pardasani University of Rajasthan, India	9,014
Roman E Gladyshevskii Lviv University, Ukraine	7,988

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

*Publications*

*Datasets*

The screenshot displays the Dimensions app interface for the search query "e.g. plastic AND instrument". The top view shows "PUBLICATIONS" with 112,019,659 results. The bottom view shows "DATASETS" with 1,559,708 results, which is circled in red. A red arrow points from the "DATASETS" count in the top view to the "DATASETS" count in the bottom view.

**Dimensions** e.g. plastic AND instrument

**FILTERS** FAVORITES

**PUBLICATIONS** 112,019,659

**DATASETS** 1,559,708

**GRANTS** 5,514,056

**PATENTS** 40,559,786

**CLINICAL TRIALS** 581,102

**POLICY DOCUMENTS** 541,628

**ANALYTICAL VIEWS**

RESEARCH CATEGORIES

- 11 Medical and Health Sciences 29,075,269
- 09 Engineering 11,802,045
- 1103 Clinical Sciences 10,762,531
- 06 Biological Sciences 8,723,243
- 03 Chemical Sciences 7,638,841

7 Affordable and Clean Energy 1,431,311

3 Good Health and Well Being 1,342,901

16 Peace, Justice and Strong Institutions 685,745

4 Quality Education 556,954

13 Climate Action 458,606

8 Decent Work and Economic Growth 242,638

11 Sustainable Cities and Communities 210,532

10 Reduced Inequalities 173,938

2 Zero Hunger 127,788

6 Clean Water and Sanitation 74,936

14 Life Below Water 65,235

More

PUBLICATION YEAR

RESEARCHER

RESEARCH CATEGORIES

FIELDS OF RESEARCH

SUSTAINABLE DEVELOPMENT GOALS

3 Good Health and Well Being 29,808

13 Climate Action 18,628

7 Affordable and Clean Energy 9,531

8 Decent Work and Economic Growth 3,391

14 Life Below Water 3,228

4 Quality Education 3,041

16 Peace, Justice and Strong Institutions 2,367

6 Clean Water and Sanitation 2,042

2 Zero Hunger 1,948

15 Life on Land 1,334

11 Sustainable Cities and Communities 1,042

More

SOURCE TITLE

JOURNAL LIST

OPEN ACCESS

Standardized population in an

Mia Kibel, James Pi

2020, Global Health

There are currently i

we estimate mortali

Exploring 2002 to 2018

Luphiwo Mdzana, I

2020, Global Health

BACKGROUND: The

orthotic services. T

Assessing comp

Tanzania

William Lodge, Gopi

2020, Global Health

**Dimensions** e.g. plastic AND instrument

**FILTERS** FAVORITES

**PUBLICATIONS** 112,019,659

**DATASETS** 1,559,708

**GRANTS** 5,514,056

**PATENTS** 40,559,786

**CLINICAL TRIALS** 581,102

**POLICY DOCUMENTS** 541,628

**ANALYTICAL VIEWS**

RESEARCH CATEGORIES

11 Medical and Health Sciences 29,075,269

09 Engineering 11,802,045

1103 Clinical Sciences 10,762,531

06 Biological Sciences 8,723,243

03 Chemical Sciences 7,638,841

7 Affordable and Clean Energy 1,431,311

3 Good Health and Well Being 1,342,901

16 Peace, Justice and Strong Institutions 685,745

4 Quality Education 556,954

13 Climate Action 458,606

8 Decent Work and Economic Growth 242,638

11 Sustainable Cities and Communities 210,532

10 Reduced Inequalities 173,938

2 Zero Hunger 127,788

6 Clean Water and Sanitation 74,936

14 Life Below Water 65,235

More

PUBLICATION YEAR

RESEARCHER

RESEARCH CATEGORIES

FIELDS OF RESEARCH

SUSTAINABLE DEVELOPMENT GOALS

3 Good Health and Well Being 29,808

13 Climate Action 18,628

7 Affordable and Clean Energy 9,531

8 Decent Work and Economic Growth 3,391

14 Life Below Water 3,228

4 Quality Education 3,041

16 Peace, Justice and Strong Institutions 2,367

6 Clean Water and Sanitation 2,042

2 Zero Hunger 1,948

15 Life on Land 1,334

11 Sustainable Cities and Communities 1,042

More

SOURCE TITLE

JOURNAL LIST

OPEN ACCESS

Strengthening resistance to the COVID-19 pandemic and fostering future resilience requires concerted action on obesity

Angela M Jackson-Morris, Rachel Nugent, Johanna Ralston, Olivia Barata Cavalcante, John Wilding

2020, Global Health Action - Article

Initial observations

adverse outcomes.

Flat-bed scanner images and daily growth of Scots pine (*Pinus sylvestris* L.) roots data in SMEAR II Hyttialä

Ding, Yiyang, Schiestl-Aalto, Pauliina, Helmsaari, Heijä-Sisko, Makita, Naoki, Ryhti, Kira, Kulmala, Liisa

2020 - Zenodo

This zip-file contains (1) the daily root scanner images of three flat-bed scanners during the growing season of 2018 in SMEAR II, Hyttialä. The images were brightness adjusted by the Authors. The im... more

INSAF-HAS: a tool to select patients with hypertension for pharmaceutical care

Beatriz Maria Pereira Girolinetto, Alan Maicon de Oliveira, Ana Maria Rosa Freato Gonçalves, Marília Silveira de Almeida Campos...

2020 - SciELO Journals

ABSTRACT Objective To develop and validate the content of a tool aimed to select patients with hypertension for pharmaceutical care, based on identification of individuals in greater need of attention... more

Grazing height targets for Alexandergrass pastures under continuous stocking in integrated crop-livestock system

André Brugnara Soares, Daniel Schmitt, Francisco Miglorini, Tangriani Simioni Assmann, Alceu Luís Assmann

2020 - SciELO Journals

ABSTRACT: The aim of this experiment was to identify grazing height targets for Alexandergrass pastures under continuous stocking in integrated crop-livestock system (ICLS). For this purpose, twelve ... more

Oxidative stability of tilapia feeds containing *Saccharomyces cerevisiae* and *Spirulina platensis*

Thiago Luis Magnani Grassi, Juliana Sedlacek-Bassani, Elisa Helena Giglio Ponsano

# 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



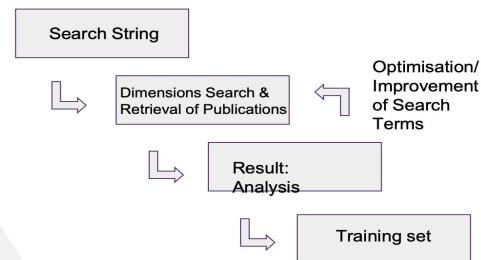
Phase 1 and Phase 2 Summary  
SDG Project by  
SpringerNature, VSNU/UKB, Digital Science  
London, December 2019

Juergen Wastl, Director Academic Relations & Consultancy  
Mario Diwersy, Chief Technology Officer  
Project Management: Timon Oefelein, Springer Nature

Part of **DIGITAL**science

## Improving the quality of the search terms through re-iteration

Bringing it all together:



- proximity searches
- language ambiguities
- subject expert input

Dimensions

Part of **DIGITAL**science

# 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

The image shows a screenshot of the Sustainable Development Goals Knowledge Platform website. The main heading is "SUSTAINABLE DEVELOPMENT GOAL 16" with the subtext "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels". Below this, there is a section for "PROGRESS OF GOAL 16 IN 2019" which includes a paragraph of text and a bulleted list of key findings. At the bottom, there is a table with two columns: "TARGETS" and "INDICATORS".

**PROGRESS OF GOAL 16 IN 2019**

Advances in ending violence, promoting the rule of law and access to justice for all are uneven and continue to deprive millions of the benefits of public services and broader economic development progress. Renewed efforts are essential to move to a more peaceful and inclusive world.

- The number of intentional homicides per 100,000 population, which was largely the result of an increase in some countries in sub-Saharan Africa.
- Various forms of violence against children per cent data on the subject, nearly 8 in 10 child victims of violence experienced physical punishment and/or psychological aggression and/or physical punishment of children experienced violent disciplinary actions. Based on the limit of at least 5 per cent of women between the age groups that were forced, physically or in other ways.
- There has been an overall increase in the detection of domestic violence. In a departure from prior findings, 58 per cent in 2016, up from 48 per cent in 2015, detected victims of human trafficking were exploited.
- The share of unsentenced detainees in the overall prison population increased from 10 per cent in recent years. This occurred in a context of a decline in the number of prisoners while remaining constant as a share of the total population.
- Killings of human rights defenders, journalists and activists.

TARGETS	INDICATORS
<b>16.1</b> Significantly reduce all forms of violence and related death rates everywhere	<b>16.1.1</b> Number of victims of intentional homicide per 100,000 population, by sex and age <b>16.1.2</b> Conflict-related deaths per 100,000 population, by sex, age and cause <b>16.1.3</b> Proportion of population subjected to physical, psychological or sexual violence in the previous 12 months <b>16.1.4</b> Proportion of population that feel safe walking alone around the area they live
<b>16.2</b> End abuse, exploitation, trafficking and all forms of violence against and torture of children	<b>16.2.1</b> Proportion of children aged 1-17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month <b>16.2.2</b> Number of victims of human trafficking per 100,000 population, by sex, age and form of exploitation <b>16.2.3</b> Proportion of young women and men aged 18-29 years who experienced sexual violence by age 18

<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

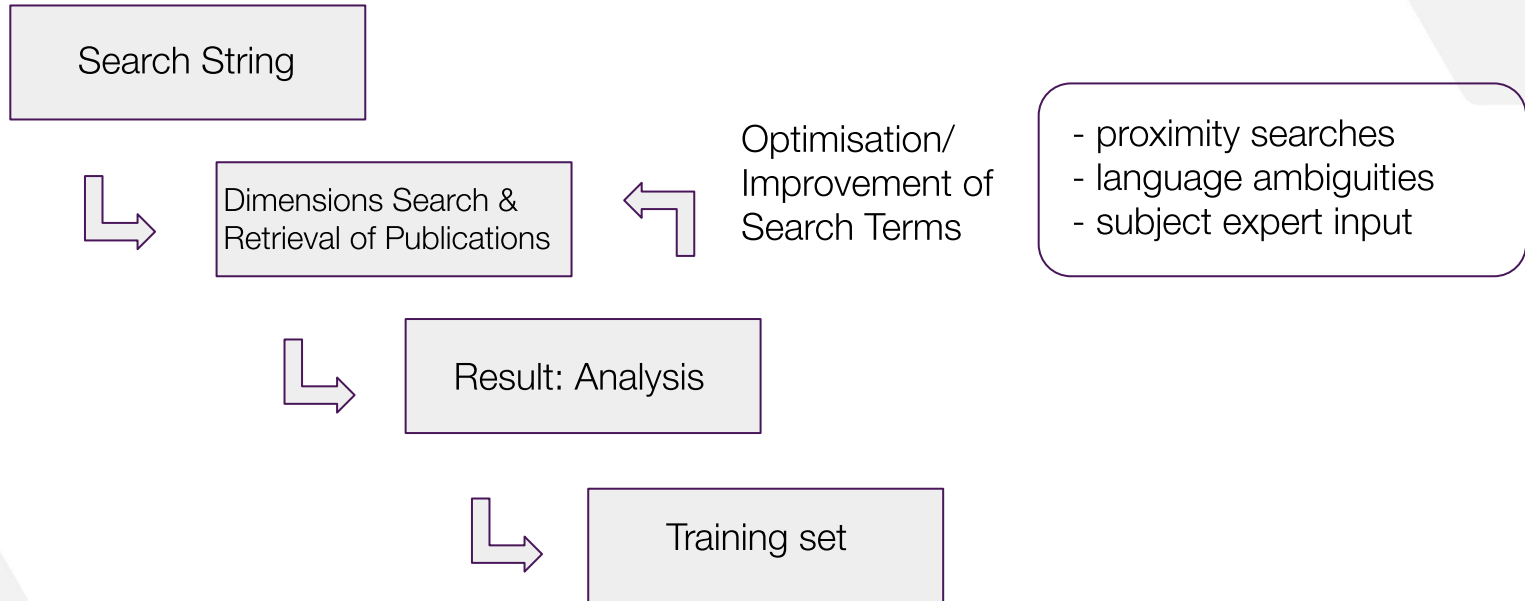
Check against existing categorisations FoR (Fields of Research)

## *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

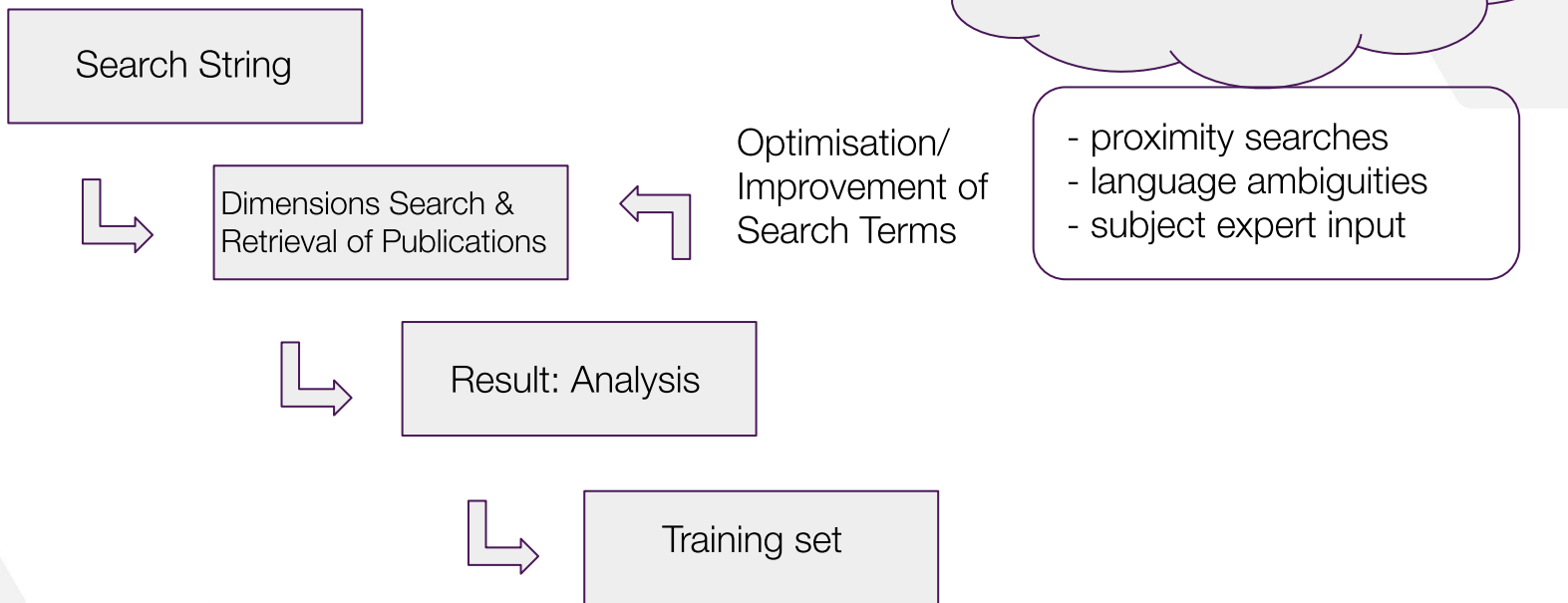
# Improving the quality of the search terms through re-iteration

Bringing it all together:



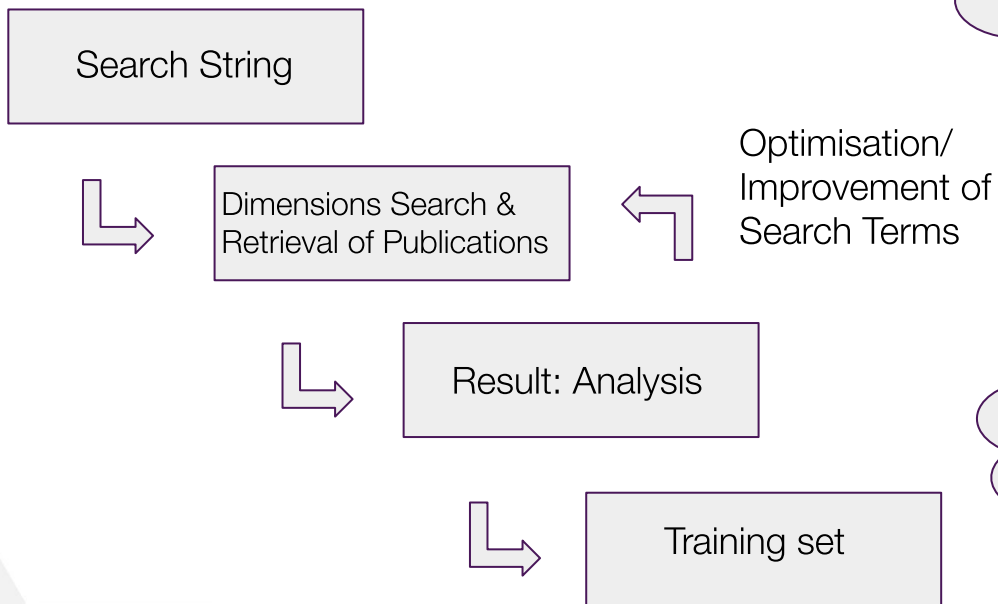
# Improving the quality of the search terms through re-iteration

Bringing it all together:



# Improving the quality of the search terms through re-iteration

Bringing it all together:



"Rural electrification"~3 finds:  
electrification of rural populations  
"Rural electrification"~5 finds  
electrification project for a rural village






- proximity searches
- language ambiguities
- subject expert input

American English vs  
British English

Drug use and drug abuse

# Machine Learning Results

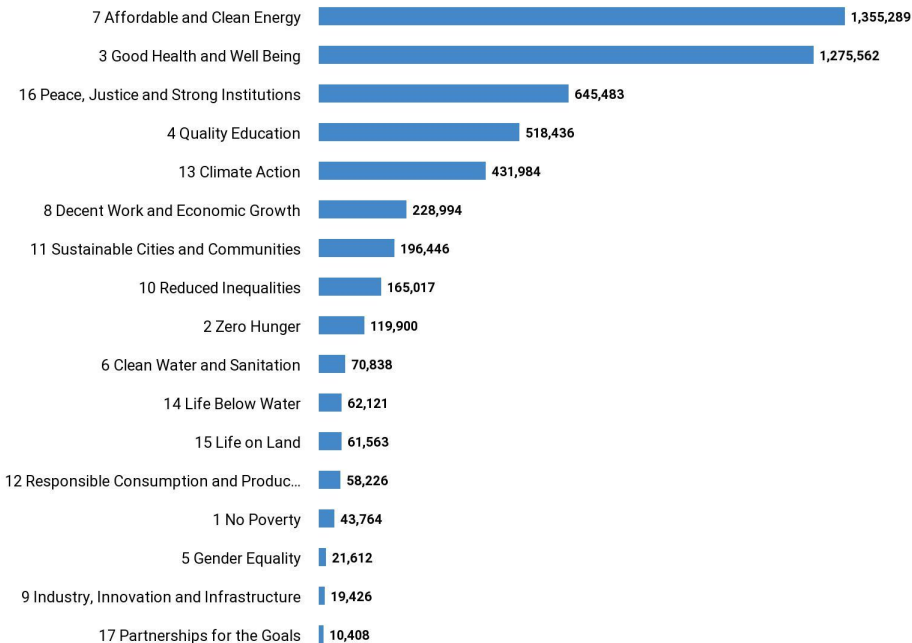
- o Classifier cross-validation on the training data
  - F1 of ~96% when cross-validated on the in-domain-only data
  - F1 of ~87% when cross-validated on all the training data (incl random publications)
  - The effectiveness values should serve only as a rough guide due to the training data not being 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

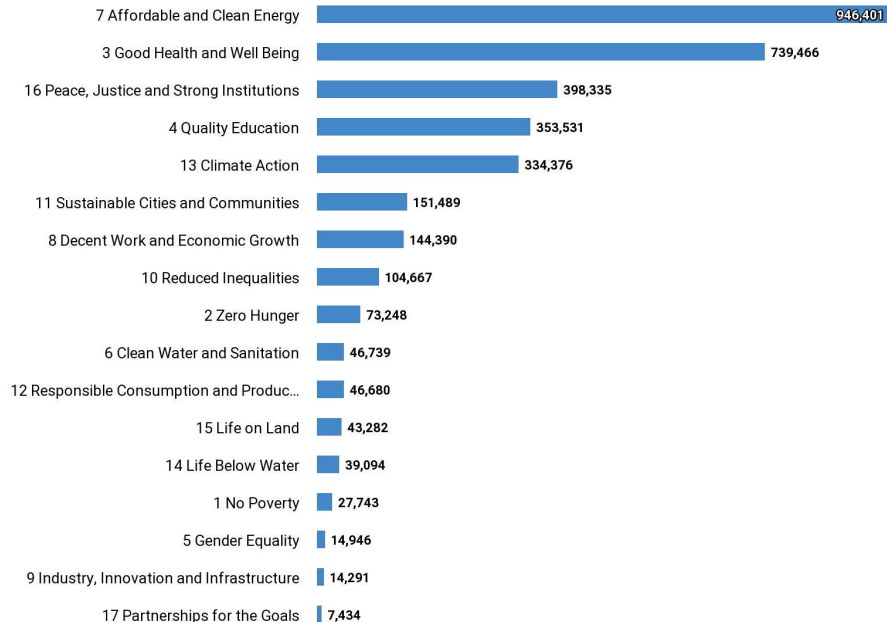
number of publications in each research category. (Criteria: see below)



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

© 2019 Digital Science and Research Solutions Inc. All rights reserved. Non-commercial redistribution / external re-use of this work is permitted subject to appropriate acknowledgement. This work is sourced from Dimensions® at [www.dimensions.ai](http://www.dimensions.ai).

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).

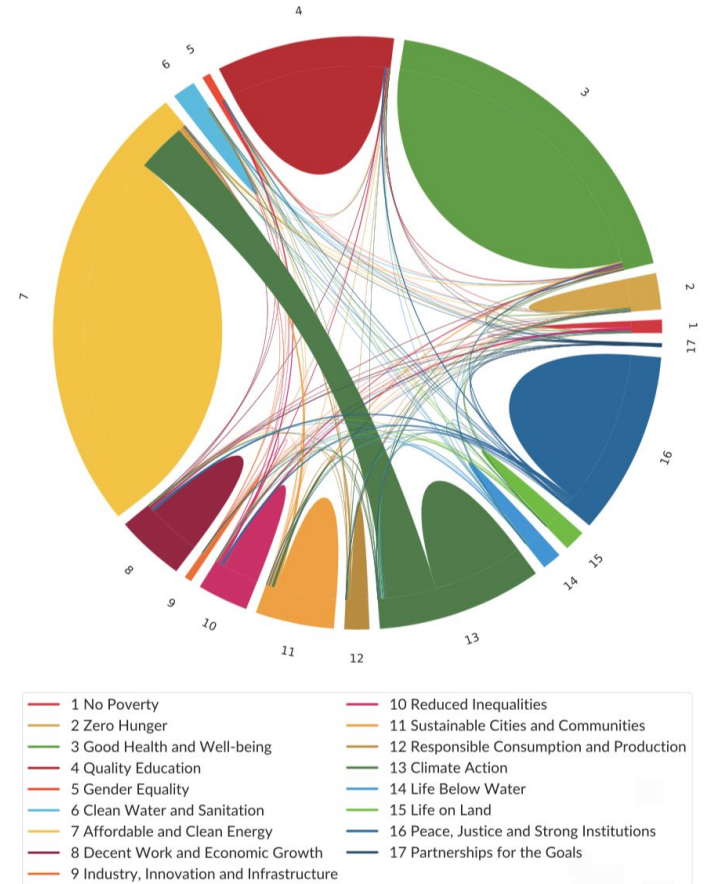
© 2019 Digital Science and Research Solutions Inc. All rights reserved. Non-commercial redistribution / external re-use of this work is permitted subject to appropriate acknowledgement. This work is sourced from Dimensions® at [www.dimensions.ai](http://www.dimensions.ai).



# Results

Number of results per SDG vary considerably

Interrelatedness between the SDGs

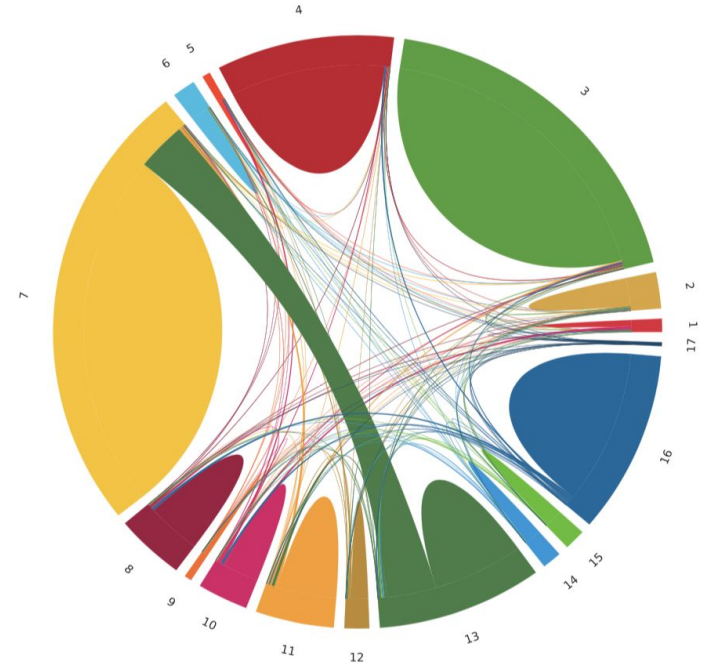


# Results

Number of results per SDG vary considerably

Interrelatedness between the SDGs

Closest tie between SDG 7 and 13:



- |   |   |
|---|---|
| 1 No Poverty                              | 10 Reduced Inequalities                   |
| 2 Zero Hunger                             | 11 Sustainable Cities and Communities     |
| 3 Good Health and Well-being              | 12 Responsible Consumption and Production |
| 4 Quality Education                       | 13 Climate Action                         |
| 5 Gender Equality                         | 14 Life Below Water                       |
| 6 Clean Water and Sanitation              | 15 Life on Land                           |
| 7 Affordable and Clean Energy             | 16 Peace, Justice and Strong Institutions |
| 8 Decent Work and Economic Growth         | 17 Partnerships for the Goals             |
| 9 Industry, Innovation and Infrastructure |   |

# Use cases...

**... answering the question:**

## **What does the academic sector demand?**

Integrate SDGs throughout the institution

Collaborate and partner in research endeavours/networks

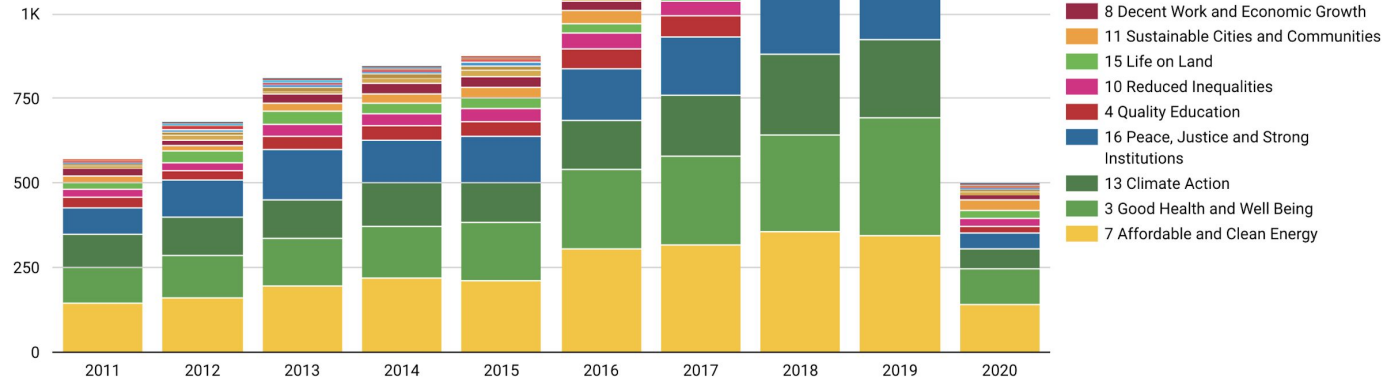
Demonstrate the institution's contribution to society

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%

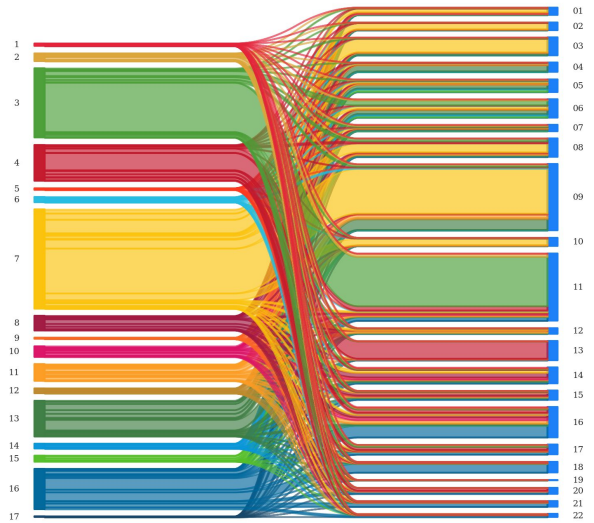


Recent publications with SDG published by analyzed organization

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

# Analysis: Publication Mapping & Interdisciplinary Research

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

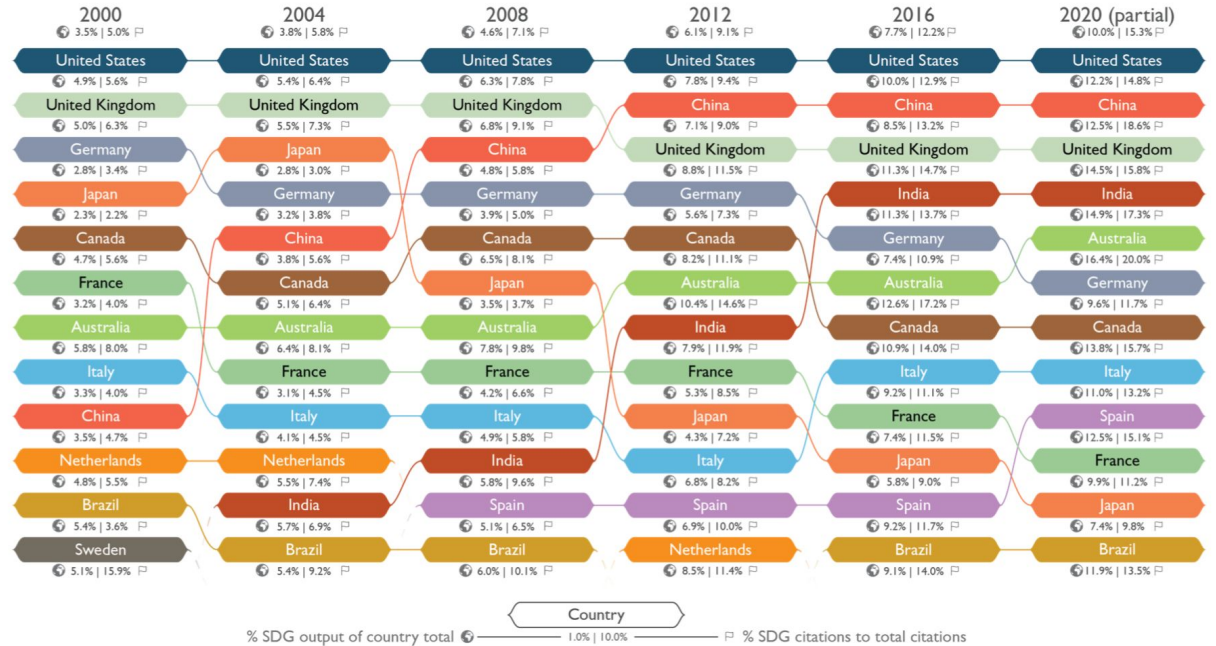


Heat map normalized by percentage of SDG



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

Relative proportions of  
SDG publications  
and  
Relative proportion of  
SDG citations



# Analysis: geography (ii)

Analysis by country

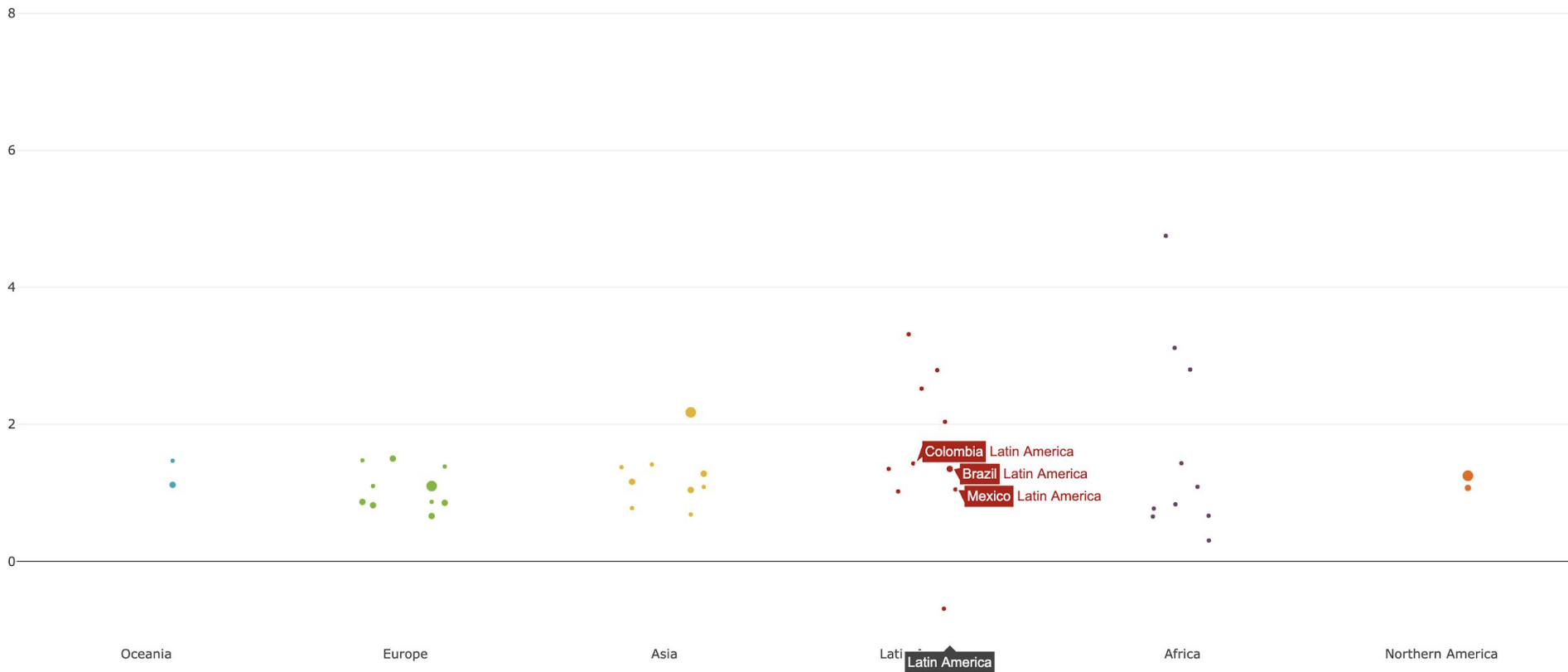
Country specific patterns in (type of) SDG research

Global South vs Global North





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



# International collaboration

Domestic focus throughout

SDG14 and SDG15  
more international

SDG4, SDG5 and SDG16  
domestically centred

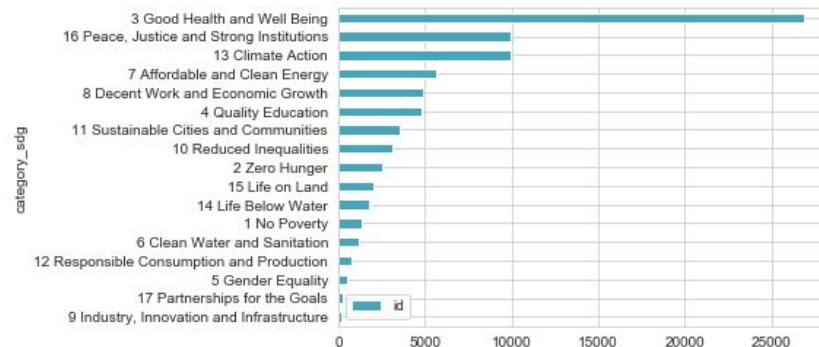
Goal	Domestic %	Bilateral %	Multilateral %
1. No Poverty	79.42	15.79	4.79
2. Zero Hunger	74.97	17.67	7.36
3. Good Health and Well-being	77.47	15.60	6.93
4. Quality Education	87.35	10.18	2.48
5. Gender Equality	83.31	13.30	3.39
6. Clean Water and Sanitation	73.56	19.53	6.91
7. Affordable and Clean Energy	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)

# 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](mailto:j.wastl@digital-science.com)  
[consultancy@digital-science.com](mailto:consultancy@digital-science.com)