



Innovative means of communicating research findings on Sustainable Development Goals (SDGs)

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Bibliometrician

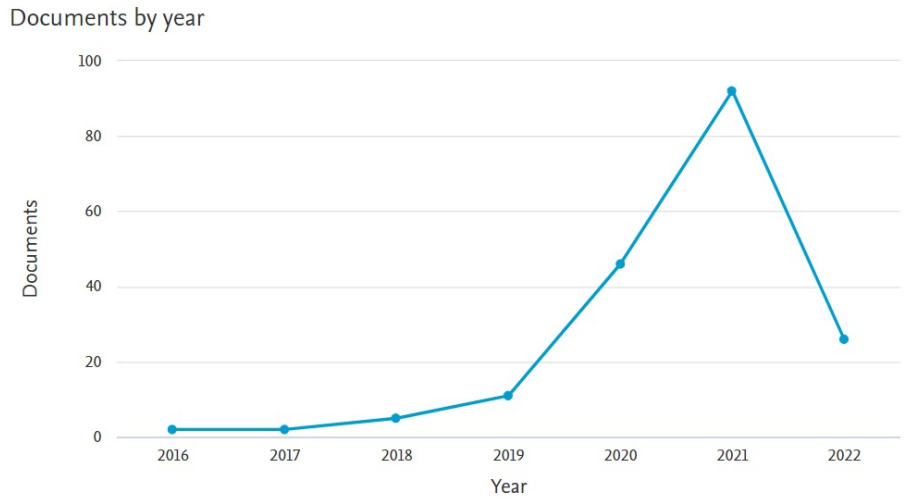
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Introduction

- The United Nations Sustainable Development Goals (SDGs).
- All UN Member States adopted the 17 Goals in 2015.
- 169 underlying targets.
- The annual SDG report.
- Sustainable Development Goals from a bibliometric angle.

Search string in Scopus - 184 document results.

(TITLE-ABS-KEY ("sustainable development goals") OR TITLE-ABS-KEY (sdg) AND TITLE-ABS-KEY (bibliometrics))



Main research questions

- How is the scientific production of SDGs represented in the bibliographical databases?
- Are differences in the results obtained from these databases?
- Could a factor analysis help us to describe the research contributions in the SDGs?
- How is the scientific production on Open Access about SDGS? and what about the number of Preprints?

Data and Methods

Publication window 2011-2020 - Has more been produced since 2015?

- SDG Indicators - United Nations Statistics Division

<https://unstats.un.org/sdgs/dataportal/>

- Incites

<https://incites.clarivate.com/>

- SciVal

<https://www.scival.com>

- Dimensions

<https://www.dimensions.ai/>

Data sources

- Incites, based on Web of Science– Clarivate
 - Articles, books, book chapters, book reviews, etc.
- SciVal, based on Scopus– Elsevier
 - Article, review or conference proceeding paper, books, etc.
- Dimensions analytics, based on Dimensions- Digital Science
 - Preprints are included as one of the publication types, articles, chapters, monographs, edited books and proceedings.
- Statistics: SPSS - Visualisations: Power BI

Available indicators - Incites

Basic indicators

- Web of Science Documents

- Times Cited

- Citation Impact

Percentage indicators

- % Documents in Top 10%

Impact indicators

- Category Normalized Citation Impact (CNCI).

Collaboration indicators

- % International Collaborations

Available indicators - SciVal

Scholarly Output

Citations

Citations per publication

Field-Weighted Citation Impact (FWCI)

Outputs in Top Citation Percentiles (top 10%)

Publications in Top Journal Percentiles (top 10%)

Collaboration

International, national, institutional and corporate collaborations.

Available indicators - Dimensions

Publications

Citations

Publications with citations

Field Citation Ratio (FCR)

Relative Citation Ratio (RCR)

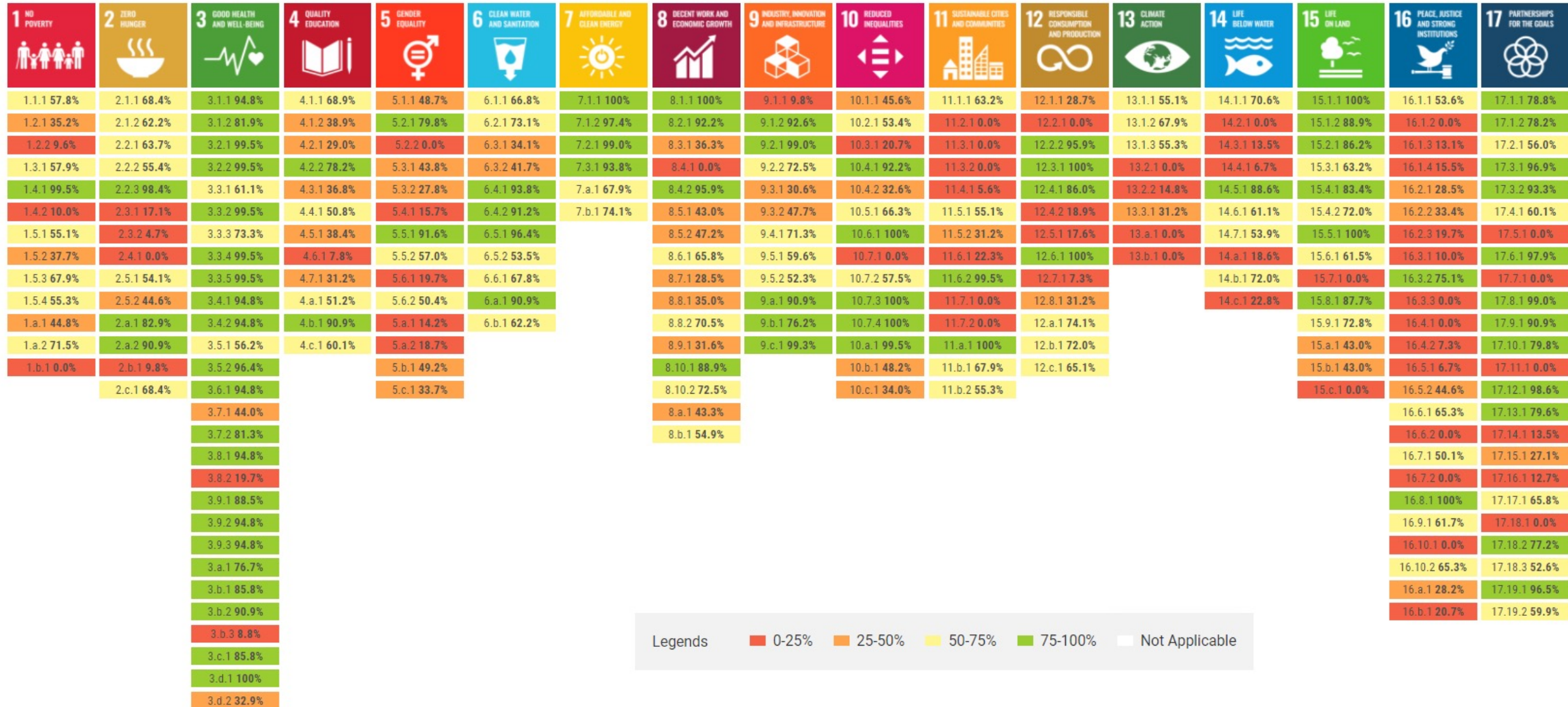
Recent citations

Altmetric Attention Score

Publications with attention

Compare indicators across all goals for All Countries

Countries with data for at least one year since 2015, by goal and indicator (average across countries in percent)



Sustainable Development Goals in InCites



- Clarivate maps publications to the most relevant Micro Citation Topic based on bibliometric analysis and manual curation.
- Maintain relevancy: Yearly re-clustering of Citation Topics.
- InCites publishes the mapping document to contribute to the transparent and high precision method.
- Community feedback: InCites are open to feedback and suggestions in order to improve and evolve SDG analysis.
- Data available via the InCites API.

Matching Research to the SDGs in SciVal

- Elsevier's Data Science teams have generated three sets of SDG mappings.
- In 2020, they used a new approach to mapping publications to the SDGs. Again, considering customer feedback, they significantly increased the number of search terms used to define each SDG.
- As a result, it captures, on average, twice as many articles while keeping precision above 80%. The mapping also overlaps with SDG queries from other independent projects.

Modelling SDGs in Dimensions



- Key phrases and terminology based on UN definitions of SDGs.
- Search strings acknowledging language ambiguities (i.e. American English vs British English)
- Implement proximity searches Involve subject matter experts and add/deduct additional term/phrases
- Quality assurance. Subject matter expertise is crucial
- Additional fine tuning, e.g. improving of proximity searches
- Eliminating false positives by improving the overall search string, not by manual intervention in the result list
- Repeated manual checks of resulting search strings
- General search terms vs specialist search terms (e.g. “well-being”): Need for exclusion and careful intervention
- Avoid very generic search terms (well-being, sustainable, etc) to minimise false positives in the training set
- Using supervised Machine Learning to build a classification model and subsequently a service that enables classification of texts.

STRINGS – Steering Research and Innovation for Global Goals



- The STRINGS project is mapping development pathways for science, technology and innovation that best address the UN Sustainable Development Goals.
- Overall meaning/robustness of the efforts of mapping SDGs to papers given very different results by different methods.
- The STRINGS approach provides a visualisation of research landscapes based on research areas, revealing a range of diverse research options related to one or more SDGs.
- They proposed a new methodology for mapping SDGs given the plurality of understanding of the relationships between research and SDGs.
- The interactive tool is based on the Web of Science.
- More comprehensive publication databases are needed to reflect research activities in social sciences, in applied fields, in diverse languages and low- and middle-income countries.

Visualising plural mappings of science for Sustainable Development Goals (SDGs).

Ismael Rafols, Ed Noyons, Hugo Confraria, Tommaso Ciarli

Empowering stakeholders to make their own choices on the relevance of STI for SDGs

Ismael Rafols, Ed Noyons, Tommaso Ciarli, Hugo Confraria, Ine Steenmans, Alfredo Yegros

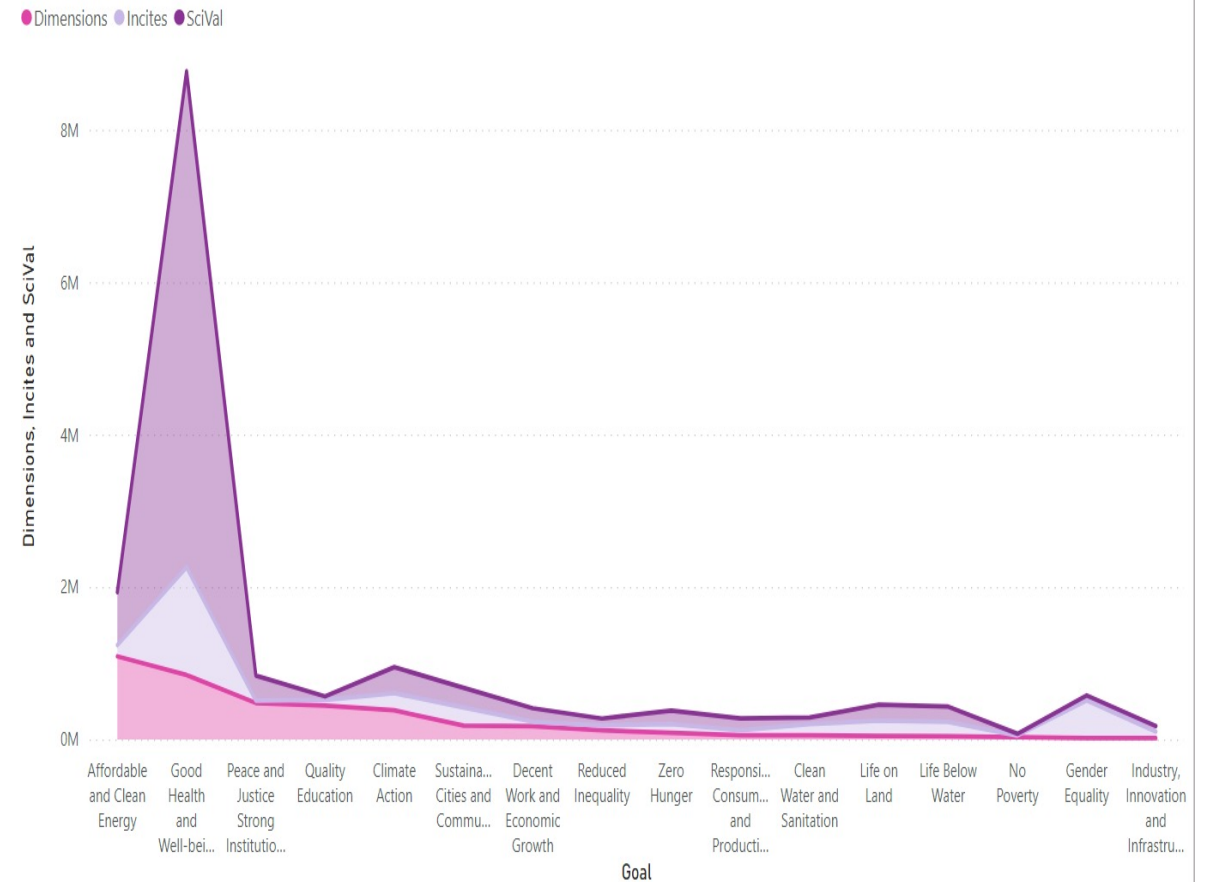
Exploring bibliometrically the SDGs

Incites, SciVal, Dimensions

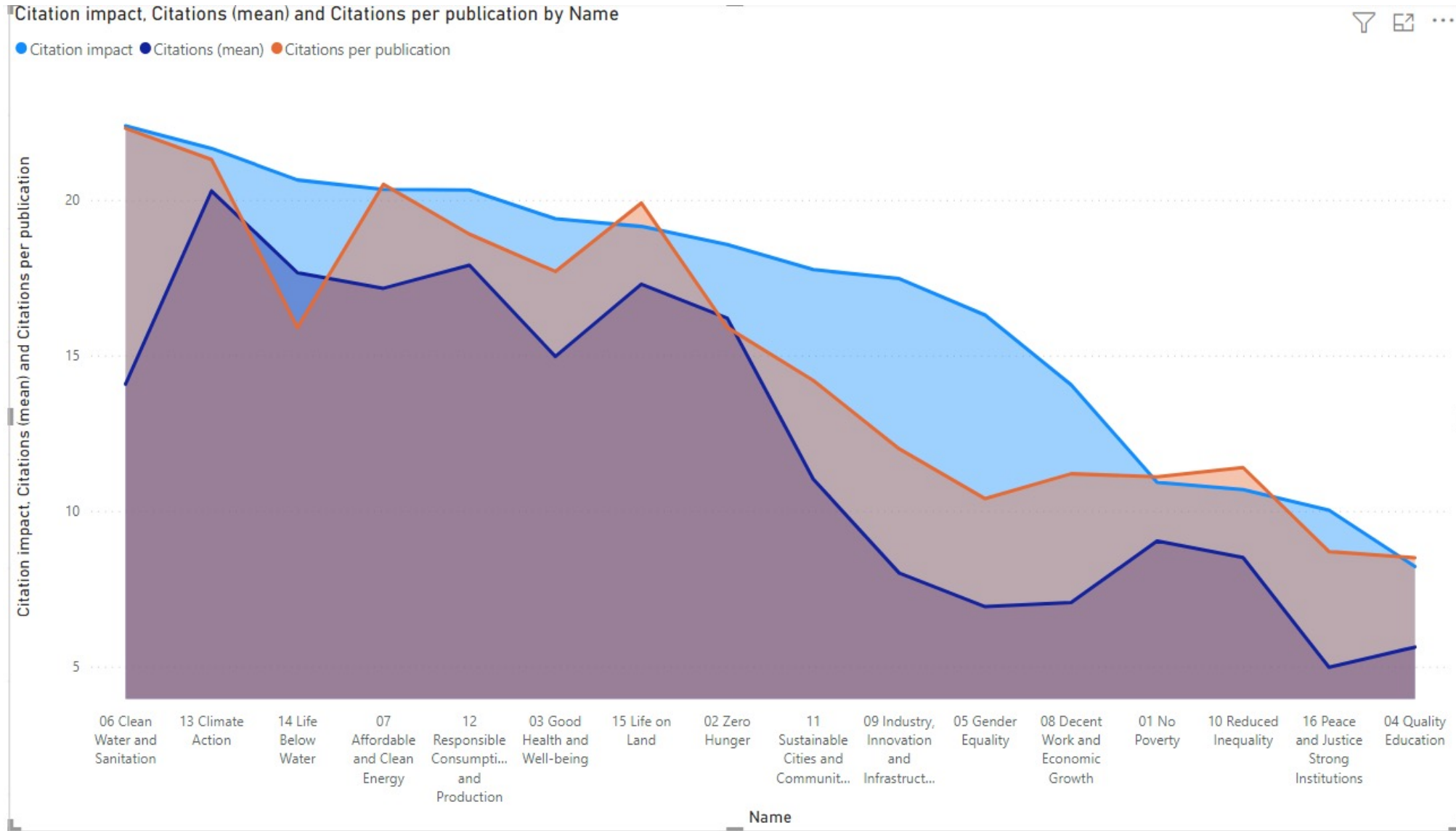


Publications across databases

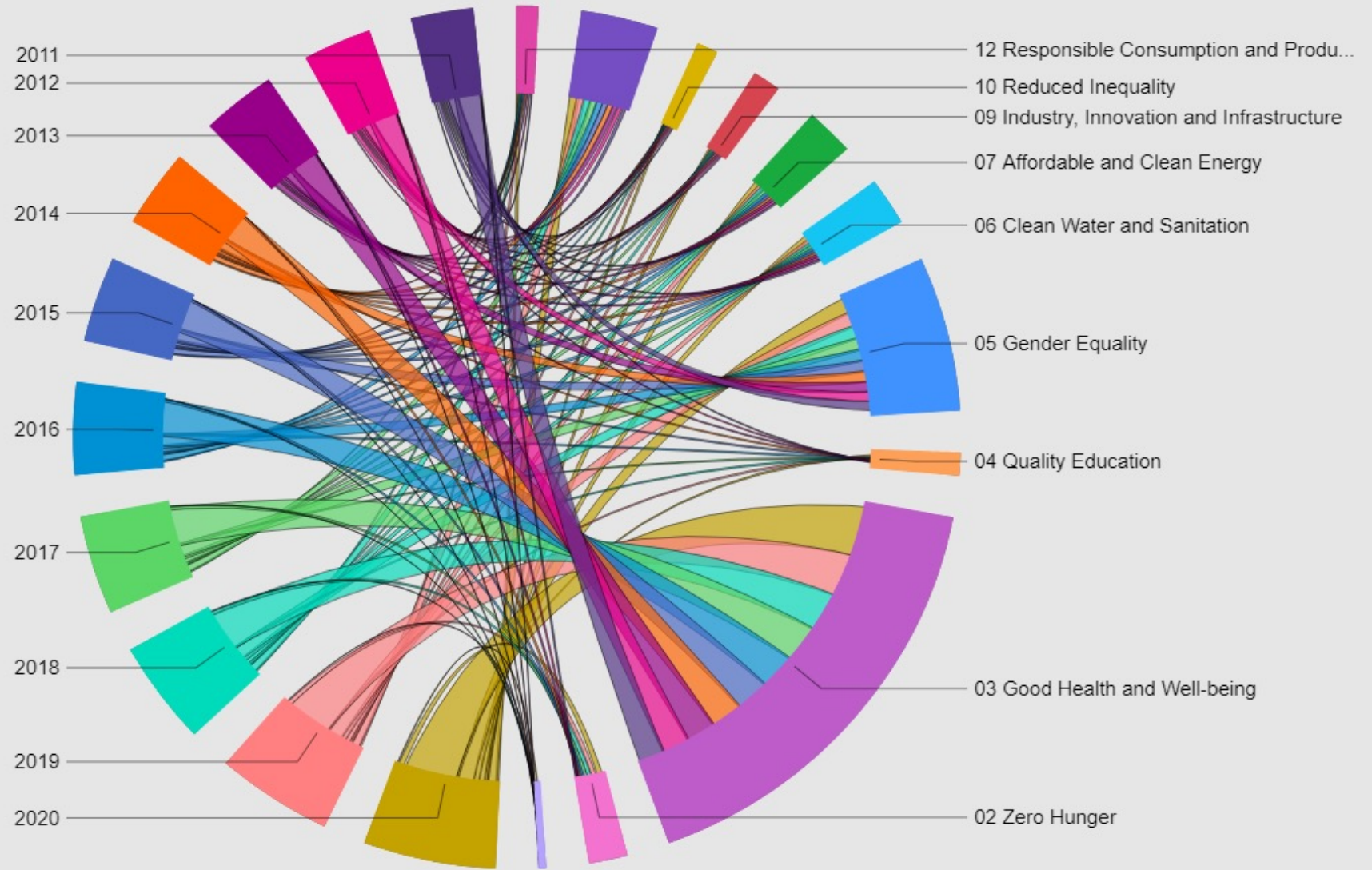
Goal	Dimensions	Incites	SciVal
Affordable and Clean Energy	1090426	148993	693397
Clean Water and Sanitation	52930	149467	86108
Climate Action	381472	225413	342175
Decent Work and Economic Growth	174224	58737	176376
Gender Equality	17785	493895	67112
Good Health and Well-being	844804	1414623	6507919
Industry, Innovation and Infrastructure	16455	84309	75676
Life Below Water	43314	188150	199447
Life on Land	47320	198558	210852
No Poverty	31503	20323	22622
Peace and Justice Strong Institutions	478264	33309	327616
Quality Education	445940	70629	48104
Reduced Inequality	119960	62785	91278
Responsible Consumption and Production	55512	65361	157144
Sustainable Cities and Communities	180994	237189	259362
Zero Hunger	86609	117604	176137
Total	4067512	3569345	9441325



Impact across data sources



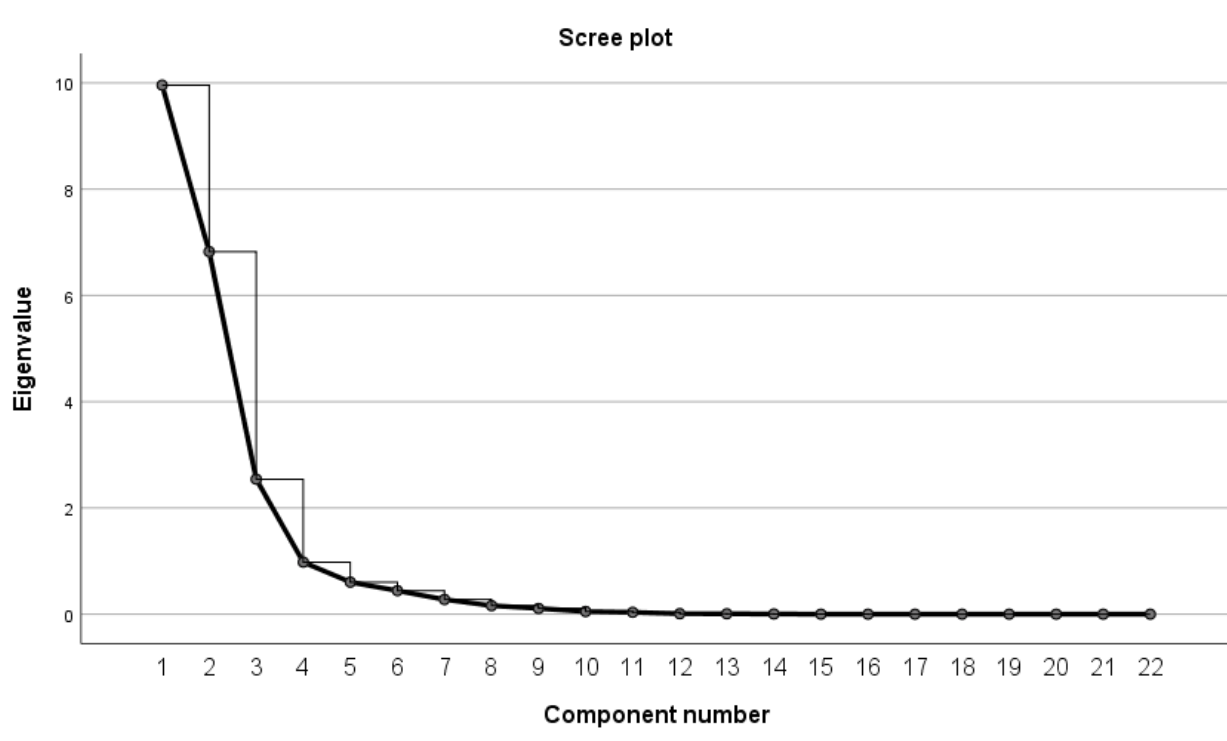
Web of Science Documents by Publication Year and Name



Exploratory Factor Analysis and Principal Component

Name	Web of Science Documents	Times Cited	Category Normalized Citation Impact	% Documents in Top 10%	% Highly Cited Papers	% Hot Papers	% Documents in Q1 Journals	Citation Impact	% International Collaborations	% All Open Access Documents	% Industry Collaborations	% Domestic Collaborations	Impact Relative to World	% Gold Documents	% Gold - Hybrid Documents	% Free to Read Documents
01 No Poverty	20323	221991	0.99	9.73	0.50	0.01	36.44	10.92	29.77	47.20	0.41	23.22	0.99	19.50	6.45	7.20
02 Zero Hunger	117604	2183470	1.00	9.75	1.44	0.03	49.43	18.57	31.79	44.18	0.66	32.06	1.68	23.54	5.71	6.41
03 Good Health and Well-being	1414623	27435847	1.00	9.72	1.20	0.02	43.70	19.39	24.38	55.36	2.10	41.96	1.76	27.42	5.24	10.99
04 Quality Education	70629	580661	0.99	9.35	0.23	0.00	29.02	8.22	13.61	29.59	0.18	22.46	0.74	13.38	3.07	3.51
05 Gender Equality	493895	8049241	1.00	9.61	0.81	0.01	41.67	16.30	23.61	51.04	1.29	40.35	1.48	23.21	4.56	9.49
06 Clean Water and Sanitation	149467	3344721	1.00	9.72	1.75	0.03	51.63	22.38	29.13	35.92	1.09	34.20	2.03	18.16	4.46	5.89
07 Affordable and Clean Energy	148993	3030486	1.00	9.74	2.00	0.04	61.93	20.34	25.20	33.78	2.04	26.92	1.84	17.77	4.01	3.22
08 Decent Work and Economic Growth	58737	825704	1.00	9.71	1.54	0.04	42.09	14.06	24.25	36.98	0.69	22.22	1.27	14.57	3.89	3.39
09 Industry, Innovation and Infrastructure	84309	1472987	1.00	9.73	1.87	0.03	53.66	17.47	25.29	35.20	0.97	23.90	1.58	16.29	4.50	2.55
10 Reduced Inequality	62785	671155	0.99	9.48	0.56	0.01	34.85	10.69	20.00	39.12	0.42	24.38	0.97	13.85	4.07	4.74
11 Sustainable Cities and Communities	237189	4212428	1.00	9.66	1.52	0.03	52.82	17.76	26.01	38.09	1.24	27.60	1.61	20.38	4.53	3.70
12 Responsible Consumption and Production	65361	1328105	1.00	9.74	2.22	0.04	56.98	20.32	25.90	36.77	1.08	27.63	1.84	19.27	4.87	3.30
13 Climate Action	225413	4881490	1.00	9.67	1.83	0.03	58.02	21.66	34.22	45.20	0.92	30.82	1.96	21.50	6.49	7.48
14 Life Below Water	188150	3883365	1.00	9.74	1.49	0.02	52.79	20.64	35.81	45.98	0.81	33.89	1.87	22.64	6.02	8.43
15 Life on Land	198558	3802022	1.00	9.78	1.16	0.02	51.94	19.15	36.30	45.52	0.60	34.03	1.73	22.64	5.38	8.58
16 Peace and Justice Strong Institutions	33309	334053	0.99	9.50	0.37	0.00	35.61	10.03	13.92	32.18	0.11	28.49	0.91	11.81	3.22	3.81

PRINCIPAL COMPONENTS (PCA) AND EXPLORATORY FACTOR ANALYSIS (EFA)



Pattern Matrix^a

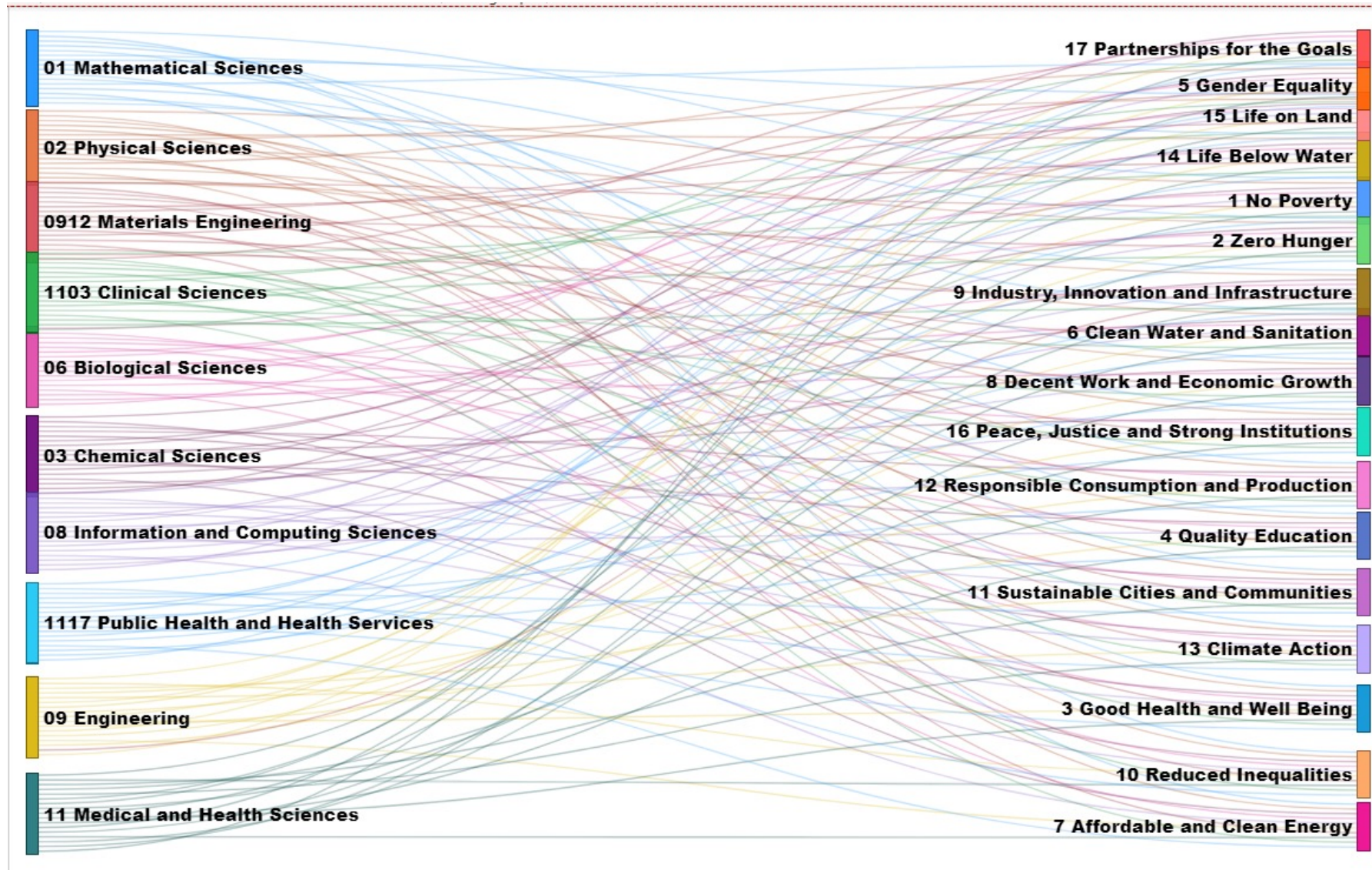
	Component		
	1	2	3
% Highly Cited Papers	,975		
% Documents in Q2 Journals	-,968		
% Documents in Q1 Journals	,945		
% Documents in Q4 Journals	-,886		
% Hot Papers	,885		
Category Normalized Citation Impact	,884		
Citation Impact	,873		
Impact Relative to World	,873		
% Documents in Q3 Journals	-,818		
Journal Normalized Citation Impact	,809		
% Green Accepted Documents	-,655		
Documents in JIF Journals		,988	
Web of Science Documents		,988	
Times Cited		,978	
% Domestic Collaborations		,837	
% Green Published Documents		,817	
% Free to Read Documents		,715	
% All Open Access Documents		,688	
% Industry Collaborations		,670	
% Gold - Hybrid Documents			,860
% International Collaborations			,817
% Green Submitted Documents			,750

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. Rotation converged in 9 iterations.

Running a linear regression on factor component scores

Name	REGR factor score 1 for analysis 1	REGR factor score 2 for analysis 1	REGR factor score 3 for analysis 1
01 No Poverty	-1,4288638	-,3156018	1,3543078
02 Zero Hunger	,2960695	-,1037114	,7655001
03 Good Health and Well-being	-,1004023	3,1496631	-,1870387
04 Quality Education	-1,4745312	-,9117199	-1,6484011
05 Gender Equality	-,6961640	1,4210170	,1609976
06 Clean Water and Sanitation	,8960573	-,0706542	-,3527880
07 Affordable and Clean Energy	1,3860421	-,2585306	-1,0991965
08 Decent Work and Economic Growth	-,0966553	-,8633509	-,1892482
09 Industry, Innovation and Infrastructure	,7100197	-,6735838	-,4284797
10 Reduced Inequality	-1,3400136	-,5285686	-,0968759
11 Sustainable Cities and Communities	,6106599	-,2103492	-,4118519
12 Responsible Consumption and Production	1,2516705	-,5025454	-,4582958
13 Climate Action	,8690775	,0863768	1,2671095
14 Life Below Water	,4794943	,1485845	1,4422430
15 Life on Land	,1298310	,1120746	1,3846147
16 Peace and Justice Strong Institutions	-1,4922917	-,4791002	-1,5025967

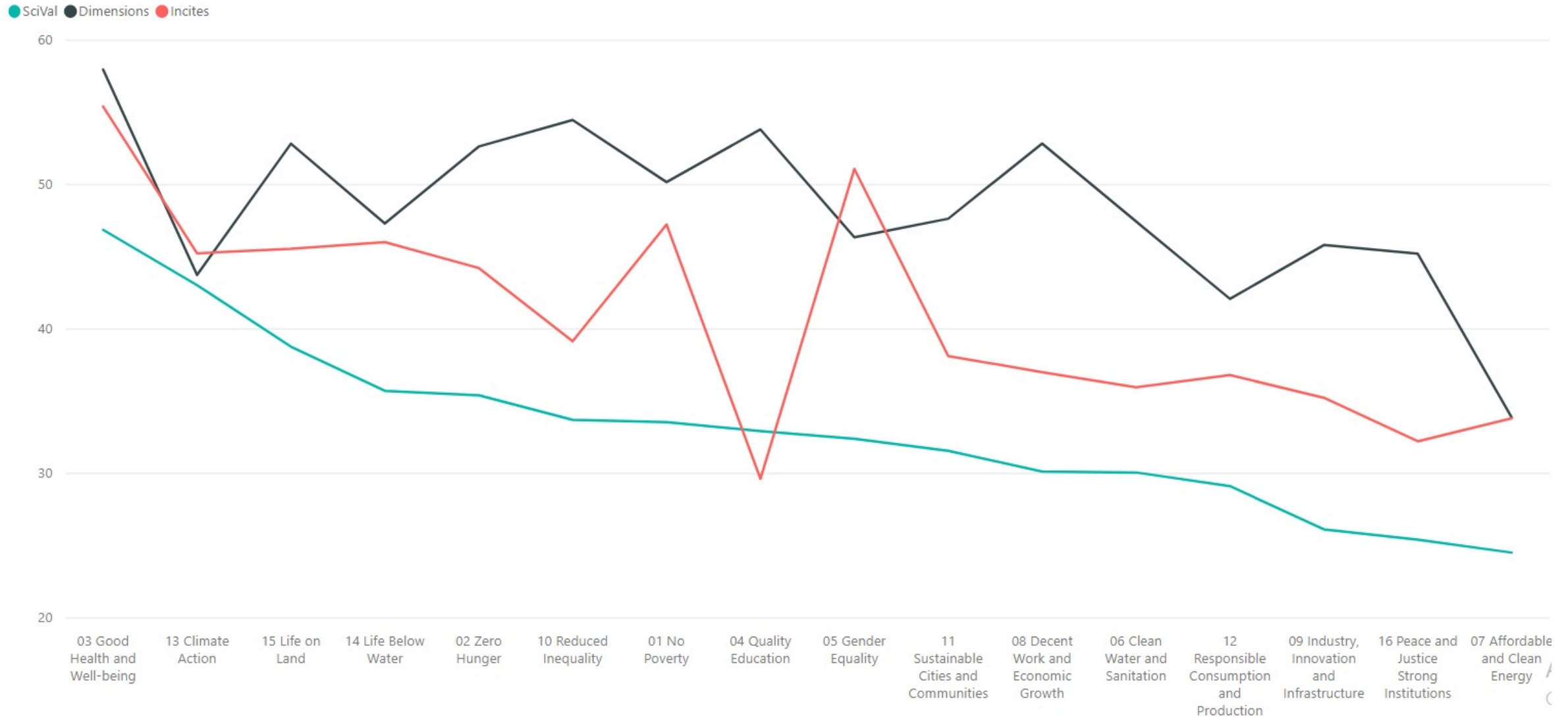
Sustainable Development Goals in Field of Research (FOR)



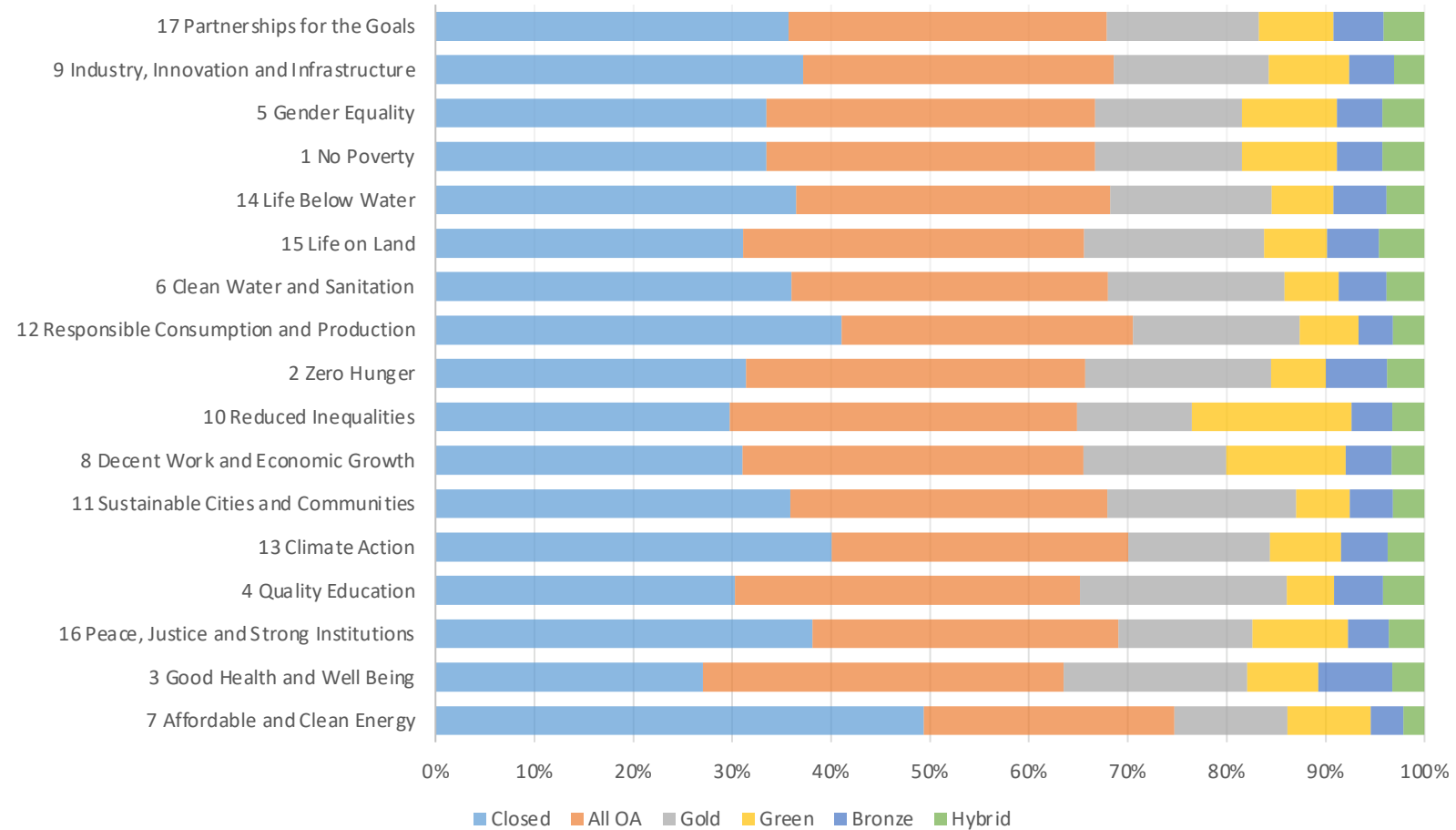
International collaborations in databases



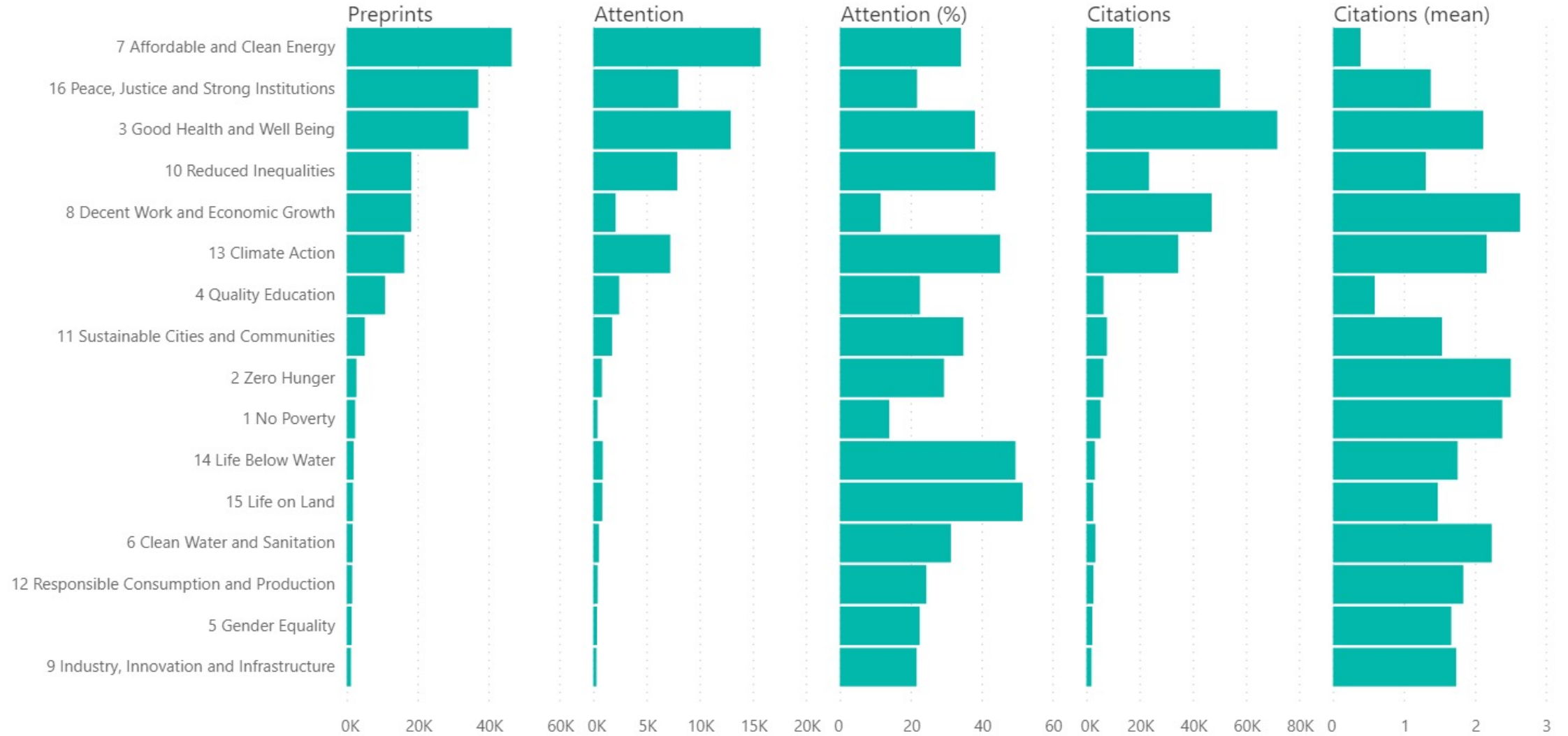
Open Access



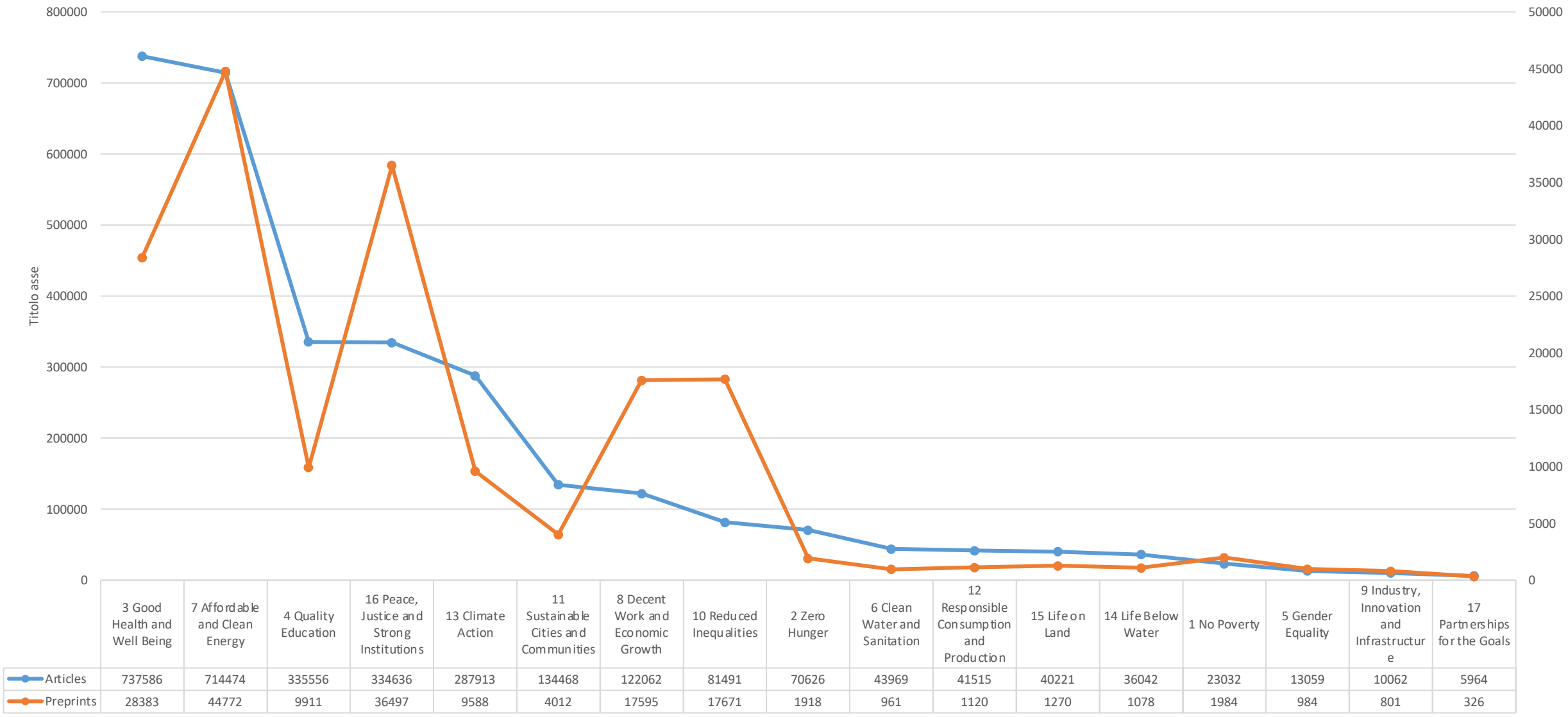
Publications by different open access options



Analysis of preprints

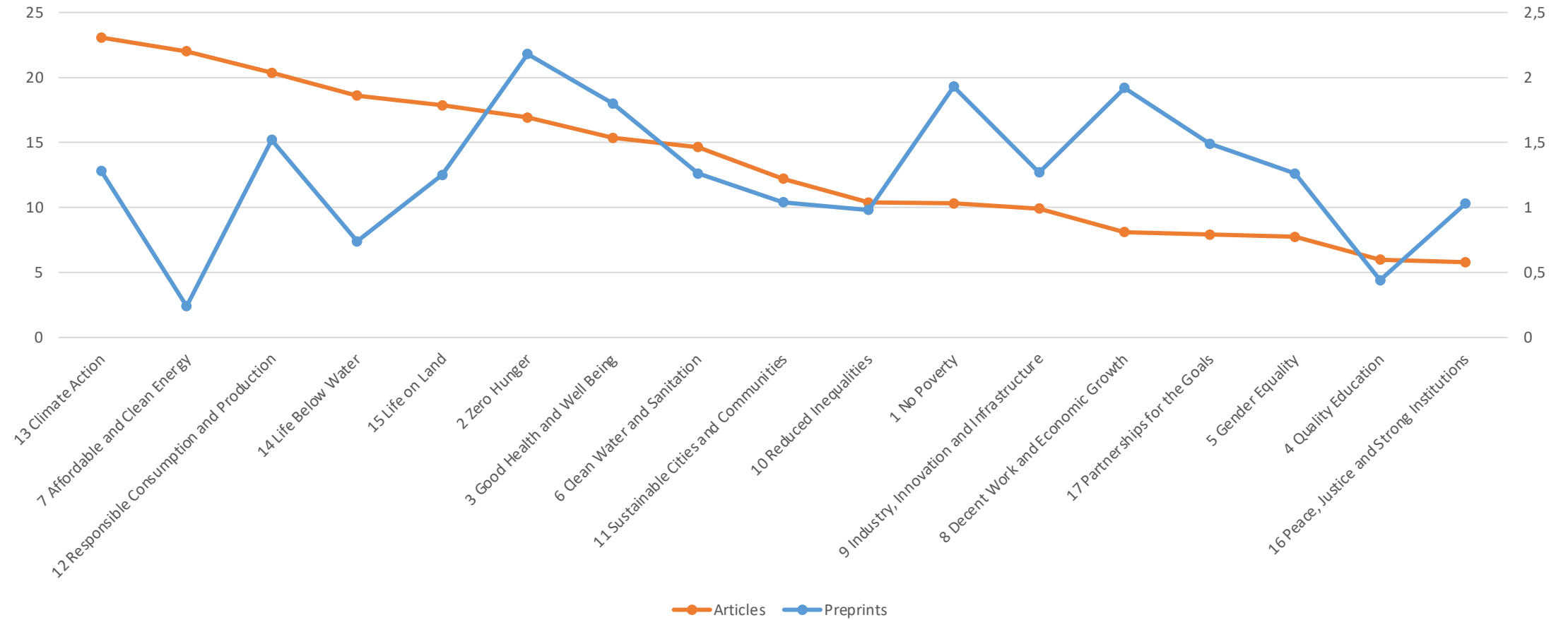


Articles vs Preprints about SDGs



Citations per paper (average)

(citations/article; citations/preprint)



In conclusion

- The three databases used for this study have very different results among them.
- Through principal component analysis and factor analysis could synthesise the indicators which define the SDGs.
- The three SDGs with the highest number of publications are 7 Affordable and Clean Energy, 3 Good Health and Well Being and 13 Climate Action. However the ones with the highest impact (citations mean) are 13 Climate Action, 14 Life Below Water and 06 Clean Water and Sanitation.
- Preprints have played an important role in the transmission of research results. However, more articles were produced with greater impact.
- The majority of open access publications are in 03 Good Health and Well-being, 05 Gender Equality and 01 No Poverty.

Future work

- The use of other open databases, for example, OpenAlex.
- Analysis of gender in publications around SDGs.
- Collaboration with Strings project.
- Identify the countries contributing the most to SDGs.
- Comparisons of data from UN and citation databases.

Acknowledgments

- Dimensions, Incites and Scival for providing the data.
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Thank you for your attention!

Any questions?

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