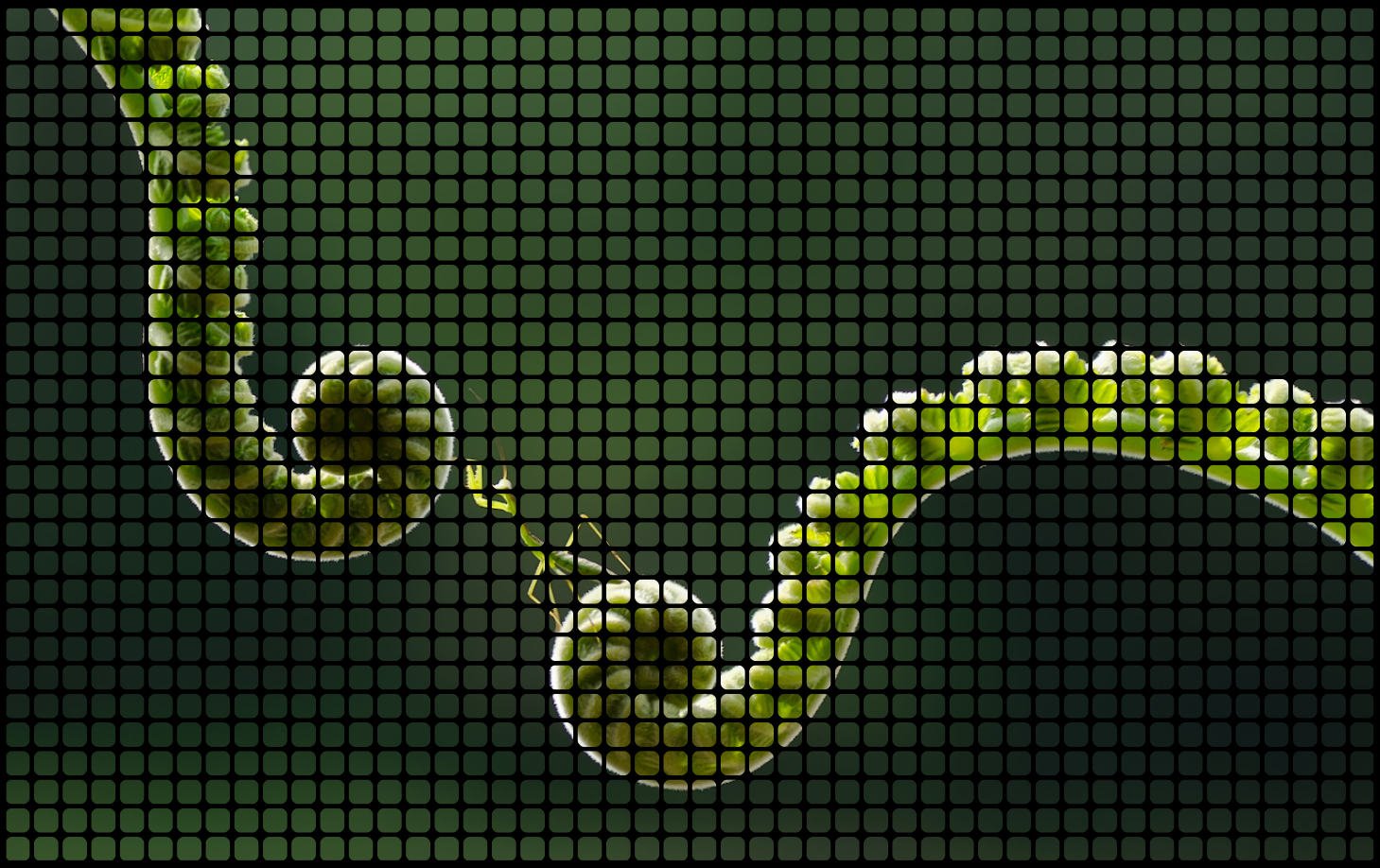

Digital Research Report

Contextualizing Sustainable Development Research

Using Dimensions to explore the global landscape of research on Sustainable Development Goals

Foreword by Keith Webster

Juergen Wastl, Daniel W. Hook, Briony Fane, Hélène Draux and Simon J. Porter

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SUSTAINABLE DEVELOPMENT GOALS

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About the Authors

Briony Fane is a Data Analyst at Digital Science. She has a higher education background, having gained a PhD from City, University of London, and has worked as both a researcher and a research manager.
https://orcid.org/0000-0001-6639-7598

Hélène Draux is Research Data Scientist at Digital Science. She has an academic background in social geography, with experience in data visualisation and data science.
https://orcid.org/0000-0001-8837-168X

Daniel Hook is CEO of Digital Science. He has been involved in research information management and software development for over 15 years, as Director of Research Metrics at Digital Science, Founder and CEO of Symplectic, and COO of Figshare. Daniel is an active researcher affiliated with Imperial College London, Washington University in St Louis, and the University of Cambridge.
https://orcid.org/0000-0001-9746-1193

Simon Porter is Director of Research Sector Transformation at Digital Science. He partners with Digital Science's customers to develop innovative uses of research infrastructure and research information.
https://orcid.org/0000-0002-6151-8423

Juergen Wastl is Director of Academic Relations and Consultancy at Digital Science. He previously headed up the Research Information team at the University of Cambridge's Research Strategy Office and worked for BASF managing BMBF-funded projects internationally.
https://orcid.org/0000-0001-7757-8001

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Digital Science, 6 Briset Street, London EC1M 5NR, UK.
info@digital-science.com

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Foreword

As I write, the COVID-19 pandemic has triggered global action. The Sustainable Development Goals (SDGs) are now more relevant than ever, for they provide a framework for recovery. It is natural that global collaboration by the research community to fight against COVID-19 must be extended into a broader implementation of the goals. Whilst the pandemic has eroded some of the progress already made towards the SDGs, we must all deepen our efforts to build a healthier, safer, fairer and more prosperous world.

At their heart the SDGs provide a blueprint to build a better world, addressing issues such as the eradication of poverty and hunger, the improvement of health and education, and the promotion of prosperity in a manner that protects our planet. The UN has set out ambitious plans to implement its SDG agenda by 2030, and governments, universities and research organizations, and policy-makers are working tirelessly towards this end. The 17 goals represent an interconnected and ambitious vision, requiring global action and international collaboration.

The opportunities for the research community are profound. Research capacity and infrastructure must be the focus of investment, supporting the expansion of research and innovation in all countries. The research community must also attend to the demand for advances that address the real world problems set out in the SDGs, and to support the formulation of policy.

This imperative to conduct relevant research brings fascinating questions for those charged with funding and carrying out such research. Funders want to target limited resources in equitable and responsible ways. Research institutions want to work with the most talented researchers, and to collaborate internationally to best effect. All want to ensure that the research reaches policy-makers and those who can deploy research outcomes to best effect. Understanding the location, impact, and penetration of research is challenging. Many of the approaches that have been developed to track research have hitherto been focused on disciplinary research and scholarly impact.

"Whilst the pandemic has eroded some of the progress already made towards the SDGs, we must all deepen our efforts to build a healthier, safer, fairer and more prosperous world."

The SDGs have different needs. Firstly, many of the challenging problems confronting the world must be addressed by researchers from disparate fields, and this demands a new window into the products of scholarship. Secondly, conventional approaches to assessing impact have taken a light-touch approach to capturing the true effects of problem-centered and policy-grounded scholarship. This important report outlines a new approach to categorizing research in line with the multidisciplinary and large scale needs of the SDGs. It allows the global scale of relevant work to be seen through a local lens, and enables the contributions of different fields to each goal to be more properly understood.

The report that follows attempts to unpack just some of the issues that I raise above. It is intended to be a guide to those who are newly considering these issues and, perhaps, a reminder to those of us who have been considering these issues for many years. In either case, I hope that you will find the analysis accessible and enjoyable.

Keith Webster
Dean of University Libraries and
Director of Emerging and Integrative Media Initiatives
Carnegie Mellon University

1 Change of Perspective

> *It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to Heaven, we were all going direct the other way – in short, the period was so far like the present period, that some of its noisiest authorities insisted on its being received, for good or for evil, in the superlative degree of comparison only.*
>
> – Charles Dickens, A Tale of Two Cities, 1859.

"Universities and the research sector should now be looking at a bigger picture - one around alignment with Sustainable Development Goals."

As late 18th Century Britain came to terms with the fundamental redrawing of its social landscape motivated by the Industrial Revolution, France was experiencing a much bloodier redefinition of its own social structure initiated by altogether different forces. In the famous quotation above, Dickens paints a vivid backdrop of the turmoil and contradictions of that age from his 80-year-distant vantage point. In France, at the time, the opulence of the aristocracy meant that the advantages available to them and their quality of life was at a level that was simply incomprehensible to ordinary people.

The reason for quoting from A Tale of Two Cities at the beginning of this report is that, in the view of the authors, this particular passage is highly reminiscent of the juxtapositions and tensions in the world that we observe today. While it is true that the rate of poverty is lower than ever [17], it is also true that the concentration of global wealth with the world's richest is increasing and that, more generally, wealth disparity is increasing. This is not only an effect between nations but also within nations. While many companies in recent years have taken a leaf out of the histories of companies like Cadbury [7], which based its values on Quaker principles of community and doing well by doing good, with enhanced corporate social responsibility programmes and moves toward stakeholder rather than shareholder value, countries have continued to strive for GDP growth as their single most important measure of success [16]. It is the best of times, it is the worst of times.

We stand at the beginning of a fourth industrial revolution. Some think of the current revolution as the AI revolution, while others think of it as an information or data revolution. What is certain is that it is an exponential revolution, in the sense that the technologies that come out of the current revolution will help to design their own successors and will consequently extend the length of duration and increase the steepness of the curve of technological development during this revolution [8].

At the same time there is a growing realisation that the accepted doctrine in economics has failed to take into account a key part of the ecosystem that it models - namely the world in which we live. The environment is not an externality that is infinite in extent and merely a set of raw materials for humanity to plunder without consequence [16]. In parallel, another overlooked part of our economy, Gross Domestic Product (GDP) is becoming an increasingly inaccurate representation of the economy, as more and more or our economy becomes intangible - based around intellectual property, software, processes and knowledge, the merest fraction of which can be accounted for by GDP [9]. Economics, in its pursuit of a mathematical theory rather than a holistic and inclusive theory, has led us to look for value in the wrong places [2].

Another parallel with Dickens' story is one of societal change. From history, we learn that technological revolution is often paired with industrial revolution [3]. When industrial revolutions take place, there is often disruption in the labour market as jobs shift, some becoming redundant, others becoming augmented, and new jobs being created [4]. This leads to an extended period of flux and uncertainty for the workforce. As the AI revolution moves forward, we will see an extended period of disruption in the workplace, which will almost inevitably lead to hardships for some. Many of the existing anti-globalisation movements already aim to limit immigration, when in fact technology change is the underlying driver. All around there are rising asymmetries. The wealth of nations in this AI and data-driven economy, as with the wealth of people, will be driven by information asymmetry [12].

And so, against this backdrop the research sector and the university sector more generally must ask itself, what should its role be in the future? The Impact agenda has been one of the key drivers in research policy since the financial crisis. Writing this in the shadow of the COVID-19 crisis, what next?

The Sustainable Development Goals (SDGs) have, we believe, found their moment - they have never been more relevant. In a world of uncertainty and economic distress, we have reached a singular moment where we can make a distinct choice - follow the same path as before, focusing on increased wealth disparity, information asymmetry and increased unemployment, or a world in which we take Maslow's 'Hierarchy of Needs' [13] to heart and reformulate economic drivers around a more holistic vision for humanity. In that second, more positive world, universities and the research sector should now be looking at a bigger picture too - one around alignment with Sustainable Development Goals. Providing impact through research, but also through continuous education and retraining in a fluid job market.

"Digital Science has invested in providing a lens in *Dimensions* through which research can be viewed by Sustainable Development Goals."

Digital Science has invested in providing a lens in *Dimensions* through which research can be viewed by Sustainable Development Goals. Understanding the goals; how much current research interest relates to them; how collaborative they are; and how they relate to traditional research fields is a key part of what research managers, policy makers and strategists should be engaging with in the next few years.

This report gives an overview of the classification that we have presented and provides some interesting and engaging initial analysis.

2 Building a New Categorisation

Building a categorisation scheme for the Sustainable Development Goals is both technically and conceptually challenging. In this section, we want to give the reader an insight into the process of the creation of the SDG categorisation. The approach that has been taken is as rigorous and scientific as we were able to make it. When building most categorisation schemes there are either highly specific goals and signposts (for example, disease classification) or there is literature that has already been pre-categorised by humans. For these types of problem, a machine learning approach can be applied in a highly successful manner. *Dimensions* has used this machine learning to create its existing categorisation schemes, mostly based on tagged content [10]. However, with SDGs there is no well-tagged data set from which to start and the subjects themselves are large and highly multifaceted.

Just think about SDG 1 'No Poverty' as an example of how complex this is. Subjects that might be included in the definition would certainly include economics and sociology but may also include history, medicine, culture and built environment. SDGs are not sharply defined subjects but large-scale endeavours that bring together many different lines of thinking and methodologies, and which may have many different cultural interpretations and impacts. These are areas that change with time and where contributors hail not just from research institutions but from policy-making bodies, think tanks, governments, economic regulators, charities and beyond.

"Using *Dimensions*, Digital Science created a model from the complete set of 17 United Nations (UN) Sustainable Development Goals."

In short, SDGs pose a unique set of problems for automated classification as they are not narrowly defined but are broad and diverse, with relevant works not necessarily mentioning the specific terminologies that typically help to define traditional research classifications. They are not stationary but dynamic and not owned by a specific stakeholder group but rather by everyone. Any classifier will be deficient. We have tried to understand and limit the deficiencies in our approach and we have chosen a balanced and robust approach that we believe will give outcomes that are at once expected and also insightful and revealing.

Using *Dimensions*, Digital Science created a model from the complete set of 17 United Nations (UN) Sustainable Development Goals. The overarching approach used to generate the 17 individual SDG publication training sets relied on producing and curating extensive and specific search queries, thus avoiding the need to have a manual build-up of a sufficiently large enough publication training set.

Keyword search strings for each of the goals were defined in order to produce training sets based on publications from the *Dimensions* platform. Key phrases and terminology were based on UN definitions of SDGs, including the target and indicator definitions, and narratives.

The aim was to create high-quality training sets with a minimum of false positives. To further improve the quality of the resulting training sets we repeatedly examined the results by checking the publications to ensure that they fitted the description of the SDG definition.

For each of the 17 created training sets, Natural Language Processing and Machine Learning was applied resulting in the classification scheme. A quality assurance (QA) process was also built in to improve the search string. Because of this, the resulting lists of publications for the training sets did not have to be adjusted manually by adding or removing individual publications.

The process for creating the training sets observed three rules:

1. For the set up of the search strings, care was taken to adjust language ambiguities by acknowledging nuances of American vs British English (NB: the entire search strings focus on English type outputs only);
2. Special care was taken to address ambivalent phrases (e.g. climate change) and common 'buzzwords' (e.g. 'sustainability' itself) which can form part of the narrative in a title and abstract without being part of the research paper per se as these can also refer to a time in which we live. We encountered this in the publications that were not associated with climate change related research and their use was commonly avoided;
3. In order to increase, and thereby maximise, the search to include both exact phrases and the essence of phrases, proximity searches were implemented. This included, for example, not just looking at 'concentration of resources' as an exact phrase; the phrase could also be relaxed so that the contributing words would be found 'nearby', ie, those within a definite distance of X number of words. For example, the phrase "concentration resources" 3 would find publications with "concentration of all resources" or "concentration of available resources" contained within them (the strict search would not have found these latter phrases due to the addition of 'all' or 'available').

To generate the training sets we took outputs into consideration that were published from the beginning of 2010, approximately coinciding with the establishment of the UN Millennium Development Goals (MDGs), the predecessor to the UN SDGs. We believe that relevant research was carried out before the official start date of the SDG Agenda (SDGs officially replaced MDGs from January 2016).

Based on the initial search strings (after a number of iterative steps to improve the quality of the overall search string to minimise false positives), the number of results per SDG varied considerably. It is important to note that this is not an effect of the uneven success rates from the research carried out prior to the formation of the Millennium Development Goals, but can be explained as the disciplinary mix of research per SDG, as well as type of publication outputs (e.g. journal articles and conference proceedings vs chapters).

Overall, the SDGs balance the three elements of sustainable development: the economic, social and environmental aspects. As well as the inter-relatedness of the individual goals, the inter-relatedness within each of the social, economic and environmental elements is crucially important, revealing that publications associated with a particular SDG may be related to others. The chord diagram (Figure 3) shows most visibly the strong link and inter-relatedness of SDG 7 'Affordable and Clean Energy' with SDG 13 'Climate Action'; both sets of results have high numbers. Nevertheless, SDGs with less coverage also reveal notable links amongst them (e.g. SDGs 1 'No Poverty', 5 'Gender Equality' and 10 'Reduced Inequalities') and links between the social, economic and environmental elements are also evident (e.g. SDGs 3 'Good Health and Well-being', 8 'Decent Work and Economic Growth' and 13 'Climate Action').

3 Analysis

The SDGs had their genesis in the Millennium Development Goals, which in turn resulted from a decade of UN conferences and meetings that culminated in the United Nations Millennium Declaration in September 2000 [14]. Although it could be argued that this work should be seen in a larger context of post-industrial revolution economics and the developing sensibilities of society in general, it can be fairly stated that we are now at least 30 years into specification and execution of an international project that attempts to conceptualise the Earth as a single world where all people have certain rights and expectations. It is then perhaps surprising that the SDGs have only very recently reached a level of prominence outside the policy and research communities.

The SDGs are still broadly unknown in a general public context, but with slowly increasing public visibility will come more impetus as well as more scrutiny. Books such as Doughnut Economics [16] have become best-sellers and, more generally, talk of environmental and societal inequities has been on the rise, especially since 2015. Movements such as Extinction Rebellion and the work of Greta Thunberg have moved many. In the analysis presented here, rather than the short term and recent trends that we see represented in the media, we see the long-term global picture of how research attention has turned increasingly to understand and contribute to improving the sustainable and equitable development of our world.

"Rather than the short term and recent trends that we see represented in the media, we see the long-term global picture of how research attention has turned increasingly to understand and contribute to improving the sustainable and equitable development of our world."

In the following sections we present analysis and thinking on two key aspects of the SDGs: geographical, and subject-based. Our geographical analysis examines the levels of research activity in different regions with the aim of understanding global locus of SDG research, research capacity and the collaborative landscape. We then move to a subject-based analysis to understand how existing research strengths and established fields are able to support SDG research.

3.1 A Geography of Sustainable Development

In our first analysis we wanted to understand the geography of academic attention. To that end we wanted to understand which countries are producing the most research related to each of the 17 SDGs. Rather than create a ranking, we have tried to show the ebb and flow of research focus. Figure 1 lists the top 12 countries by SDG publication volume for each of the years listed. While the ordering is by volume, the values shown are "relative proportion of SDG publication", and "relative proportion of SDG citations".

As in our recent analysis of Open Access [11], it is clear that the developed research economies form a core, however, there are still notable movements. In particular, China has risen to prominence faster in SDGs than it has in Open Access. India has also shown significant growth – now in fourth place globally behind the US, China and the UK in SDG research volume. Also noteworthy is the long-term decline of Japan and of France in SDG-centric research.

While Figure 1 conglomerates all 17 SDGs, the full picture of the most intensely studied SDGs is altogether more complex. Figure 2 gives an overview of research intensity between 2015 and 2020 by SDG. These footprints encapsulate a complex picture, mixing underlying national research strengths, policy choices, funding choices and beyond. Nevertheless, the picture that emerges does reveal the essence of each nation's approach to SDG research.

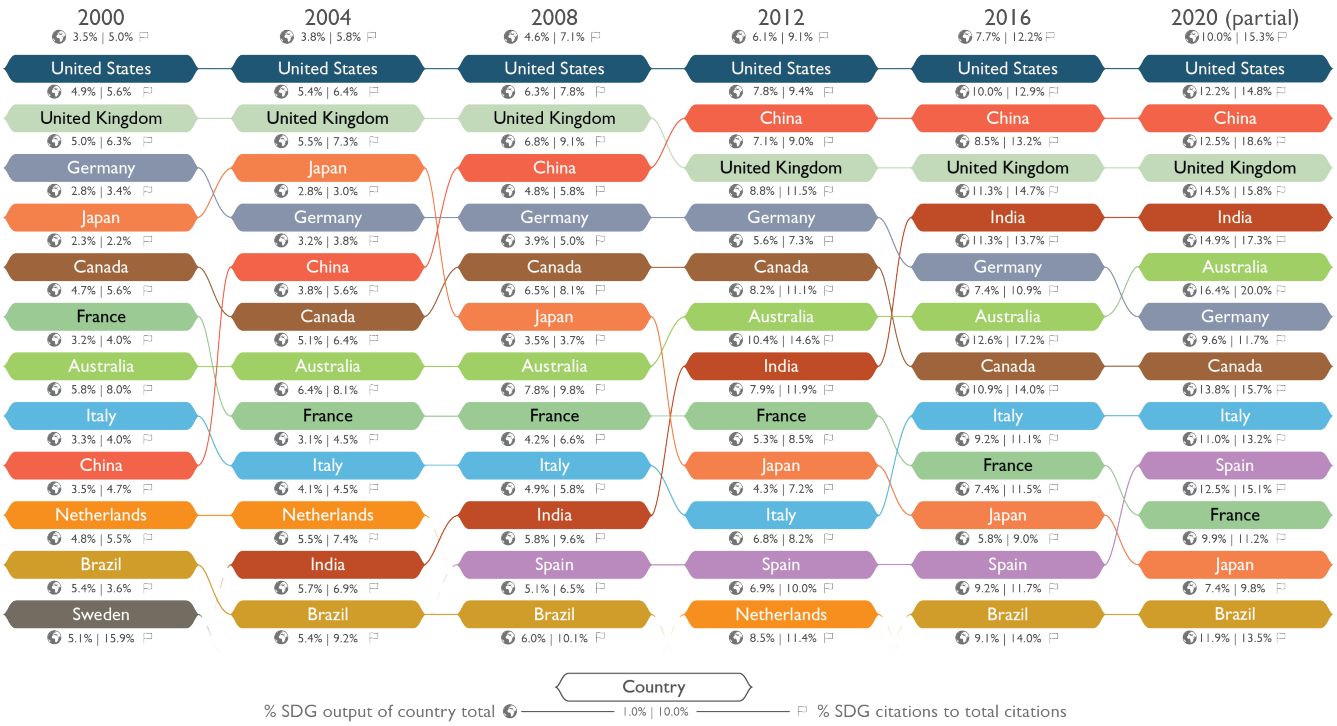

Figure 1: *Evolution of global locus of SDG research since 2000. Each of the top 12 SDG-research producing countries is listed based on their research production in the single year heading each column. At the top of the column the proportion of world research relating to the 17 SDGs is listed (left) together with the proportion of global citations that this work received (right). Each country is listed with the same two statistics, calculated at a national level, underneath their name.*

In Figure 2 the European Union footprint does not contain the UK, acknowledging recent political changes. The size and structure of the EU allows for a level of research diversity between member states. In particular, Germany and France, two of the world's most advanced research economies, show skewed SDG profiles. Germany's footprint favours SDGs 7, 9, 13 and 15: Broadly, those relating to the environment and environmental impacts of industry, while France's interest centres around SDGs 2, 3, 13, 14, 15: Sharing Germany's environmental focus, but adding hunger, health and well-being.

The UK has been a long-term, successful participant in EU research funding and collaboration. Despite its recent departure from the EU, the UK appears to have followed a different approach to SDG research than the EU as a whole. Each EU country has quite an "eccentric" or skewed footprint, while the UK has a fairly well-rounded footprint. If we focus on the EU's overall research output, we see a similar shape of footprint to the UK, though it is operating at a larger scale than the UK alone. Within the EU, the Netherlands has the most similar shape to the UK, albeit at a lower proportion of overall country output.

Although India and China are two of the strongest overall producers of SDG research, as can be seen easily in Figure 1, the shape of their SDG footprint tells a more nuanced story. Rather than pursuing a balanced strategy, both of these rapidly growing research economies are tending to focus efforts on specific SDGs. In the case of China SDGs 7, 11, 12 and 13: sustainable energy, cities, responsible consumption and climate are, perhaps understandably, at the centre of their research efforts with up to 15% of national output relating to SDG 7 in particular. In the case of India, the locus of research interest is centred around SDGs 2, 6, 7 and 12 - 'Zero Hunger', 'Clean Water and Sanitation', 'Affordable and Clean Energy', and 'Responsible Consumption and Production'. This may make sense in the context of India's current phase of industrialisation.

"While the SDG themes are global in scope and scale, issues they address often have local or immediate impact."

Figure 2: *Distribution of locus of research output by SDG within countries. Each radar plot shows the percentage of a country's total output since 2015.*

While the SDG themes are global in scope and scale, issues they address often have local or immediate impact. As such, intuition may tell us that research around many of the SDGs would be more locally or nationally focused than it would be internationally collaborative, but this is not the case. Adams demonstrated that rates of international collaboration are increasing [1]. However, there are two countries that lag behind this trend, which happen to be the two largest contributors to SDG-aligned research, the US and China. In both cases size effects account for the lag. In China, the speed of growth of the local research economy is an additional factor in their ability to collaboration internationally–the world simply doesn't have sufficient capacity to engage with the rate of growth of collaboration opportunities in China [15].

Looking from the perspective of the 17 SDGs, we find research to be domestically focused rather than internationally collaborative. Bilateral and multilateral relationships are shown in Table 1. Most SDGs have a profile of around 80% domestic collaboration with 15% bilateral and 5% multilateral. There remains, however, some variation with SDG 14 'Life Below Water' and SDG 15 'Life on Land' being more international, and SDG 4 'Quality Education', SDG 5 'Gender Equality' and SDG 16 'Peace, Justice and Strong Institutions' being more domestically centred. Based on the nature of these topics and their level of international scale and impact, the correlations in Table 1 with international engagement makes sense.

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

Table 1: *International collaboration by Sustainable Development Goal based on data from 2015 to 2020. Domestic collaboration is where author affiliations are situated in a single country. Bilateral collaboration involves co-authors from institutions in two countries. Multilateral collaboration involves co-authors from institutions in more than two countries.*

It is informative to understand whether SDG research is generally more or less collaborative than the international average. A detailed study could be carried out on this area alone. To give a rapid, high-level insight into the current state of development Table 2 shows the average international (bilateral and multilateral) collaboration percentage at a country level. In this table, for each country we have listed the percentage of overall research that is internationally collaborative and compared it with the percentage of all SDG research that is internationally collaborative for the countries that have the highest volumes of SDG research. In almost every case, for these SDG-centric research economies, SDG research is, on average, more internationally collaborative than research taken in broad terms.

Country	International %	International SDG %	Variance %
Japan	27.18	40.85	13.67
France	55.18	65.72	10.54
China	27.71	35.50	7.79
Germany	51.96	58.91	6.95
Brazil	28.90	35.55	6.65
Netherlands	61.00	66.46	5.46
United Kingdom	54.73	59.25	4.53
India	22.86	27.11	4.25
United States	36.22	39.66	3.44
Australia	55.68	58.51	2.83
Spain	47.78	50.61	2.82
Italy	49.19	51.84	2.64
Canada	52.99	55.52	2.53
Sweden	65.49	65.12	-0.37
Russia	26.88	26.14	-0.74

Table 2: *Comparison of levels of international collaboration in SDG-aligned output and total research output for the top SDG-producing countries. International % column - percentage of total country publication output involving at least one co-author with an affiliation outside the country of focus; International SDG % - as previous column but restricted to SDG-aligned research across any of the 17 SDGs. Publication sample window includes all publications between 2015 and 2020.*

3.2 A Categorisation of Sustainable Development

There is a sort of 'geography' within any categorisation scheme. In the same way that the Earth has continents and countries, human knowledge is organised into main subject areas such as natural sciences, medical sciences, arts, humanities and social sciences. This concept of mapping has been explored extensively in the bibliometric and scientometric world [5, 6]. In this section, we give a high-level overview of the key features of the SDG landscape. From the new *Dimensions* SDG classification, we have an unprecedented ability to understand not only overall trends in how SDG research is progressing, but also to place SDG research in a broader context. Part of that broader context, already shown, is to map a theme against a traditional geographical or institutional backdrop. A different part is to examine the relationship of new and established classification–understanding the change of basis.

Figure 3 shows the extent to which SDG topics appear in the same publications. The SDGs were never created to be precisely orthogonal. Indeed, the very nature of these types of problems is that there is often a common root or a critical relationship between the effects of one issue and the causes of another. In spite of this high-level intuition, the interrelationship between SDG areas is not indicated in the figure. Rather, apart from the striking connection between SDG 7 'Affordable and Clean Energy' and SDG 13 'Climate Action', the links between different SDGs in the research literature is extremely limited. This does not mean that the research works are not cross-referential or appropriately contextualised, merely that the characterisation of the work is that it seems to be highly focused on issues that are relevant to a single SDG. It is not clear whether this is an artefact of the categorisation approach that we adopted, how papers in this field tend to be written, underlying disciplinary structures, funding biases or some other sociological effect.

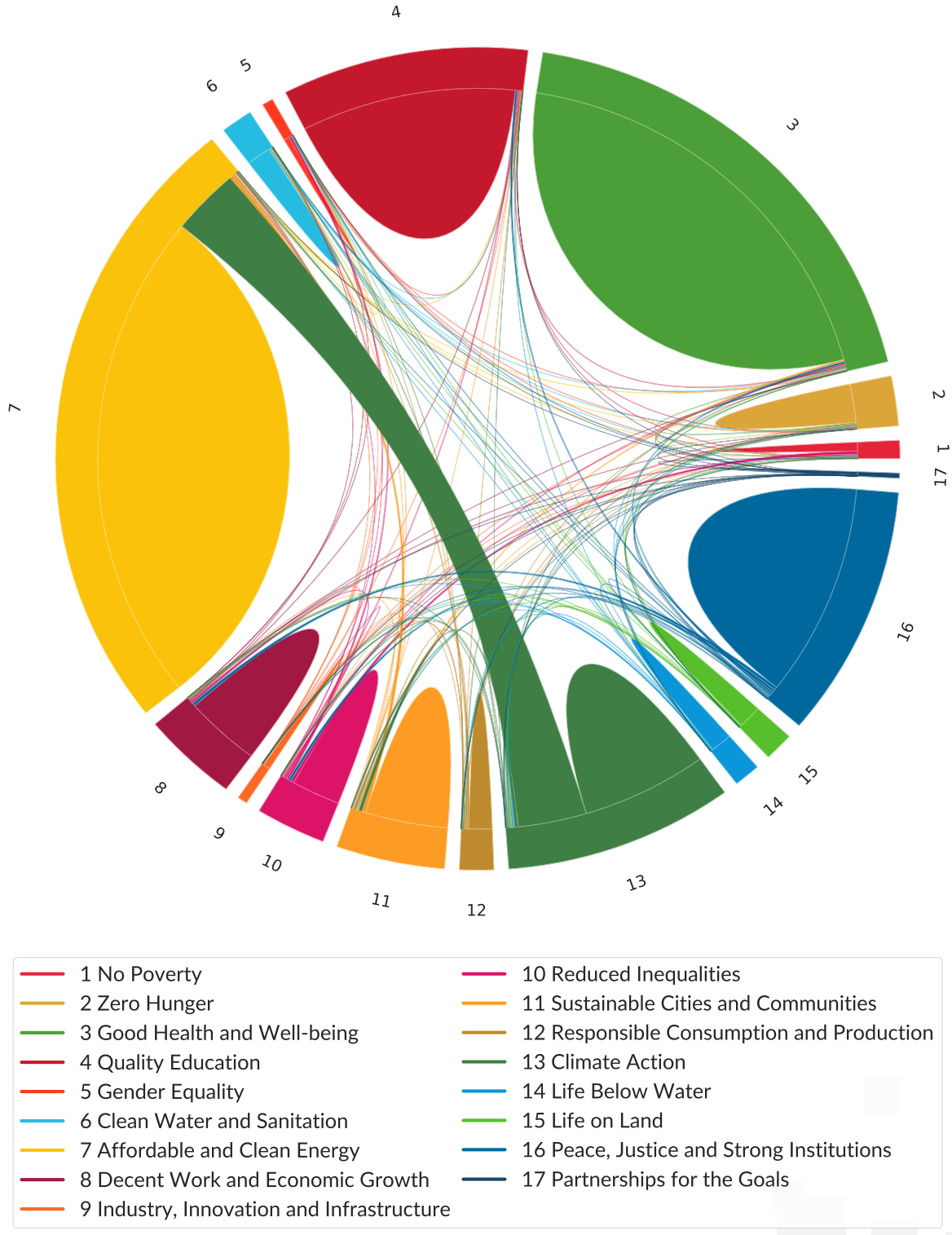

Figure 3: *Co-occurrence of SDGs in academic papers between 2015 and 2020. Each coloured segment edge of the chord corresponds to a single SDG. The portion of the chord where the arc matches the colour at the edge shows the amount of research that is specific to that SDG and which does not refer to other SDGs. The portion of the chord where the arcs link to other coloured segment edges shows the proportion of the segment that references another SDG. It is notable that this representation shows only single and bilateral SDG relationships. If a paper were to contain references to three SDGs then there would be double counting in this diagram as the paper would appear twice. However, the number of such papers is less than 0.24% of overall output and hence this difference would not be perceptible on a diagram of this scale.*

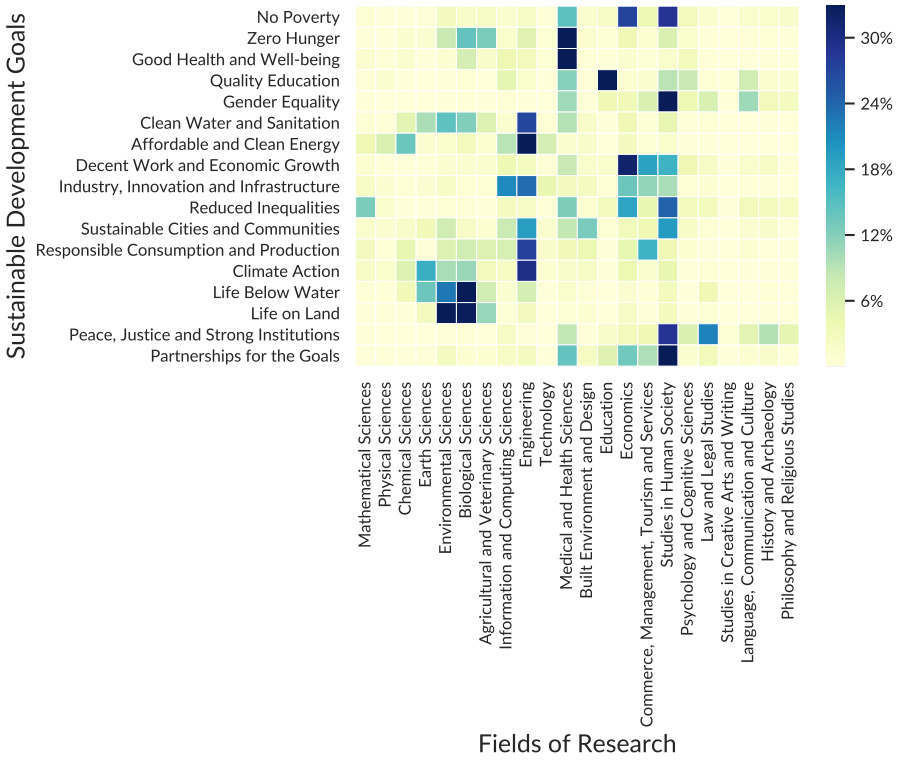

Figure 4: *Overlap between Digital Science's Sustainable Development Goal Classification and the Australia New Zealand Standard Research Classification (ANZSRC) 2-digit Fields of Research, based on publications outputs in* Dimensions *between 2015 and 2020.*

To explore this apparent issue of interdisciplinarity, we map the publication set used for Figure 3 to the Australia New Zealand Standard Research Classification (ANZSRC) 2-digit fields of research (FOR). The ANZSRC system is well recognised and broadly covers most areas of research output. We then compared this classification with the SDG classification. Figure 4 shows the result of this comparison.

Figure 4 can, of course, be read in two ways: Firstly, we can read off the subject areas from which the different SDGs draw. Secondly, we can read off the SDGs to which each subject area contributes. Since the shading of the pixels in the grid is normalised, we can also derive a sense of intensity and character. For example, SDG 15 'Life on Land' is fundamentally underpinned and aligned with the FORs Environmental Sciences, Biological Sciences and Agricultural Sciences, while SDG 6 'Clean Water and Sanitation' is supported by many different research areas including Chemical Sciences, Earth Sciences, Environmental Sciences, Agricultural Sciences, Engineering, and Medical and Health Sciences. The FORs most drawn upon are Medical and Health Sciences, Studies in Human Society, and Engineering.

In the abstract, discussions around SDGs can be challenging. Everyone has a different conceptualisation of what each SDG means and what it should cover. Typically, ideas are well aligned but nuance is sometimes lacking. For some research areas, SDGs are clearly less relevant, or at least the opportunity or funding streams to engage with SDGs are less evident. However, in thinking critically about this map, we must ask ourselves, are there missed opportunities and areas that we could or should engage with? Should policy makers take such a representation as a basis for discussions on future policy?

4 Closing Thoughts

We have presented some initial thinking on how the new SDG classification in *Dimensions* can be used to explore publication trends in a way that helps the research world understand its contribution to this important developing area of knowledge to date. We hope that this report frames some of the more obvious questions and hints at some of the complex ones while giving some insight into SDG research throughout the sector.

"If we are to have an impact agenda for research, should it not be one that is informed by the SDGs? And should we not be actively measuring sustainable development as part of research evaluation?"

To summarise, some of the questions that we have tried to address are:

- Which countries produce the greatest volume of SDG research?
- How have international contributions to SDG research developed with time?
- How collaborative is SDG research?
- Do countries focus on locally relevant SDGs?
- Does research intermingle between SDGs?
- How do traditional research areas contribute to SDGs?

Some of the questions that the present analysis raises include:

- Has the research sector focused enough on SDGs?
- Has sufficient funding been offered to SDG-aligned areas to entice researchers to do more research into these important challenges?
- What are the barriers to increasing the level of SDG research being carried out? (Indeed, is it valuable or desirable to increase the level of SDG research?)

These questions are clearly ones of policy and, while beyond the scope of the present report, we believe that the classification scheme now in *Dimensions*, and its extension to other data such as grants, patents, datasets and policy documents, will greatly inform policy discussion in the future.

We close with a final observation that over the last 30 years we have gone from a global research economy that has effectively lacked any interest or scale in areas that related to the Sustainable Development Goals to one in which around 10% of global research capacity is engaged with these important subjects. Yet it is not clear that even this level of focus is sufficient to make a difference in the short term.

These goals arguably underpin and summarise the most important topics of our time. Since the turn of the Millennium, successive financial, political and other crises have made the world think differently about the expectations of government, private enterprise and the research sector. In some regions, policy decisions have pushed research toward being self sustaining, while in other regions strong guidance has been given to ensure that research has a tangible payoff in economic terms. The most recent epidemic crisis has, perhaps, brought some of this thinking into sharp relief. The benefits of research tend not to be short term but long term, and investment in sustainable development is well aligned with this ideal.

If we are to have an impact agenda for research, should it not be one that is informed by the SDGs? And, if we agree on this point and metrics have the effect of causing academics to optimise to perform well against those metrics, then should we not be actively measuring sustainable development as part of research evaluation?

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