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Navigating the Structure of Research on Sustainable Development Goals

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About the Global Research Report series from the Institute for Scientific Information (ISI)

Global Research Reports from ISI is a new publication series to discuss and demonstrate the application of data about the research process to management issues in research assessment, research policy and the development of the global research base. ISI is the 'university' of the Web of Science Group: it maintains the knowledge corpus upon which *Web of Science* and related information and analytical content, products and services are built. It disseminates that knowledge internally through reports and recommendations and externally through events, conferences and papers and it carries out research to extend and improve the knowledge base.

About the Web of Science Group

The Web of Science Group organizes the world's research information to enable academia, corporations, publishers and governments to accelerate the pace of research. It is powered by *Web of Science* – the world's largest publisher-neutral citation index and research intelligence platform for research, discovery, access and assessment. Its many well-known brands also include Converis, EndNote, Kopernio, Publons, InCites, ScholarOne and the Institute for Scientific Information (ISI).

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Introduction

The United Nations' Sustainable Development Goals (SDGs) represent a powerful, shared aspiration for a better future and a critical agenda for coordinated investment and concerted effort. They were adopted by the UN General Assembly in September 2015 (A/RES/70/1). Progress may be tracked through 232 identifiable indicators spread across 17 main goals. Their achievement will require significant work from national and regional governments to draw on existing resources and knowledge. Many also require research and innovation across a wide range of disciplines, drawing on established science and new endeavours.

Our report aims to provide a top-down view of global research activity, drawing on the knowledge-based resources of the *Web of Science* citation index and the analytical competency of the Institute for Scientific Information (ISI) to provide a unique background view for SDG policy makers.

Policy makers have unique analytic needs and often need to react or act quickly. It is not always possible to spend any significant time to collect, clean and analyse data, and then to understand and interpret the results. This report has been prepared with the policy maker in mind as the approach used minimizes time and resources required to go from policy question to answer: first by drawing evidence from an existing data source (*Web of Science*) and using established methodologies (bibliographic coupling), then by combining reliability of the findings with accessibility of results.

The *Web of Science* indexes the contents of more than 20,000 scholarly journals and conference proceedings across all fields of science, social sciences, and humanities. The *Web of Science* is used daily by researchers as a portal into the world of high quality research. It is also widely used by policy analysts to evaluate the academic impact of research. The network of publications and citations reveals a map of the research landscape in which its territories can be described in detail. Here, we apply a specific perspective to capture global research that touches on the UN SDGs, especially recent research activity.

Our analysis is only an overview, but it confirms a redirection of research towards the UN's shared goals and it describes the focus of research around particular areas as it is based on papers directly pertaining to SDGs, i.e. research articles with a title, abstract or keywords that explicitly contain the phrase, "sustainable development goal(s)." It is important to distinguish this kind of analysis from those that are based on thematic elements of specific goals, e.g. searching for all research relating to urban environments (SDG #11). There is no one-to-one relationship between the UN's 17 SDGs and the topics identified through our search. In some cases, clusters of thematically related papers can be linked to several SDGs while in other cases they provide a more detailed or distinct aspect of a single SDG.

In summary, this report provides a literature-based analysis of research related to the SDGs. It describes the methodology used, lists the major topics uncovered, surveys research themes of particular focus for nations producing at least a moderate output of SDG-related papers, and tallies regional patterns of collaboration in SDG research. Of central interest is the thematic map of SDG research (Figure 1, found on pages 6 and 7), which reveals clusters of associated papers and the relation of these clusters to one another. Following the map, we identify some features that emerge from the visualization and are of likely interest to policy makers. Two policy-related clusters are highlighted: Water Supply and Sanitation and Health and Healthcare of Indigenous Peoples. Finally, the activity of the United Kingdom in SDG research receives special attention, including a ranking of clusters in which the UK produces the greatest number of papers and the greatest share of its SDG papers. It is our intention that these policy-relevant treatments serve to stimulate further interest in the application of such thematic maps for evidence-based decision making.

United Nations' Sustainable Development Goals – transforming our world

Transforming our world: the 2030 agenda for sustainable development, September 25 2015.

In In 2015 world leaders adopted an ambitious agenda, with seventeen Sustainable Development Goals at its heart – to wipe out poverty, fight inequality and tackle climate change. This global shared plan aims to transform the world in fifteen years and, crucially, to build lives of dignity for all. It has been hailed as, "...a universal, integrated and transformative vision for a better world."

One might expect that our search, narrowly focused on papers specifically mentioning "sustainable development goal(s)" and their citing papers, would be less reliable than a more comprehensive data extraction that sought to collect all relevant papers for each of the 17 SDGs. A comprehensive search is challenging, however, because of the nature of the SDGs, especially in terms of precision and boundaries for each goal. Our search specificity addresses the problem of determining relevance. If a paper's authors explicitly link it to SDGs, we are on firmer ground than if we created our own search profile and then judged SDG relevance. Our search leads to a summary of significant contemporary topics in SDG research rather than a catalogue of SDG-related papers. The thematic map (pages 6-7) actually captures more dimensions of SDG research, especially in the domain of health and healthcare, than several previous studies that analyzed a larger corpus of publications on sustainability science.

Goal 1.
End poverty in all its forms everywhere

Goal 2.
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3.
Ensure healthy lives and promote well-being for all at all ages

Goal 4.
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5.
Achieve gender equality and empower all women and girls

Goal 6.
Ensure availability and sustainable management of water and sanitation for all

Goal 7.
Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8.
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9.
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10.
Reduce inequality within and among countries

Goal 11.
Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12.
Ensure sustainable consumption and production patterns

Goal 13.
Take urgent action to combat climate change and its impacts

Goal 14.
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15.
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16.
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17.
Strengthen the means of implementation and revitalize the global partnership for sustainable development

Methodology

We searched for the phrase "Sustainable Development Goal(s)" in the title, abstract, or keywords of all indexed documents in the Web of Science and found some 2,800 relevant 'core' documents. The 'core' collection was expanded by adding publications that cited one or more of the core documents: we infer citing documents are related to and concern the topic of SDGs. The annual count reveals a trajectory from fewer than 100 papers per year before 2010 rising through 2016, the year after the publication of the 17 SDGs, to over 500 core papers and a wider dataset of around 4,000 citing papers in 2018.

Table 1 Summary of major thematic clusters on SDG research, labels, and the number of core and citing papers in each

CLUSTER	LABEL	SIZE	CORE PAPERS	CITING PAPERS	% CORE
1	Maternal, Newborn, and Child Morbidity and Mortality	1445	407	1038	28.2%
11	Ecosystems Services and Adaptations for Sustainability	1312	253	1059	19.3%
10	Global, Regional, and National Health Surveys; Diagnosis and Management of Tuberculosis; Substance Abuse and Longevity	819	131	688	16.0%
15	Ecosystems, Biodiversity, and Climate Change	700	131	569	18.7%
8	Sustainable Agriculture and Transgenic Crops	696	134	562	19.3%
5	Sustainability Definitions, Indicators, and Assessments	593	99	494	16.7%
6	Green Supply Chains and Management; Manufacturing/Remanufacturing Systems; Cost Analysis and Optimization Models for Waste Management and Recycling	535	66	469	12.3%
18	Nutrition and Childhood Development	460	83	377	18.0%
3	Water Supply and Sanitation	409	137	272	33.5%
13	Renewable Energy (Solar, Wind), Production and Storage	401	41	360	10.2%
16	Household Fuel Use and Emissions	334	41	293	12.3%
9	Economic Indicators and Models of Sustainability	329	61	268	18.5%
14	Neglected Tropical Diseases	314	36	278	11.5%
2	Community Mental Health	241	50	191	20.7%
20	Urban Sustainability	217	23	194	10.6%
0	Poverty and Inequality	174	98	76	56.3%
39	Resource Depletion, Peak Minerals, and Sustainable Mining; Demand for Mineral and Metal Resources	116	11	105	9.5%
29	Physical Activity and Health	88	4	84	4.5%
36	Health and Healthcare of Indigenous Peoples	87	5	82	5.7%
31	Ecotourism; Fair Trade Products and Consumption	83	10	73	12.0%
42	Food Waste and Biorenewables	66	12	54	18.2%
12	Infectious Diseases and Immunization	64	1	63	1.6%
17	Antimicrobial Resistance	54	7	47	13.0%
19	Education, Interprofessional Teaching, Volunteer Services	51	9	42	17.6%
35	Childhood Cancer Incidence	45	3	42	6.7%
4	Remote Sensing of Urban and Other Settlements	34	5	29	14.7%
52	Electrolysis for Energy Production, Fuel Cells	25	0	25	0.0%

The entire collection – core and citing papers – numbers about 10,300 unique documents. The cited references for each paper were analysed to create a similarity index via the references shared between any two papers. This analysis, called bibliographic coupling, reveals the cognitive distance between documents so that similar documents can be grouped into clusters with common themes. Visual inspection of the papers in each cluster was used to associate each cluster with a descriptive label, as summarized in Table 1 where the number of papers (both core and citing) are shown for each of the major clusters. Multiple labels are associated with a cluster in cases where clear sub-components can be identified. Readers can look ahead to Figure 1 (centre-spread on pages 6 and 7) to see how these can be visualised on a research map.

SDG topic map

The data were mapped in two dimensions for visual accessibility, positioning similar papers and related clusters in proximity whereas dissimilar papers and clusters are far apart. The map, Figure 1 on the following pages, shows major research clusters around Sustainability Definitions, Indicators and Assessments and around Economic Indicators and Models of Sustainability. The analysis identifies some clusters aligned closely with a particular SDG, but others focused on research topics. Some SDGs, such as inclusion or justice (SDGs #4, #16), do not seem overtly represented but their agenda is implicit in some of the identified clusters, such as cluster 0 - Poverty and Inequality.

An important difference between this analysis, focusing on papers explicitly dealing with the UN's SDGs, and other scientometric studies on sustainability science in general, is the prominence of health and healthcare research, under-represented in previous analyses. Our map reveals that the extent of health and healthcare research related to SDGs is nearly as great as the volume of research on the environment, agriculture, and other aspects of sustainability.

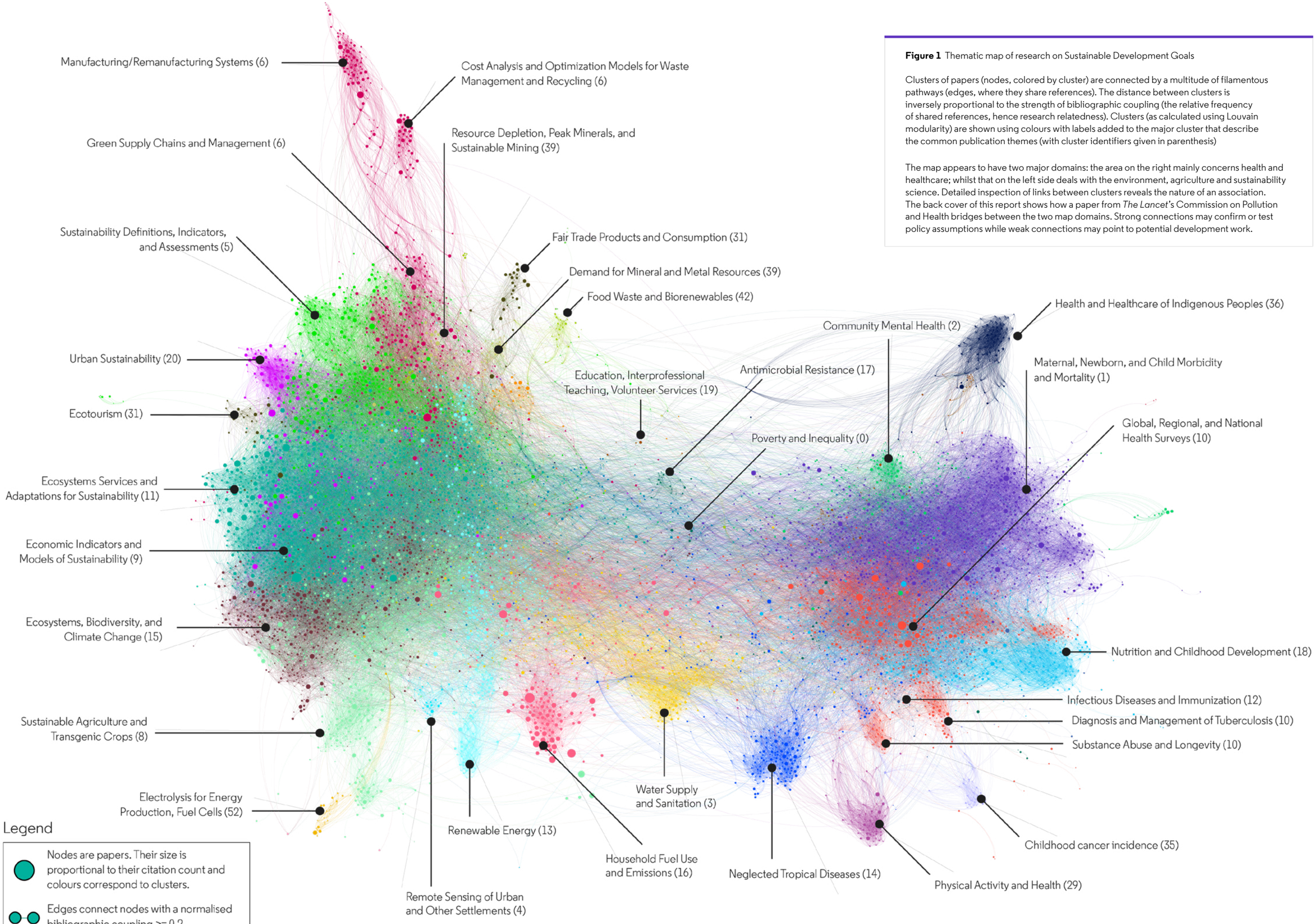


Figure 1 Thematic map of research on Sustainable Development Goals

Clusters of papers (nodes, colored by cluster) are connected by a multitude of filamentous pathways (edges, where they share references). The distance between clusters is inversely proportional to the strength of bibliographic coupling (the relative frequency of shared references, hence research relatedness). Clusters (as calculated using Louvain modularity) are shown using colours with labels added to the major cluster that describe the common publication themes (with cluster identifiers given in parenthesis)

The map appears to have two major domains: the area on the right mainly concerns health and healthcare; whilst that on the left side deals with the environment, agriculture and sustainability science. Detailed inspection of links between clusters reveals the nature of an association. The back cover of this report shows how a paper from *The Lancet*'s Commission on Pollution and Health bridges between the two map domains. Strong connections may confirm or test policy assumptions while weak connections may point to potential development work.

Select observations from the SDG topic map

Some observations selected with information for policy makers in mind show the insights made possible through mapping and analysis of the research literature.

- Clusters that exhibit more than twice the average rate of increase in publications during 2015-2018 include: among larger areas, Global, Regional, and National Health Surveys and Nutrition and Childhood Development; and among smaller areas, Physical Activity and Health and Health and Healthcare of Indigenous Peoples.

- Clusters that exhibit slow growth in publications during 2015-2018 compared to previous years are Sustainability Definitions, Indicators, and Assessments, Ecotourism and Fair Trade, and Waste Management, Recycling, and Green Supply Chains.

- Clusters with papers only from 2015-2018 include Infectious Diseases and Immunization and Childhood Cancer Incidence. The first appears across the territory intermediate to Health Surveys and Childhood Development, suggesting its importance to implementation of SDG #3 (Ensuring healthy lives). The second follows the 2017 release of the 3rd edition of WHO's International Classification of Childhood Cancer, which is intended "to drive childhood cancer research and policy", in direct response to the UN SDGs.

- Interdisciplinarity often signals a potential for knowledge innovation as concepts or methods from one area find application in another. For example, the CRISPR/Cas 9 gene-editing technique links research on transgenic crops and on vector-borne nematode diseases. Among the most interdisciplinary clusters on SDGs in terms of diversity of content are Sustainable Agriculture and Transgenic Crops, Physical Activity and Health, and Ecotourism and Fair Trade.

- The map also prompts questions for further consideration. Health and Healthcare of Indigenous Peoples appears as a separate domain at the upper right, connected to Community Mental Health and to Maternal, Newborn, and Child Health. One may ask why this specialty appears on the periphery and not integrated within the large mass of research on health and healthcare (see page 12).

- It is not always the largest institutions that set the agenda and pace in a specialty area. Author addresses on the papers in each cluster identify leading institutions for a research theme. For example, the key players in Ecosystems Services and Adaptations for Sustainability are Stockholm University, University of London, Wageningen University and Research, Australian National University, and Arizona State University.

- Research is driven by people. The researchers whose publications were most dispersed across clusters include: Eric J. Lambin, geographer and environmental scientist (Stanford University and Université Catholique de Louvain, 2018 Highly Cited Researcher in Social Sciences); Jürg Utzinger, epidemiologist (University of Basel and Swiss Tropical and Public Health Institute); and Zulfiqar Bhutta, paediatrician (University of Toronto and Aga Khan University, 2018 Highly Cited Researcher in Clinical Medicine). Such transdisciplinary knowledge and experience may be particularly valuable in formulating or implementing policy initiatives that cut across several areas. Others, such as Peter Jay Hotez, paediatrician (Baylor College of Medicine) exhibit a concentrated depth of focus and expertise in a single cluster, in this case Neglected Tropic Diseases.

- Between 0.5 and 0.9% of papers from Ethiopia, Nepal, Ghana, Tanzania, Kenya, and Uganda dealt with SDGs, and they were relatively the most productive nations for the period surveyed. Larger, richer nations publish the greatest number of papers on SDGs (USA, UK, Australia, China, Canada, in rank order) but the USA was last among the top 50 for SDG output as a percentage of publications. The most prominent wealthier nations when indexing SDGs as a percentage of output were Switzerland, Australia, New Zealand, the Nordic nations, The Netherlands and Austria.

National research focus

Table 2 reveals national areas of relative research priority with respect to the topical clusters identified for those nations with 100 or more SDG-related papers across all clusters. For example, the nations with the largest share of their SDG-related output assigned to Household fuel use and emissions were India, Austria, and Ghana. India produced 466 papers across the entire set of SDG papers, 41 of which appeared in this cluster, which amounts to 8.8% of its SDG output. The nation that produced the largest number of papers in this cluster was the United States, with 149, but that represented only 4.7% of its total SDG paper output (3,157). Policy makers can apply this analysis of SDG research activity and focus to understand current work in priority areas, or to detect an absence of research that, if pursued, may be useful to achieving one or more SDGs and delivering social betterment. Such objective evidence improves policy making by providing an independent view of a nation's SDG activities without risk of expert bias.

Table 2 Country Focus by SDG Cluster

CLUSTER	LABEL	FIRST	%	SECOND	%	THIRD	%
0	Poverty and Inequality	Nigeria	2.7	UK	2.4	Finland	2.4
1	Maternal, Newborn, and Child Morbidity and Morality	Tanzania	39.8	Uganda	39.6	Ghana	38.3
2	Community Mental Health	Uganda	7.2	South Korea	6.7	Mexico	5.1
3	Water Supply and Sanitation	Nepal	15.4	South Korea	10.3	Ghana	8.4
4	Remote Sensing of Urban and Other Settlements	Austria	1.9	Germany	1.4	Iran	1.3
5	Sustainability Definitions, Indicators, and Assessments	Portugal	14.0	Poland	9.9	Turkey	9.3
6	Waste Management and Recycling, Green Supply Chains	Iran	15.2	Malaysia	12.6	South Korea	12.4
8	Sustainable Agriculture and Transgenic Crops	Austria	20.0	Netherlands	16.5	Italy	14.9
9	Economic Indicators and Models of Sustainability	China	8.8	Turkey	8.6	Austria	7.9
10	Health Surveys, Tuberculosis, Substance Abuse, Longevity	Poland	28.8	Nigeria	27.5	Ethiopia	25.4
11	Ecosystems Services and Adaptations for Sustainability	Sweden	29.2	Indonesia	26.3	Netherlands	25.5
12	Infectious Diseases and Immunization	Bangladesh	3.2	Thailand	3.0	Singapore	2.7
13	Renewable Energy (Solar, Wind), Production and Storage	Turkey	27.2	Malaysia	11.5	New Zealand	8.4
14	Neglected Tropical Diseases	Switzerland	7.0	Tanzania	6.5	Singapore	6.3
15	Ecosystems, Biodiversity, and Climate Change	Denmark	14.1	France	13.5	Finland	13.2
16	Household Fuel Use and Emissions	India	8.8	Austria	7.9	Ghana	6.4
17	Antimicrobial Resistance	Tanzania	1.6	Sweden	1.5	Denmark	1.5
18	Nutrition and Childhood Development	Bangladesh	12.0	Pakistan	11.4	Ethiopia	8.9
19	Education, Interprofessional Teaching, Volunteer Services	Uganda	1.8	Germany	1.3	Taiwan	0.9
20	Urban Sustainability	Poland	6.3	Singapore	4.5	China	3.5
29	Physical Activity and Health	Belgium	3.3	Thailand	3.0	Brazil	2.6
31	Ecotourism, Free Trade	Belgium	2.5	Malaysia	2.3	New Zealand	2.1
35	Childhood Cancer Incidence	Poland	4.5	Portugal	4.1	France	2.6
36	Health and Healthcare of Indigenous Peoples	New Zealand	9.4	Norway	3.5	Australia	3.3
39	Mineral Resources and Sustainable Mining	Australia	2.4	Finland	1.8	China	1.7
42	Food Waste and Biorenewables	South Korea	3.4	Belgium	3.3	Thailand	3.0
52	Electrolysis for Energy Production, Fuel Cells	Poland	1.8	Thailand	1.0	Turkey	0.7

Regional collaboration

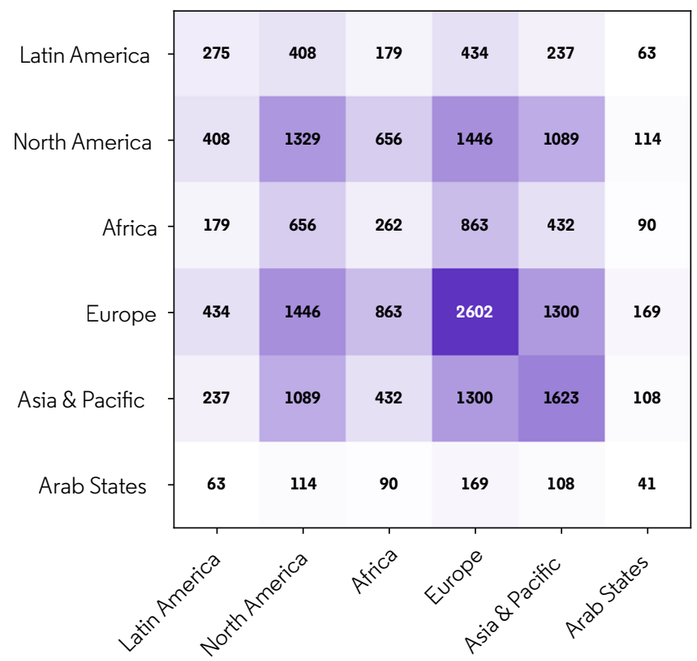
Europe's centrality in SDG research

Sustainable development is a global concern and collaborative undertaking. While research collaborations often form naturally – from the ground up – through shared interests and associations of individual researchers, joint work can also be fashioned, funded, and encouraged through government agencies and private funders – a top down process enabled through policy making.

To understand global collaborations better, the SDG literature was analysed based on an author's national affiliation. Figure 2 is a pair-wise matrix showing the number of SDG papers authored by researchers in countries within each regional pair represented by the intersection of the row and column.

This analysis shows that European nations dominate SDGs research, with North America and the Asia & Pacific region contributing less, but roughly similar output. Africa, the Arab States, and Latin America are, by contrast, small participants despite the fact that SDGs are key concerns in these regions. Owing to geography, culture, and incentives such as EU funding schemes, European nations typically exhibit higher levels of bilateral and multilateral international collaboration than other nations and regions. It is no surprise then that the highest level of collaboration within the SDG papers surveyed here was Europe-with-Europe (dark purple cell). And while North America was often the largest player in many research areas, it was Europe – not North America – that was the second most frequent collaborator with the Asia & Pacific region. Africa, the Arab States, and Latin America found more frequent co-authorships with Europe than with North America, and all three fielded more publications with Europe and North America than with themselves. Bilateral regional collaboration was least frequent between Latin America and the Arab States. Policy makers might find inspiration from this observation to identify common concerns that would generate more joint projects.

Figure 2 Regional Collaboration Matrix for SDG core and citing papers



Policy focus

Water Supply and Sanitation: a central concern linking Environment and Health

United Nations SDG Goal 6: Ensure availability and sustainable management of water and sanitation for all

Professor Zafar Adeel, of Simon Fraser University, has noted that "achievement of all water-related Sustainable Development Goals (SDGs) and underlying targets is crucial to the success of the entire suite of SDGs pertaining to universal health, food security, gender equality, sustainable consumption, resilient urbanization, and conservation of marine resources and terrestrial ecosystems" (Adeel 2017). It is no surprise, then, that this central concern is found in the middle of the map of SDGs, positioned between the large realms of environment, agricultural and sustainability science, on the left, and health and healthcare on the right (Figure 3). Detailed inspection of individual papers linked along pathways between these major areas, or any two clusters within them, reveals the nature of the association. In terms of major clusters, it is logical that Neglected Tropical Diseases is closely linked to Water Supply and Sanitation since a major cause of disease in developing nations is contact with water-borne parasites and lack of dependably potable water.

The SDG map includes strong and weak connections both of which, it should be emphasized, are of interest to policy makers – the former to confirm or test assumptions and the latter to suggest commonalities that, if exploited, may have potential in helping to achieve SDGs.

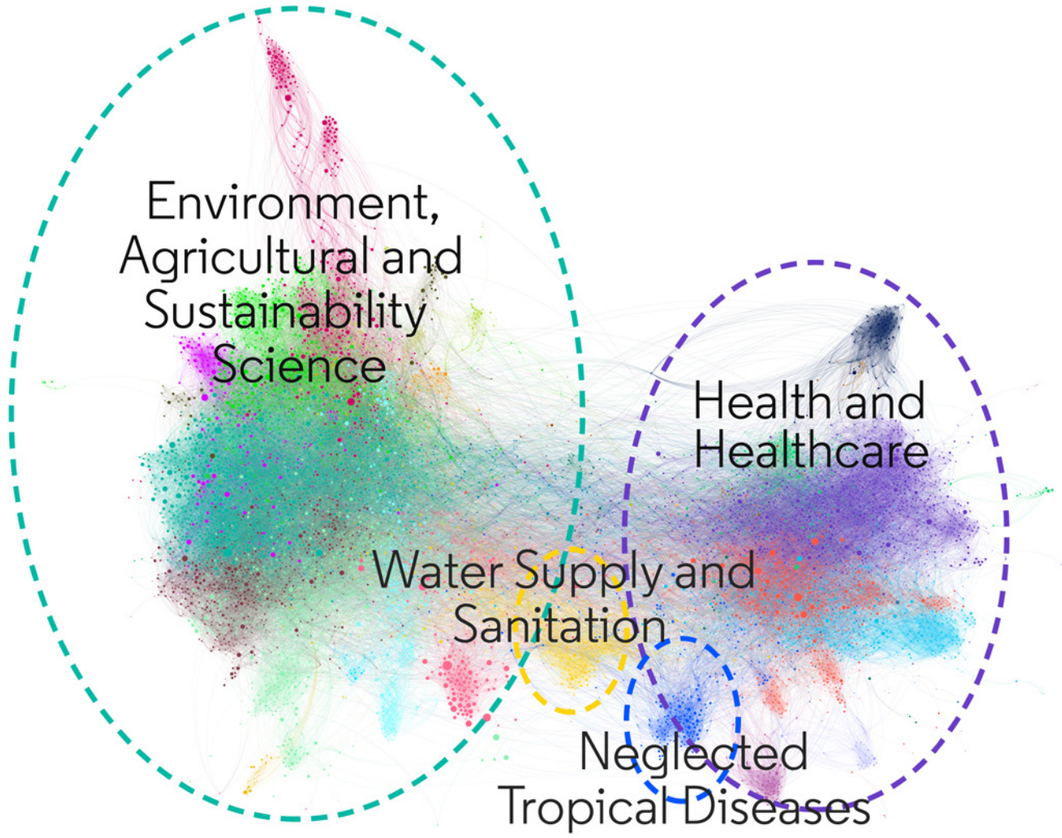


Figure 3 The Water Supply and Sanitation cluster links the two broader clusters for Environment and Health.

Policy focus

Health and Healthcare of Indigenous Peoples: a priority or on the periphery?

United Nations SDG Goal 3:
Ensure healthy lives and promote well-being for all at all ages

When used to support policy-making, the topology of the map provides unique insights for further consideration. At the upper right, the cluster Health and Healthcare of Indigenous Peoples appears as a separate domain, albeit connected strongly to Community Mental Health and to Maternal, Newborn, and Child Health as well as Nutrition and Childhood Development and Global, Regional, and National Health Surveys. The most-cited paper within Health and Healthcare of Indigenous Peoples is a pioneering report published in *The Lancet* (Anderson et al. 2016) that surveyed 28 Indigenous and tribal groups spanning 23 countries, representing more than half of the world's Indigenous peoples. The study found poorer health outcomes for this population compared to their non-Indigenous counterparts.

Is this specialty so unique and insular that it warrants a position on the periphery? Should it not be more closely integrated within the large mass of research on health and healthcare? A key nation for the topic, in Table 2, is also on the periphery (geographically) and it is noteworthy that New Zealand has focussed on policy integration between its 'Western' and Pacific research priorities. The picture is otherwise concerning and suggests something of a 'step-child' status elsewhere.

A recent review (Harfield et al. 2018) observes however that,"the evolution of indigenous primary health care services arose from mainstream health services being unable to adequately meet the needs of indigenous communities and indigenous peoples often being excluded and marginalised from mainstream health services. Part of the solution has been to establish indigenous specific primary health care services, for and managed by indigenous peoples." Because the map (Figure 4) accurately portrays this topic as a separate specialty area sufficiently distinct from traditional public health care, it can be understood by policy makers as both reliable and relevant to informing decision making.

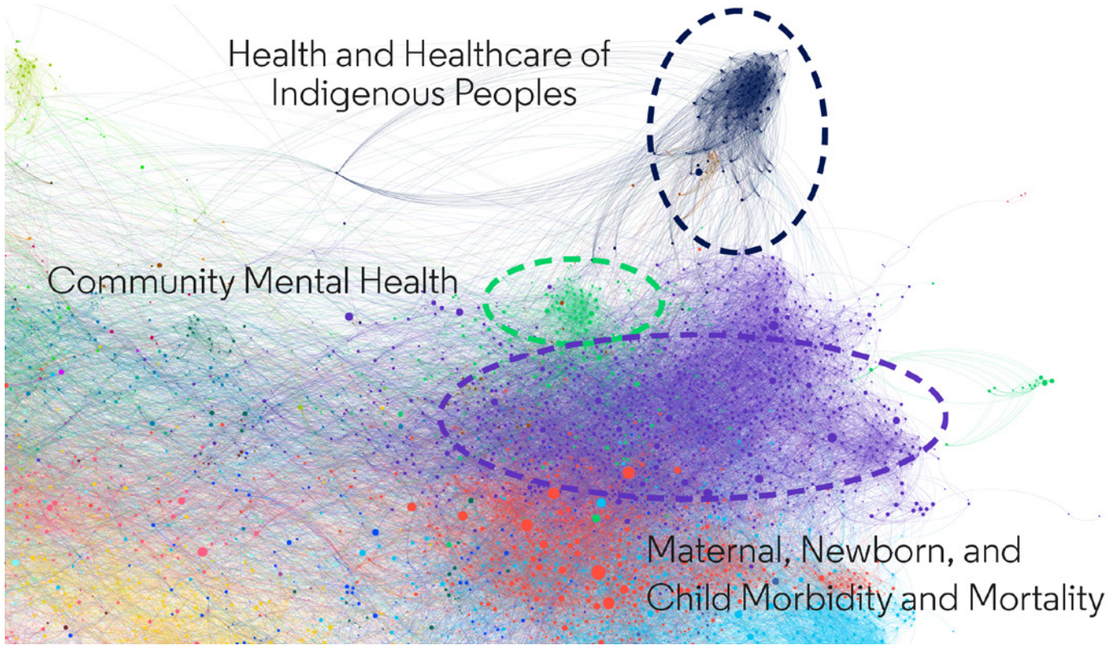


Figure 4 Health and Healthcare of Indigenous Peoples

National activity and focus: United Kingdom

Table 3 ranks the SDG clusters in which the United Kingdom contributed the greatest number of papers (either core papers or citing papers). As expected, different clusters are of different sizes (see first column). The second column reveals the percent of papers in each cluster from UK authors and their institutions. The third column provides the percent of SDG-related papers from UK authors (n = 2,230) that belong to each cluster. Cluster #14, Neglected tropical diseases (NTDs), shows a concentration of UK content, either in terms of percent of UK papers on SDGs that are focused in this area or the UK's share of papers in this cluster. Almost one-third of papers on NTDs (31.2%) are of UK origin. This number can be compared with the UK's share of papers in the sciences and social sciences indexed in the Web of Science, 2015-2018, which is 7.9%. Thus, the UK research activity on NTDs is nearly four times the expected amount.

Policy makers can use this evidence to demonstrate their country's research strengths and to understand the existing policy frameworks and infrastructure undergirding these research areas. For example, the UK is home to long-standing centres of research excellence in NTDs, including the London School of Hygiene & Tropical Medicine and the Liverpool School of Tropical Medicine, as well as Imperial College London and the University of Oxford. Among funding acknowledgements on papers in the cluster on NTDs, some UK funders are prominent: US NIH with 73 mentions, Gates Foundation 39, Wellcome Trust 26, Diabetes UK 17, European Research Council 12, US NSF 10, WHO 9, Brazil's FAPESP 9, European Union 8, Australia's NHMRC 8, and UK MRC 7.

Table 3 UK focus in SDG research topics

CLUSTER	LABEL	UK PAPERS (N = 2,230)	UK SHARE OF PAPERS IN TOPIC	SHARE OF ALL UK SDG PAPERS
1	Maternal, Newborn, and Child Morbidity and Mortality (n = 1,445)	395	27.3	17.7
11	Ecosystems Services and Adaptations for Sustainability (n = 1,312)	338	25.8	15.2
10	Health Surveys, Tuberculosis, Substance Abuse, Longevity (n = 819)	263	32.1	11.8
15	Ecosystems, Biodiversity, and Climate Change (n = 700)	184	26.3	8.3
8	Sustainable Agriculture and Transgenic Crops (n = 696)	132	19.0	5.9
18	Nutrition and Childhood Development (n = 460)	109	23.7	4.9
14	Neglected Tropical Diseases (n = 314)	98	31.2	4.4
3	Water Supply and Sanitation (n = 409)	96	23.5	4.3
5	Sustainability Definitions, Indicators, and Assessments (n = 593)	90	15.2	4.0
2	Community Mental Health (n = 241)	88	36.7	3.9
16	Household Fuel Use and Emissions (n = 334)	58	17.4	2.6
6	Waste Management and Recycling, Green Supply Chains (n = 535)	58	10.8	2.6

Discussion

Mapping Sustainable Development Goals: possibilities for policy makers

"When discussing research agenda settings, individual researchers and policy makers tend to express their opinions based on their backgrounds. We believe that, in spite of some limitations, providing common information for discussion, such as a science map, would help discussion among those with different backgrounds, where they can use the map as a common basis for discussing research planning. By sharing the same 'arena,' researchers and policy makers can conduct discussions while properly considering the distance among them."

Masatsura Igami and Ayaka Saka, "Decreasing diversity in Japanese science, evidence from in-depth analyses of science maps," *Scientometrics*, 106, 401, 2016.

Sustainability science and the UN's Sustainable Development Goals could serve as the quintessential example of a multifaceted issue with complex and interdependent aspects that nearly defy a comprehensive and coherent summarization. Yet the complex web of relationships and dependencies that the theme of sustainability presents can be captured, investigated, and visualized through research papers that address specific problems and refer to each other. These references, importantly provided by experts, offer us with shape and substance, texture and colour. The citation network, when mapped, reveals much of interest and of consequence for policy makers.

The policy treatments throughout this report provide exemplars of the value that mapping the research landscape holds for evidence-based decision making. And with research papers as the source material for constructing the map from which these treatments are developed, the map provides the 'common basis for discussing research planning' that Igami and Saka suggest is needed for researchers and policy-makers to find common ground.

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The graphic below shows how a key paper from *The Lancet's* Commission on Pollution and Health bridges the two major research domains shown in the main map in this report: health and healthcare, and the environment, agriculture and sustainability itself.

Landrigan, P. J., et al., "*The Lancet* Commission on Pollution and Health," *The Lancet*, 391(10119): 462–512, February 3, 2018

"Academicians and researchers have a special role in advocating for evidence-based strategies and research to help address the aspirational, yet attainable Sustainable Development Goals. This report is an important benchmark in this process."

Professor Zulfiqar Bhutta, University of Toronto and Aga Khan University, and 2018 Highly Cited Researcher in Clinical Medicine

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