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Trends in Attention to the 17 Sustainable Development Goals of the United Nations

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ABSTRACT

In 2015 the United Nations put forth 17 Sustainable Development Goals (SDGs). These are intended to be largely achieved by 2030. The Sustainable Development Goals are a larger follow-up to the United Nations' Millennial Development Goals (MDGs), agreed to 2000, which were the first attempt by the UN to create metrics for improving societies that were to be used across the world (From MDGs to SDGs, n.d.). This study is on trends in attention to the SDGs, as indicated by trends in the production of academic articles on the topical areas of each of the 17 SDGs. Research related to the Sustainable Development Goals is important to see what is being prioritized and what needs to get more focus (Fayomi, 2018). The sub-goals of the SDGs are called "indicators." Key topics and terms of the SDGs and their indicators can be used in searching Google Scholar year by year to ascertain cardinal and ordinal measures of trends in article publication related to the SDGs. This is based on the premise that attention to a particular SDG in academic literature is a valid indicator related to action by nations, businesses, and not-for-profit organizations on the SDGs. This research aims to investigate changes in the relative attention paid to SDGs by academics as indicated in the absolute and relative numbers of articles produced over the period 2010-2020 as indicated by their listing, year by year, in the Google Scholar database. Key terms were extracted from the sub-goals of the SDGs and utilized as search terms. Two search terms were used for each SDG, ad based on the data, we then focused in on the most relevant one for each SDG to examine in comparison with the others. We compare the located continuities, changes in a relative number of items produced (change in ranking) over this time frame. Theories that might be tested in future research on the source of change in the relative ranking of the SDGs are put forth.

Keywords: *Sustainable Development Goals, United Nations, Sustainability, Indicators*

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History of united nations-initiated sustainable development goals

The United Nations Sustainable Development Goals were put forth in 2012, the result of talks at the United Nations Conference on Sustainable Development in Rio de Janeiro. They were meant to replace the Millennial Development Goals, which were mainly focused on poverty and which were developed to be attained in 2015. The SDGs are challenges to reach development goals. They help orient the development work of governments and countries (Grant, 2017). According to the SDGs, all achievements must work in tandem with each other, with each goal playing its part in the overall improvement in the quality of life. This theory suggests that paying an equal amount of attention to each SDG would lead to a successful society. Researchers at the University of Bath observed that focusing on a critical few SDGs might lead to all of them progressing since they are interdependent to a large extent. In particular, they suggested focusing on Life Below Water, Life on Land, and Gender Equality (University of Bath, 2019; United Nations, 2018).

The impact of the SDGs on global trends has been recognized and emphasized (Urazgaliev & Menshikova, 2020; Bautista-Puig et al., 2020). The SDGs apply the same framework to all the nations of the world and orchestrate their movement towards a better 2030. The primary importance of measuring progress in achieving the SDGs by 2030 has been importantly discussed (Allen, Metternicht and Wiedmann, 2018). The importance of expert literature, in particular, to apply to SDG research on the ground, has been noted (Allen, Metternicht & Wiedmann, 2018). One advantage of the SDGs is that they provide a holistic and multidimensional view on world development. They identify synergies and tradeoffs using data (Pradhan et al., 2017).

The Millennial Development Goals (MDGs) were signed in 2010. They focused on the following issues: the eradication of poverty and hunger, the achievement of universal primary education, promotion of gender equality and empowerment of women, reduction of child mortality, improvement of maternal health, fighting HIV/AIDS, malaria, and other diseases, ensuring environmental sustainability, and creating a global partnership for development (Millennium Development Goals (MDGs), n.d.). Since the MDGs were established, low-income countries made significant progress with these goals, granting some validity to the notion that they had been successful. However, other reports indicate that progress was already being made at the time the MDGs were implemented, and the positive results were more of a result of natural trends rather than accomplishments specific to the MDGs (McArthur & Rasmussen, 2017).

The SDGs provide a value framework with which to analyze the progression of nations, and the world as a whole, in the crucial areas that they have outlined. This would be valuable at any point in our history and creates a way to track the progress made over chosen periods. During this global pandemic, the SDGs provide a guidepost to which needs are being addressed and which need more effort to respond to, hopefully creating more focus towards moving towards the future (DeLeeuw & Behrens, 2020).

Literature review

Trends in SDGs is becoming the subject of current research (Urazgaliev and Menshikova, 2020; Bautista-Puig et al., 2020). In 2018, an SDG trend scanner was initiated by the UN Development Program (UNDP) and the Research Institutes of Sweden. They, in particular, want to come up with a system to address disruptive trends and it is hoped that the SDG Trend Scanner initiatives will enable companies, the public sector, and other sectors to use trends as strategy drivers to accelerate progress towards the achievement of the SDGs by catalyzing scalable innovations. They are hoping to engage key stakeholders, including industry leaders, policymakers, and universities, to facilitate collaboration. The pandemic of 2020 certainly shows a need to have rapid and robust responses to disruptive changes raised by catastrophic diseases, climate change, and conflicts (UNDP, 2020). The SDGs have been accelerated through large meetings, including ones by the United Nations General Assembly (Hege, 2020).

McArthur and Rasmussen have developed a country-level methodology to identify which people and issues are getting left behind. They have come out with a method for estimating the consequences of falling short on targets using a measure of the number of lives at stack by missing the particular SDGs and identifying the basic needs at stake related to missing any of the SDGs. We hope to have pointed out SDGs that scholars should increase their attention. This corresponds to other reporting efforts that try to focus on those SDG targets lagging behind (Global Reporting Initiative, 2018).

Metrics and methodology

Some studies have focused on metrics related to how many people are raised or left behind by the effort to achieve the SDGs (Kharas, 2018). Our study will be based on the number of articles published in each of the years from 2010 through 2020. Though our data for 2020 includes just its first three months, we believe that for ordinal (ranking) purposes, it is valid. However, we are not using 2020 data for cardinal (absolute numbers) comparison with other years. We decided to use the Google Scholar database since it is free and readily useable by all. This is in contrast to other important databases such as the Web of Science, which has a $40,000 a year subscription fee and is accessible mostly through top research university libraries. However, we intend to expand this study to other databases to enhance the reliability and validity of our work.

Outline of the SDGs

Goal 1, No Poverty, is focused on eliminating poverty in all its manifestations around the world. One of its sub-goals is to eliminate poverty for people making less than $1.25 a day (United Nations, 2019). The rest of the sub-goals address social protection, resilience for the poor, mobilization of resources, and sound policy frameworks, among other things, providing measurable ways to evaluate the reduction of poverty. Goal 2, Zero Hunger, is aimed at achieving secure food supplies and better nutrition while promoting sustainability in farming. This is to be measured by metrics such as the achievement of vulnerable people to safe, nutritious food at all times (United Nations, 2019). Other sub-goals include ensuring sustainable

food production systems, preventing trade restrictions, and ensuring the success of small-scale food producers. Goal 3, Good Health and Well-being, focuses on promoting healthy lives for people of all ages. It aims to reduce maternal mortality to less than 70 per 100,000 live births by 2030 and curtail preventable newborn deaths and reduce neonatal mortality to as low as 12 per 1,000 live births by 2030 (United Nations, 2019). Goal 4, Quality Education, is focused on providing inclusive and equitable quality education as well as life-long learning opportunities. It notably aims at ensuring free equitable and high-quality primary and secondary education, leading to related outcomes (United Nations, 2019). Goal 5, Gender Equality, is associated with the empowerment of women and ending discriminatory practices against women and girls in all countries. Also, violence against women in both public and private contexts, including trafficking and sexual exploitation, should be ended (United Nations, 2019). Goal 6, Clean Water and Sanitation, aims to provide people with potable water and sterile practices, aspiring to assure that all the world's citizens have clean drinking water by 2030 (United Nations, 2019). Goal 7, Affordable and Clean Energy, deals with making new forms of eco-friendly energy widely available and universally accessible by 2030 (United Nations, 2019). Goal 8, Decent Work and Economic Growth, sets the standard that all people should have access to a good and productive job, measured by consistent economic growth at at least 7% yearly in lesser developed countries (United Nations, 2019).

Goal 9, Industry, Innovation, and Infrastructure, aspires to build connected cities that support new ideas, with a focus on inclusivity and infrastructure (United Nations, 2019). Goal 10, Reduced Inequalities, is focused on getting citizens to similar wealth levels within and between countries, as measured by consistent income growth of the bottom 50% of people faster than the rest of their country (United Nations, 2019). Goal 11, Sustainable Cities and Communities, is concerned with the safety and sustainability of municipalities, hoping to make secure and economically-feasible housing affordable to all by 2030 while improving bad neighbourhoods (United Nations, 2019). Goal 12, Responsible Consumption and Production, aims to make sure that the rate at which that places create and expend their resources is sustainable, with an important sub-goal involving a 10-year framework created by countries that have been successful in their development (United Nations, 2019). Goal 13, Climate Action, regards fighting the changing climate, with the main sub-goal focusing on creating systems that provide defence against natural disasters (United Nations, 2019). Goal 14, Life Below Water, focuses on sustainably utilizing marine ecosystems, as determined by a markable reduction in marine pollution by 2025 (United Nations, 2019). Goal 15, Life on Land, hopes to keep the forests healthy, as measured by meeting worldwide agreements regarding ecosystem health (United Nations, 2019). Goal 16, Peace, Justice, and Strong Institutions, strives for righteous societies, with a main sub-goal focus on reducing mortality rates (United Nations, 2019). Goal 17, Partnerships for the Goals, aims to tie the rest together, focusing on ways countries can assist each other with sustainable development initiatives (United Nations, 2019).

Table 1. SDG Search Terms

SDG	SEARCH TERM
SDG01: No Poverty	"eradicate poverty"
SDG02: Zero Hunger	"zero hunger"
SDG03: Good Health and Well-being	"healthy lives"
SDG04: Quality Education	"free education"
SDG05: Gender Equality	"gender equality"
SDG06: Clean Water and Sanitation	"clean water"
SDG07: Affordable and Clean Energy	"clean energy"
SDG08: Decent Work and Economic Growth	"economic growth"
SDG09: Industry, Innovation, and Infrastructure	"resilient infrastructure"
SDG10: Reduced Inequalities	"reduce inequality"
SDG11: Sustainable Cities and Communities	"sustainable cities"
SDG12: Sustainable Production	"sustainable production"
SDG13: Climate Action	"climate action"
SDG14: Life Below Water	"prevent marine pollution"
SDG15: Life on Land	"combat desertification"
SDG16: Peace, Justice, and Strong Institutions	"strong institutions"
SDG17: Partnerships for the Goals	"global partnership" "sustainable development"

Trends in the SDGs and progress towards achieving the goals

Scholars have endeavoured to assess progress towards attaining the SDGs, most in the Report of the Secretary-General of the United Nations (Sustainable Development Goals Report, 2019). It has been found that progress has been being made in critical areas and that favourable trends are evident. For example, extreme poverty has considerably declined between 2000-2017. Also, the under-5 mortality rate fell by 57 per cent. As we found, the Secretary-General of the United Nations has found that some areas need more collective attention, such as the deterioration of the national environment (Sustainable Development Goals Report, 2019).

Largely, the movement towards achieving the SDGs has been happening since their creation in 2015. However, performance has been less than stellar in some areas. Notably, targets for ending hunger, climate protection, and biodiversity have not been approached adequately (Nature, 2020). The least progress has been made on SDG 13 (Climate Action), SDG 14 (Life Below Water) and SDG 15 (Life on Land). Strikingly, no country has attained a "green rating," meaning the SDG has been reached on SDG 14 (Life Below Water). The United Nations noted this dismal situation in its *Sustainable Development Report 2019* (2019), which stated that the available data suggested trends on SDG 13 (Climate Action) and SDG 14 (Life Below Water) were a source of great concern in most OECD countries, which implies bolstered efforts to create and put into effect transformational policies that separate economic growth from the negative impacts on the environment.

Results of the raw data

The SDGs were agreed upon in 2015 as targets for 2030 achievement. They replaced the 2010 MDGs, which extended until 2015. Looking at the number of articles developed on SDG topics between 2015 and 2019 as an indication of interest spurred in them by the associated publicity and discussion in political, social, and industry forums that might be compared to the interest perhaps waning in the MDGs' final years. The SDG01, No Poverty, went from 362 hits in Google Scholar in 2010 to 473 in 2015, an increase of 30.7 per cent. (See Table 2).

*Table 2.*Search Results by Year

SDG	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
SDG01	362	355	395	430	473	520	762	1080	1700	2190	8267
SDG02	168	190	197	321	423	485	772	1170	2070	2840	8636
SDG03	1840	2220	2230	2650	2870	3310	4070	4230	4500	4890	32810
SDG04	3170	3640	4220	4440	5190	5510	5650	5910	5790	4990	48510
SDG05	20800	22200	25400	29100	29700	30900	32300	23600	30700	29600	274300
SDG06	22000	22800	24500	26100	26500	26700	26800	26300	26000	25600	253300
SDG07	16400	19500	22400	23500	23700	25200	26700	29300	30900	29600	247200
SDG08	182000	190000	219000	224000	242000	171000	144000	159000	117000	78000	1726000
SDG09	209	299	353	474	688	1090	1800	1820	2050	2340	11123
SDG10	1340	1420	1700	2020	2380	2820	3310	3630	3760	4150	26530
SDG11	2510	3110	3670	4480	5490	5790	7150	9200	10500	14000	65900
SDG12	6170	6970	8369	9220	10200	11600	12300	13800	14700	16700	110029
SDG13	2570	2920	3420	3950	4500	5390	6180	7320	8560	10900	55710
SDG14	31	47	71	51	57	62	65	76	63	80	603
SDG15	1170	1300	4400	1510	1560	1750	2100	2260	2300	2310	20660
SDG16	1230	1320	1530	1720	1660	1890	2270	2530	3010	3040	20200
SDG17	1210	1190	1520	1950	2280	2560	2770	2910	3050	2990	22430

This compares with the increase from 2016 to 2019 of more than 187 per cent. This suggests that the interest in the SDG has been strongly increased. SDG08, Decent Work and Economic Growth have fallen in the number of Google Scholar items from 2010 to 2019 by 57.1 per cent. This is in stark comparison to other SDGs. Our assumption that Google Scholar has been locating articles using the same search algorithm during this period might not be true. This should be investigated in further research. Looking at the micro-context, from 2017 to 2018, the number of articles for thirteen SDGs increased, and the number of articles for four SDGs decreased, suggesting shifting attention among the SDGs. However, looking at the shift over ten years, one can see a great increase in attention for SDGs 01, 02, 03, and 04, among others, while attention has sharply fallen for SDG 08.

Results of ordinal ranking

Looking at the relative attention paid to SDGs over time is facilitated by looking at the ranking of the raw data ordinals (See Table 3). Since this is ordinal data rather than cardinal data, using

the partial data for the first three months of 2020 was deemed acceptable. SDG 08, Decent Work and Economic Growth is the most written about SDG for every year 2010-2020, based upon its search term "economic growth."SDG 06, Clean Water and Sanitation, has the second most articles in 2010 and the third most in 2020.

Table 3. Search Rankings by Year

Ranking	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08	SDG08
2	SDG06	SDG06	SDG05	SDG05	SDG05	SDG05	SDG05	SDG07	SDG07	SDG05	SDG07
3	SDG05	SDG05	SDG06	SDG06	SDG06	SDG06	SDG06	SDG06	SDG05	SDG07	SDG06
4	SDG07	SDG07	SDG07	SDG07	SDG07	SDG07	SDG07	SDG05	SDG06	SDG06	SDG05
5	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12	SDG12
6	SDG04	SDG04	SDG15	SDG11	SDG11	SDG11	SDG11	SDG11	SDG11	SDG11	SDG11
7	SDG13	SDG11	SDG04	SDG04	SDG04	SDG04	SDG13	SDG13	SDG13	SDG13	SDG13
8	SDG11	SDG13	SDG11	SDG13	SDG13	SDG13	SDG04	SDG04	SDG04	SDG01	SDG01
9	SDG03	SDG03	SDG13	SDG01	SDG01	SDG03	SDG03	SDG03	SDG03	SDG04	SDG03
10	SDG01	SDG01	SDG01	SDG03	SDG03	SDG01	SDG10	SDG10	SDG10	SDG03	SDG04
11	SDG10	SDG10	SDG03	SDG10	SDG10	SDG10	SDG01	SDG01	SDG01	SDG10	SDG10
12	SDG16	SDG16	SDG10	SDG17	SDG17	SDG17	SDG17	SDG17	SDG17	SDG16	SDG02
13	SDG17	SDG15	SDG16	SDG16	SDG16	SDG16	SDG16	SDG16	SDG16	SDG17	SDG16
14	SDG15	SDG17	SDG17	SDG15	SDG15	SDG15	SDG15	SDG15	SDG15	SDG02	SDG17
15	SDG09	SDG09	SDG09	SDG09	SDG09	SD0G9	SDG09	SDG09	SDG02	SDG09	SDG09
16	SDG02	SDG02	SDG02	SDG02	SDG02	SDG02	SDG02	SDG02	SDG09	SDG15	SDG15
17	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14	SDG14

Over the ten years, it never goes lower than third on the list, based on its search term "clean water." SDG 05, Gender Equality, starts in 2010 at number 3 and drops to number 4 in 2020, never going below fourth in the years between, utilizing the search term "gender equality." SDG 07, Affordable and Clean Energy, is the fourth most written about SDG in 2010 and goes up to second by 2020, based upon results of its search term "clean energy." SDG 12, Sustainable Production, stays consistent in the #5 spot throughout the ten years, using the search term "sustainable production."SDG04, Quality Education, starts at number 6 in 2010 and drops to number 10 by 2020, using the search term "free education."SDG 13, Climate Action, is #7 in both 2010 and 2020, spending some time at number eight in the years in between; our research utilized the term "climate action."SDG 11, Sustainable Cities and Communities, rises from eighth in 2020 to sixth in 2020, using the search term "sustainable cities." SDG 03, Good Health and Well-being, sits at ninth in both 2010 and 2020, with some fluctuation in the years between, based upon the search term "healthy lives."SDG01, No Poverty, sits at #10 in 2010, rising to number eight in 2020, when utilizing the search term "eradicate poverty." SDG 10, Reduced Inequalities, ranks in the eleventh spot in both 2010 and 2011, with some fluctuation in the years in between, based upon the search term "reduce inequality." SDG 16, Peace, Justice, and Strong Institutions, drop one rank from number 12 to number 13 between 2010 and 2020, using the search term "strong institutions."SDG 17, Partnerships for the Goals, starts at number thirteen in

2010 and drops to number 14 by 2020, with the search term "global partnership" "sustainable development." SDG 15, Life on Land, starts at fourteenth in 2010 and drops to sixteenth by 2020, using the search term "combat desertification." SDG 09, Industry, Innovation, and Infrastructure, starts and ends at fifteenth, with only spending 2018 at number sixteen in the middle, utilizing the search term "resilient infrastructure." SDG 02, Zero Hunger, sees a dramatic increase of from number 16 in 2010 to number 12 in 2020, based upon the search term "zero hunger." SDG 14, Life Below Water, stays consistent in the last (seventeenth) place in every year, using its search term"prevent marine pollution."

Most SDGs have not changed in relative attention using this metric. However, some, such as SDG 04, Quality Education, have gone down several ranks, and others, such as SDG 02, Zero Hunger, have risen several ranks over this period. Since all the SDGs are important, it is hard to celebrate or lament changes in attention to them. Investigating possible factors causing such shifts might be the subject of future research.

Discussion

In 2015 the United Nations put forth 17 Sustainable Development Goals (SDGs). They are targeted to be achieved by 2030. The SDGs follow-up the United Nations' Millennial Development Goals (MDGs), agreed to 2000, which were the first attempt by the UN to create metrics for improving societies. These were used across the world. This study is of trends in attention to the SDGs. We have deployed an examination of trends in the production of academic articles om the topical areas of each of the 17 SDGs. Such research related to the SDGs enables a determination of which topics are being prioritized and which need to get more focus. The sub-goals of the SDGs are called "indicators." Key topics and terms of the SDGs and their indicators were used in searching Google Scholar year by year to ascertain cardinal and ordinal measures of trends in article publication related to the SDGs. This is grounded in the premise that the coverage of a particular SDG in the academic literature is a valid indicator of the action undertaken by nations, businesses, and not-for-profit organizations on the SDGs. This research investigated trends in the relative attention paid to SDGs by academics as indicated in the absolute and relative numbers of articles produced over the period 2010-2020 as shown by their listing, year by year, in the Google Scholar database. Key terms were developed from the sub-goals of the SDGs and utilized as search terms. Two search terms were used for each SDG and, based on the data, we then focused in on the most relevant one for each SDG to examine concerning the others. We compare the located continuities, changes in a relative number of items produced (change in ranking) over this time frame.

The SDGs are targets for attaining the development goals. They orient the development work of governments and countries. All achievements of the SDGs should work in supportive harmony with each other, with each goal playing its part in the overall improvement in the quality of life. This theory suggests that paying an equal amount of attention to each SDG should lead to successful sustainable world society. Focusing on a critical few SDGs might lead to all of

them progressing since they are interdependent. Notably, Life Below Water, Life on Land, and Gender Equality.

The impact of the SDGs on global trends has been noted and well described. The SDGs apply their same guidelines to all nations, and they are crucial towards 2030. Measuring progress towards achieving the SDGs is important. The SDGs provide a framework that links many different issues together, identifying synergies and tradeoffs.

The SDGs provide a structure with which to analyze the progression of countries, and the entire world, in the crucial areas that they have outlined. In this way, it is possible to trace the progress made over a given amount of time. In the time of COVID-19, the SDGs provide a guidepost which needs are being addressed and which need more effort to respond to, hopefully creating more focus towards moving towards the future.

Our data for 2020 included just the first three months, for ordinal (ranking) purposes, it is valid. However, we did not use 2020 data for cardinal (absolute numbers) comparison with other years. We decided to use the Google Scholar database since it is free and readily useable by all. This is in contrast to other important databases such as the Web of Science, which is very expensive. Scholars have endeavoured to assess progress towards attaining the SDGs, most in the Report of the Secretary-General of the United Nations. It has been found that progress has been being made in critical areas and that favourable trends are evident. Largely, the movement towards achieving the SDGs has been happening since their creation in 2015. However, performance has been less than stellar in some areas. Notably, targets for ending hunger, climate protection, and biodiversity have not been approached adequately. The least progress has been made on SDG 13 (Climate Action), SDG 14 (Life Below Water) and SDG 15 (Life on Land). Strikingly, no country has attained a "green rating," meaning the SDG has been reached on SDG 14 (Life Below Water). The United Nations noted this dismal situation in its *Sustainable Development Report 2019*, which stated that the available data suggested trends on SDG 13 (Climate Action) and SDG 14 (Life Below Water) was a source of great concern in most OECD countries, which implies bolstered efforts to create and put into effect transformational policies that separate economic growth from the negative impacts on the environment.

The SDGs were agreed upon in 2015 as targets for 2030 achievement. Looking at the number of articles developed on SDG topics between 2015 and 2019 as an indication of interest spurred in them by the associated publicity and discussion in political, social, and industry forums that might be compared to the interest perhaps waning in the MDGs' final years. The SDG01, No Poverty, went from 362 hits in Google Scholar in 2010 to 473 in 2015, an increase of 30.7 per cent. This compares with the increase from 2016 to 2019 of more than 187 per cent. This suggests that the interest in this SDG has been strongly increased. SDG08, Decent Work and Economic Growth have fallen in the number of Google Scholar items from 2010 to 2019 by 57.1 per cent. This is in stark comparison to other SDGs. Our assumption that Google Scholar has been locating articles using the same search algorithm during this period might not be true. Looking at the micro-context, from 2017 to 2018, the number of articles for thirteen SDGs increased, while those for four SDGs decreased, suggesting shifting attention among the SDGs.

However, looking at the shift over ten years, one can see a great increase in attention for SDGs 01, 02, 03, and 04, among others, while attention has sharply fallen for SDG 08.

Examining the relative attention paid to SDGs over time is facilitated by looking at the ranking of the raw data ordinals. Since this is ordinal data rather than cardinal data, using the partial data for the first three months of 2020 was deemed acceptable. SDG 08, Decent Work and Economic Growth is the most written about SDG for every year 2010-2020, based upon its search term "economic growth." SDG 06, Clean Water and Sanitation has the second most articles in 2010 and the third most in 2020. Over the ten years, it never goes lower than third on the list, based on its search term "clean water." SDG 05, Gender Equality, starts in 2010 at number 3 and drops to number 4 in 2020, never going below fourth in the years between, utilizing the search term "gender equality." SDG 07, Affordable and Clean Energy, is the fourth most written about SDG in 2010 and goes up to second by 2020, based upon results of its search term "clean energy." SDG 12, Sustainable Production, stays consistent in the fifth spot throughout the ten years, using the search term "sustainable production." SDG 04, Quality Education, starts at number 6 in 2010 and drops to number 10 by 2020, using the search term "free education." SDG 13, Climate Action, is seventh in both 2010 and 2020, spending some time at number eight in the years in between; our research utilized the term "climate action." SDG 11, Sustainable Cities and Communities, rises from eighth in 2020 to sixth in 2020, using the search term "sustainable cities." SDG 03, Good Health and Well-being, sits at ninth in both 2010 and 2020, with some fluctuation in the years between, based upon the search term "healthy lives." SDG 01, No Poverty, sits at 10th in 2010, rising to number eight in 2020, when utilizing the search term "eradicate poverty." SDG 10, Reduced Inequalities, ranks in the eleventh spot in both 2010 and 2011, with some fluctuation in the years in between, based upon the search term "reduce inequality." SDG 16, Peace, Justice, and Strong Institutions, drop one rank from number 12 to number 13 between 2010 and 2020, using the search term "strong institutions." SDG 17, Partnerships for the Goals, starts at number thirteen in 2010 and drops to number 14 by 2020, with the search term "global partnership" "sustainable development." SDG 15, Life on Land, starts at fourteenth in 2010 and drops to sixteenth by 2020, using the search term "combat desertification." SDG 09, Industry, Innovation, and Infrastructure, starts and ends at fifteenth, with only spending 2018 at number sixteen in the middle, utilizing the search term "resilient infrastructure." SDG 02, Zero Hunger, sees a dramatic increase of from number 16 in 2010 to number 12 in 2020, based upon the search term "zero hunger." SDG 14, Life Below Water, stays consistent in the last (seventeenth) place in every year, using its search term "prevent marine pollution."

Most SDGs have not changed in relative attention using this metric. However, some, such as SDG 04, Quality Education, have gone down several ranks, and others, such as SDG 02, Zero Hunger, have risen several ranks over this period.

Increasing attention is being paid to the SDGs, as indicated by a search of the Google Scholar database for descriptors associated with the sub-goals. Our search preceded the 2015 introduction of the SDGs by five years to provide a benchmark of the pre-SDG trends for these

topics. This burgeoning attention corresponds to a general uptick in sustainability consciousness by people around the world. The SDGs were explicitly formulated to work in tandem, with the achievement of each goal supplementing the effects of the others. Therefore, it is dismaying to observe the discrepancy between the search results for the top-ranking goal, SDG 08, Decent Work and Economic Growth, which peaks at 224,000 articles in a single year, and the lowest-ranking, SDG 04, Life Below Water, which peaks at just 80 articles in a year. For the SDGs to have their desired effect, this gap in interest must be closed.

Recommendations for further research

Comparable research concerning other databases will be helpful in order to determine how universal these findings are. Additionally, keywords derived from other sub-goals can be investigated. A deep investigation of how SDG progress is being recorded in a selected group of countries, compared with geographic locations of authors of articles, can be explored in order to draw more location-specific conclusions. We intend to expand this study to other databases beyond Google Scholar, including Web of Science, to enhance the reliability and validity of our work. It also is desirable to collect interview data from business executives, academicians, government officials, and NGO administrators on their observations and how they fit with our findings. Each of the SDGs might engender a thorough research study in which the gamut of indicators is searched and compared. International variance might be studied. The affiliation field of journal article authors might enable such a project. An alternative framework to the SDGs might be located and compared with the SDGs and their trends. Since all the SDGs are important, it is hard to celebrate or lament changes in attention to them. Investigating possible factors causing such shifts might be the subject of future research.

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