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Research article

# Top 100 highly cited sustainability researchers

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A R T I C L E I N F O

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A B S T R A C T

The announcement of the UN Sustainable Development Goals (SDGs) provided a fresh direction to sustainability research that spans different disciplines. Consequently, scholarly databases made available the mapping of research publications to different SDGs, unleashing many opportunities for analysis. In this work, the top 100 Highly Cited Sustainability Researchers (HCSRs) and information related to them, such as the institutions they belong to, the type of these institutions, the geographical diversity of these researchers, and gender representation patterns, are analyzed. Also, from their publications, their publication pattern, including (i) the least and most researched SDGs, (ii) their Open Access publishing pattern, (iii) their collaboration pattern (iv) the pattern of their research impact, are analyzed. The most sought thematic areas of their research, top journals in which they publish, important research categories handled by these journals, etc., are also investigated. The most significant contribution of these researchers and their recent contributions are also discussed. The data indicates a significant disparity in research focus among the top 100 HCSRs, with most concentrating on "Good Health and Well Being," "Zero Hunger," and "Quality Education," while notably fewer researchers focus on "Decent Work and Economic Growth" and "No Poverty," underscoring the need for a more balanced research agenda across all SDGs. The study reveals that the United States, China, and the United Kingdom are the leading contributors to the top 100 HCSRs, suggesting that these countries are predominant in global sustainability research output, while nations like Iran and Saudi Arabia also make notable, albeit smaller, contributions. The institutional affiliations of HCSRs show a significant imbalance, with only 16 from private institutions compared to 84 from public ones. Specifically, it shows that out of the top 100 researchers, 93 are men, while only 7 are women. The analysis of authorship in publications by HCSRs reveals a tendency towards middle and last author positions, underscoring their collaborative and leadership roles within the research community. All these analyses can inform academia, industry, and policymakers about the most significant developments in research regarding SDGs.

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## 1. Introduction

The introduction of the United Nations' Sustainable Development Goals (SDGs) in 2015 has laid down a global framework aimed at sustainable human development, encompassing 17 key objectives from poverty eradication to climate action [1]. These SDGs have been embedded into the fabric of global policy frameworks, business strategies, and, notably, academic research [2]. We are making progress towards the goals, but we are not on track to achieve them all by 2030. We need to accelerate our efforts, especially in areas such as climate change, poverty, and inequality, to achieve the 2030 Goals.

The advent of SDGs has catalyzed a notable shift in the research landscape. The role of research in advancing these global goals cannot be overstated. Academic research in line with SDGs possesses far-reaching implications not only for the advancement of science but also for guiding policy and practice [3]. [4] provided pivotal work in articulating the role of these goals and the mechanisms to evaluate progress toward achieving them. Researchers have been quick to align their work with these goals, often embedding SDG targets within the scope of their research [5]. This integration is crucial given the multifaceted nature of sustainability challenges, which require comprehensive, interdisciplinary solutions [6]. High-quality academic research contributes significantly to our understanding of these complex challenges and the strategies required to address them.

A key group in this research landscape is the Highly Cited Researchers (HCRs). HCRs serve as bellwethers in their respective fields, often directing the course of academic discourse and policy discussions [7]. Their work generally sets the academic agenda and serves as a reference point for other researchers and stakeholders [8]. While numerous studies have explored the role of highly cited researchers in various disciplines [9,8], literature focusing on their role in sustainability research remains sparse. The term "highly cited researchers" may be dated directly to the 1960s founding of the Institute of Scientific Information by Eugene Garfield and the release of the Science Citation Index. The number of Highly Cited Papers constitutes the raw material for the list of HCSs released yearly by Clarivate to identify, based on their publications and the citations they have generated, the most influential researchers worldwide [10]. According to Ref. [11], the Academic Ranking of World Universities uses a foundation's HCR count as a metric, and membership in the HCR has been the basis for many assessments of the quality of research.

Within the context of sustainability - a domain characterized by its interdisciplinary nature and global significance - highly cited researchers are uniquely positioned to initiate paradigm shifts [12]. Their work can form the backbone of strategies to address the world's most pressing challenges, as outlined in the SDGs.

Several studies have employed bibliometric methods to analyze the breadth and impact of sustainability research [13,14,15]. These studies often focus on citation metrics, journal impact factors, and research themes but seldom delve into the impact and characteristics of individual researchers. For instance Ref. [15], explored the key journals and countries contributing to sustainability research but did not account for the influence of highly cited researchers [16]. analyzed the mapping of the 'Analytical Hierarchy Process' to SDGs using the SPAR-4-SLR framework and revealed the top SDGs AHP contributed the most. Then, there have been focused studies on how well-emerging topics like fake news [17] and Darkweb [18] contribute to SDGs. The emergence of prolific authors, along with many other aspects such as key topics, governance issues, etc., was discussed by Ref. [19].

[20] identified and analyzed sustainability science's highly cited knowledge base (which they dubbed interdisciplinary pillars) [21]. analyzed the characteristics of highly cited articles in biomass research. They also analyzed the publication pattern of authors of such publications. Thus, most existing works focussed on specific SDGs or specialized topics for analyzing the contributions of either prolific contributors or highly cited contributors. Recent initiatives such as Impact Rankings by Times Higher Education have emerged to rank universities based on their contributions to SDG research and other societal impact indicators [22,23].

Prior studies have extensively investigated citation metrics and research themes in general disciplines [24], yet less scholarly attention has been dedicated to the particular contributions and characteristics of leading researchers in sustainability.

However, there exists a conspicuous gap in the literature concerning a comprehensive examination of high-impact researchers, specifically in the field of sustainable development as it relates to SDGs. The present study seeks to bridge this research gap by offering a comprehensive analysis of the highly cited researchers in sustainability. The adopted methodology is in some ways similar to the Clarivate Analytics' Highly Cited Researchers (HCR) initiative, ensuring a rigorous identification process based on citation metrics. Our study introduces the notion of Highly Cited Sustainability Researchers (HCSRs). HCSRs are authors whose work aligns closely with the SDGs and substantially influences the sustainability discourse due to their high citation count. Identifying HCSRs involves mapping their publications to the SDGs and assessing how much they contribute to understanding and advancing these goals. This unique approach brings together the concept of citation counts, widely used in bibliometrics, and the framework of SDGs, a universally recognized set of goals for sustainable development.

The analysis extends to encompass various facets such as geographical distribution, institutional affiliation, and gender representation. Furthermore, this study goes beyond mere citation counts to explore the researchers' publication patterns, thematic focus, collaborative networks, and overall impact.

At its core, this study seeks to accomplish multiple objectives. First, it provides a snapshot of the influential authors in sustainability research. Second, it gives a nuanced view of the least and most researched SDGs, thereby highlighting areas that require further academic attention. Third, it delves into the patterns of open-access publishing and research collaboration, aspects that are central to the dissemination and impact of research. Lastly, the study analyses the influence these researchers have on academic journals, industries, and policymaking, thereby providing a well-rounded understanding of their contributions.

The outcome of this study bears multiple implications. For academia, it sets the stage for identifying emerging trends and gaps in sustainability research. For policymakers, understanding the geographical and institutional landscapes of these researchers can inform decisions on research funding allocation and strategic collaborations. For industry stakeholders, insights into the thematic focus areas can guide investment into research and development activities that align with sustainability objectives. Therefore, our research aims at answering the following questions.

- RQ1: What is the geographical diversity of researchers?
- RQ2: Are these researchers from public and private institutions?
- RQ3: How well gender is distributed?
- RQ4: Which are the most and least researched SDGs?
- RQ5: What is the trend of publishing in Open Access?
- RQ6: Which are the most sought thematic areas?
- RQ7: What has been the pattern of collaboration?
- RQ8: Which are the most cited articles, and to which SDG are they mapped?
- RQ9: What does the distribution of first, middle, and last author positions look like?

How these objectives are attempted to be achieved is discussed in the Methodology Section.

## 2. Methodology

The schematic diagram of the overall methodology is depicted in Fig. 1. Data collection is the first step in the methodology.

### 2.1. Data collection

The Dimensions database serves as a comprehensive tool for analyzing research publications related to SDGs. With a scope that includes 82.2% more journals than Web of Science and 48.1% more than Scopus, Dimensions offers an expansive journal coverage, making it a robust platform for such examinations [25,26].

The SDGs were established at the Rio+20 Summit in 2012 as a global call to action to end poverty, protect the planet, and ensure peace and prosperity for all. Then, the SDGs were formally adopted by the United Nations General Assembly in September 2015. Consequently, the year 2013 was selected as the starting point for this study, with 2022 marking the midpoint of the target timeline, which culminates in 2030.

Several efforts are underway to align research publications with the United Nations' Sustainable Development Goals (SDGs).

- Aurora-Network-Global's SDG-Queries offer exhaustive queries to map research publications to sustainable development objectives [27].
- Digital Science's initiative in SDG mapping delves into thematic areas, collaboration networks, and funding avenues, assisting stakeholders in identifying lacunae and potential areas for further research in sustainable development.
- The University of Auckland's SDG Mapping platform graphically represents the interrelations between research contributions and SDGs, thus offering an interactive tool for users to gauge the research impact on specific SDGs and enhance collaborative efforts [28].
- The STRINGS initiative aspires to chart and track the global advancement of SDGs [29].
- Elsevier's SDG initiative assigns publications to each of the 17 SDGs through distinct SDG-specific queries [30].

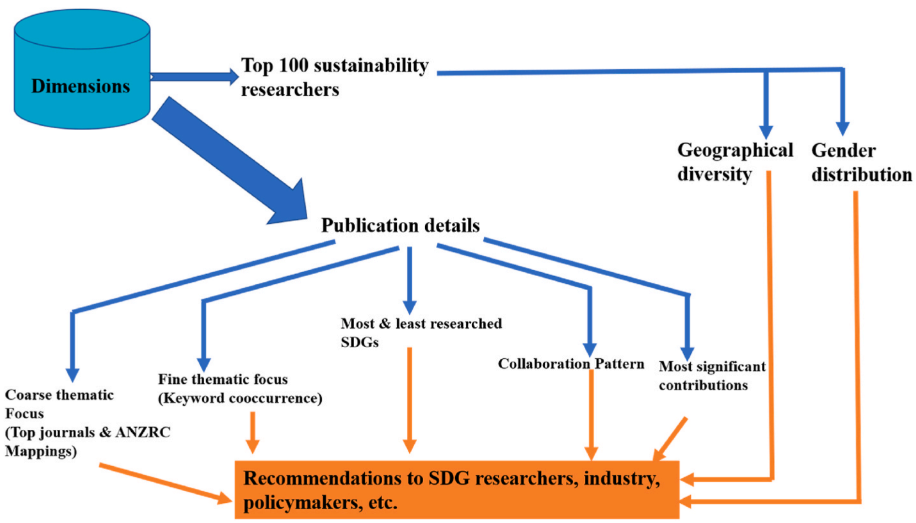


**Fig. 1.** Schematic diagram of the methodology.

The Digital Science SDG initiative was selected for this study due to its seamless integration with the Dimensions database, as well as the availability of pre-defined search queries for each SDG. The search queries have undergone meticulous review and refinement by subject-matter experts and academics and increasingly incorporate machine-learning models for enhanced precision.

The data was accessed from March 1, 2023, to March 30, 2023. The secondary data source (Dimensions database) only provides data that are fully anonymized, and authors had access only to information like the name of the author(s) and their current institution.

### 2.2. Selection of top 100 HCSRs

Among the HCSRs, the top 100 sustainability researchers are identified according to the number of citations they received via the works published from 2013 to 2022. Only their journal publications in the English language were considered.

### 2.3. Geographical distribution, institution type, and gender analysis

After identification of the top 100 sustainability researchers, RQs 1, 2, and 3 can be answered by analysis of their geographical distribution, type of institution, and gender distribution. The data of publications in the meta-data field 'affiliation' will help extract the details that can answer RQs 1 and 2. RQ 3 can be answered by examining the metadata field' gender'.

RQ1 & RQ2 will provide researchers and policymakers with the location of these researchers and can be beneficial for planning some activities, which will be discussed in Results and Discussions. RQ3 will help policymakers make programs that will help to improve Gender diversity in SDG-related research.

### 2.4. Publication pattern analysis

Firstly, the most researched SDG by the top 100 sustainability researchers and the least researched SDG can be identified after extracting the publication list of these researchers in response to RQ4. Then, the thematic focus of these researchers can be identified by keyword co-occurrence network analysis and cluster analysis of the same. This will give an idea about the fine-level thematic focus and answer RQ5. First, the top cited journals in which these publications were published should be identified to gain insights about the research category or coarse-level thematic focus of the researchers. Then, the research categories associated with these journals can be identified using the ANZRC classification [31] adopted by the Dimensions database. Both these together cover RQ6.

### 2.5. Collaboration pattern analysis

Given the complex, multifaceted challenges outlined by the SDGs, research collaboration and interdisciplinarity have become increasingly critical [32,33]. Studies have explored patterns of collaboration at the institutional and country levels, yet there is limited understanding of how highly cited researchers in sustainability are engaged in collaborative research activities.

This study created a co-authorship network of the authors at the level of individual and country. This will show how strongly the top 100 sustainability researchers collaborated to publish these research works. Country-level collaboration pattern is investigated to unveil how these collaborations are reflected at the country level. The co-authorship among 'Female' researchers at the top is extracted from the individual co-authorship network.

Analyzing the co-authorship network at the individual level, especially the cluster analysis, will provide information about important closely knit and loosely bound groups of authors. Cluster analysis at the country level will indicate how well the individual group formation led to the country-level collaboration. This can solve RQ7.

### 2.6. Most important and recent contributions

Apart from giving information about the fine-level thematic focus and coarse-level thematic focus of these researchers, the most significant contribution of these researchers can be identified by determining their most cited works (not the heavily collaborated ones, but the ones with 30 or fewer co-authors) in the period 2013–2022. Similarly, their most recent contributions are also identified this way. Content analysis of these is done to identify the specific contributions of these. These cover the specified RQ8. It can provide a sense of direction to other researchers and policymakers to understand the most significant and recent contributions to make better policies related to their respective SDGs and S&T policy as a whole.

### 2.7. Indicators

- HPSR – Highly Cited Sustainability Researchers (HCSRs)
- SDGs – Sustainable Development Goals
- TP - Total Publications
- TC – Total Citations
- TPS – Total Publications mapped to SDG
- TCS – Total Citations from Publications mapped to SDGs
- %TPS – Percentage Total Publications mapped to SDGs
- %TCS – Percentage Total Citations from publications mapped to SDGs

- TPOA - Total Publications in Open Access
- TPSOA- Total Publications in Open Access mapped to SDGs
- TPS-H - Total Publications mapped to SDGs by HCSRs
- TCS-H - Total Citations from publications mapped to SDGs by HCSRs
- TCSSDG-H - Total Citations from publications mapped to SDGs by HCSRs
- TPSOA-H – Total Publications under Open Access by HCSRs
- TCSOA-H - Total Citations from publications under Open Access by HCSRs

### *2.8. SDG indicators*

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

## 3. Results and discussion

Before proceeding to the research questions, some interesting growth patterns related to sustainability or SDG research are determined from the collected data.

During 2013–2022, the Compound Annual Growth Rate (CAGR) for Total Publications (TP) was 6%; for Sustainability-related Publications (TPS), it was 12.9%; and for Publications by Highly Cited Sustainability Researchers (TPS-H), it stood at 8.7%. CAGR for total citations received by all publications (TC) was 60.3% for 2013–2022. For citations received by sustainability-related publications (TCS), the CAGR was 69.5%. Meanwhile, the CAGR for citations received by publications from Highly Cited Sustainability Researchers (TCS-H) was 66.6%. The CAGR values determined from the growth of the relevant publications and citation data reveal why it is important to analyze SDG-related research.

Publications by HCSR can reflect the critical mass of contributions to sustainability research. This can be confirmed by the analysis of the growth pattern of the average citations for total publications (TC/TP), for sustainability-related publications (TCS/TPS), and for publications by HCSRs (TCS-H/TPS-H). This growth pattern is shown in Fig. 2.

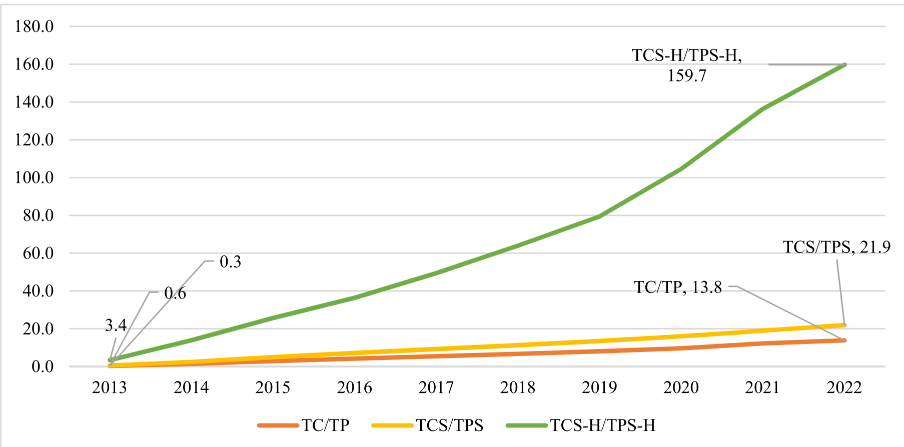


**Fig. 2.** Growth patterns of citations/paper to total publications, sustainability-related publications, and publications by HCSR.

From Fig. 2, we can see that citations/paper by HCSRs outperform the other two sets as it has grown from 3.4 (in 2013) to 159.7 (in 2022) with a CAGR of 53.4 %. CAGRs of total and sustainability-related publication sets are 53 % and 46.8 %, respectively. This may indicate the prevalence of clear demarcation of performance difference between the top 100 and the rest of the sustainability researchers. Reasons for the heavy difference may be because most of the top 100 researchers prefer to work on one or a few of the most researched and cited SDGs and hence can heavily accumulate citations or both. More clarity can be gained only through in-depth analysis directed towards that.

### 3.1. RQ1: geographical distribution

Based on a study by Ref. [34] that the number of HCRs in a country is a good proxy for the overall research output of that country, we explore the geographical distribution of the top 100 HCSRs as shown in Fig. 3. Highest number (25 out of 100) of researchers are found to be from the USA, followed by China (17), the United Kingdom (12), Australia (7), Germany (5), Canada (4), etc. From Asia, other than China, Iran, with three, and Saudi Arabia, with one, have contributed to sustainability research. With halfway to 2030 goals, countries must prioritize sustainability research and nurture sustainability researchers with special research fellowship packages and other allied funding programs after identifying their country's strong and weak SDGs. According to the Sustainable Development Report 2022 [19], countries like Germany, France, etc., are listed in the top 10, and the UK is 11th. The US (41), China (56), and Australia (38) are far behind in the list. The top 10 countries listed contributed 17 top SDG researchers, the top 50 countries produced around 86 researchers, and countries above rank 100 produced six researchers. This confirms that countries with orientation and working towards achieving all the SDGs were somewhat successful in contributing to top SDG researchers.

However, have top SDG researchers provided substantial advantages in attaining one or more SDGs? This question is difficult to answer. Though the SDG ranking of countries by Ref. [35], is based on progress towards the overall achievement of 17 SDGs and our finding of the geographical distribution of the top 100 sustainability researchers is expected to differ, it can be indicative of many facts. An important possibility would be that though countries like the US, China, Australia, etc., have more concentration of top sustainability researchers, they might belong to one or a few SDGs, and that countries might benefit from their research only to those SDGs. Countries with overall progress in 17 SDGs might not have top SDG researchers but might have a large concentration of dedicated SDG researchers in multiple SDGs, and their research efforts and national-level policymakers' effectiveness in utilizing these efforts might have worked in that country's favor. We do not have supporting data for both to embrace and rule out the other. So, this may be treated as an open question, and dedicated research can be carried out.

Next, we compare the list of HCSRs with the HCR 2023 list by Clarivate Analytics. The fact that 87 out of the top 100 Highly Cited Sustainability Researchers are also included in the Highly Cited Researchers list is a validation of our methodology. This overlap suggests that researchers whose work significantly influences the academic field, as measured by citation rates, also contribute substantially to sustainable development, as their work aligns with the SDGs.

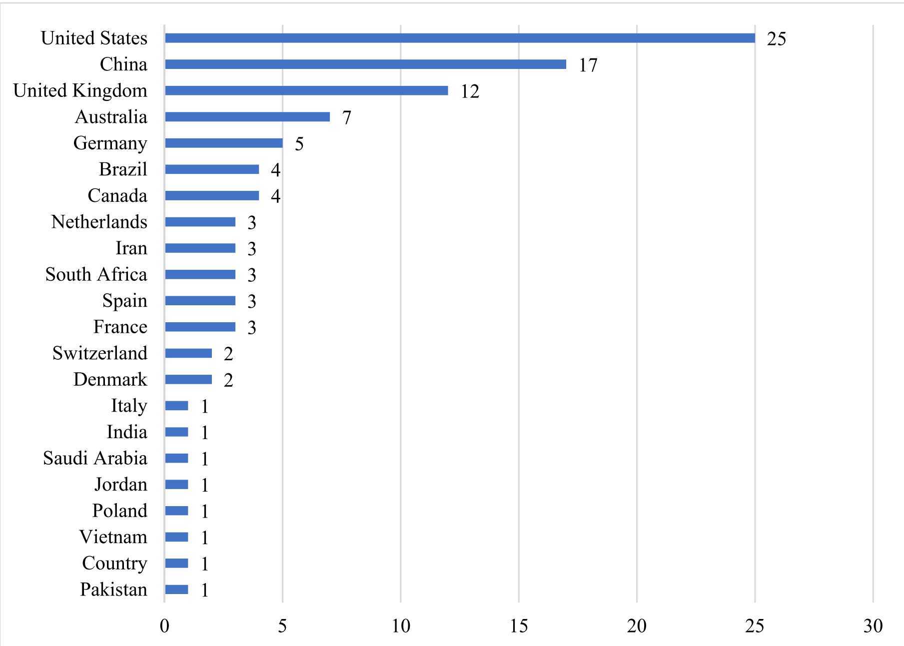


**Fig. 3.** Geographical distribution of the top 100 HCSRs.

### 3.2. RQ2: Author's affiliated institutions

Studies by Refs. [36,37] suggest that the productivity of top sustainability researchers is influenced by their affiliated institutions, highlighting these institutions' significant contributions to sustainability research. The institutional affiliations of HCSRs show a significant imbalance, with only 16 from private institutions compared to 84 from public ones. This discrepancy raises pertinent questions about the contributions of private institutions to sustainable development. One plausible explanation could be that public institutions have greater accessibility to public funds, thereby facilitating more research and publications. Private firms, although possibly contributing to SDGs, appear to be less engaged in academic research and publishing. They might opt for local publications or collaborations with public entities instead. Despite these challenges, the presence of 28 researchers from private institutions is noteworthy and suggests untapped potential. Given the pressing need for a multi-sectoral approach to achieving SDGs, the study recommends that private firms intensify their research efforts and disseminate their findings through established international academic platforms to broaden the scope of effective solutions for sustainable development.

### 3.3. RQ3: gender distribution

Issues of gender and geographic diversity in academic research have received increasing attention, especially in the context of science and engineering fields [38,39]. Studies show that such diversity can drive innovation and produce more comprehensive solutions to complex problems [39]. [40] challenges the common perception of highly cited researchers as individual geniuses who can be singled out for their extraordinary contributions. The authors analyze a sample of highly cited researchers from the Clarivate HCR list and find that their work is often the result of large collective research efforts conducted in research consortia. The study suggests that the ranking of HCRs is very sensitive to the specific method used for allocating papers and citations to individuals [38]. used a bibliometric analysis of 5.4 million research papers to study gender disparities in science. They found that women are underrepresented as authors of highly cited papers and that this gender gap is even more pronounced in the most productive countries.

However, the geographic and gender diversity among highly cited sustainability researchers is an area that has yet to be rigorously explored. Table 1 indicates the gender distribution of the top 100 HCSRs and their corresponding mean citation rates. Specifically, it shows that out of the top 100 researchers, 93 are men, with a citation mean of 174.6, while only 7 are women, with a higher citation mean of 219.8. The overall citation mean for all 100 researchers is 177.8. Though the average citations per paper by women is found to be higher than that of men, the small number of women authors prevents us from clearly saying that the performance of women authors is significantly better than that of men. There is a significant gender disparity in the top HCSR, with men overwhelmingly represented. This could indicate the broader issue of gender inequality within academic research. It is a reminder of the need for intentional, sustained efforts to support female researchers, improve diversity, and reduce barriers to entry and success within academia.

Women HCSRs sorted according to the average citations received for publications are given in Table 2. All these contributors are found to be from 'public' institutions. All these researchers have shown a significant focus on SDG 3, emphasizing the centrality of health-related research within the broader sustainability discourse. Their citation counts and the average number of citations per paper highlight their influential contributions to SDG research.

Elisabete Weiderpass, affiliated with the International Agency for Research on Cancer in France, has the highest total citations from SDG-related research. With the highest mean citation of 411, her work focuses primarily on SDG 3, which is related to good health and well-being. Isabela Judith Martins Bensenor from Brazil's Universidade de São Paulo closely follows Weiderpass. Bensenor also focuses on SDG 3 and has an impressive mean citation of 410.6. Deborah De Carvalho Malta, Ai Koyanagi, and Louisa J. Degenhardt have made notable contributions to SDG research. From Universidade Federal de Minas Gerais in Brazil, Malta focuses on SDGs 3 and 16. From Institució Catalana de Recerca i Estudis Avançats in Spain, Kusanagi focuses on SDGs 2 and 3. From UNSW Sydney in Australia, Degenhardt focuses on SDGs 3 and 16. Marion P. G. Koopmans from Erasmus MC in the Netherlands and Annette Peters from Helmholtz Zentrum München in Germany contribute significantly to SDG-related research.

All these researchers have shown a significant focus on SDG 3, emphasizing the centrality of health-related research within the broader sustainability discourse. Their citation counts and the average number of citations per paper highlight their influential contributions to SDG research.

### 3.4. RQ4: most and least researched SDGs

Fig. 4 enumerates researchers distributed across various Sustainable Development Goals (SDGs). "Good Health and Well Being" (SDG 3) is most represented, with 86 researchers engaged in this area. This is followed by "Zero Hunger" (SDG 2) and "Quality Education" (SDG 4), having 68 and 57 researchers, respectively. "Climate Action" (SDG 13), "Reduced Inequalities" (SDG 10), and

**Table 1**
Gender distribution of HCSRs.

| Gender | HCSRs | Citation mean |
|---|---|---|
| women | 7 | 219.8 |
| men | 93 | 174.6 |
| Total | 100 | 177.8 |

**Table 2**
Women HCSRs, their SDG focus, affiliation.

| Researcher name | Institution | Country | Type | TPS-H | TCS-H | TCS-H/TPS-H | SDG focus |
|---|---|---|---|---|---|---|---|
| Elisabete Weiderpass | International Agency for Research on Cancer | France | Public | 253 | 103992 | 411.0 | SDG 3 |
| Isabela Judith Martins Bensenor | Universidade de São Paulo | Brazil | Public | 248 | 101816 | 410.6 | SDG 3 |
| Deborah De Carvalho Malta | Universidade Federal de Minas Gerais | Brazil | Public | 399 | 80553 | 201.9 | SDGs 3 & 16 |
| Ai Koyanagi | Institució Catalana de Recerca i Estudis Avançats | Spain | Public | 395 | 70769 | 179.2 | SDGs 2 & 3 |
| Louisa J Degenhardt | UNSW Sydney | Australia | Public | 388 | 58693 | 151.3 | SDGs 3 & 16 |
| Marion P G Koopmans | Erasmus MC | Netherlands | Public | 304 | 29611 | 97.4 | SDG 3 |
| Annette Peters | Helmholtz Zentrum München | Germany | Public | 297 | 26084 | 87.8 | SDGs 3 & 15 |

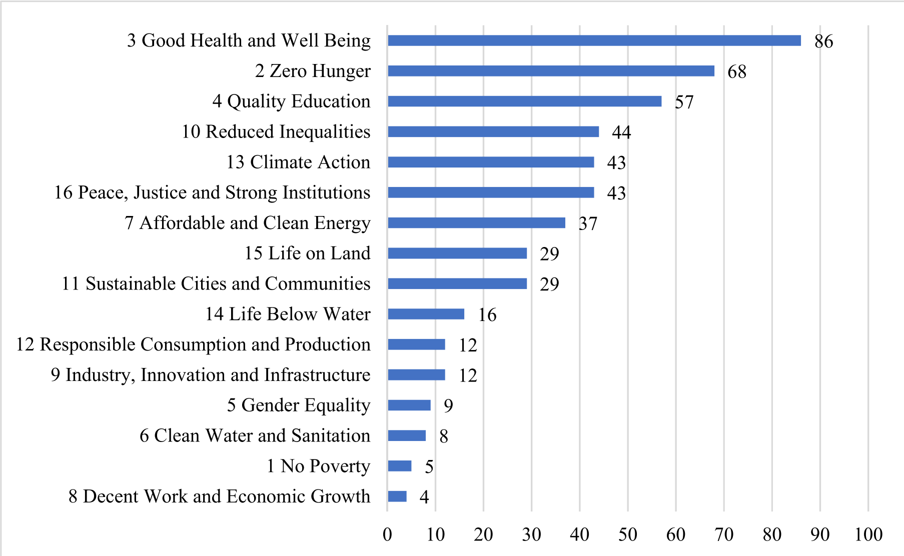


**Fig. 4.** Top 100 HCSRs and their SDG focus.

**Table 3**
Number of publications, citations received, and mean citations in each SDG.

| SDG | TPS-H | TCS-H | TCS-H/TPS-H | %Share of publications |
|---|---|---|---|---|
| SDG 3 | 21795 | 1866743 | 85.65 | 67.32% |
| SDG 7 | 8099 | 841312 | 103.88 | 25.02% |
| SDG 13 | 1733 | 156862 | 90.51 | 5.35% |
| SDG 15 | 667 | 67524 | 101.24 | 2.06% |
| SDG 2 | 519 | 41830 | 80.6 | 1.60% |
| SDG 11 | 405 | 19902 | 49.14 | 1.25% |
| SDG 4 | 307 | 13025 | 42.43 | 0.95% |
| SDG 16 | 230 | 7907 | 34.38 | 0.71% |
| SDG 16 | 207 | 23691 | 114.45 | 0.64% |
| SDG 6 | 112 | 10404 | 92.89 | 0.35% |
| SDG 14 | 96 | 7303 | 76.07 | 0.30% |
| SDG 5 | 93 | 2443 | 26.27 | 0.29% |
| SDG 8 | 52 | 2911 | 55.98 | 0.16% |
| SDG 1 | 46 | 1862 | 40.48 | 0.14% |
| SDG 12 | 45 | 2655 | 59 | 0.14% |
| SDG 17 | 9 | 158 | 17.56 | 0.03% |
| SDG 9 | 8 | 234 | 29.25 | 0.02% |

"Peace, Justice and Strong Institutions" (SDG 16) are relatively well represented, each with over 40 researchers. Conversely, "Decent Work and Economic Growth" (SDG 8) and "No Poverty" (SDG 1) are the least represented, with 4 and 5 researchers, respectively. This distribution suggests that the research community is highly engaged in health, education, and climate action, while areas such as economic growth and poverty alleviation are underrepresented.

Table 3 showcases the number of publications of the top 100 HCSRs concerning various SDGs, the citations received in each SDG, mean citations, and % share of publications.

The most striking observation is the substantial focus on SDG3 - Good Health and Well-Being, accounting for 67.32% of all publications. It is followed by SDG7 - Affordable and Clean Energy, contributing 25.02%. The concentration on these two areas is highlighted by the considerable gap between them and the third-most focused area, SDG13 - Climate Action, which only represents 5.35% of all publications. Regarding citations per paper, both SDGs perform better than SDG 3. The most performing SDG in terms of citations per paper is SDG 10: Reducing inequalities. However, it is modest regarding the number of publications and citations; hence, its effect can be marginal. Thus, the excellent performance and growth trend of the top 100 sustainability researchers' works can be reasonably attributed to their nature of work that got aligned to the most popular SDGs, such as 3, 7, and 13.

Global health crises, like the COVID-19 pandemic, might have driven research focus toward health and well-being. As for SDG7, growing environmental concerns and the urgent need to combat climate change may have directed research towards renewable energy. Health and energy sectors often receive substantial funding, which fuels further research. Conversely, SDGs like 1 (No Poverty) and 12 (Responsible Consumption and Production) receive less attention. This might be due to their complex, multifaceted nature, which makes it difficult to devise straightforward research approaches and see immediate results. These areas might also lack adequate funding compared to health or energy. The least researched SDGs are SDGs 17 and 9, representing Partnerships for Goals and Industry, Innovation, and Infrastructure.

Table 4 provides an overview of the temporal evolution of publications mapped to each of the SDGs from 2013 to 2022, as well as the percent change pre-2015 (before the UN's official adoption of the SDGs) and post-2015.

When interpreting the data, several notable patterns emerge between the pre-2015 and post-2015 periods for certain SDGs: Increased Focus on Climate and Health: SDG3 (Good Health and Well Being) and SDG13 (Climate Action) have seen considerable growth in publications post-2015. This increase might be attributable to the growing global awareness of climate change and health-related issues, accelerated by events like the Paris Agreement and the COVID-19 pandemic. Some SDGs that had minimal attention pre-2015, such as SDG5 (Gender Equality), SDG14 (Life Below Water), and SDG12 (Responsible Consumption and Production), have shown considerable percentage growth post-2015. This might suggest that the formal adoption of the SDGs has broadened the research focus to include these previously underrepresented areas. Some SDG8 (Decent Work and Economic Growth) and SDG17 (Partnerships for the Goals) have shown negative growth post-2015, indicating inconsistent progress and attention toward these areas.

### 3.5. RQ5: trend of publishing in open access by HCSRs

Open-access publishing has emerged as an important trend in academic research, providing unrestricted access to research findings [41]. Several studies indicate a positive correlation between open access and research impact, measured through citations and online engagement [41,42]. However, the extent to which highly cited researchers in sustainability are engaged in open-access publishing remains underexamined.

Fig. 5 presents data on the trend of open access (OA) publications in general, those related to SDGs specifically termed as TPSOA, and those related to SDGs published by sustainability researchers (TPSOA-H). There is a clear upward trend in the percentage of open access (TPOA) publications from 2013 to 2022. This trend may signal a transition towards a broader academic trend to make research more accessible. The percentage of open-access publications related to SDGs (TPSOA) is consistently higher than the general

**Table 4**
Dynamics of publications by HCSRs in different SDGs.

| SDG | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | pre-2015 | post-2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SDG 7 | 288 | 410 | 552 | 654 | 823 | 998 | 1108 | 1130 | 1113 | 1026 | 92% | 57% |
| SDG 13 | 103 | 95 | 115 | 133 | 172 | 207 | 203 | 212 | 247 | 247 | 12% | 86% |
| SDG 2 | 33 | 28 | 29 | 43 | 63 | 62 | 52 | 68 | 80 | 61 | −12% | 42% |
| SDG 3 | 1477 | 1630 | 1717 | 1915 | 1981 | 2067 | 2231 | 3076 | 2958 | 2742 | 16% | 43% |
| SDG 15 | 48 | 54 | 63 | 61 | 66 | 96 | 68 | 75 | 74 | 62 | 31% | 2% |
| SDG 4 | 14 | 14 | 30 | 37 | 30 | 30 | 34 | 39 | 44 | 35 | 114% | −5% |
| SDG 5 | 5 | 4 | 3 | 7 | 8 | 6 | 11 | 15 | 14 | 20 | −40% | 186% |
| SDG 1 | 6 | 4 | 7 | 1 | 5 | 1 | 4 | 12 | 4 | 2 | 17% | 100% |
| SDG 8 | 3 | 5 | 9 | 4 | 2 | 9 | 7 | 5 | 6 | 2 | 200% | −50% |
| SDG 9 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 2 | −100% | 100% |
| SDG 6 | 3 | 9 | 1 | 12 | 5 | 9 | 14 | 22 | 22 | 15 | −67% | 25% |
| SDG 16 | 17 | 12 | 18 | 16 | 27 | 28 | 30 | 35 | 21 | 26 | 6% | 63% |
| SDG 11 | 15 | 26 | 30 | 32 | 56 | 42 | 47 | 61 | 52 | 44 | 100% | 38% |
| SDG 17 | 1 | 2 | 0 | 2 | 1 | 0 | 2 | 0 | 0 | 1 | −100% | −50% |
| SDG 14 | 8 | 5 | 4 | 2 | 9 | 13 | 16 | 8 | 14 | 17 | −50% | 750% |
| SDG 12 | 1 | 3 | 2 | 1 | 7 | 3 | 2 | 3 | 12 | 11 | 100% | 1000% |
| SDG 10 | 11 | 14 | 20 | 17 | 21 | 16 | 19 | 33 | 28 | 28 | 82% | 65% |

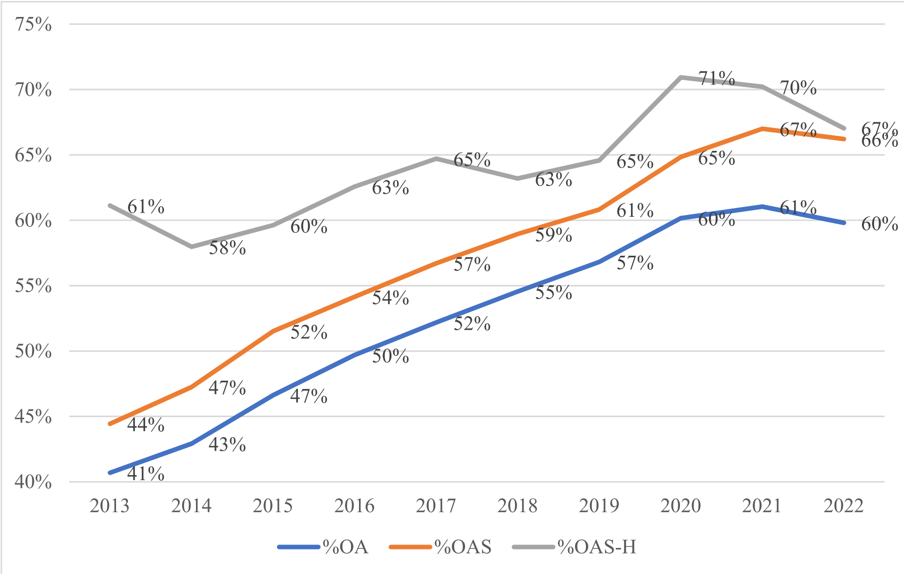


**Fig. 5.** Open access publication trend (overall, sustainability research and sustainability research by HCSRs).

percentage of TPOA publications. This might be due to an awareness of the global importance of SDGs and the necessity to make this research accessible to as wide an audience as possible, including policymakers, practitioners, and the general public. Interestingly, the percentage of open-access SDG-related publications by sustainability researchers (TPSOA-H) is even higher than the general TPSOA percentage. This might suggest that researchers in the field of sustainability are particularly committed to the principles of open access, which aligns with the overall ethos of the SDGs - cooperation, accessibility, and transparency.

Ranked according to publications, Table 5 shows that SDG3 tops in open access, followed by SDG7 and SDG13. In terms of impact due to citations from open access, it is SDGs 10, 4, and 16 that are leading. Interestingly, SDG7 has the lowest percentage of citations from open access. Sustainability research is inherently interdisciplinary, covering a wide array of themes from environmental sciences to social equity and economic development [43]. Although some studies have identified dominant themes within sustainability research, the thematic focus areas of highly cited researchers have not been systematically explored.

### 3.6. RQ6: most sought fine thematic areas (through keyword co-occurrence)

Fig. 6a and b show thematic clusters based on keyword co-occurrences for 2013 and 2022, respectively. The total number of keywords in 2013 was 13056, and those occurring at least 15 times are shown in Fig. 6a. Similarly, the total number of keywords in 2022 was 26124, and those occurring at least 15 times are shown in Fig. 6b.

Table 6 compares the thematic clusters for 2013 vs. 2022. In 2013, there were three clusters, while in 2022, we have four. By analyzing each cluster, we can infer the fine thematic focus and possibly associate them with specific SDGs.

**Table 5**
SDG-wise distribution of OA publications by sustainability researchers and citations received by those publications. '

| SDG | TPSOA-H | TPS-H | %TPSOA-H | TCS-H | TCSOA-H | %TCSOA-H |
|---|---|---|---|---|---|---|
| SDG 3 | 16380 | 21795 | 75% | 1866743 | 1686014 | 90% |
| SDG 7 | 2889 | 8099 | 36% | 841312 | 310021 | 37% |
| SDG 13 | 1248 | 1733 | 72% | 156862 | 114231 | 73% |
| SDG 15 | 498 | 667 | 75% | 67524 | 55678 | 82% |
| SDG 2 | 422 | 519 | 81% | 41830 | 30865 | 74% |
| SDG 11 | 243 | 405 | 60% | 19902 | 14238 | 72% |
| SDG 4 | 247 | 307 | 80% | 13025 | 12643 | 97% |
| SDG 16 | 194 | 230 | 84% | 8907 | 8490 | 95% |
| SDG 10 | 171 | 207 | 83% | 23691 | 23101 | 98% |
| SDG 6 | 68 | 112 | 61% | 10404 | 7267 | 70% |
| SDG 14 | 43 | 96 | 45% | 7437 | 2944 | 40% |
| SDG 5 | 78 | 93 | 84% | 2443 | 2089 | 86% |
| SDG 8 | 39 | 52 | 75% | 2911 | 2109 | 72% |
| SDG 1 | 37 | 46 | 80% | 1862 | 1045 | 56% |
| SDG 12 | 28 | 45 | 62% | 2655 | 2058 | 78% |
| SDG 17 | 7 | 9 | 78% | 158 | 112 | 71% |
| SDG 9 | 5 | 8 | 63% | 234 | 97 | 41% |

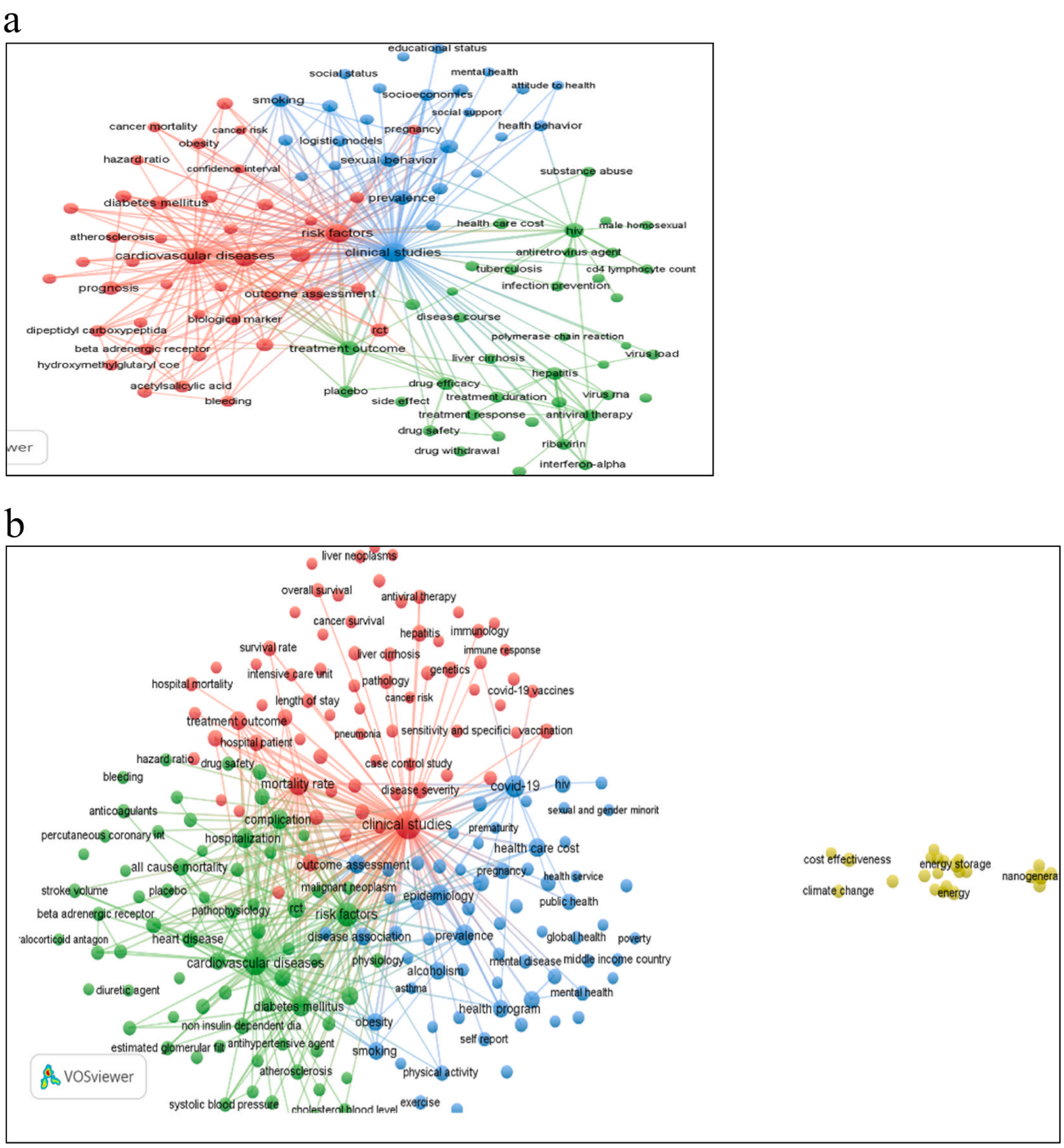


**Fig. 6a.** Thematic clusters for the year 2013 based on keyword co-occurrence
Fig. 6b Thematic clusters for the year 2022 based on keyword co-occurrence.

Firstly, the keyword co-occurrence network for 2013 is analyzed.

1. Cluster 1: Given terms like ‘risk factors’, ‘cardiovascular diseases’, ‘mortality’, ‘diabetes mellitus’, and ’prognosis’, this cluster can be themed as ‘Non-Communicable Diseases and Health Risk Factors’. It’s strongly related to SDG 3: Good Health and Well-being, as it concerns major non-communicable diseases and their potential triggers.
2. Cluster 2: This cluster focuses on ‘Clinical Studies and Disease Severity’ as indicated by keywords such as ‘clinical studies’, ‘mortality rate’, ‘comorbidity’, ‘disease severity’, and ’biomarkers’. While it also relates to SDG 3: Good Health and Well-being due to its medical nature, it could potentially connect with SDG 9: Industry, Innovation, and Infrastructure, considering the innovation in biomarkers and other clinical tools.
3. Cluster 3: The presence of ‘hiv’, ’hepatitis’, ‘antiviral therapy’, ‘drug efficacy’, and ‘treatment outcome’ suggests a theme of ‘Infectious Diseases and Treatment Strategies’. This cluster aligns with SDG 3: Good Health and Well-being, with a particular focus on target 3.3, which aims to combat hepatitis, AIDS, and other communicable diseases.

All three clusters primarily concern SDG 3: Good Health and Well-being, but with different health-related focuses. These themes underscore the importance of addressing non-communicable and infectious diseases while promoting advancements in clinical studies and healthcare technologies.

**Table 6**
Top keywords in each cluster for years 2013 and 2022.

| Cluster themes | | | | |
|---|---|---|---|---|
| | Non-Communicable Diseases and Health Risk Factors | Clinical Studies and Disease Severity | Infectious Diseases and Treatment strategies | Advanced Energy Technologies |
| Year | Cluster 1 | Cluster 2 | Cluster 3 | |
| **2013** | risk factors, cardiovascular diseases, mortality, disease association, outcome assessment, diabetes mellitus, prognosis, rct, comorbidity, time factors | clinical studies, mortality rate, treatment outcome, comorbidity, prognosis, disease severity, hospital patient, blood sampling, genetics, biomarkers | treatment outcome, HIV, hepatitis, drug efficacy, antiviral therapy, placebo, drug effect, drug safety, ribavirin, treatment duration | |
| **Year** | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** |
| **2022** | cardiovascular diseases, risk factors, diabetes mellitus, hospitalization, complication, rct, body mass index, cerebrovascular accident, chronic kidney disease, diabetes mellitus | clinical studies, mortality rate, treatment outcome, comorbidity, prognosis, disease severity, hospital patient, blood sampling, genetics, biomarkers | covid-19, prevalence, epidemiology, outcome assessment, health care cost, obesity, disease association, smoking, health program, sexual behavior | nanogenerators, triboelectricity, triboelectric nanogenerators, quality control, nanotechnology, energy harvesting, energy, energy storage, hydrogen production, solar power generation |

**Table 7**
Top 10 among the most sought journals by the HCSRs.

| **Name** | **Publications** | **Citations** | **Citations (mean)** | **Name** | **Publications** | **Citations** | **Citations (mean)** |
|---|---|---|---|---|---|---|---|
| Circulation | 567 | 28505 | 50.3 | CA A Cancer Journal for Clinicians | 48 | 301575 | 6282.8 |
| European Heart Journal | 511 | 41549 | 81.3 | The Lancet | 391 | 242072 | 619.1 |
| PLOS ONE | 506 | 18906 | 37.4 | New England Journal of Medicine | 144 | 144890 | 1006.2 |
| Nano Energy | 434 | 42346 | 97.6 | Advanced Materials | 346 | 87306 | 252.3 |
| Advanced Energy Materials | 394 | 47021 | 119.3 | Nature | 133 | 69271 | 520.8 |
| The Lancet | 391 | 242072 | 619.1 | Nature Communications | 343 | 60122 | 175.3 |
| Journal of Materials Chemistry A | 377 | 35860 | 95.1 | Advanced Energy Materials | 394 | 47021 | 119.3 |
| BMJ Open | 346 | 6747 | 19.5 | Science | 89 | 44920 | 504.7 |
| Advanced Materials | 346 | 87306 | 252.3 | Nano Energy | 434 | 42346 | 97.6 |
| Nature Communications | 343 | 60122 | 175.3 | JAMA | 105 | 41832 | 398.4 |
| Journal of the American College of Cardiology | 319 | 23727 | 74.4 | European Heart Journal | 511 | 41549 | 81.3 |
| Journal of Hepatology | 318 | 10176 | 32.0 | ACS Nano | 244 | 40188 | 164.7 |
| ACS Applied Materials & Interfaces | 273 | 19934 | 73.0 | Journal of Materials Chemistry A | 377 | 35860 | 95.1 |
| Advanced Functional Materials | 254 | 29519 | 116.2 | Advanced Functional Materials | 254 | 29519 | 116.2 |
| ACS Nano | 244 | 40188 | 164.7 | Circulation | 567 | 28505 | 50.3 |

For the keyword co-occurrence network for 2022, cluster analysis details are given below.

1. Cluster 1: With terms like 'cardiovascular diseases', 'risk factors', 'diabetes mellitus', and 'chronic kidney disease', this cluster can be themed as 'Non-Communicable Diseases and Health Risk Factors', aligning primarily with SDG 3: Good Health and Well-being.
2. Cluster 2: Highlighting 'clinical studies', 'mortality rate', 'disease severity', and 'biomarkers', this cluster can be themed 'Clinical Studies and Disease Severity'. It relates to SDG 3: Good Health and Well-being, and potentially to SDG 9: Industry, Innovation and Infrastructure given the scientific advancements in health technologies.
3. Cluster 3: Focusing on 'COVID-19′, 'prevalence', 'epidemiology', 'obesity', and 'smoking', this cluster can be themed 'Infectious Diseases, Lifestyle Factors and Health Care'. It strongly aligns with SDG 3: Good Health and Well-being.
4. Cluster 4: The presence of 'nanogenerators', 'triboelectricity', 'energy harvesting', 'energy storage', and 'solar power generation' suggests an 'Advanced Energy Technologies' theme. This cluster is most associated with SDG 7: Affordable and Clean Energy and SDG 9: Industry, Innovation, and Infrastructure.

Comparing the themes from 2013 to 2022, it is apparent that the research landscape has evolved. The themes concerning non-communicable diseases, health risk factors, and clinical studies have remained, indicating the persistent significance of these areas. However, we see the emergence of two new themes: 'Infectious Diseases, Lifestyle Factors and Health Care', and 'Advanced Energy Technologies'. The inclusion of 'COVID-19′ in the keywords indicates how the pandemic has influenced research, while the focus on lifestyle factors like 'obesity' and 'smoking' illustrates an expanded view of health determinants. The fourth theme signifies an increased interest in sustainable energy technologies, reflecting global urgency to address climate change and energy sustainability.

### *3.7. The most sought coarse thematic areas by the HCSRs*

As mentioned in the methodology, the most thematic areas can be identified by identifying the most sought journals by HCSRs and then determining the research categories associated with those journals. Table 7 lists the top journals according to their number of

**Table 8**
SDG focus of most sought journals by HCSRs.

| Journal | SDG 3 | SDG 7 | SDG 13 | SDG 15 | SDG 2 | SDG 11 | SDG 4 | SDG 16 | SDG 10 | SDG 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Circulation | 562 | 0 | 0 | 0 | 0 | 2 | 7 | 0 | 2 | 0 |
| European Heart Journal | 505 | 0 | 1 | 1 | 3 | 2 | 3 | 1 | 0 | 0 |
| PLOS ONE | 473 | 4 | 10 | 8 | 11 | 5 | 6 | 2 | 7 | 1 |
| Nano Energy | 7 | 425 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Advanced Energy Materials | 0 | 394 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| The Lancet | 381 | 0 | 0 | 1 | 10 | 3 | 4 | 10 | 8 | 2 |
| Journal of Materials Chemistry A | 0 | 371 | 11 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| BMJ Open | 319 | 0 | 1 | 2 | 8 | 6 | 13 | 7 | 5 | 1 |
| Advanced Materials | 4 | 338 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Nature Communications | 123 | 173 | 45 | 15 | 6 | 0 | 0 | 0 | 1 | 2 |
| Journal of the American College of Cardiology | 315 | 0 | 0 | 0 | 1 | 2 | 4 | 0 | 0 | 0 |
| Journal of Hepatology | 317 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| ACS Applied Materials & Interfaces | 0 | 272 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Advanced Functional Materials | 2 | 249 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| ACS Nano | 5 | 236 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

publications and number of citations. The left side ranks them by the number of publications, while the right side ranks them by the number of citations.

"Circulation" has the highest number of publications (567), but its mean citations (50.3) are relatively low compared to other journals on the list. This could indicate that while the journal publishes much research, each article may not have a high impact or visibility. Conversely, "The Lancet", with 391 publications, has a substantially higher mean citation rate (619.1), indicating that its publications might be of higher impact or more widely read or referenced within the scientific community. "CA A Cancer Journal for Clinicians", with only 48 publications, tops the list when ranked by citations and has a very high mean citation rate (6282.8). This suggests that while the journal has fewer publications, the work it publishes substantially impacts the field. "The Lancet" and "New England Journal of Medicine" follow, with high numbers of total citations and high mean citation rates, indicating both journals publish work that has significant influence within the scientific community. It's also interesting to see that some journals, like "The Lancet", "Advanced Materials", "Nature Communications", and "Advanced Energy Materials", appear in the top list of both categories, which indicates that these journals not only publish a significant amount of research but also the research they publish is highly impactful, as measured by citations.

Interpreting this data is also worth considering the fields these journals represent. For instance, the high number of citations for medical journals like "The Lancet" could indicate the importance and broad relevance of health-related research. Similarly, the prominence of materials and energy-related journals may reflect current global priorities and research trends around sustainability and technology development.

Table 8 shows the focus of top journals on different Sustainable Development Goals (SDGs) based on their publication record. Each row represents a journal, and each column represents a particular SDG. The numbers in the table cells indicate the number of publications in each journal that correspond to each SDG.

The journal "Circulation" primarily focuses on SDG 3 - Good Health and Well Being, with 562 articles, with a small number of publications focusing on SDG 4 - Quality Education and SDG 11 - Sustainable Cities and Communities. This suggests a primary focus on health, which aligns with the journal's theme. "European Heart Journal" has a similar pattern as "Circulation", with a strong focus on SDG 3 and minor focuses on SDGs 2, 4, and 11. This again aligns with the journal's medical orientation. "PLOS ONE" shows a more diverse distribution across several SDGs, although it still significantly focuses on SDG 3. This is reflective of PLOS ONE's broad scope as a multidisciplinary journal. "Nano Energy" and "Advanced Energy Materials" have the most publications for SDG 7 - Affordable and Clean Energy, which is expected given their focus on energy research. "The Lancet" also focuses on SDG 3, but it also has some publications addressing SDGs 2, 4, 10, and 11, indicating a more interdisciplinary approach to health and well-being.

In summary, most journals' publication patterns align with their focus areas, with health-oriented journals mainly contributing to SDG 3 and energy/materials-oriented journals to SDG 7. However, some journals like PLOS ONE and The Lancet demonstrate a broader spread across SDGs, reflecting their multidisciplinary nature. Researchers and policymakers must understand these trends as they navigate the literature and seek venues for publishing SDG-related work.

The coarse thematic areas of focus of the top 5 cited journals are discussed next. Heat map representation of the top 5 cited journals according to the number of publications in ANZSRC 2020 research categories and mapping to different SDGs is shown in Tables 9–13.

### *3.8. CA A Cancer Journal for clinicians (IF 286.13)*

Among the top 5 cited journals, despite being a selective journal with very few publications shared, CA A Cancer Journal for Clinicians occupies the top position due to its emphasis on one of the major life-threatening diseases and its various clinical and therapeutical aspects (Table 9). Most of its articles mapped to SDGs belong to the research category '32 Biomedical & Clinical Sciences'. These articles are mostly mapped to SDG 3: Good Health and Well-being. Very few articles are also mapped to SDGs 4, 10, and 2. The most cited subcategory is '3211 Oncology & Carcinogenesis'. Researchers working on this category, especially the subcategory 3211, can eye this journal and set it as one of the top benchmarks as this journal may ensure maximum reach and citations to their work. Practicing clinicians and health policymakers should make it a point to carefully follow this journal to get updated information on findings and new leads that may revolutionize therapeutics.

### *3.9. The Lancet (IF: 202.731)*

The Lancet occupies second position among most cited journals but with not a low publication share compared to CA A Cancer Journal for Physicians (Table 10). Most publications are found in the research category '42 Health Sciences'. The category '32 Biomedical and Clinical Sciences' is the second hottest category. The Lancet contains multiple-authored publications by top researchers, most of which are global studies of the burden of fatal diseases. Most of the publications belong to SDG 3. SDGs 16, 4, and 10 come next. So, researchers in 42 Health Sciences' (especially 4206 Public Health) can set this as the highest benchmark journal. Researchers in '32 Biomedical and Clinical Sciences' (especially 3202 Clinical Sciences') can make this one of their top target journals.

**Table 9**
Coarse thematic focus of the journal 'CA: A Cancer Journal for Clinicians'.

| | SDG 3 | SDG 4 | SDG 10 | SDG 2 |
|---|---|---|---|---|
| 32 Biomedical & Clinical Sciences | 159 | 3 | 2 | 1 |

**Table 10**
The coarse thematic focus of the journal 'The Lancet.'

| | SDG 3 | SDG 16 | SDG 2 | SDG 4 | SDG 5 | SDG 10 | SDG 13 | SDG 6 | SDG 11 |
|---|---|---|---|---|---|---|---|---|---|
| 32 Biomedical & Clinical Sciences | 2056 | 73 | 61 | 51 | 33 | 32 | 28 | 10 | 9 |
| 42 Health Sciences | 2196 | 131 | 71 | 128 | 49 | 107 | 22 | 16 | 23 |

**Table 11**
The coarse thematic focus of the journal' New England Journal of Medicine.'

| | SDG 3 | SDG 16 | SDG 4 | SDG 2 | SDG 5 | SDG 13 | SDG 9 | SDG 8 | SDG 11 |
|---|---|---|---|---|---|---|---|---|---|
| 32 Biomedical & Clinical Sciences | 2539 | 57 | 42 | 20 | 17 | 10 | 5 | 3 | 2 |
| 42 Health Sciences | 1392 | 58 | 26 | 7 | 12 | 12 | 5 | 8 | 6 |

**Table 12**
The Coarse thematic focus of the journal' Advanced Materials.'

| | SDG 7 | SDG 13 | SDG 3 | SDG 6 | SDG 11 | SDG 12 | SDG 2 | SDG 14 | SDG 15 | SDG 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 34 Chemical Sciences | 2567 | 140 | 134 | 12 | 12 | 12 | 7 | 5 | 4 | 0 |
| 40 Engineering | 2907 | 139 | 190 | 19 | 14 | 15 | 6 | 7 | 4 | 7 |
| 51 Physical Sciences | 506 | 12 | 114 | 3 | 3 | 3 | 4 | 2 | 2 | 0 |

**Table 13**
The Coarse thematic focus of the journal' Nature Communications.'

| | SDG 3 | SDG 14 | SDG 13 | SDG 15 | SDG 7 | SDG 2 | SDG 12 | SDG 10 | SDG 6 | SDG 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| 31 Biological Sciences | 1294 | 333 | 252 | 242 | 144 | 45 | 16 | 7 | 5 | 4 |
| 32 Biomedical & Clinical Sciences | 1994 | 9 | 9 | 12 | 35 | 17 | 0 | 3 | 0 | 0 |
| 34 Chemical Sciences | 83 | 4 | 128 | 11 | 1358 | 2 | 10 | 0 | 2 | 5 |
| 37 Earth Sciences | 25 | 340 | 618 | 67 | 42 | 8 | 0 | 0 | 12 | 5 |
| 40 Engineering | 41 | 24 | 144 | 8 | 1424 | 1 | 10 | 0 | 9 | 4 |

Besides researchers, practicing professionals from different medical backgrounds can follow this journal. Being a much broader journal, health policymakers can follow this journal to obtain decisive information to plan reforms. Apart from medical science researchers and professionals, researchers from social sciences and humanities and professionals from education and law backgrounds can follow this journal as SDGs 16, 4, and 10 are also reasonably represented by this journal during our study period. General S&T policymakers may also benefit from following the journal.

### *3.10. New England Journal of Medicine (IF: 176.1)*

For the New England Journal of Medicine journal, '32 Biomedical & Clinical Sciences' is the research category to which the greatest number of publications belongs (Table 11). It is followed by '42 Health Sciences'. Obviously, the most mapped SDG is SDG 3. Researchers in both these categories (especially subcategories 3202 Clinical Sciences and 4203 Health Services and Systems) can target this journal. Though its impact factor is comparatively less than 'The Lancet,' it will be a more suitable target for researchers in subcategory 3202 as this journal focuses more on this subcategory than 'The Lancet'. Apart from researchers, practitioners, health system administrators, and health policymakers should follow the issues of this journal regularly.

### *3.11. Advanced materials (IF: 32.09)*

This journal is dominated by research categories '40 Engineering', '34 Chemical Sciences' and '51 Physical Sciences' (Table 12). Its major contribution is 'SDG 7: Affordable and Clean Energy'. While '4016 Materials Engineering' is the major subcategory in which most publications are found in category 40, '3406 Physical Chemistry' tops the list of category 34, and '5104 Condensed Matter Physics' becomes the topper in the list of category 51. Thus, this journal is particularly suitable for SDG 7 researchers if their faculties lie in either materials engineering, physical chemistry, or condensed matter physics. Like the previous three journals, this journal is also worthy of the attention of academia and industry. If it is the pharmaceutical industry, biomedical industry, etc., for the previous three journals, in the case of this journal, several industries where advanced materials and energy can play phenomenal roles should be interested in following the new developments reported. This way, possible paradigm shifts, technological obsolescence, or disruptions can be detected earlier and planned accordingly. S&T policymakers and energy policymakers should be vigilant about these shifts, too.

### 3.12. Nature Communications (IF: 17.69)

Nature Communications is known to be interdisciplinary and multidisciplinary. Most publications are found to be from '32 Biomedical & Clinical Sciences', in which '3207 Medical microbiology' contributes the most (Table 13). '40 Engineering' is the second highest category in the productive category list, with '4016 Materials Engineering' as the subcategory that contributes the most. '34 Chemical Sciences' is third, with '3406′ Physical chemistry as the most significant contributor. While category 32 contributed mostly to SDG 3, categories 40 and 34 contributed to SDG 7. Again, to SDG 3, there is a major contribution from '31 Biological Sciences', with '3103 Ecology' being the highest contributor. A significant contribution to 'SDG 13: Climate Action' is visible from category '37 Earth Sciences'; the subcategory that contributed most is '3709 Physical Geology and Environmental Geoscience'. Some other contributions from several research categories, like Physical Sciences, Agricultural Sciences, Information, and computing Sciences, etc., justify the interdisciplinarity and multi-disciplinarity focus of the journal. However, the heat map shows the most significant contributing categories and their density in publications.

Thus, though researchers from any discipline can eye this journal for disseminating their good quality works, SDG researchers working in SDGs 3, 7, and 13 might have a slight edge over the others, especially if they are working in main categories 31, 40, 34, 31 and 37 and subcategories 3207, 4016, 3406, 3103 and 3709. Though this journal is not especially focused on the medical field, researchers from that background and practitioners are known to be following this journal. We recommend the same for those who are not doing so. Researchers in academia and industry from Physical, Chemical, and Engineering Science backgrounds should also follow this journal. Aspirants in Climate Action SDG should also try to follow this journal and make this journal a target to build a successful career. National-level S&T policymakers, health policymakers, energy policymakers, environmental and climate action policymakers, etc., should carefully follow this journal to be effective.

### 3.13. RQ7: collaboration pattern of HCSRs

Fig. 7 shows the distribution of publications based on the number of authors involved. The columns represent the number of co-authors and the number of publications corresponding to that count.

A minority of papers (227) are single-authored, suggesting that sustainability research tends to be a collaborative endeavor. The largest category is 6–9 authors, with 10,978 publications. This suggests that medium-sized teams are most common in this field, possibly reflecting the interdisciplinary nature of sustainability research, which often requires diverse expertise. A significant number of papers with larger author counts (14–17 and 18+) indicate that large collaborative efforts are not uncommon in this field. The presence of papers with very high author counts (500+ and 1000+) is striking. These are likely to represent major international collaborations, often in fields like physics or genomics, where large datasets are analyzed, and many people contribute to the work. There are 36 papers with 1000+ authors, indicating that large-scale, collaborative, international research is a key feature of highly cited sustainability research.

Overall, these statistics underscore the collaborative and interdisciplinary nature of sustainability research. It suggests the importance of teamwork, cooperation, and broad expertise in addressing complex sustainability issues.

Fig. 8 indicates the distribution of publications by Highly Cited Sustainability Researchers based on the number of collaborating countries. The columns represent the number of countries involved and the corresponding number of publications.

Most papers (3,599) involve authors from just one country. This suggests that while sustainability is a global concern, many research efforts are carried out within a single country. Most publications involve collaboration between 2 and 5 countries (17,740 publications). This underlines the international character of sustainability research, reflecting the need for diverse perspectives and data to tackle globally relevant issues. There are fewer publications involving medium (6–9) and large (10–17) numbers of countries,

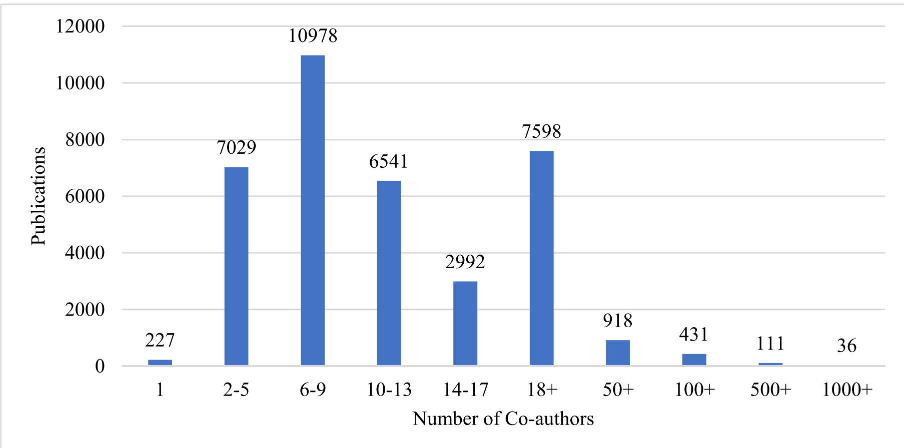


**Fig. 7.** Distribution of co-authors per publication.

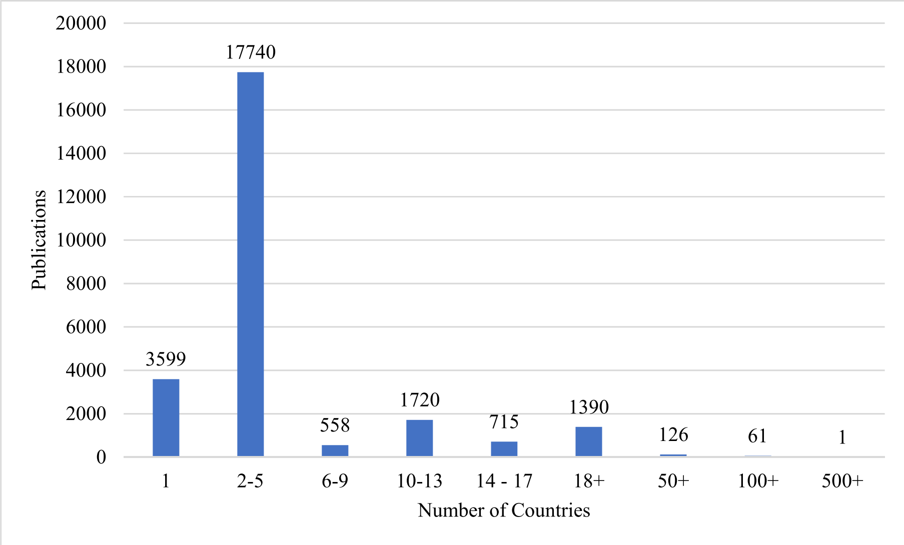


**Fig. 8.** Distribution of countries of collaborating authors.

but they still represent a significant amount of research output. Notably, a good number of publications involving collaborations with an extremely large number of countries (18+, 50+, 100+). Even a single paper involved over 500 countries, which likely signifies a global initiative or a multinational organization's research efforts.

Overall, these statistics point to the international nature of sustainability research. It emphasizes the global scale of sustainability issues and the importance of international collaboration to address these challenges. It also shows that highly cited research often involves substantial international collaboration, suggesting that this is a productive and influential approach within the field.

### *3.14. RQ8: most cited articles from these researchers and SDG alignment of these articles*

Table 14 provides top works (excluding publications with more than 30 authors) from the top 10 cited researchers in terms of citations. Among the top 10, nine researchers are active in research related to 'SDG 3: Good health and well-being', and one is found to have contributed mostly to 'SDG 7: Affordable and clean energy'. These researchers' most important specific contributions, reflected by top-cited articles, are briefly discussed here.

1. **Ahmedin M Jemal:** The top cited work for this researcher is a study reporting the global burden of cancer using GLOBOCAN 2018 estimates by the International Agency for Research in Cancer. It observed that the most frequently diagnosed cancer and the leading cause of cancer death substantially vary across the countries. Within a country, too, this varies based on economic development and social and lifestyle factors. In low- and middle-income countries, the lack of high-quality cancer registry data seems to affect planning and implementing evidence-based cancer control programs. The importance of global initiatives for cancer registry development and an international partnership is also outlined in this article.

**Table 14**
Top cited works of top HCSRs.

| Name | Top cited work (Publication year) |
|---|---|
| Ahmedin M Jemal | Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries (2018) |
| Christopher J L Murray | Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010 (2013) |
| Simon Iain Hay | The global distribution and burden of dengue (2013) |
| Ali H Mokdad | Our future: a Lancet commission on adolescent health and well-being (2016) Maternal and child undernutrition and overweight in low-income and middle-income countries (2013) |
| Zulfiqar Ahmed Bhutta | Maternal and child undernutrition and overweight in low-income and middle-income countries (2013) |
| Yousef S Khader | Global Burden of Multiple Myeloma: A S systematic Analysis for the Global Burden of Disease Study 2016 (2018) |
| Bach Xuan Tran | A longitudinal study on the mental health of the general population during the COVID-19 epidemic in China (2020) |
| Zhong Lin Wang | Triboelectric Nanogenerators as New Energy Technology for Self-Powered Systems and as Active Mechanical and Chemical Sensors (2013) |
| Paulo A Andrade Lotufo | The Sertraline vs Electrical Current Therapy for Treating Depression Clinical Study: Results From a Factorial, Randomized, Controlled Trial (2013) |
| Farshad G Farzadfar | Inequalities in non-communicable diseases and effective responses (2013) |

2. **Christopher J L Murray:** His most cited paper used data from the global burden of diseases, injuries, and risk factor study 2010 (GBD 2010) to estimate the burden of disease attributable to mental and substance use disorders in terms of disability-adjusted life years (DALYs), years of life lost to premature mortality (YLLs) and years lived with disability (YLDs). They have shown the striking growth of challenges posed by disorders for health systems in developed and developing regions. Countries should make the prevention and treatment of mental and substance use disorders a public health priority.
3. **Simon Iain Hay:** This researcher's predominant contribution is also related to SDG 3. His most cited contribution, which is published in nature, is related to the global distribution of the burden of dengue. This work uses a formal modeling framework to map the global occurrence of dengue risk from known records of dengue occurrence. New risk maps and infection estimates are expected to provide novel insights into the global, regional, and national public health burden dengue imposes and may guide disease control strategies and their economic evaluation.
4. **Ali H Mokdad:** His top cited work is a commissioned study on the importance of adolescence in achieving human potential. It elaborated on how an individual acquires the physical, cognitive, emotional, social, and economic resources that may serve as a foundation for future life and well-being. It observed that investment in these resources will benefit the present and future generations. In multidimensional care components, resuscitation showed the most progress by follow-up compared to baseline.
5. **Zulfiqar Ahmed Bhutta:** The most cited work of this researcher dealt with undernutrition and overweight in mothers and children in lower and middle-income countries, various contributing factors, and various effects. Childhood overweight is a major contributor to obesity, diabetes, and non-communicable diseases in adulthood. It concluded that interventions focusing on women of reproductive age and children in the first two years should be based on present and future disease burden caused by malnutrition. It concluded that adolescents and high school students were more prone to infection than children below ten years of age and recommended the need for studies directed toward public health and educational policymaking related to school reopening.
6. **Yousef S Khader:** The top-cited article of this author described the burden of Multiple Myeloma (MM) from 1990 to 2016 and the availability of effective therapies for 21 world regions and 195 countries and territories. The major finding is that the incidence of MM has increased uniformly since 1990 but in a highly variable fashion among countries; the largest increase was found in middle and low-middle SDI countries. MM's Global health policy priorities should address the heterogeneity and improve diagnostic and treatment capacity in low and middle-income countries.
7. **Bach Xuan Tran:** In his top-cited article, a longitudinal study on the general population of China was conducted to determine the levels of psychological impact, stress, anxiety, and depression during this pandemic. While psychological impact was found to reduce after four weeks, physical symptoms were major contributors to psychological impact, especially in females. Protective measures and confidence in doctors acted as factors that reduced psychological impact and concluded that online trauma-focused psychotherapy may be helpful to the public during COVID-19.
8. **Zhong Lin Wang:** This author contributed mainly to the 'SDG 7: Affordable and clean energy'. In that work, they reviewed important properties of then recently invented triboelectric nanogenerator (TENG), which enabled a simple, low-cost, and effective approach to using the charging process in friction to convert mechanical energy into electric power for driving small electronic devices. The review resulted in the determination of different vital ways (from a materials science angle) to enhance the performance of TENGs. Such enhanced TENGs are anticipated to be used for great applications in self-powered systems for personal electronics, environmental monitoring, medical science, and large-scale power.
9. **Paulo A Andrade Lotufo:** This author also contributed mostly to SDG 3. His top cited work compared the safety and efficacy of treatment by tDCS (Transcranial direct current stimulation) and common pharmacological treatment by sertraline hydrochloride, 50 mg/d for major depressive disorder (MDD) in a randomized controlled trial. While no significant difference in safety and efficacy was found for individual treatments, combined treatment is found to improve efficacy and safety.
10. **Farshad G Farzadfar:** The top cited work of this author was oriented around the prevalence of inequality between people of low socioeconomic status and the other group at risk associated with non-communicable diseases (NCDs). As prevention and effective treatment of NCDs in low socioeconomic groups is vital for reduction in substantial reduction of total NCD burden, measures to address that are very important, and several such measures were recommended in this work. The recommended measures can be treated as a wholistic approach that covers aspects ranging from 'equitable early childhood development programs and education' to 'removal of financial barriers to health care'.

Thus, major themes that were focussed upon by top cited works of the top 10 cited researchers are (i) the burden of diseases like cancer, mental and substance use disorders, dengue, novel SARS-CoV-2, depressive disorders and multiple myeloma, (ii) importance of adolescence in determining future characteristics of the individual, (iii) maternal and child undernutrition & overweight and its complications, (iv) overweight and obesity prevalence in adults and (v) triboelectric generators for self-powered systems.

While studies in SDG 3 that compared the global burden of diseases recommended the need for global repositories to address to improve performance in low and middle-income countries, country/region studies recommended the adoption of the models developed in other regions or countries. Regarding SDG 7, triboelectric generator technology's application in self-powered systems and future wearable system design is discussed. Thus, researchers working in SDG 3 and SDG 7 with similar interests can focus on these themes and contributions and plan their future impactful works accordingly. Policymakers can prioritize these themes for promoting research, and funding agencies can look for proposals that have the potential for novel contributions that can revolutionize these themes.

### 3.15. RQ9: authorship positions of HCSRs

The roles and contributions of researchers in Highly Cited Sustainability Researchers can be assessed through the lens of authorship position. The last author position is frequently used as a proxy for the corresponding author in many research fields. This practice is grounded in the norm that the last author often takes on the responsibilities commonly associated with the corresponding author, such as overseeing the research project and handling the manuscript's submission and correspondence. Based on the data in Appendix A, HCSRs seem to occupy the middle and last author positions frequently. This suggests that these researchers are often involved in collaborative roles and likely contribute to the research in a supervisory or advisory capacity, as indicated by the prevalence of last author positions. Their positioning as last authors might also imply that they are established experts in their fields, mentoring other researchers and overseeing projects rather than being the primary investigators or the ones who contribute the most work, which the first author position would typically reflect. 'First Author' positions, suggesting primary contribution and leadership in the research, are held by researchers like 'Younossi, Zobair M′, 'De Carvalho Malta, Deborah', 'Tran, Bach Xuan', and 'Hotez, Peter Jay'. For the 'Last Author' role, which often reflects a senior or guiding hand in the project, individuals such as 'Bhutta, Zulfiqar Ahmed', 'Mckee, Martin Mc', 'Lip, Gregory Yoke Hong', and 'Stein, Daniel Joseph' are prominent. For 'Middle Author' roles, significant contributions are indicated by names like 'Kang, Feiyu', 'Chen, Zhongwei', 'Smeeth', and 'Dou, Shi Xue', who may be involved in various aspects of the research.

## 4. Implications

The study's implications are threefold. First, it stresses the need for proactive measures by institutions and policymakers to support women researchers through funding, mentorship, and family-friendly policies while also combating unconscious biases. Second, the high citation mean for women researchers underscores the benefit of diverse perspectives in enhancing the quality and impact of research, particularly in relation to SDGs. Third, it calls for refinement in evaluation metrics by academic institutions to capture a broader spectrum of contributions rather than a singular focus on output quantity, thereby recognizing researchers who may otherwise be marginalized.

The unequal focus on certain SDGs has implications for various stakeholders. Policymakers are cautioned against neglecting underrepresented areas like poverty and responsible consumption, as an unbalanced focus could jeopardize the holistic, sustainable development agenda. Governments may need to reconsider funding allocations to encourage research in these less-represented areas through grants and incentives. Similarly, practitioners and funding agencies could use this data to identify research gaps and strategically allocate resources. Overall, a balanced approach to researching across all SDGs is crucial for achieving comprehensive sustainable development.

The temporal patterns in SDG-related publications have multiple implications. First, the post-2015 surge in health and climate-related publications reveals these domains as globally recognized priorities. Second, growth in underrepresented SDGs suggests that the adoption of the SDGs has fostered a more diverse and comprehensive approach to sustainability research. Third, negative growth in specific SDGs highlights the need for targeted policies, efforts, and funding to address these overlooked areas. Finally, the overall increase in SDG-related publications after 2015 affirms the influence of the SDGs in shaping research trajectories, advocating for a holistic approach to global development.

Regarding implications, the trend towards open access, particularly in SDG-related research, is positive. It enables broader engagement with this important work, fostering global cooperation in addressing these universal challenges. For researchers, the high percentage of OAS and OAS-H means that their work is more likely to be seen and used by a global audience, potentially increasing their impact. For policymakers, practitioners, and the public, it increases their access to the latest research and insights in these critical areas.

The evolution of thematic focuses in research highlights several key takeaways. Non-communicable disease research continues to hold enduring significance, while attention to infectious diseases has escalated, in part due to the COVID-19 pandemic. Moreover, research increasingly recognizes the role of lifestyle factors in health outcomes. Simultaneously, a surge in clean energy technologies research elucidates the intricate relationship between health and sustainability.

## 5. Conclusion

The study offers an exhaustive examination of the contributions of the top 100 highly influential sustainability researchers, herein referred to as HCSRs, in the context of Sustainable Development Goals (SDGs). Utilizing a meticulously designed framework, eight significant research questions were addressed, focusing on various aspects such as geographical distribution, gender disparity, thematic focus, and collaboration patterns. The study employs key metrics like the Compound Annual Growth Rate (CAGR) to quantify the growth of publications among these HCSRs, revealing a rate that surpasses general scholarly output.

The geographical concentration of HCSRs in countries like the USA, China, and the UK raises questions about the global distribution of research efforts and its correlation with SDG achievement. Gender disparities were evident, yet the work of female researchers showed a higher mean citation rate, indicating impactful but underrepresented contributions. A predominant focus was observed on SDG 3 (Good Health and Well-Being) and SDG 7 (Affordable and Clean Energy), necessitating a more balanced research agenda across all SDGs.

Temporal shifts in research focus post-2015 were also noted, likely influenced by global events such as the Paris Agreement and the COVID-19 pandemic. The study observed an upward trend in open-access publications, particularly in SDG-related research, which is significant given the elite group of researchers analyzed. Collaboration patterns were found to be international in scope, emphasizing the need for interdisciplinary and global partnerships.

The study's findings have critical implications for academia, policymakers, and funding agencies, offering a roadmap for future research agendas, policy formulation, and resource allocation. It serves as a benchmark for what constitutes 'high-impact' in sustainability research and provides actionable insights for various stakeholders.

The approach of identifying Highly Cited Sustainability Researchers (HCSRs) based on their alignment with Sustainable Development Goals (SDGs) presents several implications and limitations. First, inadvertent mapping may occur where researchers do not intentionally align their work with SDGs, thus potentially missing out on focused research efforts for specific goals. Second, the complexity and interlinkages among SDGs may not be sufficiently accounted for in studies mapped to a single goal. Third, a skewed focus may arise where some SDGs garner more attention than others, resulting in an imbalanced development strategy. Fourth, there is a natural bias toward fields with higher citation rates, which could overshadow valuable but less-cited research in other SDG-aligned areas. Hence, while the current approach serves to mainstream SDG concerns in research, it is vital to stimulate dedicated research that addresses the unique and complex challenges encapsulated by each SDG.

## Data availability statement

Data associated with our study is available as a supplementary file to this submission.

## Funding statement

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## CRediT authorship contribution statement

**Raghu Raman:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Conceptualization. **Hiran H. Lathabai:** Writing – review & editing, Writing – original draft, Methodology, Data curation. **Anand Patwardhan:** Writing – review & editing, Funding acquisition. **Sandhya Harikumar:** Writing – review & editing, Conceptualization. **Prema Nedungadi:** Writing – review & editing, Writing – original draft, Visualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e28604.

## Appendix A

| Researcher ID | Author Name | Current Organization | Current Organization Country | Type | Gender | Profile URL |
|---|---|---|---|---|---|---|
| ur.0735175411.53 | Zhong Lin Wang | Beijing Institute of Nanoenergy and Nanosystems | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0735175411.53 |
| ur.015211733477.35 | Gregory Yoke Hong Lip | University of Liverpool | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.015211733477.35 |
| ur.01111066700.89 | Deepak L Bhatt | Brigham and Women's Hospital | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.01111066700.89 |
| ur.016311470037.48 | Frede Blaabjerg | Aalborg University | Denmark | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.016311470037.48 |

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| Researcher ID | Author Name | Current Organization | Current Organization Country | Type | Gender | Profile URL |
|---|---|---|---|---|---|---|
| ur.013417056762.57 | Zulfiqar Ahmed Bhutta | Aga Khan University | Pakistan | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.013417056762.57 |
| ur.01231663222.16 | Phillippe Ciais | Laboratoire des Sciences du Climat et de l'Environnement | France | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01231663222.16 |
| ur.01245263262.85 | Zobair M Younossi | Inova Health System | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.01245263262.85 |
| ur.016171531435.40 | Josep M Guerrero | Aalborg University | Denmark | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.016171531435.40 |
| ur.01367673420.84 | Martin Mc Mckee | London School of Hygiene & Tropical Medicine | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01367673420.84 |
| ur.013145671557.48 | Didier A Raoult | Méditerranée Infection Foundation | France | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.013145671557.48 |
| ur.01257234653.60 | Stefan S Zeuzem | University Hospital Frankfurt | Germany | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01257234653.60 |
| ur.010734436325.46 | Wei E Huang | Northwestern Polytechnical University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.010734436325.46 |
| ur.0627614723.01 | Daniel Joseph Stein | University of Cape Town | South Africa | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0627614723.01 |
| ur.015775364015.32 | Shi Xue Dou | University of Wollongong | Australia | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.015775364015.32 |
| ur.01000372303.10 | Fei-Yu Kang | Tsinghua University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01000372303.10 |
| ur.0754506514.72 | John Joseph Valentine Mcmurray | University of Glasgow | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0754506514.72 |
| ur.012700421217.04 | Joseph Coresh | Johns Hopkins University | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.012700421217.04 |
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| ur.01026114310.09 | Naveed A Sattar | University of Glasgow | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01026114310.09 |
| ur.01055762674.33 | Herrmann Brenner | German Cancer Research Center | Germany | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01055762674.33 |
| ur.0610416233.89 | Maarten Jacobus Postma | University of Groningen | Netherlands | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0610416233.89 |
| ur.01125214207.48 | Aziz Sheikh | University of Edinburgh | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01125214207.48 |
| ur.01254700671.30 | Maciej Banach | Medical University of Lodz | Poland | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01254700671.30 |
| ur.01221015642.25 | Till Winfried Bärnighausen | Heidelberg University | Germany | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01221015642.25 |
| ur.01011613642.30 | Deborah De Carvalho Malta | Universidade Federal de Minas Gerais | Brazil | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.01011613642.30 |
| ur.01347713232.06 | Ai Koyanagi | Institució Catalana de Recerca i Estudis Avançats | Spain | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.01347713232.06 |

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| Researcher ID | Author Name | Current Organization | Current Organization Country | Type | Gender | Profile URL |
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| ur.01152202075.77 | Mika Kivimäki | University College London | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01152202075.77 |
| ur.01341635650.05 | Louisa J Degenhardt | UNSW Sydney | Australia | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.01341635650.05 |
| ur.012212666457.88 | Ronald C Kessler | Harvard University | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.012212666457.88 |
| ur.012310237337.47 | Christopher J L Murray | University of Washington | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.012310237337.47 |
| ur.01130111705.12 | Qiang Zhang | Tsinghua University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01130111705.12 |
| ur.0715707617.53 | Kunihiro Matsushita | Johns Hopkins University | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.0715707617.53 |
| ur.012563304640.48 | Lin Gu | Institute of Physics | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.012563304640.48 |
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| ur.014464574077.84 | Amir Hossein Sahebkar | Mashhad University of Medical Sciences | Iran | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.014464574077.84 |
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| ur.01027121051.13 | Andrew John Pollard | University of Oxford | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01027121051.13 |
| ur.01270042052.88 | John R Mascola | National Institute of Allergy and Infectious Diseases | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01270042052.88 |
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| ur.0652735016.56 | Kwok-Yung Yuen | University of Hong Kong | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0652735016.56 |
| ur.07675207637.48 | Benjamin John Cowling | University of Hong Kong | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.07675207637.48 |

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| ur.01126605522.44 | Jun Lu | Zhejiang University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01126605522.44 |
| ur.016527313277.78 | Alessandro D Sette | La Jolla Institute For Allergy & Immunology | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.016527313277.78 |
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| ur.015413333635.19 | Abdullah Mohammad Ahmad Asiri | King Abdulaziz University | Saudi Arabia | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.015413333635.19 |
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| ur.013117453357.11 | Marion P G Koopmans | Erasmus MC | Netherlands | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.013117453357.11 |
| ur.0577741546.62 | Saad Bin Omer | Yale University | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0577741546.62 |
| ur.01253462737.51 | Guo-Xiu Wang | University of Technology Sydney | Australia | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01253462737.51 |
| ur.01154357674.52 | Cyrus Cooper | University of Southampton | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01154357674.52 |
| ur.01072733407.19 | George Fu Gao | Institute of Microbiology | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01072733407.19 |
| ur.01117072553.44 | Annette Peters | Helmholtz Zentrum München | Germany | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.01117072553.44 |

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| Researcher ID | Author Name | Current Organization | Current Organization Country | Type | Gender | Profile URL |
|---|---|---|---|---|---|---|
| ur.012157544257.74 | Mohammad Hassan Murad | Mayo Clinic | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.012157544257.74 |
| ur.0607477203.05 | Walter Churchill Willett | Harvard University | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.0607477203.05 |
| ur.0757052535.15 | Michael S Phd Diamond | Washington University in St. Louis | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0757052535.15 |
| ur.0736352243.56 | Muthiah Vaduganathan | Brigham and Women's Hospital | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.0736352243.56 |
| ur.01354223052.40 | Farshad G Farzadfar | Tehran University of Medical Sciences | Iran | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01354223052.40 |
| ur.01024513032.33 | Dorairaj Prabhakaran | Public Health Foundation of India | India | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01024513032.33 |
| ur.014552666540.04 | Yi Cui | Stanford University | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.014552666540.04 |
| ur.0614206313.94 | Hai-Dong Kan | Fudan University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0614206313.94 |
| ur.010404067437.77 | Yousef S Khader | Jordan University of Science and Technology | Jordan | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.010404067437.77 |
| ur.01007375027.42 | Marcello A Tonelli | University of Calgary | Canada | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01007375027.42 |
| ur.01171532202.66 | Oscar Horacio Franco | University of Bern | Switzerland | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01171532202.66 |
| ur.01274317233.41 | Zhongwei Chen | University of Waterloo | Canada | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01274317233.41 |
| ur.0742445763.83 | Peter Jay Hotez | Baylor College of Medicine | United States | Private | male | https://app.dimensions.ai/details/entities/publication/author/ur.0742445763.83 |
| ur.0763150144.41 | Khalil Amine | Argonne National Laboratory | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0763150144.41 |
| ur.01317022003.24 | Jiaguo Yu | China University of Geosciences | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01317022003.24 |
| ur.016356410605.89 | Detlef P Van Vuuren | Utrecht University | Netherlands | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.016356410605.89 |
| ur.01302111327.46 | Liam L Smeeth | London School of Hygiene & Tropical Medicine | United Kingdom | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01302111327.46 |
| ur.01057113165.47 | Paulo A Andrade Lotufo | Universidade de São Paulo | Brazil | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01057113165.47 |
| ur.01262702375.54 | Shilong L Piao | Peking University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01262702375.54 |
| ur.0711604550.97 | Mostafa Qorbani | Tehran University of Medical Sciences | Iran | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0711604550.97 |
| ur.01337072056.92 | Ahmedin M Jemal | American Cancer Society | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01337072056.92 |
| ur.0644324362.10 | Dan H Barouch | Beth Israel Deaconess Medical Center | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0644324362.10 |

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| Researcher ID | Author Name | Current Organization | Current Organization Country | Type | Gender | Profile URL |
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| ur.01317176547.68 | Elisabete Weiderpass | International Agency for Research on Cancer | France | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.01317176547.68 |
| ur.015512105430.99 | Jun Chen | Nankai University | China | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.015512105430.99 |
| ur.0601361767.18 | Pei-Yong Shi | The University of Texas Medical Branch at Galveston | United States | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0601361767.18 |
| ur.013475630227.21 | Isabela Judith Martins Bensenor | Universidade de São Paulo | Brazil | Public | female | https://app.dimensions.ai/details/entities/publication/author/ur.013475630227.21 |
| ur.01060303422.38 | Alberto Arduan Ortiz | Hospital Universitario Fundación Jiménez Díaz | Spain | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01060303422.38 |
| ur.01012127621.38 | Andre Pascal Kengne | South African Medical Research Council | South Africa | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.01012127621.38 |
| ur.0754307115.11 | Scott Burton Patten | University of Calgary | Canada | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0754307115.11 |
| ur.0667111132.59 | Charles Shey Wiysonge | South African Medical Research Council | South Africa | Public | male | https://app.dimensions.ai/details/entities/publication/author/ur.0667111132.59 |

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