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# **Influences of the COVID-19 Pandemic on the Impact Factor of a Sample of Environment/Sustainability-Related Journals**

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## **Abstract**

**Purpose** - The COVID-19 pandemic has led to changes in academic routines. These changes have also contributed to an increase in the number of papers submitted to journals, citations, and, ultimately, to changes in metrics. This study aims to address a gap between theory and practice, analysing the changes in the impact factor (IF) of a sample of 30 environment/sustainability-related journals, in the face of the COVID-19 pandemic.

**Design/methodology/approach** - The study used an expert-driven literature analysis and an assessment of a selected sample of 30 environment/sustainability-related journals' increased trends.

**Findings** - The unprecedented trend observed when analysing the results obtained in the IF of environment/sustainability-related journals contribute to the body of knowledge on this topic, allowing us to understand how specifically the COVID-19 pandemic has influenced scientific publishing, despite the restrictions imposed by lockdowns and access to research knowledge and facilities.

**Research limitations/implications** – Based on a sample of 30 environment/sustainability-related journals, this study can highlight lessons learned from the COVID-19 pandemic, suggesting specific measures which may be addressed to contribute to upkeep levels of publishing in the environment/sustainability field covered in this study.

**Practical implications** - This study will contribute to setting the stage for additional research on the influences of the COVID-19 pandemic on scientific publishing's impact in environment/sustainability areas of knowledge. The implications of this research will allow us to set the basis for more extensive research in other areas of knowledge.

**Originality/value** – To the authors' knowledge, this study is unique, since it addresses the implications of the COVID-19 pandemic in 30 considered exemplary environment/sustainability-related journals, the main research area of all the authors involved in this publication.

## Keywords

COVID-19 pandemic; Academic routine; Levels of publishing; Environment/sustainability research; Impact factor (IF).

### 1. COVID-19 pandemic influence on the academic routine

The Coronavirus pandemic (COVID-19) caused by the novel coronavirus SARS-CoV-2, whose first outbreak started in Wuhan, Hubei, China in November 2019, has since then become a worldwide problem. As of June 7, 2023, the pandemic has infected over 760 million people, resulting in an excess of more than 6.9 million deaths. In an attempt to stop the complications from the disease, more than 13 billion-registered vaccine doses have been administered (WHO, 2023).

The COVID-19 pandemic has been affecting the lives of many millions of people in very different ways. Apart from leading to a global recession (Alam *et al.*, 2021), it has been disrupting global citizens' daily lives (Scharf, 2021). It has also extensively impacted research knowledge and activities worldwide (Radecki and Schonfeld, 2020; Sohrabi *et al.*, 2021). This is especially so due to restrictions imposed on accessing institutions and research facilities, including laboratories (Alam *et al.*, 2021; Sohrabi *et al.*, 2021), from which many experimental studies depend.

The lockdowns forced by COVID-19 led most academics to work remotely from home, impacting academic productivity and affecting other job responsibilities including teaching or supervision of students. AbuJarour *et al.* (2021), for instance, found that elements, such as technical knowledge and access, affect home productivity, and, therefore, they need to be considered by higher education institutions (HEIs) at a higher management level. In the case of women working in academics and with younger children, domestic childcare resulted in a challenging additional workload (Krukowski *et al.*, 2021; Viglione, 2020), that forced them to work fewer hours per week, consequently decreasing academic productivity due to work reorganization. Indeed, it may be argued that COVID-19 amplified gender inequality in academic publishing (Alam *et al.*, 2021; Kasymova *et al.*, 2021; Leal Filho, Kovaleva, *et al.*, 2022; Radecki and Schonfeld, 2020; Viglione, 2020).

Publishing may be perceived as an optional activity (Krukowski *et al.*, 2021), but academics are required to publish in prominent journals to advance their career, especially when pursuing grants, particularly those related to the environment/sustainability area. Due to the COVID-19

pandemic, distinct fields or disciplines were affected differently and those less dependent on sensitive equipment resulted in the lowest decrease in research (Scharf, 2021). Financial funds necessary for specific research have also been restricted, greatly affecting the available funds, specifically in clinical research worldwide (Radecki and Schonfeld, 2020; Scharf, 2021; Sohrabi *et al.*, 2021).

On the other hand, according to Scharf (2021) and Odone *et al.* (2020), the significant increase in specific publications relating to COVID-19 is a partial reflection of the changes in editorial and publication policy that, apart from open access, allow registered reports or preprints in large scale, particularly when related to the emerging COVID-19 science (Eisen *et al.*, 2020; Fraser *et al.*, 2021; Miller and Tsai, 2020; Škorić *et al.*, n.d.; Viglione, 2020), impacting the scientific communication landscape. As a consequence of the COVID-19 pandemic, a “publish, then review” model of publishing, with preprints as standard procedure, was adopted by journals, such as “eLife” (Eisen *et al.*, 2020). Additionally, some journals implemented *fast/track* reviews to avoid delays and to decrease submission and publication time (Horbach, 2021; Palayew *et al.*, 2020).

Considering the above context, this article aims to review the changes in the impact factor (IF) of a sample of environment/sustainability-related journals, chosen as a clear example of a boost in scientific publishing, in the face of the COVID-19 pandemic. It draws some lessons learned from the pandemic and suggests specific measures which may be addressed, aiming to upkeep levels of publishing. Whereas there is a movement towards environment/sustainability that precedes the pandemic, the fact that academic staff had more time to read and write, could have led to greater use and citations of journals, matters which were analysed in this study through the analysis of 30 found relevant environment/sustainability-related journals, chosen due to its importance in the addressed field, in order to illustrate the role played by the COVID-19 pandemic in this environment/sustainability scientific publishing area.

## **2. Impacts of the COVID-19 pandemic on the performance of academics and environment/sustainability-related issues**

Far beyond just a disruptive event, the pandemic of COVID-19 has generated a new momentum and triggered a variety of research efforts aimed at analysing the pandemic’s social, economic, environmental, and political dimensions. It also demanded an adjustment of nearly the entire

social system to the new post-pandemic world (Beane and Brynjolfsson, 2021; Hitt *et al.*, 2021; Pisani-Ferry, 2020; Romeo *et al.*, 2020).

Consistent with this reality, the literature shows that a wide body of scientists from numerous fields of knowledge have turned their attention to and made a considerable effort towards mapping the potential implications of the COVID-19 pandemic into virtually all social subsystems; including work, and organizations (King *et al.*, 2022; Mihalache and Mihalache, 2022; Min *et al.*, 2021); business, supply chains (Sarkis, 2021); sustainable development (Dinis *et al.*, 2022; Leal Filho, Dinis, *et al.*, 2022; Leal Filho, Vidal, *et al.*, 2022); environmental impacts (Leal Filho, Salvia, *et al.*, 2022; Mekonnen and Aragaw, 2021) and production industry (Chowdhury *et al.*, 2021; Rizou *et al.*, 2020); travel, and tourism (Gössling *et al.*, 2021; Magano *et al.*, 2021a, 2021b; Ranasinghe *et al.*, 2020); academic routines regarding teaching, research, and outreach (Dwivedi *et al.*, 2020; Hanaei *et al.*, 2022; Leal Filho, Azul, *et al.*, 2021; Leal Filho, Price, *et al.*, 2021; Rasiah *et al.*, 2020); or social impacts (Debrah *et al.*, 2022a, 2022b; Huiskes *et al.*, 2022; Leite *et al.*, 2021); to cite a few.

In terms of teaching, the lack of a pedagogical model for distance learning was reported as an important challenge affecting the work of teaching staff. On the other hand, there is an overall perception of the COVID-19 pandemic, as representing an opportunity for teachers to enhance creativity and increase the use of distance/blended learning approaches (Leal Filho, Price, *et al.*, 2021). When research is considered, the main challenge seems to be associated with the lack of personal interaction, needed in participatory methodologies (Leal Filho, Azul, *et al.*, 2021). In both academic dimensions, and despite the challenges, the pandemic was also perceived as an opportunity to reflect on and rethink the processes of teaching and researching environment/sustainability-related topics, with climate change, resilience, and the connection between people and the environment being further considered (Leal Filho, Azul, *et al.*, 2021; Leal Filho, Price, *et al.*, 2021).

From an individual-oriented perspective, the literature points out that people have been affected by the pandemic differently, depending on factors such as social class (Benach, 2020; Ohlbrecht and Jellen, 2021), age, gender, income (van Barneveld *et al.*, 2020; Lo Coco *et al.*, 2021; Özkazanç-Pan and Pullen, 2020), and the country/place they live in (Sharifi *et al.*, 2021; Sugawara *et al.*, 2021). The effects of the COVID-19 pandemic are mostly complex but not always negative. On the one hand, it is assumed that the pandemic has or will continue to increase inequality, and is associated with the risks of economic recession, which could lead to 8% of the world population living in poverty (van Barneveld *et al.*, 2020). On the other hand,

the global lockdowns and retention of the movement of passengers and goods promoted short-term environmental benefits, such as the reduction of CO<sub>2</sub> emissions and improvement in biodiversity in some areas (Bates *et al.*, 2020; Diffenbaugh *et al.*, 2020; Liu *et al.*, 2020). Nevertheless, these benefits were temporary and some projections alerted for the forthcoming rebound in carbon emissions as economic activities recommence (IEA, 2021; WMO, 2021).

These aspects, among many others, gave the needed basis to researchers around the globe to investigate the connection between the COVID-19 pandemic and environmental/sustainability-related issues. In particular, the changes in work arrangements have also contributed to an increased volume of scientific outputs, as most researchers spent more time at home and were thus able to write more, further developing their environment/sustainability studies and, consequently, publishing and citing more (Sloane and Zimmerman, 2021).

## **Methods**

Based on an extensive expert-guided literature review, this paper pursued a research question (RQ), namely: to what extent has the COVID-19 pandemic influenced the scientific production in the environment/sustainability field and the IF of a selection of related journals?

To answer this question, a comparative assessment analysis of the IF of a sample of 30 exemplary journals in the field of environment/sustainability was undertaken. These journals were chosen based on their focus on environmental matters and a direct or indirect focus on sustainability. In particular, the selection of the journals has considered the emphasis on journals that have extensively published on sustainability issues before, while also considering the attention on journals that are well established and have an IF on environment/sustainability-related topics. These are also the areas of work of the authors and are relevant to the chosen journals' field. In addition, these 30 journals are the ones exemplary of this area, highlighted in the text. The information source utilized to obtain the IF is, naturally, the Web of Science website of the respective considered journals.

The assessment included the pre-pandemic year of 2019 and then the years when the COVID-19 pandemic reached its peak, namely 2020, also including 2021. The differences in the IF were calculated in percentage since this offers a clear indication of the changing trend.

The methodological phases followed in this research are briefly described in Figure 1. The approach used was a qualitative one.

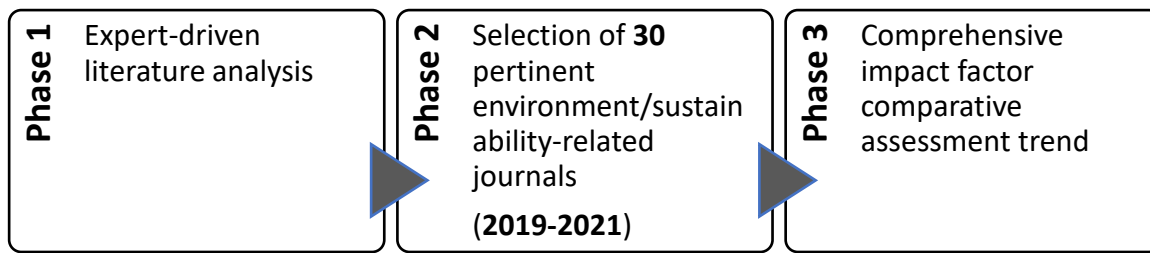


Figure 1. The methodological approach used in this research. Authors' development.

## Results and Discussion

As mentioned before, the COVID-19 pandemic lockdowns have strongly influenced the research schedule. Most of the major publishers have made publications related to COVID-19 “immediately available” in PubMed Central and other publicly funded repositories. This also included the WHO COVID database, which provided free access rights, requesting that the original sources be acknowledged. While some researchers, involving women, in particular, have seen their time at home limited with other tasks, many other researchers have managed to combine their life and work balance under the new COVID-19 pandemic circumstances, and have been able to spend more time reading and writing at home. Else (2020) acknowledges that there was a sharp increase in submissions of articles in numerous subjects to scientific journals during the year 2020. The author postulates that this surge may have arisen from the fact that many researchers have had to stay at home and concentrate on article writing, instead of conducting scientific lab research. Similarly, Riccaboni and Verginer (2022), who studied the impact of the COVID-19 pandemic on scientific research in life sciences, found that the pandemic acted as an unexpected and unique source of variation, resulting in a displacement effect on several aspects of scientific publishing. This led to a significant shift in research priorities and efforts.

The above-mentioned combined factors seem to have supported the improvement in the performance of academic journals on environment/sustainability-related topics. Considering the selected sample, Table 1 presents the results of this analysis, with journals listed by descending values of variation in the IF over the years under review, represented in the last column. In 2019, the journals with the highest IF were, in descending order, *Resources, Conservation and Recycling, Environment International, Journal of Cleaner Production, Science of the Total Environment, and Environmental Research Letters*. Between 2019 and 2020, the highest percentage increases were observed for the journals *Corporate Social*

*Responsibility and Environmental Management* and *Business Strategy and the Environment*, covering organizational and business concerns and responses to sustainable development and environmental performance. With this increase, these two sources made the top five list of the highest IF in 2020 (in 5<sup>th</sup> and 1<sup>st</sup> positions, respectively), along with *Resources, Conservation and Recycling*, *Environment International*, and *Journal of Cleaner Production*.

Table 1. Impact factor-based performance of environment/sustainability academic journals

Journal	Impact Factor (JCR)			Change 2019-2021 (%)
	2019	2020	2021	
<i>Sustainable Production and Consumption</i>	3.660	5.032	8.921	143.74
<i>Sustainable Development</i>	4.082	6.159	8.562	109.75
<i>Ambio: A Journal of Environment and Society</i>	4.778	5.129	6.943	108.10
<i>International Journal of Sustainability in Higher Education</i>	2.000	2.854	4.120	106.00
<i>Sustainable Cities and Society</i>	5.268	7.587	10.696	103.04
<i>Business Strategy and the Environment</i>	5.483	10.302	10.801	96.99
<i>Environmental Development</i>	2.400	3.326	4.690	95.42
<i>Local Environment: The International Journal of Justice and Sustainability</i>	1.856	2.496	3.590	93.43
<i>Corporate Social Responsibility and Environmental Management</i>	4.542	8.741	8.464	86.35
<i>Environment. Development. and Sustainability</i>	2.191	3.219	4.080	82.93
<i>Environment International</i>	7.577	9.621	13.352	76.22
<i>International Journal of Sustainable Development and World Ecology</i>	2.772	3.716	4.870	75.69
<i>Population and Environment</i>	2.439	3.537	4.283	75.60
<i>Environmental Science and Pollution Research</i>	3.056	4.223	5.190	69.83
<i>Resources. Conservation and Recycling</i>	8.086	10.204	13.716	69.63
<i>Science of The Total Environment</i>	6.551	7.963	10.753	64.14
<i>Journal of Environmental Planning and Management</i>	2.093	2.735	3.371	61.06
<i>Journal of Environmental Management</i>	5.647	6.789	8.910	57.78
<i>Information Processing &amp; Management</i>	4.787	6.222	7.466	55.96
<i>Journal of Cleaner Production</i>	7.246	9.297	11.072	52.80
<i>Environmental Health</i>	4.690	5.984	7.158	52.62
<i>Sustainability</i>	2.576	3.251	3.889	50.97
<i>Ecological Indicators</i>	4.229	4.958	6.263	48.10
<i>Biodiversity and Conservation</i>	2.935	3.549	4.296	46.37
<i>The Journal of Environment &amp; Development</i>	1.844	2.097	2.639	43.11
<i>Environmental Management</i>	2.561	3.266	3.644	42.29
<i>Sustainability Science</i>	5.301	6.367	7.196	35.75
<i>Environmental Science &amp; Policy</i>	4.767	5.581	6.424	34.76
<i>Environment and Urbanization</i>	3.273	3.200	4.066	24.23
<i>Environmental Research Letters</i>	6.096	6.793	6.947	13.96
<b>Average Values</b>	<b>4.160</b>	<b>5.473</b>	<b>6.879</b>	<b>69.22</b>



Note: JCR – Journal Citation Report, from Web of Science

The period under study has witnessed a notable increase in the IF scores, with an average variation of 69.22% between 2019 and 2021. The growth is considered significant in the context of this research. Among the journals analysed, five demonstrated a doubling of their IF scores, surpassing a variation of 100%. These journals include *Sustainable Production and Consumption*, *Sustainable Development*, *Ambio: A Journal of Environment and Society*, *International Journal of Sustainability in Higher Education*, and *Sustainable Cities and Society*.

The *Sustainable Production and Consumption* journal emerged as the highest-performing one within the sample. In 2019, it boasted an IF of 3.660, which witnessed remarkable growth to 8.921 in 2021, representing a substantial variation of 143.74%. The outcome is consistent with the studies conducted by Riccaboni and Verginer (Riccaboni and Verginer, 2022), which examined various indicators of scientific production in the life sciences prior to and following the onset of the COVID-19 pandemic. In order to evaluate the impact of COVID-19 on global scientific production in the life sciences, the authors assessed several indicators, including the effect of the IF weighted by the number of publications. These authors discovered that COVID-19-related medical subject terms have experienced an average increase of 6.5 times in production, consequently influencing the IF.

The findings presented in this article also align with the research performed by González-Hermosillo and Roldan-Valadez (2022), which sought to compare the effect of the COVID-19 pandemic on the growth rate of IF in the dermatology field over the preceding five years. The authors observed a noteworthy 50% rise in the IF in the analysed field.

In the sample of environment/sustainability-related journals, it was possible to observe an increase in the IF for all the analysed journals. As mentioned earlier, some journals showed significant growth, while others, such as the *Environmental Research Letters* journal, demonstrated a different pattern. In 2019, it had an initial IF of 6.096, which experienced a modest growth of 13.96% by 2021, resulting in an IF of 6.947. While the increase may be considered more conservative, when compared to other journals, it still reflects a positive upward progression in its IF.

Overall, the trends observed in Table 1 indicate that the increases in IF are a widespread trend, which has boosted the profile of all analysed environment/sustainability-related journals

perceived as a consequence of the COVID-19 pandemic. The trends that started in 2020 continued in 2021, and in some cases, more significant increases in the IF were observed in 2021, as compared to 2020. This could result from publications written in 2020 being published in 2021 due to lengthier peer-review processes.

As previously noted, the impact of the COVID-19 pandemic on scientific publications is multifaceted, diverse, and unparalleled. The pandemic has resulted in adjustments that have accelerated the manuscript review process by scientific journals and fostered the development of sustainable solutions in the entire areas affected by the pandemic. For instance, Więckowski (2021) examined the redefinition of the role of transportation in promoting sustainable tourism in response to the pandemic's effect on the industry. Tokazhanov *et al.* (2020) analysed the impact of the pandemic on the design of sustainable living spaces, emphasizing the significance of healthy and comfortable living environments in promoting mental and physical well-being. Siksnyte-Butkiene (2021) investigated the pandemic's effect on the energy sustainability sector, which has undergone significant changes due to the economy's lockdown, leading to permanent modifications in production, travel, and entertainment models, and, consequently, in energy consumption habits as a whole. These studies provide an overview of how the COVID-19 pandemic has influenced environment/sustainability-related fields of study. They demonstrate the scientific community's commitment to presenting sustainable solutions envisioned during the COVID-19 pandemic in their respective areas of expertise. This effort to bridge the gaps that come up during the pandemic has contributed to an escalation in publications and, also consequently affecting the IF of environment/sustainability-related journals. It highlights the relevance of the scientific community's contributions to the evolution towards sustainable development by providing a comprehensive understanding of this emerging new context.

### **3. Conclusions**

The COVID-19 pandemic has influenced academic routines worldwide, at several levels and contexts. This study has provided an overview of the extent to which the pandemic influenced the IF of a set of selected 30 environment/sustainability-related journals (RQ), chosen to illustrate the influence of the COVID-19 pandemic in scientific publishing. It fills a knowledge gap in this respect.

Being a major global health problem, which has profoundly affected the lives of many people around the world, and led to severe economic problems, the COVID-19 pandemic also limited

many academic routines. The switch to home office posed severe restrictions to research and teaching practices, in particular to women researchers. However, this fact did not appear to be generally detrimental to the performance of the journals' publishing process, specifically in the case of the addressed sample of journals. Observing the variation data listed in the last column of Table 1, it is clear that there was an increase in the IF in all journals. Some present an increase of more than 100%, while others have a modest variation of 13%. This is an unprecedented trend, which, to the authors' knowledge, has not been analysed before in this specific environment/sustainability-related scope.

Among the environment/sustainability-related journals, it is noticeable that publications associated with the United Nations Sustainable Development Goals, with related sustainability issues corresponding to the main area of action of the authors signing this study, are particularly popular, possibly because the topic has been a prominent research theme, tackled in numerous publications, also exploring the connections with the COVID-19 pandemic and the focus of dedicated special issues of journals during the COVID-19 pandemic.

Some measures which may be addressed to try to upkeep the levels of publishing seen during the pandemic can be considered:

- i. more time for research, by a better combination of working tasks and time to read, develop research and write;
- ii. additional collaborative efforts in teams, since team members can share the burden of writing far better than one single person can do, resulting in significantly more relevant publications;
- iii. tackle research issues under an interdisciplinary perspective, considering that environment/sustainability issues are topics that go beyond the domain of single disciplines.

As to the future, it is rather unclear if the IF change trends reported in this paper will be sustained since routines are largely back to normal, and presence-based teaching and research means that many researchers have less time for research, reading, and writing tasks, than during the COVID-19 pandemic lockdowns. In any case, the COVID-19 pandemic has led to a boost to the IF of many environment/sustainability-related journals, favourably reflecting on the research profile of many authors and institutions worldwide, and contributing to the dissemination of knowledge. The implications of the present study are significant since they illustrate how the scientific community has used the COVID-19 pandemic to increase scientific

production in the environment/sustainability field, illustrated by the sample of 30 relevant journals in this area of knowledge, used in this investigation.

Future studies could further analyse the trends in the IF of other areas, to allow to produce more significant statistical data in this respect. The implications of the paper are two-fold. Firstly, the study allows us to clarify the connections between the COVID-19 pandemic and academic productivity. Secondly, it illustrates the fact that, during this specific time in history, an emphasis on the environment/sustainability field was promoted, probably due to the additional time academic staff have had, to develop research and publish.

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