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The Influence of the Corona Virus Pandemic on Sustainable Development Goal 13 and United Nations Framework Convention on Climate Change Processes

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Apart from many social and economic problems worldwide, the COVID-19 pandemic has also led to sudden halt in face-to-face climate-related meetings. Moreover, it has also negatively influenced the works related to the preparations for the sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and organizing the 26th Conference of the Parties of the UN Framework Convention on Climate Change (UNFCCC), namely COP26 to be held in Glasgow, which was postponed to November 2021. This article presents a global study undertaken among UNFCCC contact points and other climate experts, to ascertain the impacts of the pandemic on the implementation of SDG13 and UNFCCC processes. The methodological approach entails a bibliometric analysis, online survey, and authors' expert judgment. Results of the bibliometric analysis show that the most common terms associated with this theme are COVID-19, climate change, CO₂, energy, “pandemic-related,” and “adaptation-related.” In addition, the survey revealed some difficulties associated with online participation in the processes from many developing countries. The study concluded that there is negative impact of COVID-19 pandemic on the UNFCCC process, more minor government priorities regarding climate action, loss of traction of the process, and a challenge to achieve the Paris Agreement, with less significant support from the respondents from less developed countries. The findings suggest that urgent action is needed, to make up for the lost time, and place climate issues more prominently on the global agenda.

Keywords: COVID-19, climate change, IPCC, UNFCCC (United Nations Framework Convention on Climate Change), world region, development

1 INTRODUCTION

1.1 Background

The climate crisis is still raging, but COVID-19 has reduced the level of attention it used to have (Leal Filho et al., 2020). Moreover, the theme “climate change” has recently slipped from the top of the global political agenda because of the need to tackle the immediacies of the COVID-19 pandemic (Lancet, 2020). However, the implications of the pandemic are crippling economic growth and stagnating development progress in climate change programmes, including climate research (Leal Filho et al., 2021a). While the response action focuses on addressing people’s immediate health needs, other threats, including climate extremes, have still affected more than 168 million people in 2020 (OCHA, 2020). Moreover, the levels of air pollution reduced in the pandemic due to a drastic reduction in economic activities (Dasgupta and Srikanth, 2020; Venter et al., 2020), which are now bouncing back to the pre-pandemic levels.

Although 2020 was designated the “year of climate action” by the UN Framework Convention on Climate Change (UNFCCC), COVID-19 has reversed progress, including the postponement of COP26 from 2020 to 2021 and interfered with the timely submissions of the Nationally Determined Contributions (NDCs). Therefore, whereas accomplishing resilience through climate change adaptation (CCA) and disaster risk reduction (DRR) programmes is becoming more crucial, the occurrence of COVID-19 has made access to CCA and DRR finance more difficult due to competing priorities and personnel shortages (Cao et al., 2020).

Another crucial aspect is the diversion of development funds to tackling the pandemic, meaning that some of which was not used to address climate change. . Despite negative trends, the European Commission has made funds available for recovery and resilience, in addition to the “Green Deal” (Wolf et al., 2021).

Additionally, a variety of countries alienated themselves from the international community to tackle the pandemic. On account of the G20-driven debt service suspension initiative (DSSI), each participating country has to accept to utilize the resources they would have used for the debt on social, health and economic now spending diverted to the implications of COVID-19 (Cao et al., 2020). Unfortunately, environmental issues were not properly considered. Furthermore, questions have been raised about the wisdom of the de-prioritization of funding for climate and disaster resilience.

however previous to COVID-19, CCA and DRR finance were already inadequate to accomplish the objectives articulated in the Paris Agreement on climate change (UNFCCC, 2015). Public and private sectors were struggling to meet the target of \$100 billion of funding per year by 2020 to assist low-income countries in fighting climate change (UNFCCC, 2009). Furthermore, finance allocations for mitigation have dominated those for adaptation. Only around \$30 billion was allocated to CCA in 2017/2018 (CPI, 2019).

Furthermore, many recipient countries have requested funding destined for CCA and DRR to be redirected to tackle COVID-19. For instance, India and Pakistan have requested it (Donor Tracker, 2020).

In conclusion, the need to allocate finance to COVID-19 responses has taken priority, but this should not decrease finance for CCA and DRR. On the contrary, rebuilding economies to be green, equitable, and resilient to various climate threats, may ensure that they will not be exacerbated (Centre for the Study of Existential Risks, 2020).

1.2 COVID-19, the Work of IPCC and the Climate Negotiations

In 1988, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) jointly established the Intergovernmental Panel on Climate Change (IPCC) with the mandate to regularly conduct assessments of the scientific knowledge on climate change. The IPCC functions as a scientific advisory body that is mainly funded by states voluntarily. It is organised in three Working Groups (WG) (WG 1: Physical Science Basis; WG2: Impacts, Adaptation, and Vulnerabilities; WG3: Mitigation of Climate Change) whose governments appoint leading authors. In plenary sessions, government representatives adopt the scientific assessment reports and approve the summaries for policymakers of the scientific reports line by line. The IPCC is now in its sixth assessment cycle (AR6), with an expected publication in 2022.

Because of the COVID-19 pandemic, the IPCC plenary meetings have been held virtually since the beginning of 2020. The pandemic has also led to increases in the disparities in climate change research among scholars from the global south and global north Institutions (Leal Filho et al., 2021a), affecting mainly the women (especially mothers). During the pandemic, the authors (and among them mothers) faced multiple challenges everywhere (Minello, 2020), especially in global south institutions. Managing multiple work-related demands under precarious work conditions prevents attending to the established international academic standards. These involve a lack of appropriate internet connection, available libraries, and journal subscriptions compounding to challenge and/or making it impossible to compete with the same metrics for scholars based in the global north Institutions (Schipper et al., 2021). Another study from Leal Filho et al. (2021a) found similar results based on the Human Development Index (HDI) instead of the Global North-South divide.

In the IPCC process, for instance, there has been an increase in the number of female authors over the past recent years, despite over 100 female authors still feeling underrepresented and facing barriers to fully participating in the process associated with English proficiency, race, nationality, and discipline of interest (Gay-Antaki and Liverman, 2018). During the COVID-19 pandemic, moving the IPCC meetings to a virtual platform exacerbated the challenges faced by female authors in the Global South whose language proficiency has prevented full participation and engagement in the process. This is so as there are additional costs in communicating in English for non-native speakers associated with comprehension, writing ease, time, and anxiety (Ramírez-Castañeda, 2020). It is also true that Northern-based authors dominate the discussions,

sharing ideas and writing unfairly, placing non-English native speakers marginal in the process.

The negative consequences of the hegemony of English perpetuate the global gap in science (Ramírez-Castañeda, 2020) and might be even so for female climate change academics. This is so as academic mothers everywhere, likethose based in the global south, are falling behind their male counterparts as compounded housework, childcare, and elderly care, including giving the patriarchal culture importance and priority to male's work (Mavin and Yusupova, 2020) (Table 1). As a result, globally, gender differences in climate change research have increased substantially despite the growing engagement of women's academic presence in the subject (Huang et al., 2020). Without gender equity approaches in institutions and research funding, the persistent inequalities in the academy now exacerbated with COVID-19 will continue to exacerbate the mental and emotional distress, including the economic security of women in the academy (Malisch et al., 2020). Such inequalities in research conditions across the North and Global South scholars, together with the international metrics of judging research-related academic progress (or success), are perpetuating the legacy of colonising science (Schipper et al., 2021).

The COVID-19 pandemic exposed rooted vulnerabilities and inequalities across many domains of human life and ecosystems. However, it also promoted new visions and behaviors through technology, culture, education, and across the environment and humanity, indicating many possibilities to navigate new innovative and resilient pathways.

Therefore, the authors pose two untested propositions that guide this research and serve as departing points for the subsequent analysis.

Proposition 1—COVID-19 affects the UNFCCC process quality and timing.

Proposition 2—Participants from developing countries are more affected than those from developed societies.

2 METHODS

This research examines some of the effects of the COVID-19 on the UNFCCC process based on a hybrid approach of bibliometric analysis and an online survey targeted on the UNFCCC agenda. Bibliometric analysis is a well-tried method, which has been successfully deployed in a variety of climate studies (Wang et al., 2018; Sharifi et al., 2021). The use of surveys to gather evidence related to climate change is also a proven method (e.g. Taylor et al., 2020), one being recently undertaken among IPCC authors to seek their views on extreme events in the future (Tollefson 2021).

Besides, the study focuses on propositions (P1 and P2).

2.1 Description of Bibliometric Analysis Method

The authors conducted a term co-occurrence analysis using VOSviewer, a widely-used software tool for bibliometric

analysis (van Eck and Waltman, 2010) to understand what issues related to connections between the COVID-19 pandemic and achievement of the SDG 13 on climate action have been discussed in the literature. Input data for the analysis were peer-reviewed academic papers indexed in the Web of Science (WoS). The WoS was selected among different databases because it indexes quality research and provides detailed data for analysis using VOSviewer. A broad-based search string includes a combination of terms related to the pandemic and climate change adaptation and mitigation documents. The literature search was conducted on 30 January 2021, and returned 349 documents. Titles and abstracts of these documents were screened, and 132 studies relevant to the focus of this study were selected for term co-occurrence analysis using VOSviewer. The analysis output is presented as a network of nodes and links, where node size is proportional to the frequency of term occurrence, and link width is proportional to the strength of the connection between two terms. Terms that have frequently co-occurred are close to each other and form thematic clusters.

This article draws on insights from a web-based expert survey sent to various UNFCCC contact points and climate experts involved in the implementation process of climate agreements. The questions for the survey have been formulated based on prior knowledge about the specific field ranging from some general questions posed in the beginning to a set of crucial target questions and some optional open questions at the end of the questionnaire.

Expert surveys are a widely used method to collect data on the respondents' perceptions of a particular domain of expertise (Gideon 2012; Wolf et al., 2016). The expert survey conducted for this article aims to gain insights into stakeholders' perspectives involved in the UNFCCC process. In addition, the web-based survey is particularly suited for our research to explore the effects of the COVID-19 pandemic on the international climate negotiations shifted towards a virtual setting (Fleming and Bowden 2009).

These are to be complemented by some selected case studies where the influences of the pandemic on the negotiations leading to COP26 are showcased.

2.2 Author's Expert Judgment

These paper authors conducted an internal expert judgment among several Lead Authors in the IPCC AR-6 WG II regarding the main changes since January 2020 in the assessment process, focused on the severe effects of the new virtuality and the dialogue between pairs during the Lead Authors Meeting (LAMs) and BOGs.

2.3 Online Questionnaire Survey

The authors conducted an online data gathering through a structured questionnaire survey to understand the impacts of COVID-19 on the UNFCCC process. The survey encompassed five parts. 1) Questions 1-7 described the sociographic respondent information. 2) Questions 8-12 described the influence of the COVID-19 pandemic in the UNFCCC work agenda. 3) Multiple question #13 described the evolution of the UNFCCC process. 4) Questions 14-15 addressed the

respondents' perceptions of the UNFCCC process. Finally, 5) Questions 16–19 allowed for some space for open-ended questions.

The data were collected through an iterative process that requested opinions and feedback from international climate change experts. It was then pre-tested and adjusted to corroborate its adequacy (Bryman 2016, pp. 260–261). The questionnaire was received by a specific target group related to the UNFCCC process. Besides, a snowball sampling included the author's networks to capitalise on individuals' connectedness in research networks' (Bryman 2016, p. 415). Respondents were from academia and government, and non-governmental organisations (NGOs).

The questionnaire was available through the online Google forms platform from March 25th to 20 July 2021. The responses to the questionnaire were classed into a 1–5 Likert scale, e.g., 1 = Doesn't apply at all; 2 = Doesn't apply predominantly; 3 = Undecided; 4 = Partly applies; 5 = Fully applies, which allows reporting them as averages.

2.2.1 Correlation Analyses

Pearson and Spearman rho correlation analyses explored relationships between the questions (Qs) and HDI groups (VH-H and Other), selecting those significant ($p < 0.05$) shared in both analyses.

2.2.2 Contrast Analyses

The non-parametric (*t*-test and ANOVA) and parametric (Mann-Whitney U and Kruskal–Wallis) tests analyse the possible differences between the responses, minimising the Type I and II errors (false positive and negative conclusions, respectively). The analysis only includes those variables for which both tests show a significance level <0.05 .

2.2.3 Sample

The sample consisted of 68 respondents from 38 countries; 43 were male, and 25 were female. Regarding their education levels, 43 obtained PhD degree, 18 are postgraduate students, seven graduate students, and 3 had high school education. Their age group was 21–30 ($n = 4$), 31–40 ($n = 18$), 41–50 ($n = 16$), 51–60 ($n = 17$), 61–70 ($n = 10$), and 70+ ($n = 3$). Forty-eight per cent of them were scientists ($n = 33$), 32% were NGO members, and 18% government employees. Thirty-one respondents have never participated in a UNFCCC meeting. The other 37 participated once ($n = 1$), 2–3 times ($n = 11$), 4–8 times ($n = 7$), 9–15 times ($n = 9$), and 15+ ($n = 3$). The countries ($n = 38$) most represented in the survey were Nigeria ($n = 6$), Germany and South Africa ($n = 5$), Kenya, Uganda, Zimbabwe, India and The United States ($n = 4$), Mexico and Italy ($n = 2$). Their distribution by region was Africa ($n = 33$), Europe ($n = 15$), Asia ($n = 9$), North America ($n = 4$), Latin America ($n = 4$), and Australia ($n = 3$).

The 68 responses were divided into two groups according to the Human Development Index (HDI) of the respondents' 38 countries. The divide separated the respondents from Very High and High human development ($n = 39$) and Medium and Low development ($N = 29$). Therefore, the HDI aggregation (UNDP,

2015) was preferred to regions to divide the responses and verify P2.

3 RESULTS

3.1 Results of the Bibliometric Analysis

Figure 1 presents the output of the term co-occurrence analysis, which shows that issues related to connections between the pandemic and mitigation and adaptation have been addressed in the literature. Clusters at the right side of the figure are mainly related to energy and associated greenhouse gas emissions (GHGs). Two terms, CO₂ and energy, have a more central position, indicating their dominance in the literature. The term CO₂ that is the most frequently occurred (excluding “COVID-19” and “climate change” that are essential terms of the search string and, therefore, have occurred more), has strong connections with other terms such as “transport,” “lockdown,” and “energy demand.” Much research was published in 2020 demonstrating temporary reductions in CO₂ and other GHGs following lockdown and social distancing measures that resulted in mobility restrictions (Abu-Rayash and Dincer, 2020; Balsalobre-Lorente et al., 2020; Safarian et al., 2020). However, change patterns have not been consistent across different sectors. For instance, some studies have reported increasing residential sector emissions due to increased energy demand (Bolaño-Ortiz et al., 2020). Despite this, evidence of emission reductions is prevalent (Sharifi and Khavarian-Garmsir, 2020), indicating the environmental externalities of current transportation, industrial, and global trade patterns that have been adopted in pursuit of economic growth (Balsalobre-Lorente et al., 2020). Such observations call for decoupling emissions and economic growth and transition towards renewable energy sources that contribute to achieving climate mitigation targets of the Paris Agreement and also provide health co-benefits (Balsalobre-Lorente et al., 2020; Sharmina et al., 2020). However, despite the CO₂ emissions reductions during the first stages of the pandemic—the largest ever decline—owing to the pandemic hitting demand for oil and coal harder than other energy sources, while renewables increased, leading to the highest ever global energy-related C emissions. Apart from the data gathered from the bibliometric analysis, it is worth mentioning that in 2021, carbon emissions were projected to rebound and grow by 4.8% as demand for coal, oil and gas rebounds with the economy (IEA, 2021).

Besides, some studies warn that decarbonising the economy may be challenging as the pandemic has caused significant financial crises in many parts of the world. As a result, there is a risk that economic stimuli packages of governments may prioritise economic recovery at the expense of climate action (Cojoianu et al., 2020; Shan et al., 2020). This highlights the significance of designing and implementing strategies that ensure green recovery from the crisis (Bui and de Villiers, 2021).

A central theme on the left side of the figure is significant adaptation-related terms such as resilience, vulnerability, and disasters. There has been some focus on how the emergence of COVID-19 in the context of other stressors and vulnerabilities

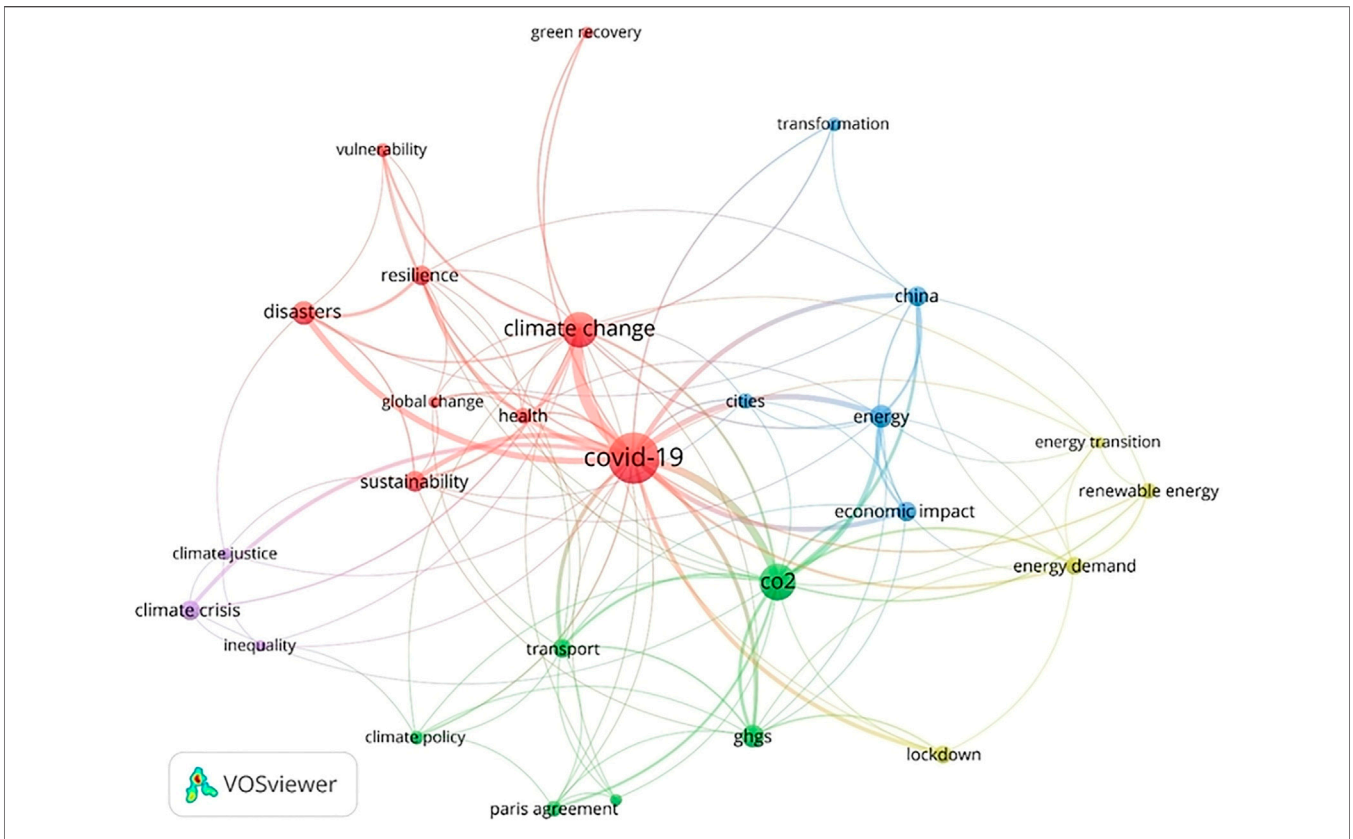


FIGURE 1 | Results of Bibliometric analysis.

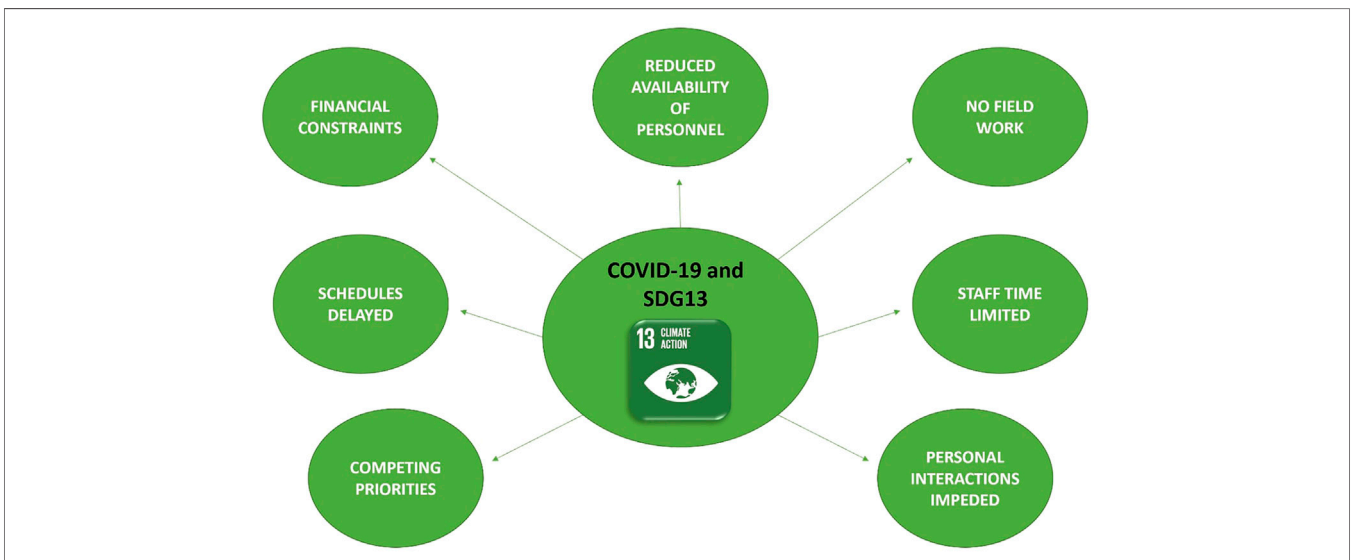


FIGURE 2 | presents an overall view of the influences of the COVID-19 pandemic on the pursuit of SDG 13.

may lead to cascading and compounded impacts that can cause significant challenges for societal resilience (Phillips et al., 2020; Webb, 2020; Simonovic et al., 2021). It is argued that dealing with such multi-hazard challenges requires adopting more

comprehensive and integrated approaches towards disaster risk reduction that consider various types of risks and stressors and their potential interactions (Linh et al., 2020; Takewaki, 2020). Drawing analogies between the pandemic and the ongoing

TABLE 1 | Results on questions regarding the influence of the COVID-19 pandemic on the UNFCCC work agenda.

	1	2	3	4	5 (%)
Q8. Have you encountered any delays in your communication with the UNFCCC Secretariat after the outbreak of the Covid-19 pandemic?	47.1%	13.2%	8.8%	27.9%	2.9
Q9. Have you been able to proceed with your UNFCCC work agenda more or less in the same way as before the outbreak of the Covid-19 pandemic?	60.3%*		8.8%	30.9%**	5.9
Q10. Have you been asked by your organisation to dedicate working hours on matters related to the COVID-19 pandemic, which reduced your time for UNFCCC matters?	35.3%	17.6%	4.4%	36.8%	
Q11. Have you encountered personal grievances caused by the COVID-19 pandemic that limited the time you have allotted for working on the UNFCCC process?	52.9%*		4.4%	42.6%**	
Q12. Did the lockdowns and travel restrictions allow you to save time (that would have otherwise been spent on travel/meetings) and allocate it to your UNFCCC work agenda?	38.2%	5.9%	4.4%	38.2%	13.2
	44.1%*		4.4%	51.5%**	
	34.3%	7.5%	3.0%	43.3%	11.9
	41.8%*		3.0%	55.2%**	
	23.5%	14.7%	5.9%	27.9%	27.9
	38.2%*		5.9%	55.9%**	

Note: 1 = Doesn't apply at all; 2 = Doesn't apply predominantly; 3 = Undecided; 4 = Partly applies; 5 = Fully applies. *Sum up of 1 and 2 options. **Sum up of 4 and 5 options, highlighting those >50percent.

climate crisis in terms of potential impacts and consequences, there have been some arguments that the vulnerabilities exposed by the pandemic should be considered as a wake-up call to increase awareness about the seriousness of the looming climate crisis and encourage further actions towards climate resilience (Leal Filho et al., 2020; Manzanedo and Manning, 2020; Prideaux et al., 2020). Such actions could also help prevent significantly potential health effects of climate change and similar future pandemics (Salas, 2020). Discussing the need to reduce societal inequalities has been a common focus area in analogies between the pandemic and the climate crisis. The pandemic has demonstrated that the poor, women, elderly, and marginalised groups, are more vulnerable to disasters (Lee et al., 2020; Mabon et al., 2020), highlighting the need for prioritising efforts on enhancing climate justice to ensure a better response to climate-induced adverse events that are highly likely to occur in the future.

3.2. Results of the Online Survey

The responses from the questionnaire survey were divided based on national HDI into two classes: Very High and High countries (>0.70) (VH-H) and other countries (<0.70) (others), which is close to the above and below the worldwide average (0.70). The former ($n = 39$) includes all European countries, plus Australia, Botswana, Brazil, Egypt, Indonesia, Mexico, Malaysia, Mexico, Philippines, Fiji, South Africa, Thailand, the United States, and Zimbabwe. The latter ($n = 29$) includes most of the African countries, plus a few more from Asia, Latin America (Guatemala), and the Pacific Small Islands (Vanuatu).

The HDI divide, related to Proposition 2, shows a minor but significant difference (e.g., Q 13.4), which is not the case for gender and age. On the other hand, there were statistical differences between Scientists ($n = 33$) and the few government representatives ($n = 10$), with 1.79 and 3.33 in the 1-5 scale of agreement, respectively, and postgraduate ($n = 18$) and Ph.D. ($n = 40$), with 4 and 2.75 agreement respectively. Therefore, for brevity, the analyses of the results focus on the HDI-related differences.

Influence of COVID-19 Pandemic in UNFCCC Work Agenda (Q8–Q12)

Table 1 summarizes the percentage of responses from questions 8–12. While 60.3% of the respondents reported not having any

delays “at all” or “predominantly” in the communication with UNFCCC, about half (51.5%) indicated that their organizations had asked them to dedicate more time on COVID-19 related matters to the detriment of their work related to UNFCCC. Similarly, a little over half (55.2%) stated that they faced personal grievances due to the pandemic reduced their time working on the UNFCCC process. Conversely, 56% of the participants have gained time to attend UNFCCC work due to the lockdown.

3.2.2. Evolution of the UNFCCC Process (Q13)

In most of the questions, 50% or more respondents agree with the statements, except question 13.3 (regarding the limited possibilities of NGOs to be involved in online meetings), the answers are equally divided between disagreement, the middle point options, undecided, and agreement options. Table 2 summarizes the responses regarding the UNFCCC processes.

3.2.3. The Impact of Poverty (Q14–Q15)

Table 3 summarises the responses regarding the relationship between poverty and climate change. Responses to question 14 indicated that the vast majority (75%) of the respondents believe that lack of knowledge is the root cause of poverty. Also, 47.8 and 19.4% of the respondents agree to a great extent or to some extent that their national Climate Change Frameworks addresses the issues of poverty (Q15).

3.2.4 Correlation and Contrast Analyses

Table 4 presents the significant Pearson and Spearman rho correlations focused on the divide in two HDI groups of the respondents' countries.

Both groups share positive correlations regarding the influence of the pandemic in their work with UNFCCC. Those respondents that declared that they had been able to proceed with their work agenda more or less in the same way as before the pandemic also declared that they had been asked to work on COVID-19 matters. They have encountered personal grievance and, consequently, they had reduced time to work on UNFCCC matters.

There are also eight correlations regarding Q13 (the evolution of the UNFCCC process) exclusive to one of the two groups; four positive correlations from H-VH and the other four from other, three positives and one negative.

TABLE 2 | summarizes the responses regarding the evolution of the UNFCCC process.

	Strongly disagree	Disagree (%)	Undecided (%)	Agree	Strongly agree (%)
13.1. National delegations to the UNFCCC have currently less time to prepare for the COP-26 in Glasgow to be scheduled 1–12 November 2021	3.3%	4.9	27.9	42.6%	21.3
		8.2%*	27.9	63.9%**	
13.2. National governments throughout have shifted their priorities from mitigating and adapting to climate change towards addressing Covid-19	3.1%	6.2	15.4	50.8%	24.6
		9.2%*	15.4	75.4%**	
13.3. The limited possibilities of NGOs to be involved in online events and meetings organised by the UNFCCC Secretariat enhances the effectiveness of the UNFCCC process	17.7%	14.5	30.6	21%	16.1
		32.3%*	30.6	37.1%**	
13.4. The Virtual Climate Dialogues last year (November 23rd–4 December 2020) have been successful in keeping the momentum of the post-Paris process	6.3%	15.9	27	30.2%	20.6
		22.2%*	27.0	50.8%**	
13.5. The online format of current and future UNFCCC meetings has the potential to improve the chances for developing countries to participate in the discussion	9.4%	17.2	18.8	32.8%	21.9
		26.6%*	18.8	54.7%**	
13.6 The achievement of the climate targets stipulated in the Paris Agreement is severely threatened due to the ongoing Covid-19 pandemic	7.9%	14.3	23.8	39.7%	14.3
		22.2%*	23.8	54.0%**	
13.7. The UNFCCC process has lost traction due to Covid-19 and COP-26 will presumably not lead to any substantial negotiation outcomes	4.5%	7.6	19.7	43.9%	24.2
		12.1%*	19.7	68.2%**	

Note Valid percentages. NAND, Neither agree nor disagree. *Sum up of Strongly disagree and Disagree options. ** Sum up of Agree and Strongly Agree options, highlighting those >50percent.

TABLE 3 | Results on questions regarding poverty.

Q14. How do you rate the importance of knowledge on root causes of poverty?				
Not important at all	Not so important (%)	Neutral (%)	Important (%)	Very important (%)
0%	1.5	4.5	19.4	74.6

Q15. Does your national climate change framework make provisions to address transient poverty?				
No	Yes, to a limited extent	Yes, to some extent	Yes, to a great extent	
7.5%	25.4%	47.8%	19.4%	

TABLE 4 | Pearson and Spearman’s rho correlations results. Groups by HDI levels.

	Q8	Q9	Q10	Q11	Q12	Q13.1	Q13.2	Q13.3	Q13.4	Q13.5	Q13.6	Q13.7	Q14	Q15
Q8	1													
Q9	H/O	1												
Q10	H/O	H/O	1											
Q11	H/O	H/O	H/O	1										
Q12	O	H/O	O	H/O	1									
Q13.1						1								
Q13.2						O	1							
Q13.3			O*			H	H	1						
Q13.4							O	H	1					
Q13.5	H*							H	H	1				
Q13.6								O			1			
Q13.7						O					H	1		
Q14													1	
Q15											H	O*		1

Note. H = High- Very High HDI; O = Others HDI., In bold correlations that independent variables could influence. * Negative correlation.

TABLE 5 | Responses from open questions.

Open questions and number of responses (n)	Overall perception and selected responses
Q16, Do you have any further remarks on how the Covid-19 pandemic affected the UNFCCC process in the past and presumably in the future? n = 31	Mostly negative "It slows things down." "The much attention given to COVID-19 by developed countries may limit UNFCCC process" "Online system has been useful to communicate information, and in future, it can also help as it increases the participation of people"
Q17 Do you see particular opportunities in the COVID-19 pandemic for the global response to climate change and the UNFCCC process? n = 36	Positive "The opportunity is about changing mindset how resources can be balanced to tackle the pandemic and biodiversity protection" "Nope, rather the pandemic started stress in worldwide"
Q18 Do you see particular challenges in the COVID-19 pandemic for the global response to climate change and the UNFCCC process? n = 44	Highly negative "Responses to Covid-19 pandemic should not only be of the urgency/short terms side". "Too many resources which would be allocated to climate change and UNFCCC process has been diverted to address COVID-19 pandemic" "I think there are no big insurmountable challenges as all meetings can be migrated to virtual platforms"
Q19 please add any additional comments in the COVID-19 pandemic for the global response to climate change and the UNFCCC process n = 27	Focused on poverty "We need funds to empower small organisations in Africa to do advocacy". "COVID-19 and climate change are also poverty-related challenges. Unless poverty is addressed as the main actor in developing countries, little progress will be achieved in combating both challenges"

On the one hand, attending the H-VH group, the first correlation refers to the Q13.1 regarding the fewer time delegations have to prepare the COP26 and Q13.3, for which, as much as respondents confirm it, they also affirm that the limited time of NGOs to assist in online events will enhance the effectiveness of the UNFCCC process. Question 13.3 also correlated with Q13.4 and Q13.5, regarding the potential that the Virtual Climate Dialogues and the future online meetings have to keep the momentum of the post-Paris process and the improvements of chances for developing countries to participate, respectively. Finally, Q13.6, which asserts that the targets achieved in Paris are threatened due to the pandemic, correlates with Q13.7, which states that the UNFCCC process will not lead to any negotiation.

On the other hand, attending to the "others" group, those respondents assert that national delegations have less time to prepare for the COP26 (2021) (Q13.1) also confirm that governments have shifted their priorities regarding climate change management (Q13.2) and that the UNFCCC process has lost traction and COP-26 will not lead to substantial negotiations outcomes (Q13.7). Also, those that related the limited possibilities of the ONGs with the enhancement of the effectiveness of the UNFCCC process (Q13.3) affirm the threat posed by the pandemic on achieving Paris Agreements targets (Q13.6). Finally, the question stating that time invested in COVID-19 matters has reduced the worktime in UNFCCC issues (Q10) correlates negatively with Q13.3, indicating that those who confirm having less time to work on the agenda do not think that the limited presence of ONGs in online events will enhance the effectiveness of the process.

The last correlations for both groups are with question 15 about the national climate change framework's provisions to address transient poverty. Again, within the H-VH group, Q13.6 (...the UNFCCC process has lost traction) correlates positively, whereas, within the Others, Q13.7 (...the Paris agreement targets severely threatened) correlates negatively.

Regarding the contrast analysis, there is only a significant difference for Q13.4 regarding the Paris agreement through the climate change virtual dialogues (in 2020), showing a lower level of agreement from the VH-HI (3.16) than for other (3.81) groups.

3.2.5 Open Questions

Table 5 summarises the responses to the open-ended questions 16–19 (see supplementary material). More than two out of five respondents answered each of the four questions with the highest responses ($n = 44$) for the question on COVID-19 challenges, while the least responded question ($n = 27$) solicited additional information.

3.3 Author's Expert Judgment of the IPCC AR-6 Working Group II During the Pandemic

According to several authors of this paper who are lead authors in the IPCC AR-6 Working Group II, the COVID-19 pandemic has affected the work of the IPCC in different ways, as follows:

- Moving to online meeting
- Changes to all due dates
- Having surveys of all authors or even suggesting support for severely impacted author
- Greater reliance on BOGs as communication tools among authors
- Longer discussion times, i.e., 2 weeks for the LAMs as opposed to only one as in physical events
- Poor connections made the participation of some authors difficult
- Non-native speakers of English have a more significant impact on fully understanding and participating in the online BOGs during eLAM4
- In countries, gender disparities exacerbate difficulties for women to work on IPCC during eLAM4.

- Increased work demand, such as developing new online courses and lecturing, and “internet platforms meetings” reduced the available time of many authors.

3.4 DISCUSSION

The COVID-19 pandemic has influenced or is likely to affect the Sustainable Development Goal (SDG) # 13 “Climate action” worldwide. For instance, the pandemic drew attention away from climate policy during its first phase (Leal Filho et al., 2021a).

The SDG Report 2021 shows the pandemic’s toll on the 2030 Agenda; because, besides the high death toll, the development progress was halted or reversed, years or even decades. As a result, extreme poverty rose worldwide for the first time since 1998; hunger was exacerbated, economic growth and decent job, education gains, and climate action were affected, like all other SDGs (UN, 2021).

The results presented, whether from bibliometric analysis, expert judgment, or online survey, support the literature about the adverse effects on climate action, gender inequality, and the climate process (e.g., Cao et al., 2020; Donor Tracker, 2020; Huang et al., 2020; Minello, 2020; OCHA, 2020; Leal Filho et al., 2021a; Schipper et al., 2021).

The bibliometric analysis shows the issues associated with the connections between the pandemic and climate change management and disasters. The central terms are COVID-19 and Climate Change, while the main secondary terms are, on the one side, “pandemic-related terms”, e.g., transport, lockdown, and energy demand, and on the other side, “adaptation-related terms”, e.g., resilience, vulnerability, and disasters.

Regarding the pandemic-related terms, there are varied and opposed trends, showing emission reduction (Sharifi and Khavarian-Garmsir, 2020) during the first stages of the outbreak, calling for decoupling emissions and economic growth (decarbonisation) and the achievement of the Paris Agreement with additional health benefits (Balsalobre-Lorente et al., 2020; Sharmina et al., 2020). However, the total C emission increased in 2020 due to renewable resources and will do the same in 2021 (IEA, 2021). On the other hand, decarbonisation is not free of challenges to climate action due to the allocation of resources to economic recovery (Cojoianu et al., 2020; Shan et al., 2020), highlighting the need for green recovery approaches (Bui and de Villiers, 2021).

Concerning the adaptation-related terms, the analysis calls attention to the increasing complexity of multi-hazard risks due to COVID-19 and other environmental stressors and vulnerabilities and disaster management (Linh et al., 2020; Takewaki, 2020).

This new complex vulnerability is appealing for the search of analogies between the parallel global crises and the wake-up call because of their apparent common roots of over-consumption and environmental degradation and the need for climate resilience (Leal Filho et al., 2020; Manzanedo and Manning, 2020; Prideaux et al., 2020; Leal Filho et al., 2021a). Nevertheless, the perception of the climate crisis is not as urgent as the pandemic crisis (Leal Filho et al., 2020).

The pandemic accentuates the relevance of the SDGs 1 “No Poverty” and 13 “Climate Action” (UN, 2021) due to the social

inequalities and the disaster-prone vulnerable groups (Lee et al., 2020; Mabon et al., 2020).

The author’s judgment on the IPCC WG II AR-6 process focuses on three main disadvantages. Firstly, the internet-based communications difficulties of many developing countries. Secondly, more working-time demands. Thirdly, English fluency makes online communication more difficult for many non-native speakers, than face-to-face dialogue, complementing Ramírez-Castañeda’s research (2020) for writing proficiency.

Regarding the online survey and the proposition P1: COVID-19 affects the UNFCCC process quality and timing, most respondents (50–60%) to Qs 8–12) (about the impacts on the UNFCCC work agenda) (Table 6) say they were not affected (Qs 8–9, 12), while, at the same time, had to pay attention to or encountered personal grievances related to the pandemic (Qs 10–11). Nevertheless, the opposing views reach around one-third of the answers.

When it comes to the evolution of the UNFCCC process (Table 1), most answers agree (55–75%) with the posed questions, e.g., having less time to prepare the COP-26 or a negative view about the loss of traction of the process, and achieving the Paris Agreement. However, the responses are divided regarding the alleged advantage of less participation of NGOs (Q 13.3).

Proposition P-1 receives support from responses with an agreement >3 (1-5 scale) and with significant correlations among them, e.g., questions 9–12 and 13.2 (showing a difference between graduate (3.33) and Ph.D. respondents (4.11)—to 13.7.

Regarding if national policies address transient poverty (Q15), despite a strongly positive view, only 20% responded to a great extent, which does not support SDG 1.

Concerning the HDI divide and the proposition P2—Participants from developing countries are more affected than those from developed societies; Table 3 shows that both HDI groups agree with Qs 8–12, not validating the P2. On the other hand, the responses to Q 13, depicting the UNFCCC process, mostly positively intra-correlated, show some differences and opposite views, e.g., 13.1–3, 5-7.

Question 13.4, about the success of the virtual dialogue held in 2020 to keep the Paris Agreement momentum, with 50% of the overall agreement, significantly divide HDI groups, which is, besides several overall supports ($\geq 60\%$) for Qs 8, 13.1, 2, 7, and 14, the only verification of the P- 2. Hence, there is no robust verification of P2, except for 13.4.

In summary, the online survey showed a more remarkable agreement with the negative impacts of the pandemic on the UNFCCC process than a sharp divide. However, Q 13.4 focuses on an issue whose relevance is likely second to none, receiving more support from the other (less developed) group.

Finally, concerning the open questions Q16 (further remarks on how the COVID-19 pandemic affects the UNFCCC process), the answers are mostly negative; for Q17 (opportunities in the pandemic for the global response to climate change and the UNFCCC process), are overall positive; for Q18 (challenges for the global response to climate change and the UNFCCC process) are strongly negative; for Q19 (free additional comment), several responses focused on poverty and Africa.

TABLE 6 | Shows Country of origin of respondents.

Countries	Responses (n)
Nigeria	6
South Africa, and Germany	5
Kenya, Uganda, Zimbabwe, United States, and India	4
Italy, and Mexico	2
Malaysia, Portugal, Mozambique, Brazil, Spain, Guatemala, Pakistan, United Kingdom, Vanuatu, Austria, Fiji, Republic of Korea, Australia, Burkina Faso, Greece, Côte d'Ivoire, Indonesia, Switzerland, Tanzania, Philippines, Netherlands, Thailand, Malawi, Niger, Gambia, Egypt, Ghana, and Botswana	1

4 CONCLUSION

The COVID-19 pandemic has led to significant impacts on climate change mitigation and adaptation efforts worldwide. Notwithstanding the health and other socioeconomic problems humanity faces due to the pandemic, the activities of personnel working in climate-related sectors were impaired by the pandemic due to a sudden halt in face-to-face climate-related meetings and a decline in personal communications. The present study indicates that the pandemic negatively influenced SDG13 and UNFCCC processes, especially regarding interactions in meetings and personal exchanges.

Figure 2 presents an overall view of the influences of the COVID-19 pandemic on the pursuit of SDG 13. The literature analysis indicated that research on the relationship between the COVID-19 pandemic and climate change mitigation and adaptation is relatively scarce and mainly focused on how the lockdown contributed to decreasing carbon emissions and energy use, and transportation demand. Some studies have reported on increased household energy use spurred by increased energy demand during the lockdown.

Responses from UNFCCC contact points worldwide indicate that the COVID-19 impacted the quality and timing of the UNFCCC process. Respondents reported delays in communicating within their UNFCCC activities, dedicating more time on COVID-19 related matters to the detriment of their work related to UNFCCC. Although some participants have gained time to work more due to the lockdown, others indicated that personal grievances associated with the pandemic had reduced the time required to work on climate issues. The negative influence of the pandemic also includes postponing climate actions and delaying or suspending some planned deliverables, threatening the attainment of climate targets such as the Paris Agreement. The focus on the pandemic also led, to some extent, to less funding for climate works.

Participants from developing countries were more affected by the pandemic than those from developed societies due to low-quality communication infrastructure and more working-time demands.

This study has some limitations. First, although the bibliometric analysis provides a comprehensive approach to connecting the COVID-19 pandemic and climate management issues, the questionnaire survey relied on a small sample, so its results need to be contextualized. However, since many of the participants are or were UNFCCC contact points or IPCC authors, their replies provide a well-informed overview of the influences of the pandemic to the UNFCCC and IPCC processes over 2020 and 2021. This feature contributes to identifying some facts not evident from the currently available literature on the

influence of the COVID-19 pandemic on UNFCCC processes and, *inter alia*, in achieving SDG 13.

A positive trend is that, despite the pandemic, two major publications were produced, which may provide additional impulses to implement UNFCCC processes. The first one is the “African Handbook of Climate Change Adaptation”. With over 130 chapters and more than 200 contributing authors from across Africa, it is the one of most comprehensive publications on climate change adaptation in Africa available (<https://www.springer.com/gp/book/9783030451059>), and is fully open access (Leal Filho et al., 2021b). The second is the “Handbook of Climate Change Management” <https://link.springer.com/referencework/10.1007/978-3-030-22759-3>) which, with 6 volumes and over 500 authors, is the most comprehensive non-publicly funded publication on climate change produced to date (Leal Filho et al., 2021c).

A final further conclusion drawn from the study is that the negative impact of the COVID-19 pandemic on the UNFCCC processes could be reduced by governments and NGOs refocusing their priorities on climate action, removing obstacles to virtual meetings, and more funding support to less developed countries. These measures are crucial to repositioning climate change to the top of the global political agenda and further actions towards climate resilience.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

WF: Conceptualization, Writing, Supervision; TH: Methodology, Writing; GN: Methodology, Formal analysis, Visualization, Writing; PP: Writing; AS: Methodology, Formal analysis, Investigation, Writing; AM: Methodology, Investigation; RI: Methodology; RD: Writing; AV: Writing, Visualization; IA: Writing, Validation.

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APPENDIX

(TS= ((“covid*” OR “coronavirus” OR “pandemic”) AND
(((“climat*”) NEAR/3 (“mitigation” OR “adaptation” OR
“fund*” OR “finance*”)) OR (“SDG*13” OR “goal* 13” OR

“climat* action” OR “climat* crisis” OR “IPCC” OR “
UNFCCC” OR “sendai framework” OR “COP26” OR “
natural disaster*” OR “ghg emission*” OR “co2 emission*” OR
“carbon dioxide emission*” OR “conference of parties” OR
“disaster risk reduction”))))