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Discussion

Influence of the COVID-19 pandemic on climate change summit negotiations from the climate governance perspective



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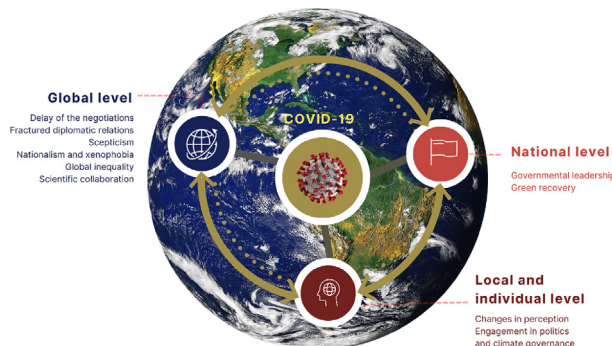
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HIGHLIGHTS

- This paper reviews the pandemic's impact on climate change negotiations.
- These impacts are evaluated at global, national, and community levels.
- COVID-19 solutions accelerated faster than actions on the climate change crisis.
- The pandemic caused delays in climate policy and renewable energy investment.
- The pandemic provides opportunities and challenges for the low-carbon transition.

GRAPHICAL ABSTRACT

Impacts of the COVID-19 pandemic on climate change summits from a climate governance perspective



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ABSTRACT

The COVID-19 pandemic has caused significant disruptions to the world since 2020, with over 647 million confirmed cases and 6.7 million reported deaths as of January 2023. Despite its far-reaching impact, the effects of COVID-19 on the progress of global climate change negotiations have yet to be thoroughly evaluated. This discussion paper conducts an examination of COVID-19's impact on climate change actions at global, national, and local levels through a comprehensive review of existing literature. This analysis reveals that the pandemic has resulted in delays in implementing climate policies and altered priorities from climate action to the pandemic response. Despite these setbacks, the pandemic has also presented opportunities for accelerating the transition to a low-carbon economy. The interplay between these outcomes and the different levels of governance will play a crucial role in determining the success or failure of future climate change negotiations.

1. Introduction

With more than 647 million people contracting the disease and more than 6.7 million deaths as of the end of January 2023, the COVID-19 pandemic is one of the worst pandemics in history (Worldometer, 2023). The

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pandemic has also led to significant economic disruption (Choi et al., 2022), supply chain disruptions (Pujawan and Bah, 2022), and job loss (Josephson et al., 2021). In addition, social interactions have been significantly impacted, including travel restrictions, limitations on gatherings and public events, and changes in work arrangements and social distancing measures (Long et al., 2022). The pandemic has also affected mental health, with many people experiencing increased stress, anxiety, and isolation (Belen, 2023; Keller et al., 2023). While the pandemic has had both positive and negative impacts on the environment, it has also had political implications, including changes in government policies and responses, as well as shifts in public attitudes towards science, health, and safety (Chakraborty et al., 2021; Mohommad and Pugacheva, 2022; Ormaza-Gonzalez et al., 2021; Rutz et al., 2020). The far-reaching impacts of the pandemic on multiple aspects of human life highlight the interconnectedness of our global society and the need for coordinated responses to address global crises (Guimón and Narula, 2020).

While the exact origins of the COVID-19 pandemic are still unclear, some scientists have suggested that climate change may have played a role in the emergence and spread of the virus (Barouki et al., 2021; Ford et al., 2022). Land-use changes, deforestation, and wildlife trading are among the factors that have increased the risk of zoonotic diseases, which can jump from animals to humans, and climate change has been identified as a critical driver of these risks (Beyer et al., 2021). Changes in temperature and rainfall patterns can alter the distribution and abundance of wildlife, increasing the chances of transmission to humans. Climate change can also indirectly impact human health by affecting the spread of disease vectors, such as mosquitoes that carry malaria and dengue fever, and by exacerbating food and water insecurity, which can lead to malnutrition and disease (Gupta et al., 2021).

Although there was a substantial amount of literature working on the correlation between climate change and the pandemic, there were not many discussions about the impacts of the COVID-19 crisis on climate change negotiations from the multi-level climate governance perspective. Fuelled by the Paris Agreement 2015 to enable “an agent of change”, multi-level climate governance (MLCG) comprises of state and nonstate actors at different scales – global, supra-national, national, state, local, and individual – to navigate the entirety of social systems to prevent, resolve and adapt to climate change consequences. These interconnected levels have different roles, responsibilities, dynamics, and mechanisms to address climate change challenges (Fig. 1). To simplify the assessment, this paper focuses mainly on three primary perspectives: (1) global, (2) national, and (3) local and individual (Marquardt, 2017). Whereas global leaders are expected to take the lead in addressing climate change, effective action requires the involvement of all stakeholders, including local communities, businesses, and civil society (Di Gregorio et al., 2019). Climate change summits and international agreements provide a platform for cooperation and collective action; however, action must also be taken at the national and local levels, with policies and practices that support low-carbon and sustainable development (Fünfgeld et al., 2023). The success of future climate change negotiations will depend on how well these different levels work together and whether they can effectively collaborate, coordinate, and implement actions across multiple scales. Changes in these factors could lead to the success or failure of future climate change negotiations. The COVID-19 pandemic has highlighted the urgent need for such action, and for a more comprehensive and integrated approach to addressing global environmental and public health challenges.

This paper discusses the impact of the COVID-19 pandemic on climate change negotiations by conducting a comprehensive review of the relevant literature. The discussion focuses on several vital questions at different governing levels, including:

- How has the COVID-19 pandemic impacted global efforts to combat climate change?
- What are the short-term and long-term implications of the pandemic on global, national, and local emissions reduction efforts?
- To what extent has the pandemic affected cooperation and funding for climate action?

- How has the pandemic influenced public opinion and attitudes towards climate change and the actions needed to address it at the global, national, and local levels?
- How can the international community, national governments, and local governments ensure that the recovery from the pandemic will not negatively affect progress towards mitigating climate change?

2. Methodology

The methodology for exploring the impacts of COVID-19 on climate change negotiations involves conducting a comprehensive review of existing literature. We systematically search relevant academic databases, such as JSTOR, Scopus, and Science Direct, to identify relevant peer-reviewed articles, reports, and conference proceedings. In addition to the database search, the methodology will also include a manual search of relevant websites and online resources, such as government and non-government organisations, to identify any relevant reports and studies that may not be available through academic databases. Only scientific papers from the last three years (2020–2023) are considered to ensure the most up-to-date information. The search terms will include “COVID-19,” “climate change,” “negotiations,” “emissions,” “renewable energy,” “international cooperation,” “public perception,” and “recovery.”

Once the relevant literature has been identified, it will be critically evaluated to determine its quality and relevance. The evaluation will involve assessing the methodology used in each study, the sample size and representativeness, the validity and reliability of the data and results, and the conclusions drawn by the authors. The information will then be analysed to identify common themes and trends in the research questions.

Finally, a narrative synthesis will be conducted to summarise the main findings and provide a comprehensive overview of the impact of COVID-19 on climate change negotiations. The results will be presented clearly and concisely, highlighting the key insights and implications for future research and policy.

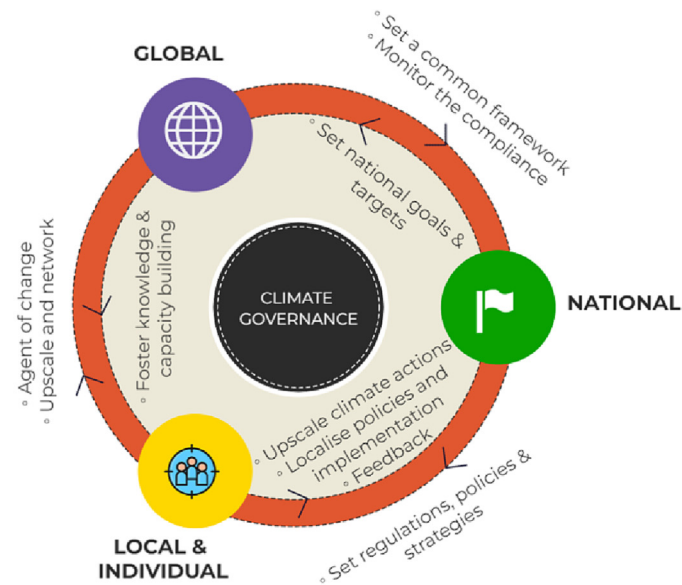
3. Discussion

3.1. The impacts of the COVID-19 pandemic on international climate negotiations

3.1.1. Delays in international climate conferences and negotiations

3.1.1.1. Postponement of the Conference of Parties 26 (COP26). Due to the risks imposed by COVID-19, COP26 was postponed from December 2020 to November 2021. The COP26 was considered the last best opportunity for every state to come up with an updated target for the first time since the Paris Agreement of 2015. This delay has disrupted the regular schedule of climate negotiations and made it more challenging to maintain momentum on critical issues. The correlation between the national ambitions of target updates and the COVID-19 pandemic was unclear. However, with the latest NDCs in COP26, the projected greenhouse gas (GHG) emissions in 2030 were still higher than 2010's level by 15.9 %, whereas it should be 45 % lower (with the 1.5 °C scenario) or 25 % lower (with the 2 °C scenario) (UNFCCC, 2021c). The chance of achieving 1.5 °C is steadily slipping out of reach when the world is heading towards the 2 °C increase, even if all pledges and long-term net-zero targets are fully implemented (Meinshausen et al., 2022).

The paper delved into examining the provisional registration and actual attendance data obtained from the United Nations Framework Convention on Climate Change (UNFCCC) official websites (UNFCCC, 2021a, 2021b). The data encompassed both the registered and physically present participants from various categories, including parties, observer states, units and bodies of the United Nations (UN) Secretariat, specialised agencies of the UN, inter-governmental organisations, non-governmental organisations (NGO), and media representatives. The analysis showed that the COVID-19 pandemic significantly impacted the attendance of COP 26, with a lower attendance rate among registered participants across all types of organisations. Out of 39,509 registered participants, approximately 59 % were present in person at the event. The attendance rate was the lowest among the officials from



	GLOBAL	NATIONAL	LOCAL AND INDIVIDUAL
ACTORS	WMO, UNFCCC, UNEP, IPCC, and so on	National and sub-national governments	Scientists, businesses, communities, NGOs, and individuals
RESPONSIBILITIES	Provide a global policy agenda with defined problems and broadly agreed-upon general objectives Initiate international climate negotiations Set out core beliefs, legitimacy, and guidelines for actors at lower levels	Develop public policies, regulations, and decision-making First point to react to crises	Participate, contribute, and influence in climate decision-making processes
DYNAMICS	Comparably weak formal institutions Strong knowledge-based influence Decision-making on legally binding rules is restricted	The most powerful actor in MLCG Highest level of legitimacy Have the greatest competencies, coercive power, and financial resources Nucleus of domestic policy networks Members of global networks	Limited intervention Increase the influence over the decision-making process through elections, protests, campaigns, and initiatives
TOOLS	UNFCCC Paris Agreement	Nationally Determined Contributions (NDCs) and related action plans Laws, regulations, policies Long-term strategies	Civil rights – election, protests, etc. Local GHG inventories

Fig. 1. Characteristics and interactions between global, national, and local contexts in multi-level climate governance (MLCG) (adapted from (Jänicke, 2017)).

the 196 parties, with only 44.5 % of the registered participants attending. According to the COP26 Coalition, two-thirds of its civil society groups and numerous officials from vulnerable nations, mainly from the Global South, had

to abstain from attending in person (Lakhani, 2021). The decline in attendance could be attributed to COVID-19-related travel restrictions, lack of access to vaccines, quarantine requirements, and health concerns. The limits on

attendance due to social distancing measures also impacted the accessibility and equity of the event, as only one in four accredited individuals could attend the venue (Burelli et al., 2021). Despite the challenges posed by the pandemic, some organisations still participated in the event, highlighting the importance of COP 26 and the efforts made to ensure its success.

3.1.1.2. Nationally Determined Contributions (NDCs) preparation and implementation. This paper analysed the submitted NDCs (Nationally Determined Contributions) on the NDC Registry by 2nd May 2022 (UNFCCC, 2022) to

understand the impact of the COVID-19 pandemic on their preparation and implementation. The NDCs were categorised into three groups: first submission, updated first submission, and second submission. As required in Decision 1/CP.21 in COP 21, all Parties must submit their updated NDCs by 2020. However, the widespread and catastrophic results of the pandemic led to the postponement of the deadline for updated NDC submissions due to the recognition of “the impact of COVID-19 on the preparation of NDCs” by the UNFCCC (FCCC/PA/CMA/2021/8, paragraph 1) (UNFCCC, 2021c). As of the COP26 conference, only 116 out of 194 parties had updated their NDCs

Table 1
Impacts of COVID-19 mentioned in NDCs.

COVID-19 impacts mentioned in NDCs	Parties	Examples
Impacts on the socioeconomic conditions of the parties	Angola, Barbados, Belize, Bosnia and Herzegovina, Cabo Verde, Chad, Chile, Columbia, Congo, Ethiopia, Fiji, Ghana, Grenada, Republic of Guinea-Bissau, Indonesia, Iraq, Jordan, Kyrgyzstan, Lebanon, Liberia, Malawi, Maldives, Mauritania, Mauritius, Montenegro, Morocco, Myanmar, Nauru, Nepal, Pakistan, St. Kitts and Nevis, Saint Lucia, Samoa, Seychelles, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Palestine, Sri Lanka, Tunisia, Uganda, Ukraine, UAE, Venezuela, Vietnam, Osman, EU, Bolivia, Guatemala, Tajikistan	Osman: “The COVID-19 pandemic outbreak has plunged the national economy into an unprecedented recession.” Jordan: “The COVID-19 pandemic which has made the fragile macroeconomic situation worse and increased the country’s vulnerability to shocks.” Tajikistan: “COVID-19 significantly affected the socioeconomic situations in the country, including the impact of pandemic on climate change initiatives.”
Increase poverty	Albania, Barbados, Cabo Verde, Panama, Samoa, Somalia	Barbados: “Many industries were closed and numerous workers were laid off, placing many families into a dire state of poverty.” Samoa: “Poverty rates are expected to increase due to the COVID-19 pandemic.”
Requests for financial assistant and external support	Barbados, Costa Rica, Cabo Verde, Republic of Guinea-Bissau, Kyrgyzstan, Lebanon, Maldives, Namibia, Saint Lucia, Samoa, South Africa, Palestine, Uganda, Tajikistan	Namibia: “... without external assistance, the government’s recovery strategies and stronger policies cannot be efficiently enforced.” Samoa: “The country also requires considerable external financial support, capacity building and technology investment.” Tajikistan: “... relies on the international financial support both for mitigation and adaptation action.”
Delay of NDC implementation and climate action	Angola, Burkina Faso, Chad, Chile, Columbia, Fiji, Solomon Islands, Togo, Tonga, Vietnam, Tajikistan	Angola: “The impacts that the current pandemic COVID - 19 will have in the country are not certain yet, but it is already identified that the impacts in terms of the economy and public health may delay the implementation of the proposed objectives.” Solomon Island: “... the effective implementation of mitigation and adaptation measures in Solomon Islands will also depend on the effective elimination or control of the transmission of the current COVID-19 pandemic ...” Chile: “... the delivery of [commitments] must also take into account the circumstances and requirements arising from the COVID-19 pandemic, with possible adjustments to the execution of the NDC ...”
Opportunities for green recovery	Philippines, Albania, Antigua and Barbuda, Barbados, Bhutan, Ethiopia, Japan, Jordan, Kyrgyzstan, Lao, Mauritius, Myanmar, New Zealand, Pakistan, Paraguay, Sao Tome and Principe, South Africa, Palestine, Sri Lanka, Tunisia, the UK, EU, Bolivia, Macedonia	Jordan: “The government is currently planning to build back better with a focus on green recovery.” Sao Tome and Principe: “... a post-COVID-19 pandemic green recovery ... by taking advantage of vast opportunities in pursuing low-carbon and resilient development.” Macedonia: “... with COVID-19, the world was just being handed a once-in-a-lifetime opportunity to alter the energy landscape.”
Experiences of combined impacts between climate change and the pandemic	Barbados, Columbia, Ethiopia, Honduras, Lebanon, Malawi, St. Kitts and Nevis, Saint Lucia, Samoa, Seychelles, Somalia, Tonga, Tunisia, Zambia	Barbados: “In recent times, Barbados has had to manage the impacts suffered from the synergies between three different crises: (1) the climate crisis, which the people of Barbados have already seen impact on the territory; (2) the COVID-19 crisis, which has heavily impacted the society and economy; and (3) the volcanic ash crisis.” Ethiopia: “Ethiopia is currently facing a double threat from climate change and the COVID-19 pandemic.” St. Kitts and Nevis: “Climate change is already impacting critical sectors including agriculture, water, tourism, health and affecting particularly vulnerable communities and groups. In addition, the COVID-19 pandemic has had a severe impact on St. Kitts and Nevis’s tourism-dependent economy.” Tonga: “Irreversible loss and damage from extreme weather events and coastal erosions are putting the Government’s poverty alleviation commitments and national development objectives at risk, and this risk is now compounded by the impacts of the COVID-19 pandemic.”
Uncertainties in assessment and setting targets	Brunei, Bosnia and Herzegovina, Iraq, Kuwait, Montenegro, Myanmar, Paraguay, Saint Lucia, South Africa, UAE, Vanuatu	Bosnia and Herzegovina: “The fulfilment of the foregoing defined and describe targets will greatly depend on the development of the situation regarding the COVID-19 pandemic ...” Kuwait: “The base year for 2035 may be recalculated and updated based on the COVID-19 and further methodological improvements.”
Employment of virtual/hybrid platforms	Angola, Cabo Verde, China, Grenada, Guinea, Kenya, Panama, Paraguay, Seychelles, South Africa, Sri Lanka, Uganda	Angola: “Due to the global pandemic COVID-19, the bilateral meetings were developed through virtual platform.”
Difficulties in preparation of NDCs	Brunei, Bhutan, Gambia, Vanuatu, Guatemala	Bhutan: “The COVID-19 pandemic affected the preparation of the second NDC from Bhutan with disruptions and delays to technical work and the consultation process.” Gambia: “The COVID-19 pandemic also posed a significant challenge as it hindered data collection and reduced the number and quality of consultations with stakeholders.”

(UNFCCC, 2021c). By May 2022, more than 30 parties had not updated their climate change plan. Out of 126 NDC updates submitted by 151 parties between 2020 and 2022 (EU and its 27 member states counted as one NDC), 70 % (88 NDCs) mention the impacts of COVID-19. The following analysis provides a glimpse of how countries described COVID-19 impacts in their NDCs, though the actual extent was far more significant.

One of the most significant socioeconomic impacts is pandemic-induced recessions. As a result of the pandemic, several countries, such as Somalia, Samoa, and Panama, have witnessed a surge in multidimensional poverty. Many countries shifted their priorities to addressing their immediate health and socioeconomic crises. This has resulted in a reduction of resources and attention towards long-term goals such as mitigating and adapting to the impacts of climate change, including the preparation of NDCs.

14 Parties have also acknowledged the combined impacts of both COVID-19 and climate change in their NDCs (Table 1). For instance, the COVID-19 pandemic has compounded the detrimental effects of extreme weather events and coastal erosion in Tonga, causing irreversible harm and exacerbating poverty while hindering the country's efforts to achieve its national development goals. Similarly, the tourism-dependent economy of St. Kitts and Nevis has been severely affected by the COVID-19 pandemic when climate change has already impacted its critical sectors.

Poverty and surging debt were significant challenges in many developing countries, as 13 NDCs demanded urgent financial support. The year 2020 marked an enormous rise in sovereign debts in low- and middle-income countries by 9 % of the GDP, compared to 1.9 % over the previous decades (World Bank, 2022b). The downgrading of 51 countries' credit rankings, including 44 emerging economies (World Bank, 2022b), leads to more money being directed to pay off debts rather than services for citizens. Compounding these challenges is the potential impact of global warming, which has not been fully considered or understood in most sovereign bond prospectuses (Dibley et al., 2021). As extreme weather events become more frequent and intense, there is an increased risk of economic disruption, infrastructure damage, and social instability, all of which can impede a country's ability to repay its debts. In light of these challenges, governments and financial institutions must take a proactive and holistic approach to address the interrelated issues of pandemic recovery, climate change, and financial stability (Dibley et al., 2021).

The long-term effects of COVID-19 on economies are uncertain and will take time to evaluate (11 NDCs). Fewer than half of the submitted NDCs proposed higher reductions in emissions, while 11 NDCs acknowledged that the pandemic might disrupt their efforts towards addressing climate change. Some Parties, such as Chile and Vanuatu, might revise their GHG targets in light of the COVID-19 pandemic and its consequences.

Interestingly, the NDCs that communicated 'green recovery' increased from nine in December 2020 (Wyns and Daalen, 2021) to 24 in May 2022. As stated in Macedonia's NDC, "... with COVID-19, the world was just being handed a once-in-a-lifetime opportunity to alter the energy landscape." Island nations, including Mauritius and Barbados, pledged to prioritise environmentally sustainable revitalisation of their economies in the post-pandemic era. Although 23 countries have pledged to pursue a green recovery as part of their Nationally Determined Contributions (NDCs), there is a significant disparity in low-carbon investment in COVID-19 recovery efforts, ranging from 2.5 to 12.1 % of total COVID-19 spending or 17–19 % of recovery spending (UNEP, 2021).

3.1.2. The role of virtual negotiations during the pandemic

Virtual diplomacy refers to the use of digital and technological tools to conduct diplomatic activities. Virtual diplomacy includes virtual meetings, video conferencing, and other forms of communication that allow diplomats to interact with one another and foreign officials, despite geographical distance. It offers an excellent platform for sharing information with a broader range of participants from different regions, even in meetings usually reserved for high-level diplomats (Bjola and Manor, 2022). The widespread use of virtual diplomacy has only taken off in recent years. This shift can be largely attributed to the COVID-19 pandemic, which forced diplomats to find new ways to communicate and work together due to a variety of restrictions, including

border closures, social distancing, and lack of vaccination. As a result of these limitations, most pre-summit meetings and conferences have been forced to occur online. This has prompted a significant increase in the use of virtual diplomacy, with diplomats and government officials around the world embracing new technologies and platforms to facilitate their work.

Despite their widespread use, virtual conferences revealed some pitfalls that could undermine meeting outcomes. In a study about the transition of conventional in-person COP meetings towards a more virtual environment, SEI (2021) pointed out three most concerning issues, namely, (1) exacerbating power imbalances in the negotiations between developing and developed countries; (2) hindering active participation, interaction and relationship-building; and (3) reducing effectiveness and legitimacy of the decision-making process. The most cited difficulty was barriers in time zones and scheduling (69 %), followed by inequality in participation, especially in countries with unreliable networks or a lack of technical skills about online platforms (40 %). The lack of human interactions in the virtual environment was the main counterproductive factor in building trust, negotiating, and reaching conclusions (Bjola and Manor, 2022). Although the virtual environment could offer a higher participation rate, the level of meaningful engagement and influence of civil society representatives, observers and journalists were marginalised. Finally, cybersecurity issues during meetings were often overlooked and unaddressed.

Nevertheless, as COVID-19 subsides, many bilateral and multilateral meetings will remain virtual due to time, travel, and budget advantages. The choice between in-person, online, or hybrid modes will depend on the importance of the matter, its urgency, and the purposes of the meeting. Whereas virtual and hybrid meetings are more suitable for exchanging information and raising public awareness, in-person meetings are irreplaceable for more sensitive and results-oriented negotiations (Lehne, 2021).

3.1.3. Nationalism and xenophobia

During the COVID-19 pandemic, nationalism, isolationism, and protectionism have gained prominence, as some wealthy nations have placed their interests ahead of those of vulnerable populations in other countries (Bieber, 2022; Lehne, 2021). Despite this, the global nature of the COVID-19 pandemic has emphasised the need for international cooperation. The United Nations has repeated the message that "no one is safe until everyone is safe", yet some countries have prioritised their own vaccine needs, leading to disparities in access to vaccines between high-income and low-income countries. While more than 70 % of people in high-income and upper-middle-income countries were fully vaccinated and 40–50 % received their booster shot, low-income countries only passed the mark of 15 % of their population being injected (Fig. 2). As a result, many people in low-income countries are still waiting for their first vaccine dose, while some countries are destroying surplus supplies. The World Bank (2022a) projects that only one-third of the population in low-income countries will receive their first injection by the end of 2023. This inequality in vaccine access may have significant public health implications and raises questions about equitable solutions for addressing global challenges such as climate change.

The outbreak of COVID-19 was accompanied by a surge in xenophobia, fuelled by media coverage. Terms such as "Chinese virus", "China-virus", "Wuhan-virus", and "Kung Flu" were deliberately used not only in mainstream or social media but also by influential politicians, despite efforts by the World Health Organization (WHO) in 2015 not to name a disease that refers to specific geographical locations, names, animals, or cultures (WHO, 2015). The repetition of such a race-tinged language may result in a subtle but profound psychological shift towards Sinophobia. As a result, people and businesses perceived as Asian have skyrocketed, with reported anti-Asian crimes in the US alone increasing by 150 % in 2020 (Ittefaq et al., 2022). Despite attempts by UN Secretary-General António Guterres to address the "tsunami of hate and xenophobia" in 2020, Sinophobia is unlikely to ever disappear entirely, even after the end of the COVID-19 pandemic.

3.1.4. Fractures of international diplomacy

The COVID-19 pandemic has heightened existing challenges in international diplomacy. There has been a noticeable shift towards inward-looking

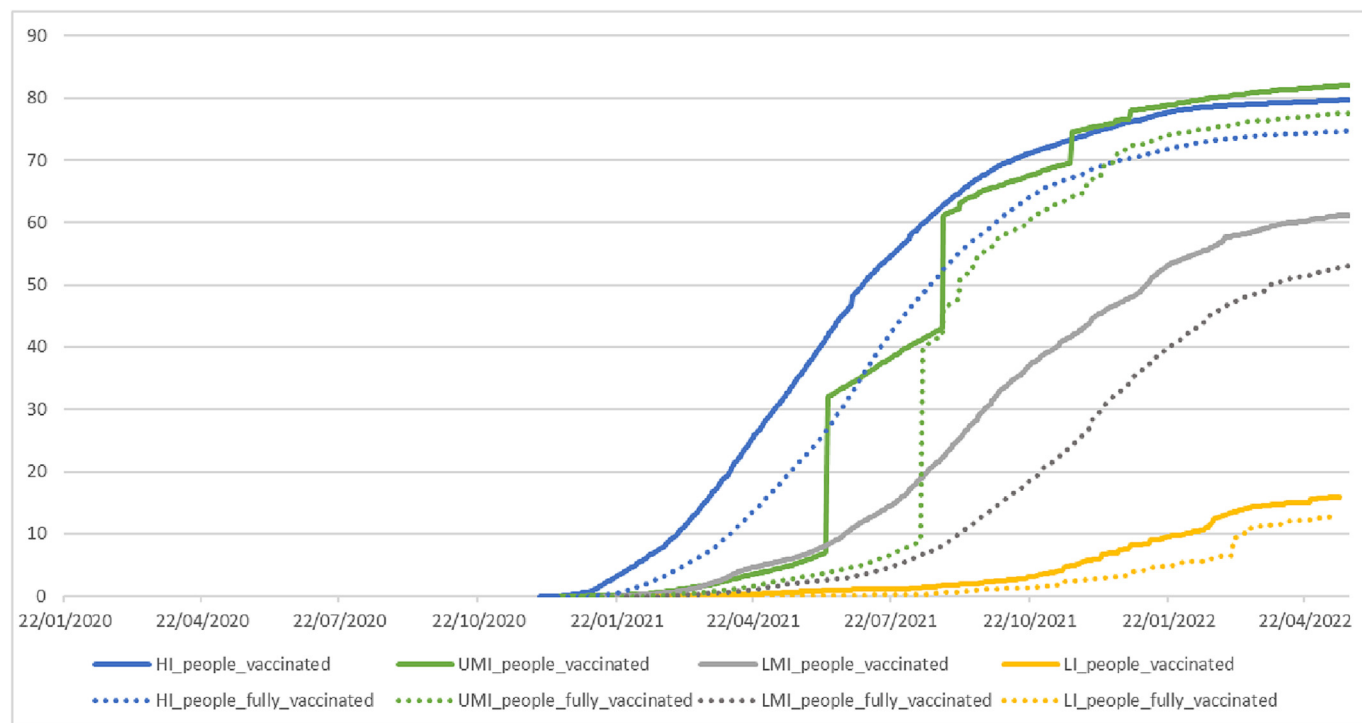


Fig. 2. Percentage of vaccinated and fully vaccinated people in high-income (HI), upper-medium income (UMI), lower-medium income (LMI), and low-income (LI) countries (data obtained from <https://ourworldindata.org/covid-vaccinations>, accessed on 30th May 2022).

policies and a decrease in foreign engagement. The introduction of border restrictions, differing opinions over the origin of COVID-19, competition for medical supplies, export bans, and vaccine nationalism have caused increased tensions, mistrust, and scepticism among nations. The handling of COVID-19 in its early stages has led to heated debates and strained relationships between neighbouring countries such as China, Japan, and South Korea, as well as between the US and China, with several rounds of tariffs and counter-tariffs taking place in 2020–2021.

COVID-19 also acts as a catalyst for speeding up international relations from unipolarity towards multipolarity, with the US, China, and other middle powers such as the European Union emerging as critical players. Both the US and China have faced challenges in their leadership roles in response to the pandemic. China's initial success in controlling the spread of the virus has boosted its confidence, while the US's delayed and divided response has raised questions about its leadership abilities. However, China's reputation was impacted by the initial handling of the outbreak, which was criticised for lack of transparency. Despite China's subsequent efforts to improve its image, some have questioned the motives behind its provision of masks and vaccines to other countries (Álamo and Lim, 2021).

The relationship between two of the world's largest polluters and geopolitical rivals, China and the US, has the potential to escalate significant conflicts. These tensions could undermine collective efforts to curb global warming, such as a carbon border tax agreement. However, multipolarity might benefit climate actions when China and the US compete to lead the global fight against climate change. To date, both countries have been reluctant to prioritise decarbonisation. While China is at the frontier of clean-tech manufacturing, it struggles to reduce domestic emissions. Addressing global warming will require both countries to work together, with middle powers playing a crucial role in mediating the situation (The Atlantic Council of the United States, 2022).

3.1.5. Scepticism about the role of UN institutions

The importance of a global entity in guiding the world through global challenges such as climate change or COVID-19 is obvious, but the effectiveness of UN institutions in fulfilling this role may be open to criticism. The COVID-19 pandemic exposed the lack of coordination among UN

institutions, the IMF, and the World Bank, hindering multilateral efforts to address current and future crises (United Nations, 2022).

The most pressing issue regarding the World Health Organization's (WHO) governance is its lack of enforcement powers. While its technical functions have enabled it to gather and disseminate information about the novel virus effectively, coordinate scientific research, and rapidly facilitate vaccine development and distribution, its inability to enforce accountability has faced criticism from multiple countries. The failure to heed early warnings about the potential for human-to-human transmission of the virus, and to promptly warn the world of the impending pandemic, has been seen as a significant weakness. The WHO has also faced criticism for being indecisive or biased towards China, which resulted in the withdrawal of substantial funding from its largest donor, the United States, in May 2020.

The governance of the WHO and the UNFCCC share similar challenges in their respective efforts to address global issues. While the Paris Agreement has been adopted as a legally binding treaty, the provisions for its implementation are limited to the submission and updating of NDCs and lack robust enforcement mechanisms. The non-adversarial and non-punitive approach of the agreement may have encouraged countries to ratify it, but progress towards its goals may still face obstacles such as political neglect, free-riding, conflicting interests, and lack of public involvement (Lehne, 2021).

3.1.6. Exacerbation of global inequality

The COVID-19 pandemic has exposed disparities and unequal resource distribution in addressing its global impacts. Rich countries have the advantage of being able to make decisions and adjust their course of action. In contrast, poorer countries may not have the same resources to deal effectively with the virus once it reaches their territories. This inequality is reflected in the predicted economic recovery, with advanced countries expected to return to pre-pandemic growth trends by 2023, while developing economies may continue to face the consequences due to low vaccination rates, persistent outbreaks of COVID-19 variants, and limited budgets (World Bank, 2022a).

Income inequality, both within and between countries, is a direct result of the COVID-19 recession and unequal recovery. During the lockdowns,

not all economic sectors were impacted equally. High-tech industries, such as pharmaceuticals and technology, prospered, while over 114 million jobs were lost, primarily in the service sector. In 2021, the wealth of the top ten wealthiest individuals increased by \$402.17 billion, yet approximately 163 million people were pushed into poverty, living on less than \$5.5 a day (Oxfam, 2022). Women, low-skilled, and informal workers are the most vulnerable groups to income losses (World Bank, 2022a).

The income inequality caused by the COVID-19 pandemic is likely to persist and possibly worsen over time due to the exacerbation of the digital divide. The shift to remote learning as a result of the pandemic has affected hundreds of millions of children who lack access to technology and a reliable internet connection, particularly in low-income countries (United Nations Children's Fund and International Telecommunication Union, 2020). Additionally, the education of children who have lost their parents or income during the pandemic has been severely impacted.

Poverty and livelihood disruption threatens political stability, social cohesion, and democracy and hinders progress in addressing climate change (Lehne, 2021). Narrowing the inequality gap will require cooperation from all countries. In the short term, lifting vaccine export restrictions and providing debt relief are critical for low-income countries to recover economically. In the long term, rich countries must provide substantial financial and technical support for inclusive and sustainable green economic development.

3.1.7. Scientific collaboration

The successful deployment of scientific knowledge in tackling the COVID-19 pandemic requires several critical aspects, including the establishment of a common consensus platform, data and knowledge sharing, international cooperation, funding, public-private partnerships, and political endorsements. These elements work together to create a comprehensive and practical approach to addressing the challenges posed by the virus. Without a common platform for collaboration and a commitment to sharing data and knowledge, efforts to tackle the pandemic could be hindered. In February 2020, the World Health Organization (WHO) organised the Global Forum on Research and Innovation for COVID-19 (Global Research Forum). It established a Research and Innovation Collaborative Platform to foster international collaboration and knowledge sharing. The forum experienced significant growth in participation over the next two years, welcoming 3000 researchers from 134 countries in the following year and 5000 researchers from 171 countries by the second year (WHO, 2021, 2022). Druedahl et al. (2021) observed a rapid increase in partnerships for vaccine development, with 93 cases for the COVID-19 vaccines established within a year, compared to just 101 cases in the previous two decades.

Adequate funding and public-private partnerships are also essential to ensure the necessary resources are available to support research and innovation. Various sources of funding have been utilised, including government funding, international organisations, philanthropic organisations, and private sector investment (Cross et al., 2021). This includes initiatives such as the COVAX facility, which aims to ensure equitable access to COVID-19 vaccines for all countries, regardless of income level. In addition, several countries have also established public-private partnerships to accelerate vaccine production and distribution (Maher and Noorden, 2021). There have been criticisms over unequal funding and vaccine distribution in some cases. One of the main issues has been the role of monopolies in vaccine production and distribution (Guimón and Narula, 2020). In response, some countries and international organisations have called for greater transparency and cooperation in the production and distribution of vaccines, including sharing technology and intellectual property (Cross et al., 2021; Editorials, 2021). Despite those challenges, the funding for COVID-19 response and recovery is ongoing and continuously under review to address the evolving needs and challenges of the pandemic.

Collaboration between politicians and scientists in response to COVID-19 has been a crucial factor in determining the effectiveness of measures taken to control the spread of the virus and manage its impacts. Politicians play a vital role in providing the necessary resources and setting policies

that drive scientific knowledge and research implementation. On the other hand, scientists offer critical insights and evidence-based recommendations to inform effective decision-making (Colman et al., 2021). It should be noted that the role of scientific advice in COVID-19 policy-making changed throughout the pandemic and that expert advice contributes to sense-making rather than optimal decision-making in the context of conflicting values and uncertainty (Hodges et al., 2022). Nevertheless, effective collaboration between the two has resulted in more coordinated and effective responses to the pandemic (Klenert et al., 2020). This collaboration will provide a good channel for raising public awareness of more complex and subtle issues such as climate change (Bernardo et al., 2021; Editorials, 2021). Although both crises bear high levels of uncertainty, COVID-19 impacts are more immediate and obvious when global warming has more psychologically distant consequences (Ven and Sun, 2021). Thankfully, more evidence about climate change has been verified, and pathways to reduce its foreseeable consequences are widely available. Therefore, science and advanced technology will still be the foundation of the “just transition” from traditional fossil fuel-based to renewable-based or ‘green’ economies.

3.2. National level

The following section analyses how governments were challenged during the pandemic and the implications for future climate governance and green recovery.

3.2.1. Governmental leadership

Tackling the COVID-19 and climate change crises requires government leadership, adaptive governance, and public trust and compliance. The early decisions made by leaders have significantly impacted the infection rate and economic consequences, with three approaches observed globally: proactive intervention, reactive intervention, and lack of intervention, which can result in high costs if delayed or not acted upon. The rationale for these approaches might first be attributed to their presence or absence of exposures to previous viral epidemics, although this was not always the case (Klenert et al., 2020).

The ability of politicians to make difficult and unprecedented decisions in response to uncertain circumstances to protect human lives is a critical factor in managing the effects of the crisis. Addressing climate change will also require this type of political determination over a much extended period. However, unlike the COVID-19 pandemic, where swift and extensive measures were taken to return to a “new normal,” climate governance has yet to garner sufficient momentum to curb the trend of increasing CO₂ emissions. Ven and Sun (2021) documented factors that drove such drastically different responses from developed countries and their implications to shorten the psychological distance for more robust, resilient, and in-depth climate change policies. These factors must be well communicated to the public in an honest, informative, and evidence-based way to ensure the sustainability of such policies (Table 2).

Many countries have implemented strict and extreme measures to control the spread of the virus. This has raised concerns among supporters of democracy about the strengthening of authoritarianism and the erosion of democracy in over 80 countries (Repucci and Slipowitz, 2020). Despite the similarity in effectiveness between authoritarian regimes and democracies in controlling the pandemic (Lowy Institute, 2022), the autocratic style of solving issues is gaining traction (Bieber, 2022). There is fear that some governments may continue to abuse their increased power and authority gained from COVID-19 containment and surveillance measures to suppress democracy long after the pandemic has passed (Brown et al., 2021). The consequences of weakened democracy and unprecedented control may include corruption and, in the long term, dissatisfaction with the government, as seen in Vietnam, where numerous high-ranking officials, including a president, deputy prime ministers, several ministers and mayors, have been involved in COVID-19-related bribes.

In addition, public trust and compliance are the core of any policy's short-term enactment and long-term sustainability. Nations with high levels of public trust in governments and institutions, as well as social

Table 2

Comparison of characteristics between the COVID-19 crisis and climate crisis (adapted from Ven and Sun (2021)).

Characteristics		COVID-19 crisis	Climate crisis	Implications for climate change governance
Immediacy	Speed of crisis	Fast	Slow, speeding up	Reinforce that climate change is speeding up and more intense, based on factual evidence
Transience	Duration of crisis and its responses	Temporary	Long-term	Ensure transient cost will be compensated in a longer-term
Visibility	Appearance of visuals	Daily	Indirect, abstract	Provide more connected visuals in prominent channels Shift abstract policies to local actions
Proximity	Geological and psychological distance	Close	Varied	Present impacts closer to home
Accountability	Personal responsibility	High	Low	Foster public awareness of personal accountability
Universality	Being shared by all people	Yes	No	Present impacts closer to the self
Expertise	Expert knowledge	Objective, unprejudiced	Politicised	Reduce political influence on climate research
Legibility	Causal interaction between measures and impacts	Direct	Indirect	Set up specific and accountable goals and outcomes

cohesion, have been found to have better compliance with official measures during the COVID-19 pandemic, leading to lower infection and mortality rates (Apeti, 2022; Bargain and Aminjonov, 2020; Reiersen et al., 2022; Vu, 2021). This can be attributed to the correlation between government trust and personal responsibility, resulting in a greater willingness to act on individual-level policies (Poortinga et al., 2022).

On the other hand, how the COVID-19 pandemic has been managed can either boost or weaken public confidence in the government's ability to handle future crises. Trust in the government is a dynamic, constantly changing entity that is influenced by events and the responses of the government (Bi et al., 2022). If the government's handling of the pandemic leads to a loss of trust, this could result in scepticism about future climate action plans, particularly among young people. For example, individuals who experienced epidemics during their impressionable years (18–25) displayed a substantial and lasting decrease in confidence in political leaders, governments, and elections, with the highest exposure to an epidemic resulting in a 7.2 percentage point decrease in confidence in election integrity, a 5.1 percentage point decrease in confidence in the national government, and a 6.2 percentage point decrease in political leader approval (Aksoy et al., 2020). The complex and unpredictable nature of climate change and COVID-19, combined with conflicting messages from world leaders, has fostered a fertile ground for the proliferation of “misinfodemics”, which has gone beyond the bounds of the pandemic (Chou et al., 2021).

3.2.2. Green recovery

The COVID-19 pandemic served as a global-scale experiment on the magnitude of actions necessary to achieve emissions targets. The sudden shutdown of the global economy led to a 5.4 % reduction in anthropogenic CO₂ emissions in 2020, according to the United Nations Environment Programme (UNEP, 2021). Unfortunately, this temporary dip did not affect the atmospheric CO₂ concentration, which would require a constant cutback of at least 7.6 % annually in 2020–2030 (UNEP, 2019). Therefore, implementing significant reductions in CO₂ emissions will have substantial socio-economic consequences, and some of the measures taken during the pandemic may need to be replicated to effectively reduce gigatons of CO₂ (Garrido-Cumbrera et al., 2021).

It is imperative to quickly transition to low-carbon industries post-COVID to ensure the well-being of both humanity and the environment (ERIA, 2022). To mitigate the negative economic impact of the pandemic, many countries have launched stimulus programs aimed at revitalising their economies and promoting low-carbon development. These programs aim to direct investment towards clean energy, low-carbon infrastructure, and other climate-friendly initiatives (IMF, 2021). As World Bank (2022b) stated, green initiatives should be integrated into their recovery, reinforcement, and redevelopment efforts to align their trajectory with the global temperature goal (World Bank, 2022b). In addition, the energy crisis resulting from the pandemic and the Russia-Ukraine war have accelerated the trend towards renewable energy sources and decentralised energy systems to reduce dependence on imported fossil fuels and increase energy security.

However, moving from the traditional emission-intensive economy to a carbon-reduction economy is facing enormous pressure to facilitate a

speedy recovery (Marquardt and Fearnough, 2021). The return of economic activities has resulted in a historic increase in CO₂ emissions, with more than 2 billion tonnes added in 2021 alone (IEA, 2022). A similar pattern was observed after the global financial crisis in 2007–2009 (Jaeger et al., 2020). In a comprehensive analysis of the G20 pandemic economic recovery packages between 1st January 2020 to 31st December 2021, Nahm et al. (2022) discovered that the COVID-19 fiscal stimulus response has varied among countries regarding investments in emissions-reducing measures. The European Union and South Korea have dedicated over 30 % of their stimulus funds towards such initiatives. In contrast, the United States, Japan, Canada, and the UK have invested less than 10 % despite their official commitments to the Paris climate agreement (Fig. 3). It is worth noting that most of the research has focused on higher-income countries, leaving a lack of information on the stimulus programs in other developing nations (Marquardt and Fearnough, 2021). The absence of sufficient funding and development of capacities in these countries could hinder their ability to adopt a green recovery, forcing them to turn towards fossil fuels as a means of resuscitating their economies, as in the case of India, China and South Africa (Nahm et al., 2022).

3.3. Local and individual level

3.3.1. Changes in perception of human-nature interactions

The pandemic has profoundly affected people's perception of the relationship between humans and nature. First, during lockdowns and other measures taken to slow the spread of the virus, many people observed the positive effects of reduced human activities on the environment, such as improved air quality (Hammer et al., 2021; Le Quéré et al., 2020) and water quality (Chakraborty et al., 2021; Ormaza-Gonzalez et al., 2021) and the return of wildlife (Rutz et al., 2020) to urban areas. Secondly, due to travel restrictions and limited leisure opportunities, people have discovered the natural beauty and tranquillity close to home, leading to a greater appreciation of local parks and nature reserves. This has heightened awareness of the benefits of green spaces and nature for mental and physical health (Reid et al., 2022). A recent survey conducted by the International Monetary Fund (IMF) among 14,500 people in 16 countries found that 43 % of respondents are more concerned about climate change and support green policies compared to before the pandemic, especially those who have been directly or indirectly impacted by COVID-19 (Mohammad and Pugacheva, 2022). However, an in-depth study by Poortinga et al. (2022) shows that people tend to believe that their actions are more effective in preventing COVID-19 than in preventing climate change. Consequently, people are more reluctant to support policies that target individual efforts to address climate change, making it difficult to motivate individuals to make personal lifestyle changes compared to their willingness to accept government actions. Public education about the relationship between personal behaviour and wider system change is necessary to help promote sustainable practices.

3.3.2. Engagement in politics and climate governance

The pandemic has also increased the sense of urgency around climate change and led to a rise in youth activism and mobilisation (Storch et al.,

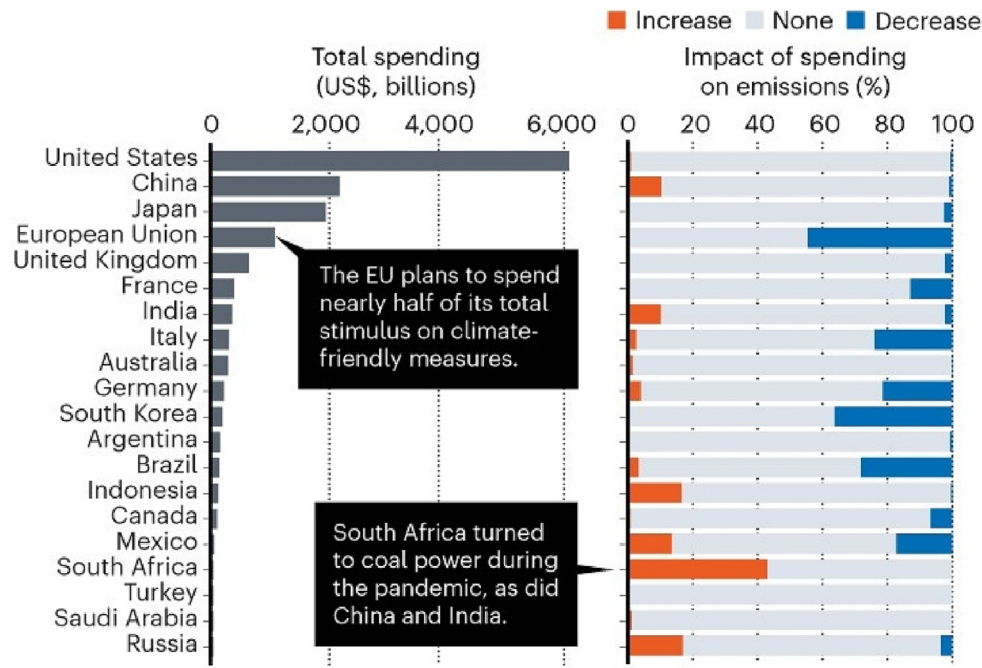


Fig. 3. The total spending of COVID-19 fiscal stimulus packages and impacts on emissions (Jaeger et al., 2020).

2021). Many young people have become more aware of the impacts of the pandemic and are eager to advocate for a more sustainable future. The bottom-up approach and public-private partnerships, as emphasised in the Paris Agreement, have become even more crucial in the face of the pandemic, as these mechanisms allow for the active engagement of citizens in the fight against climate change (Jernäs and Lövbrand, 2022).

In addition, the COVID-19 pandemic has significantly shifted towards utilising digital technology for public engagement (Hofstra et al., 2022). With the vast amount of readily available information and the deliberate dissemination of data from reputable scientific institutions and communities, the public is now better equipped to access and understand the actions to address the issue. The well-informed and engaged public can play a crucial role in advocating for climate change prioritisation by the government. Therefore, in the post-pandemic recovery phase, it is vital to involve the public in re-assessing government responses and accountability, as authentic public participation can lead to a deeper understanding of pandemic response effectiveness and promote shared responsibility among the public, local governments, and central government (Evans, 2021). The more powerful and consistent the climate movement is, the less it becomes susceptible to political fluctuations.

4. Recommendations

The pandemic has posed several challenges to the transition towards a more sustainable future. The short-term economic pressures brought about by the pandemic may lead to a shift towards more traditional and less sustainable economic practices. Additionally, the lack of political will and investment in green initiatives may be a hindrance. However, this also presents a unique opportunity for increased investment in green infrastructure and technologies. Here are some recommendations for fostering the post-pandemic low-carbon recovery, which will require a concerted effort from governments, the private sector, and civil society to ensure that the transition towards a more sustainable future is inclusive and equitable:

- Leveraging the benefits of virtual and traditional diplomacy to achieve more comprehensive and inclusive climate action: To effectively tackle climate change, a combination of virtual and traditional diplomacy can be employed during negotiations. Virtual diplomacy can be leveraged through video conferencing, online platforms, and social media to hold

virtual meetings, ensure inclusivity and transparency, and build public support. Traditional diplomacy can be used through international conferences, bilateral and multilateral diplomacy, and climate diplomacy, which can help build relationships and facilitate communication, support international cooperation, and achieve a low-carbon future.

- Addressing post-pandemic nationalism and xenophobia: Avoiding post-COVID nationalism and xenophobia requires a collective effort from individuals, governments, and civil society. To achieve this, actions can be taken such as promoting inclusivity and diversity through public education campaigns, community engagement and policies; addressing misinformation and stereotypes related to COVID-19 and foreign cultures through public awareness campaigns, fact-checking, and education; fostering international cooperation; supporting economic recovery efforts that are inclusive and equitable; and holding leaders accountable for their actions and statements related to nationalism and xenophobia.
- Integrating climate goals into all policies: The COVID-19 pandemic has shown the importance of coordinated and integrated policy approaches. This should extend to climate policy, with the integration of climate goals into all economic, social, and environmental policies, especially to promote collaboration across different levels of organisations while incorporating major polluters.
- Supporting the transition to a low-carbon economy: As emphasised by Klenert et al. (2020), the main challenge in mitigating climate change lies in need for extensive efforts to transform the global economy as a whole. This includes a transition to circular and regenerative economic models, which prioritise preserving and restoring natural resources and promoting social and environmental justice. Because the transition to a low-carbon economy will be challenging, particularly for developing countries, the international community should support these countries through technical assistance, capacity building, and access to financing.
- Improving scientific collaboration and communication: The COVID-19 pandemic and climate change highlight the importance of science and evidence-based decision-making. In both cases, accurate data and scientific analysis have been essential to understanding the nature of the crises and developing effective responses. While climate change research already has a strong collaboration and data sharing foundation, the COVID-19 pandemic has shown room for improvement. Learning from the information campaign surrounding the pandemic, we can support open access to scientific information and data related to climate change.

This can increase the accessibility and transparency of research findings and enable more individuals and organisations to contribute to scientific discussions, ultimately leading to more effective solutions to the challenges of climate change.

- Encouraging investment in low-carbon technologies: The pandemic has demonstrated the need for new and innovative technologies to respond to global challenges, such as renewable energy and energy efficiency, which can support the transition to a low-carbon economy.
- Promoting green stimulus packages: The COVID-19 pandemic has resulted in widespread economic stimulus packages, many of which have focused on recovering traditional, high-carbon industries. Nahm et al. (2022) recommended four strategies to prioritise green initiatives and low-carbon industries, such as: (1) imposing environmental prerequisites on stimulus bills, (2) accelerating measures that directly reduce emissions, (3) allocating resources towards industries that have low carbon emissions, developing strong institutions that can withstand potential crises, and supporting employees in the fossil fuel sector in transitioning to new jobs, and (4) investigating why there has been a decrease in emissions-reducing recovery spending and identify the most effective types of investment for both climate and economic recovery.
- Fostering individual responsibilities in climate action: In addition to promoting low-carbon industries and building resilient institutions, encouraging personal responsibility in climate action is crucial. One way to do this is by making values transparent and inoculating citizens against misinformation. People may not always have access to accurate information or fully understand their actions' impact on the environment. By promoting transparency and providing accurate information, people can make more informed decisions and take responsibility for their actions. Changing perceptions and tweaking policies to make them more appealing are also essential. Policies that incentivise sustainable behaviour, such as using public transportation or consuming local produce, can encourage people to make more environmentally conscious decisions. This, in turn, can lead to a reduction in carbon emissions and a more sustainable future for all.

5. Conclusion

The COVID-19 pandemic has brought about profound global changes, with far-reaching impacts yet to be fully understood. It has underscored the critical importance of sustainability and environmental issues and revealed the need for resilience and sustainability in the face of global challenges, emphasising the importance of preparing for future disruptions and uncertainties. This study aims to provide a nuanced understanding of how the pandemic is likely to shape climate change negotiations from global, national, and local, as well as individual perspectives. The pandemic has highlighted the fragility, divisiveness, and lack of coordination of collective responses to an acute crisis. At the global level, the pandemic has caused international climate change negotiations delays, such as the COP26 conference and updates to Nationally Determined Contributions (NDCs). It has also led to strained diplomatic relations and raised questions about the role of UN institutions in guiding nations through crises. The rise of nationalism and growing global inequality may pose short-term and long-term challenges to the fight against climate change. However, the unprecedented level of scientific collaboration has provided a foundation for innovative solutions. At the national level, government leadership has been tested in many ways, from protecting citizens to providing support and maintaining livelihoods. The concept of green recovery is gaining traction, though it faces substantial socioeconomic challenges. At the local and individual levels, the sustained negative impacts of the pandemic for over two years have shifted people's perspectives and behaviours, leading to increased engagement in environmental issues and solutions.

The COVID-19 pandemic has brought about a renewed focus on sustainability and environmental issues, as the crisis has highlighted the importance of resilience and sustainability in the face of global challenges. This presents opportunities for investment in green infrastructure and technologies, such as renewable energy, electric vehicles, and sustainable transportation. Such investment can not only contribute to a more sustainable future but can

also create new jobs and stimulate economic growth. Furthermore, the pandemic has resulted in a shift towards more sustainable consumption and production patterns as people become more conscious of their impacts on the environment.

However, the pandemic has also posed several challenges to the transition towards a more sustainable future. The short-term economic pressures brought about by the pandemic may lead to a shift towards more traditional and less sustainable economic practices. Additionally, the lack of political will and investment in green initiatives may be a hindrance, as many countries prioritise short-term economic recovery over long-term sustainability goals. Furthermore, the benefits and costs of a green recovery may not be equitably distributed, with marginalised communities and countries potentially missing out on the benefits. Addressing these challenges will require a concerted effort from governments, the private sector, and civil society to ensure that the transition towards a more sustainable future is inclusive and equitable.

CRedit authorship contribution statement

Thi Phuong Tram Vo: investigation, writing - original draft, methodology, formal analysis, data curation

Huu Hao Ngo: supervision, investigation, project administration, conceptualization, review & editing

Wenshan Guo: supervision, investigation, review, editing.

Chis Turney: investigation, project administration, review

Yiwen Liu: formal analysis, resources, review

Dinh Duc Nguyen: investigation, review

Xuan Thanh Bui: resources, review

Sunita Varjani: formal analysis, review

Data availability

Data will be made available on request.

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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