Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Preface

Introduction to the special issue "Environmental impacts of COVID-19 pandemic"

COVID-19 (Coronavirus Disease – 2019) is an infectious disease identified in late December 2019 in the Wuhan city of China and well known to the world as WHO (World Health Organization) declared it as a pandemic in March 2020. It is caused by severe acute respiratory syndrome coronavirus (SARC-CoV-2). COVID-19 has spread worldwide and caused several million deaths. Many countries have announced some sort of lockdown to find a solution to COVID-19 by discontinuing the transmission. People remember COVID-19 with a number of major negative impacts on humans and their surrounding environment; however, communities never decline the positive effects on environmental quality during COVID-19. This special issue of *Gondwana Research* assembles a set of contributions that provide an overview of the impact of COVID-19 on air and water quality, air pollutant quantification, solid waste, economics status, and meteorology and provide mitigation measures.

In view of the impact of COVID-19, Kurwadkar et al. (2023) have focused on emissions of black carbon and polycyclic aromatic hydrocarbons: Potential implications of cultural practices during the Covid-19 pandemic. The study showed that major COVID-19 hotspots in India, such as Delhi, Mumbai, Chennai and Bangalore, Pune, Ahmedabad, Varanasi, Surat, and Lucknow, with a higher incidence of COVID-19 cases and deaths, also had higher $PM_{2.5}$ emissions with a positive correlation between the incident of COVID-19 cases (R^2 = 0.66) and subsequent resulting deaths (R^2 = 0.60). The implication of this study is to demonstrate that besides enforced lockdown, national preparedness policies must also consider the cultural practices which may offset the gains and potentially exacerbate the spread of viral diseases during the pandemic. These investigations suggest that increased short-term deterioration of air quality affects human health and potentially exacerbates the spread of viruses due to acute exposure to large amounts of airborne particulates and aerosols.

Sekar et al. (2023) investigated a case study on air quality change and public perception during the COVID-19 lockdown in India. From this study, it is evident that there was a significant improvement in the actual and perceived air quality in India after the COVID-19-induced lockdown. The perception of improvement in air quality was influenced mainly by the reduction in particulate matter. The odds ratio showed a very strong dependence of perception on actual air quality and a strong association between air quality improvement and health improvement. Suggestions by the public for maintaining air quality even after lifting the COVID-19 lockdown are also given in this study.

The impact of COVID-19 on the environment with special reference to wildfire was presented by Naqvi et al. (2023). Here, authors highlighted wildfire-induced pollution and its short-term impact on COVID-19 cases and mortality in California. In this study, authors examined wildfire-induced short-term changes in the tropospheric and ground air pollutants in five major cities in California, US. Results show that wildfires contribute to a rapid surge in PM2.5 and CO levels during the peak wildfire period (August 16-September 15, 2020). Interestingly, increase in air pollution overlaps with the spike in COVID-19 cases and mortalities in Fresno, Sacramento suggesting that in addition to wildfire generates air pollution, other factors may contribute to the adverse increment in viral spread. Our results highlight the crosstalk between wildfire-induced air pollution, and human health in the wake of a highly transmissible pandemic.

COVID-19 pandemic has severely crippled the economy on a global scale. Effective and accurate forecasting models are essential for proper management and preparedness of the healthcare system and resources, eventually aiding in preventing the rapid spread of the disease. With the intention to provide better forecasting tools for the management of the pandemic, the current research work analyzes the effect of the inclusion of environmental parameters in the forecasting of daily COVID-19 cases. The outcome of this work reported by Wathore et al. (2023) suggests that the inclusion of daily averaged environmental parameters could significantly improve the prediction capability of deep learning forecasting model for COVID-19. Hence, it is recommended to integrate publicly available weather data (historical and forecast) for enhanced accuracy in the forecasting of city-level COVID-19 cases, although other positive and negative confounding factors can affect the forecasting power.

On the other hand, Mirza et al. (2022) studied the dispersion and tracking of aerosols in various artificial ventilation conditions using OpenFOAM to check the view of making distance only a safe way to prevent COVID-19. The preliminary results of this study with respect to flow fields were in close agreement with published literature, which was then extended under varied ventilation scenarios and respiratory-related activities. The study observed that improper wearing of masks leads to escape of SARS-CoV-2 contaminated aerosols having a smaller aerodynamic diameter from the gap between face mask and face, infecting different surfaces in the vicinity. It was also observed that aerosol propagation infecting the area through coughing is a faster phenomenon compared to the propagation of coronavirus-laden particles during speaking.

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The study's findings will help decision-makers formulate common but differentiated guidelines for safe distancing under different micro-environmental conditions.

Liu (2023) highlighted the issue entitled "The dynamics of early-stage transmission of COVID-19: A novel quantification of the role of global temperature". This result sheds light on the mechanism in the cyclicity of the ongoing COVID-19 pandemic worldwide. The implications of these results on policy issues are also discussed concerning a possible cyclical fluctuation pattern between the Northern and Southern Hemispheres. this study can still inspire the possible interaction between temperature and aerosol transmission. More interdisciplinary investigations from the perspective of biology, medicine, chemistry, physics, and so on are needed to unravel that mystery.

Wathore et al. (2023) showed improving performance of deep learning predictive models for COVID-19 by incorporating environmental parameters. The research presents the improved potential for deep learning models incorporated with environmental parameters as inputs for better and improved prediction of the daily COVID-19 cases in the selected locations, consisting of 8 cities across the globe with varying climatic zones. The multivariate long short-term memory model (LSTM) significantly outperformed the other univariate models. The proposed temperature and relative humidity integrated multivariate LSTM model can help the decision-makers and the authorities to effectively manage lockdown measures, resources and available infrastructure.

Kumar et al. (2023) reported a review article on Pollution free UV-C radiation to mitigate COVID-19 transmission. The high rate of transmission of the COVID-19 virus has brought various types of disinfection techniques, for instance, hydrogen peroxide vaporization, microwave-generating steam, UV radiation, dry heating, etc. to prevent the further transmission of the virus. Presented review article, efforts have been made to evaluate the technical aspects of UV (under different spectrum and wavelength ranges) and the control of COVID 19 virus spread in the atmosphere including the possibilities of the human body sanitization in working condition.

Zhang et al. (2023) also added information about reducing the COVID-19 mortality. In this study they found a significantly higher death rate from COVID-19 in low-Se states than in medium-Se or high-Se states, though the case densities of these states were not significantly different. Because inhaled dimethyldiselenide is a potent inducer of nuclear-factor erythroid 2 p45-related factor 2 (Nrf2), exposure to higher atmospheric dimethyldiselenide may increase Nrf2- dependent antioxidant defences, reducing the activation of NFjB by SARS-CoV-2 in the lung, thereby decreasing cytokine activation and COVID-19 severity. Atmospheric dimethyldiselenide may thereby play a role in COVID-19 mortality, although the extent of its involvement is unclear.

On the other hand, Gollakota and Shu (2023) found the way on energy with a unique opportunity for switching to clean energy during COVID-19. The presented review gives a clear picture of the current status of fossils and renewables, the impact of a pandemic, energy investments, government policy standings, threats, and opportunities, and finally, the key takeaways of avoiding energy scarcity in once a lifetime disaster situation.

Similarly, Sharma et al. (2023) pointing out the COVID-19 variant and their possible outcomes through the review article. Here, they synthesized the current state of knowledge on black fungus outbreak in India and identify key gaps in its understanding with respect to potential risk factors leading to the widespread infection. Authors looked at 3354 black fungus cases in India, enlisting ailment history (particularly diabetes) and steroid usage in COVID-19 patients as the key factors responsible for exacerbating risks associated with the disease. However, Sharma et al. (2023) also press on the possibilities that other less studied non-traditional risk factors may also have a role in causing the infection. Black fungus is therefore a reality of COVID-19, with or without diabetes or steroid use needs to be investigated. They believe such a review is imperative for making informed decisions specially around timely diagnosis and channelizing efforts in controlling the spread of COVID-19 associated mucormycosis.

Ranjbari et al. (2023) highlighted waste management (WM) updates through bibliometric and text mining analysis especially during COVID-19. This research aims at mapping the COVID-19-related scientific production to date in the field of WM. In this vein, the performance indicators of the target literature were analyzed and discussed through conducting a bibliometric analysis. The conceptual structure of COVID-19-related WM research, including seven main research themes, were uncovered and visualized through a text mining analysis as follows: (1) household and food waste, (2) personnel safety and training for waste handling, (3) sustainability and circular economy, (4) personal protective equipment and plastic waste, (5) healthcare waste management practices, (6) wastewater management, and (7) COVID-19 transmission through infectious waste. Finally, a research agenda for WM practices and activities in the post-COVID-19 era was proposed, focusing on the following three identified research gaps: (i) developing a systemic framework to properly manage the pandemic crisis implications for WM practices as a whole, following a systems thinking approach, (ii) building a circular economy model encompassing all activities from the design stage to the implementation stage, and (iii) proposing incentives to effectively involve informal sectors and local capacity in decentralizing municipal waste management, with a specific focus on developing and less-developed countries.

In view of sustainable development, Ameli et al. (2023) addressed on COVID-19 and Sustainable Development Goals (SDGs): Scenario analysis through fuzzy cognitive map modeling. The present research considers all the 17 UN's SDGs and aims at presenting a new insight for the 2030 Agenda for Sustainable Development and achieving the SDGs post COVID-19 in Iran, as a developing country. Iran has been infected dramatically by the pandemic with 4,960,744 positive cases, 107,151 death records, and the rank of 9 among all countries in terms of cumulative total death per 100,000 populations by August 31, 2021. Total economic loss resulting from the pandemic restrictions in Iran is estimated to be 47.23 billion dollars, which can affect the achievement of the UN's SDGs in this country. In this regard, the main questions of the research are formulated as follows. (1) How do SDGs affect each other? (2) How much has COVID-19 affected each one of the SDGs? and (3) What are the proper strategies to approach the 2030 Agenda for Sustainable Development post COVID-19?

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