Environmental Science and Pollution Research (2023) 30:99261–99272
https://doi.org/10.1007/s11356-023-25714-1

RECENT TRENDS IN ENVIRONMENTAL SUSTAINABILITY

Impacts of COVID-19 pandemic on environment, society, and food security

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Received: 20 April 2022 / Accepted: 31 January 2023 / Published online: 11 February 2023

Abstract

Coronavirus disease (COVID)-19 is a viral and transferable disease caused by severe respiratory syndrome-coronavirus-2. It can spread through breathing droplets in human beings. It caused 5.32 million deaths around the world at the end of 2021. COVID-19 has caused several positive impacts as well, such as a reduction in air, water, and noise pollution. However, its negative impacts are by far critical such as increased death rate, increased release of microcontaminants (pesticides, biocides, pharmaceuticals, surfactants, polycyclic aromatic hydrocarbons (PAHs), flame retardants, and heavy metals), increased biomedical waste generation due to excessive use of safety equipment and its disposal, and municipal solid waste generation. Environmental pollution was significantly reduced due to lockdown during the COVID-19 period. Therefore, the quality of air and water improved. COVID-19 affected all sections of the population, particularly the most vulnerable members of society, and thus pushed more people into poverty. At the world level, it increased risks to food safety by increasing prices and lowering revenues, forcing households to reduce their food consumption in terms of quantity and quality. COVID-19 also upset various exercises e.g., horticulture, fisheries, domesticated animals, and agribusiness hence prohibiting the development of merchandise for poor-country ranchers. Most of the patients can self-recover from COVID-19 if they do not have any other diseases like high blood pressure, diabetes, and heart problems. Predictably, the appropriate execution of the proposed approaches (vaccination, wearing face masks, social distancing, sustainable industrialization) is helpful for worldwide environmental sustainability.

Keywords COVID-19 · Microcontaminants · Pollution · SARS-CoV-2 · Social distance

Responsible Editor: Philippe Garrigues

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Introduction

The outbreak of coronavirus disease-19 (COVID-19) originated in Wuhan (China) at the end of December 2019. It is a transmittable disease instigated by unembellished acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) (Islam et al. 2020; Wang et al. 2020). Tyrell and Bynoe developed the infections from patients with regular colds and were first distinguished as COVID in 1966. They were called COVID (Latin: crown = crown), given their morphology as round virions with a focal shell and surface projections looking like a sun-oriented crown. Gnomically, it was found that bats might be the primary source of this SARS-CoV-2 (Chakraborty and Maity 2020). This virus contains a protein called spikes which play a role in the entry of the virus into the human cell.

COVID-19 requires a host. Incubation time is the time when a virus enters the human body up till the virus transmits from one person to another by direct interaction or by cough and sneeze droplets (Hui et al. 2020). Usually, serious convoluted conditions were recorded in 33% of the COVID-19 patients, who developed an intense respiratory infection, intense renal disappointment, intense respiratory harm, septic stun, and genuine pneumonia (Huang et al. 2020). While severe COVID-19 symptoms are like cardiac and lung injury and respiratory failure, which ultimately cause death (Holsey et al. 2020). Mostly, patients can self-recover from COVID-19 if they have no any other diseases like high blood pressure, diabetes, and heart problems (Verma and Prakash 2020). John Hopkins University reported that confirmed COVID-19-infected cases were 265.5 million which caused 5.32 million deaths around the world at the end of 2021 (BBC Report 2021). Even after 2021, COVID-19 continued to spread in all the countries of the world and has infected 658.8 million up till December 21, 2022, and caused 6.67 million deaths in 224 countries, while a few of the major infected countries are shown in Table 1 (WHO 2022) and these numbers are gradually increasing day by day.

Globally, countries adopted lockdown measures during its initial waves to protect their people by maintaining social distancing (French-Pardo et al. 2021). These lockdowns had several direct and indirect impacts (e.g., deterioration of solid waste, improved air and water quality, excessive maternal and child mortality, reduced economic activities, disrupted education, increased school dropouts, adolescent job loss, and disruption of food supply) on the environment, economy, and social well-being of people. COVID-19 drastically reduced anthropogenic activities, especially CO_2 emissions which resulted in the nourishment of nature and the environment (Tripathi 2020). As of April 7, 2020, World Economic Forum (WEF) stated that almost 3 billion individuals confronted lockdown worldwide, and movement was limited by corresponding administrations to overcome the spread of COVID-19 infection (WEF 2020).

Table 1 Spread of COVID-19 in various countries (since December 2019 till December 21, 2022) (WHO 2022)

Countries	Number of infected persons	Number of recorded deaths
USA	101,865,927	1,113,808
India	44,677,449	530,677
Brazil	35,992,620	692,210
UK	24,089,042	198,271
Russian Federation	21,728,409	393,107
Turkey	17,042,722	101,492
France	38,971,117	160,74
Germany	37,035,898	160,045
Iran	7,560,581	144,667
Argentina	9,829,236	130,080
Spain	13,651,239	116,658
Italy	24,884,034	183,138
Indonesia	6,711,703	160,451
Mexico	7,190,702	330,805
Poland	6,362,604	118,436
Ukraine	5,350,380	110,696
South Africa	4,046,986	102,568
Netherlands	8,559,116	22,952
Philippines	4,057,629	65,127
Malaysia	5,019,400	36,814
Peru	4,416,823	217,926
Thailand	4,718,908	33,505
Iraq	2,465,107	25,373
Pakistan	1,575,618	30,635
Total	437,803,250	5,019,441

A study reported that COVID-19 appeared as a blessing in disguise for the environment as air quality improved, concentration of GHGs reduced, water resources became clean, and wildlife was blooming (Saadat et al. 2020). A drastic reduction in particulate matter was observed, especially in the different cities of Spain, China, Italy, and the USA leading to clean air as well as clean beaches as tourists were not visiting them (Somani et al. 2020). Furthermore, people were working from home so different kinds of new job opportunities opened, e.g., freelancing and eCommerce. But there are negative and indirect impacts of COVID-19 on the environment, health, socioeconomic status, employment, industry, and education system (United Nations Sustainable Development Goals 2019). And these are very relevant to the global soil and water resources and their sustainable management (Keesstra et al. 2021).

Some of the major disadvantages of COVID-19 include an increase in waste production (organic and inorganic). Solid waste treatment/recycling programs have been ceased in major cities. Plastic pollution continues to increase (due to masks, other personal protective equipment, and disposable medical

waste) (Somani et al. 2020). Microcontaminants (insecticides, biocides, medicines, wetting agents, polycyclic aromatic hydrocarbons (PAHs), flare retardants, and heavy metals) are growing as a new contest to scientists internationally. They are released into the environment due to human actions and congregation into aquatic ecosystems (Abbas et al. 2022). Domestic chemicals have been releasing poisonous gases into the atmosphere and affecting human lives for a long period of time. Similarly, domestic chemicals disturb human health and affect fetuses, newborn babies, and male and female reproductive systems. People are converting to green products, compelling the producers to do the same, enhancing green companies' economic role and worth (Khalil et al. 2022).

Most importantly, food insecurity is increasing day by day as people in third-world countries have no access to their staple food, e.g., wheat and rice. The use of chemical fertilizers is decreasing in some areas due to hiking prices. However, bioorganic liquid fertilizers formed with various contents have appeared as a substitute for plant nutrition, soil conditioner, and improver. As a result, chemical fertilizers should be subsidized for maintainable land management by increasing their trials both in terms of low cost and in field greenhouse condition (Turan et al. 2022). Due to limited movement, people were unable to go outside and earn for their families and thus suffered from several social and psychological disorders, e.g., depression and anxiety.

The current COVID-19 pandemic is a message from nature to quit misusing the earth. A lot of natural historians quoted this and other media reports agree that, among other things, erosion and habitat loss increases the risk of viruses spreading from one organism to another, including humans. Coronavirus is a reminder to mankind. It is expected that the proper implementation of the proposed strategies (Fig. 1) (vaccination, wearing face masks, sustainable industrialization, reduction, reuse, recycling, international cooperation, and social distancing) might be helpful for global environmental sustainability (Singh and Mishra 2021). The studies must happen to find out high transmission rates of COVID-19. We need practical and cheap diagnostics of it. Community studies are key to learning about transmission rates and testing treatments to keep the disease from becoming severe. We need studies to work out how and why the impacts of such interventions could offset the benefit to public health and the environment. By some estimates, less than 1% of global research is led by researchers in developing countries (Lang 2020). The pandemic is devastating communities across the globe. Therefore, we need global data across communities to remedy it.

Environmental effects of COVID-19

COVID-19 has caused several positive and negative impacts, as shown in Fig. 2 (Rume and Islam 2020), on our planet. We are learning to be grateful that we are still alive. With the progression of the pandemic incited by the coronavirus, numerous urban communities throughout the planet embraced isolation, invigorating individuals to not course without the need (Zambrano-Monserrate et al. 2020). The fall in the development of urban areas caused coordinated impacts on the climate, similar to the lessening of the emanation of poisons in the environment and the expansion of home-grown and clinic waste generation (Zambrano-Monserrate et al. 2020).

Due to social movement restrictions, the quality of air improved and water contamination reduced in various parts of the world (Rume and Islam 2020). The disease transmission is influenced by absolute air temperature and humidity. And the plague unfavorably affected everyday lives, exercises, and climate (Liu et al. 2020). The majority of people were obligated to live in their houses, which prevented them

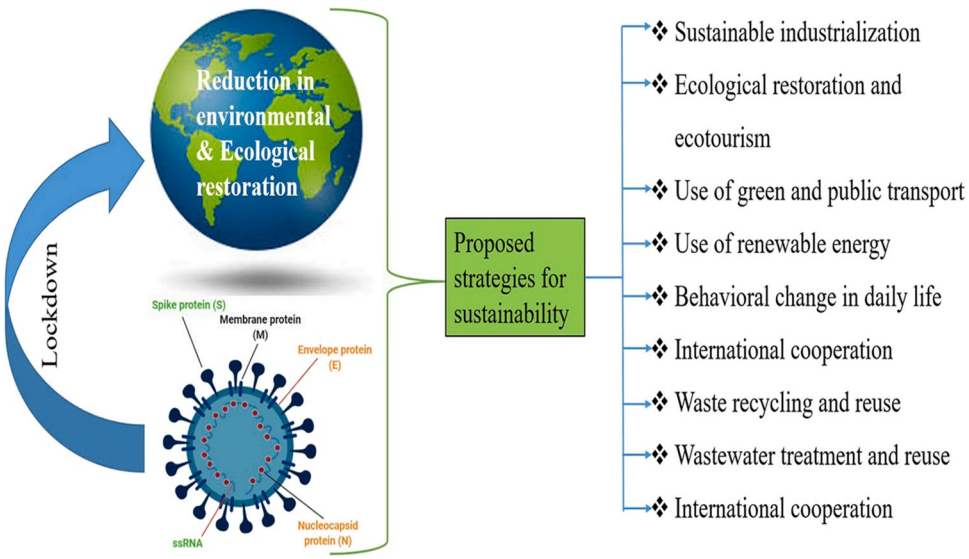

Fig. 1 COVID-19 impacts and strategies for sustainable development (Singh and Mishra 2021)

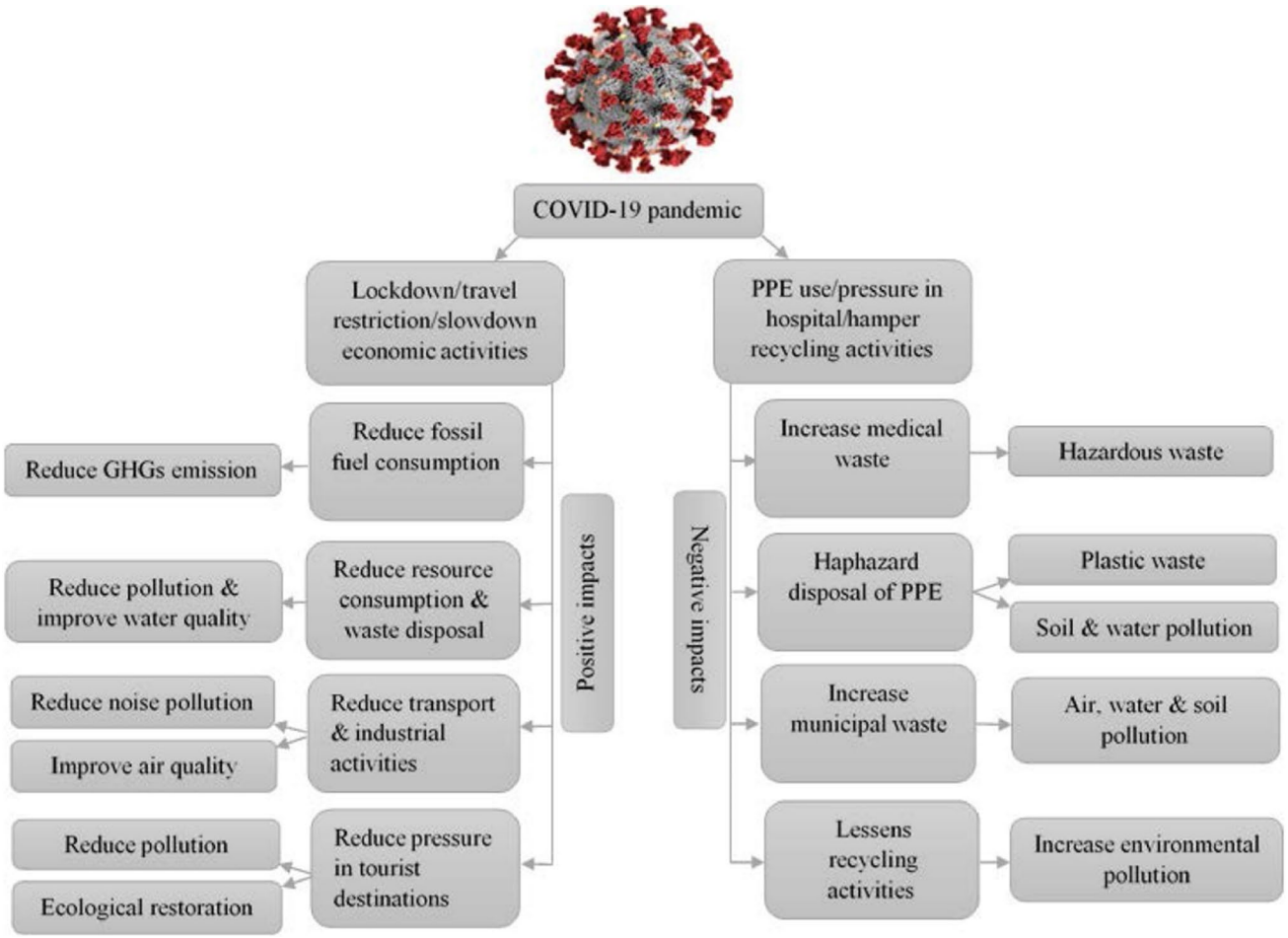

Fig. 2 Positive and negative impacts of COVID-19 (Rume and Islam 2020)

from causing different forms of pollution. Clean and green was reflected in the surrounding climate (Verma and Prakash 2020).

Positive environmental impacts of COVID-19

Decrease in atmospheric pollution and GHG emission

There are many pollutants, e.g., particulate matter (PM_{10} and $PM_{2.5}$), ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), in the atmosphere (Albayati et al. 2021). These contaminants were high before the spread of the COVID-19 pandemic due to transportation and industrial and human activities. Our World in Data (2022) reported that the amount of atmospheric CO_2 emission was decreased by about 5.14% (36.70 vs 34.81 billion tons CO_2 equivalent) during COVID-19 (Fig. 3) in the year 2020. Many industries in different countries were closed and transport was stopped due to lockdown, which led to less emissions of GHGs.

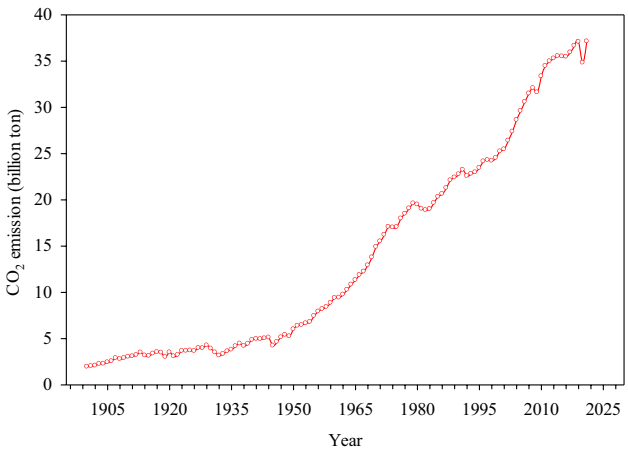

Fig. 3 World annual CO_2 emissions from the burning of fossil fuels for energy and cement production. Land use change is not included (source: Our World in Data https://ourworldindata.org)

According to an estimate, China's GHG emissions were decreased by around 50% due to industrial and transportation shutdown (Travaglio et al. 2021; Caine 2020). And improved (7.8%) air quality was observed during the lockdown in China. Specifically, the concentration of SO_2, $PM_{2.5}$, PM_{10}, NO_2, and CO_2 decreased by 6.76%, 5.93%, 13.66%, 24.67%, and 4.58%, respectively. However, due to a decrease in pollutants, ozone (O_3) concentration was observed to increase during the period of lockdown (Li et al. 2020). Singh and Mishra (2021) presented comparative data of various pollutants, i.e., $PM_{2.5}$ (μg/m^3), PM_{10} (μg/m^3), NO (μg/m^3), NO_2 (μg/m^3), NO_x (ppb), NH_3 (μg/m^3), SO_2 (μg/m^3), CO (mg/m^3), ozone (μg/m^3), benzene (μg/m^3), and toluene (μg/m^3) in Table 2.

The concentration of GHGs was decreasing, according to estimated C emissions decreased by around 25% over a month; similarly, a 10% reduction in the pollutants was reported, especially C and NO_2, in Northern Italy over of period of 2 months (Travaglio et al. 2021). Vehicles were not found on the streets leading to nearly zero emanation of GHGs and poisonous minuscule suspended particles to the climate. Because of the lesser interest in movements, the utilization of petroleum products or customary fuel sources was brought down extensively. Industries, transportation, and companies were shut down, leading to an unexpected decrease in GHG releases. Comparatively, levels of air pollution in New York dropped by almost 50% due to virus control measures with respect to 2019 (Singh and Mishra 2021).

The closure of heavy industries in China was estimated to cause a 50% reduction in NO_2 and CO emissions. The NO_2 emissions are a major indicator of worldwide financial activity, which indicated a decline for most of the nations (e.g., China, USA, India, Brazil, Canada, Italy) owing to closures. Similarly, NO_2 levels showed a decline in Ontario (Canada) from 4.5 to 1 ppb. Sao Paulo, Brazil, saw a 54.3% decline in NO_2. Whereas, NO_2 and $PM_{2.5}$ levels in the Indian capital Delhi dropped by almost 70%. Overall, the reduction of $PM_{2.5}$ and PM_{10} in India was 46% and 50% respectively, which occurred during the nationwide lockout (Siciliano et al. 2020).

Decrease in water contamination

Human life was positively and negatively affected by the COVID-19 pandemic. Anthropogenic activities polluted the atmosphere, biosphere, and hydrosphere, particularly in the last two decades. The ongoing water pollution caused by industrialization, overexploitation, and rapid urbanization was decreased during the period of lockdown due to the stoppage of wastewater disposal, plastics, and crude oil (Häder et al. 2020).

In developing countries like India, Pakistan, and Bangladesh, industrial and domestic wastes are disposed of into waterways without proper treatment. That has caused unprecedented water pollution in human history and is a common wonder for the developed world. During the pandemic, water quality improved in the rivers due to the lack of different industrial pollutants entering the water bodies; likewise, dissolved oxygen (DO) levels also increased by 8 ppm, and biological oxygen demand (BOD) levels dropped down by 3 ppm. All this improved the water quality supplemented by increased rainfall, reduction in irrigation, and melting of snow in summer (Zheng et al. 2021). This has been deeply studied in the USA (Maiti et al. 2021).

Prior to the COVID-19 pandemic, a high concentration of mercury was found in surface sediments and fish samples of Vembanad Lake, the biggest lake in India (Ramasamy et al. 2017). The major cause of water pollution was the industrial effluents (Priju and Narayana 2007), and water pollution from these sources was almost halted due to the closure of industrial and tourism activities and it caused improvement in water quality. The foremost industrial cause of contamination was immobility, which helped to decrease the pollution burden during the lockdown period.

Table 2 Comparison between air quality data of lockdown and unlock period (Singh and Mishra 2021)

Sr. No	Parameters	May 31, 2019	May 31, 2020	Standards (CPCB)
1	$PM_{2.5}$ (μg/m^3)	98.49	28.61	0.00–60.00
2	PM_{10} (μg/m^3)	439.14	39.44	0.00–100.00
3	NO (μg/m^3)	125.16	4.57	0.00–80.00
4	NO_2 (μg/m^3)	113.59	16.89	0.00–80.00
5	NO_x (ppb)	149.73	12.71	0.00–200.00
6	NH_3 (μg/m^3)	48.06	21.03	0.00–400.00
7	SO_2 (μg/m^3)	19.63	11.97	0.00–80.00
8	CO (mg/m^3)	2.30	2.97	0.00–4.00
9	Ozone (μg/m^3)	45.95	83.48	0.00–180.00
10	Benzene (μg/m^3)	4.62	2.33	0.00–5.00
11	Toluene (μg/m^3)	25.41	26.38	0.00–5.00

Decrease in noise pollution

The higher levels of sound, produced from various anthropogenic activities (e.g., heavy machines, construction works, vehicles), have a great impact on humans and other living beings. Generally, noise has an adverse impact on physical health, causes cardiac diseases and high blood pressure, etc. It has been recorded that around 360 million individuals have lost hearing because of noise pollution worldwide. Noise increases stress levels, and noise above the permissible limit can cause depression and anxiety (Fyhri and Aasvang 2010).

During the COVID-19 pandemic, the level of noise pollution decreased in major metropolitan cities. Pre-pandemic studies showed that the roadside noise level was the highest, which lowered by 1–3 dB during the lockdown (Terry et al. 2021). The indoor and outdoor sound levels at night remained around 25 dB during COVID-19. Age plays an important role to demonstrate noise level (Caniato et al. 2021). Therefore, the indoor noise level was measured across different ages, as the younger people give more noise level responses than 60 years olds, and older than 60 years give fewer responses to the noise than the younger people (Tables 3 and 4).

Adverse environmental impacts

Increase in the biomedical waste

Globally, medical waste generation increased due to the outbreak of COVID-19, posing a risk to communal healthiness. The waste was generated for the sample assortment of the supposed COVID-19 patients, analysis, and treatment of a vast number of patients. Since the initiation of the COVID-19 pandemic, medical waste expanded universally, which is a significant danger to general well-being and environment (Chakraborty and Maity 2020). The increased generation of hospital waste all over the world during this outbreak of COVID-19 was a great risk to human health of people. The waste came out of the diagnosis, treatment, and sample collection of huge populations, and from the disinfecting activities.

Use of safety kit and municipal solid waste

To protect from this viral infection, people used hand gloves, facemasks, and other security apparatus, which raised the amount of healthcare left over (Fadare and Okoffo 2020). It was reported that, in the USA, the waste volume increased because of an increase in personal protective equipment (PPE) usage at the domestic level. With the eruption of COVID-19, the creation and usage of

Table 3 Proposed survey (Caniato et al 2021)

ID	Question
Q.1	In this period of COVID-19 emergency lockdown, have you sensed any modifications level, related to NOISE?
Q.2	Do you agree with the following statement: URBAN noise now has not changed compared to what you could hear before the COVID-19 emergency lockdown?
Q.3	If you sensed some difference in the URBAN noise level during this COVID-19 emergency lockdown, can you please RATE this change?
Q.4	Do you agree with the following statement: the INDOOR noise in your home environment now has not changed compared to what you could feel before the COVID-19 emergency lockdown?
Q.5	If you sensed some difference in the INDOOR noise level in your home environment during this COVID-19 emergency lockdown, can you please RATE this change?
Q.6	Could you rate the sensation you perceive due to URBAN noise present in your city during the COVID-19 emergency lockdown in comparison to what you were used to perceiving before the COVID-19 emergency lockdown? Please use the graduate scale, where 1 is "great concern" and 5 is "well-being"?
Q.7	Could you rate the sensation you perceive due to INDOOR noise present at your home during the COVID-19 emergency lockdown in comparison to what you were used to perceiving before the COVID-19 emergency lockdown? Please use the graduate scale, where 1 is "great concern" and 5 is "well-being"?
Q.8	If you could change your home during the lockdown COVID-19 emergency because of URBAN noise, you would prefer
Q.9	If you could change your home during the lockdown COVID-19 emergency, because of INDOOR noise, you would prefer
Q.10	Would you prefer the present URBAN noise condition to be maintained in the future?
Q.11	Would you prefer the present INDOOR noise condition in your home to be maintained in the future?
Q.12	Gender
Q.13	Age
Q.14	Home typology
Q.15	Home location

Table 4 Survey possible choices per question (Caniato et al 2021)

Index	Question	First response	Second response	Third response	Fourth response	Fifth response
General topic	**Q.1**	Yes, related only to urban noise	Yes, related only to indoor noise at my home	Yes, both related to urban and indoor noise	No	–
Noise variation	**Q.2**	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Q.3	Much noisier	Noisier	–	Quieter	Much quieter
	Q.4	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Q.5	Much noisier	Noisier	–	Quieter	Much quieter
Sensation	**Q.6**	1 (great concern)	2	3	4	5 (well-being)
	Q.7	1 (great concern)	2	3	4	5 (well-being)
Living place variation	**Q.8**	A much quieter place	A quieter place	–	No change	A noisier place
	Q.9	A much quieter place	A quieter place	–	No change	A noisier place
Preference	**Q.10**	Definitely not	Possibly not	Neutral	Possibly yes	Definitely yes
	Q.11	Definitely not	Possibly not	Neutral	Possibly yes	Definitely yes
Gender	**Q.12**	Male	Female	–	–	–
Age	**Q.13**	19 or less	20–39	40–59	60–79	80 or more
Home typology	**Q.14**	Detached house	Townhouse	Apartment building with up to 10 apartments	Apartment building with up to 30 apartments	Apartment building with more than 30 apartments
Home localization	**Q.15**	City center	Suburbs	Countryside	–	–

plastic-based PPE enhanced globally and the use of disposable medical goods, e.g., gloves and surgical masks, increased the generation of medical waste.

It was reported that 0.40 to 2.40 million tons of medical waste was generated each day in China. Similarly, reusable packaging material increased. It was estimated that packaging material increased to about 165 billion units made of cardboard and plastic (Benson et al. 2021). It also exacerbated the microplastic pollution, which affects the aquatic life from the small pieces of plastics (5 mm or lower in size) causing severe problems for the food chain safety. Microplastic generation increased due to plastic masks and plastic gloves. All municipal wastes (inorganic and organic) have a major impact on the environment like air, water, and land contamination. In many countries, quarantine policies were established and online shopping demand increased for home-based conveyance, which enhanced domestic waste.

Waste recycling is an effective approach to conserving natural resources and saving energy. Many countries postponed their recycling activities due to COVID-19 so that they can reduce the transmission of viral disease. For example, the USA constrained recycling plans in many cities (almost 46%), to mitigate the risk of COVID-19 which was expected during recycling services (Ahmad et al. 2020).

COVID-19 pandemic impacts on society

The COVID-19 outbreak affected all sections of the population, particularly the members of the most vulnerable social groups, and pushed more people into poverty. For instance, homeless people were at high risk of the virus being unable to safeguard themselves. Youth was also most vulnerable, as they helped increase public health and social awareness among their communities (Chakraborty and Maity 2020).

Youth are therefore vital in limiting the viral disease and its impact on community health, society, and economy in general. Social distancing developed breaches between family members and friends' relationships. Similarly, the COVID-19 lockdowns reduced the consumption of resources (Singh and Singh 2020). It brought a lot of severe social consequences, e.g., increased anxiety and depression. Due to the lockdown, people were unable to earn for their families leading to poverty, poor housing, poor health, and increased other vulnerabilities. Furthermore, as COVID-19 caused people to stay at their homes for long time periods, the population of the world relatively increased more as predicted by WHO (Sarkodie and Owusu 2021).

Increase in mortality and death rates

COVID-19 caused a huge increase in mortality and death rates globally. As of August 24, 2020, South Africa verified 611,450 confirmed cases of COVID-19 of which 13,226 perished thus giving out a casualty rate of 2%. Most of the casualties took place due to a lack of access to proper hospitalizations, particularly for ladies that were deprived of antenatal and post-pregnancy care administrations (Bostan et al. 2020).

Education sector

The quality of education severely decreased all over the world due to the lockdowns. COVID-19 led to the closure of most of the educational institutes, i.e., schools, colleges, and universities. As COVID-19 brought various changes in different aspects of life, similarly in the educational system, it shifted from physical classes to online learning in higher education in the major parts of the world (Paudel 2021). COVID-19 had great social, emotional, societal, and environmental impacts (positive and negative) on the students' lives; moreover, *t*-test revealed statistically significant gender differences among men and women. Findings are given in Tables 5 and 6 (Alghamdi 2021).

Online learning was a big challenge for both teachers and students especially in developing countries, where the internet facilities and network speed are limited. The government declared brief closure of educational institutes to lessen the spread of COVID-19. The interruption of physical instructing and educational exercises influenced the educational performance of students and inferred fewer financial freedoms and anthropoid resources later on, just like the expanding number of teen relationships (Akat and Karataş 2020). However, different studies also indicated the affectivity and importance of online learning.

Table 5 Descriptive statistics for the impacts of COVID-19 on social and emotional aspects of students' lives (Alghamdi 2021)

Positive consequences			*M*			± SD
4.09			***±.60***			
Cohesion among family members			4.42			*±.82*
Attention to friends' well-being			4.11			*±.87*
Passion for the sick and poor			4.05			*±.95*
Solving family problems collectively			3.98			*±1.02*
Enhanced sense of community contact			3.75			*±1.08*
Awareness of importance of personal and public			4.24			*±.85*
Negative impacts			**3.93**			***±.88***
Fear of burden on others when infected			4.35			*±1.00*
Social alienation and distancing			3.51			*±1.31*
Result			**4.05**			***±.50***
	Overview result	*t*-test for equality of means				
Gender	*N*	Mean	St. dev	*t*	df	Sig. (2-tailed)
Man	642	4.08	±.508	2.411	1358	.016
Woman	718	4.02	±.497	–	-	-

Table 6 Descriptive statistics for the impacts of COVID-19 on societal and environmental aspects of students' lives (Alghamdi 2021)

Positive consequences			*M*			± SD
4.16			***±.63***			
Equality with all infected society members			4.00			*±1.15*
Feeling of societal destiny unity			4.22			*±.94*
New popular culture and humor			3.99			*±1.01*
Investment in environmental hygiene			4.41			*±.78*
Negative impacts			**3.29**			***±1.29***
Unnecessary purchasing of material things			3.29			*±1.29*
Result			**3.98**			***±.56***
	Overview result	*t*-test for equality of means				
Gender	*N*	Mean	St. dev	*t*	df	Sig. (2-tailed)
Man	642	3.96	±.574	−1.586	1358	.113
Woman	718	4.01	±.552	–		

A finding of this study is that primarily online education is beneficial for indorsing skills, connecting people around the globe, developing problem-solving communities, and online research by improving time-management skills. Thus, suggesting that online education may be an alternative to the traditional method of education (Paudel 2021).

Psychological health

COVID-19 illness not only undermines the two individuals' physical well-being but also influences individual psychological well-being. This was due to the fact that whenever somebody manifested pneumonia-like symptoms, even the immediate family members became pessimistic and exhibited avoidant practices by keeping away from the patient thus influencing their emotional wellness. Besides, high infectivity, joblessness, casualty rates, monetary misfortunes, ceaseless lockdowns, constrained isolation, and other limitations brought about by COVID-19 fundamentally changed day-to-day lives and at last led to psychological issues and substance misuse (Chakraborty and Maity 2020).

A sudden change of lifestyle and reduced physical activity level

The COVID-19 outbreak affected all segments of the population and was particularly troublesome for individuals who were in the most vulnerable circumstances. It continues to affect populations, including those living in neediness situations (Verma and Prakash 2020). Diminished proactive tasks and more causative snacking in isolated and detachment conditions led to weight gains and increased diabetes-related difficulties. Shockingly, the popularity-based nature of web-based media, where anyone can undoubtedly turn into a newsmaker, brought up issues about the quality and the factuality of the data shared at these stages (Alam et al. 2020).

A positive effect of the COVID-19 lockdown was that the assets were devoured in a restricted way. Individuals understood that their endurance needs were exceptionally less, and they were squandering their assets just for exhibiting status in the society (Verma and Prakash 2020). The authors explicitly targeted disinformation posted on Twitter related to the COVID-19 pandemic. Coronavirus journalistic spin and tattle enhancement patterns were analyzed utilizing five distinct web-based media channels to comprehend diverse substance styles like passionate, racially biased, or dread-inciting content (Alam et al. 2020). The modern corona infection had no lines, no religion, and a blowout past cast and belief. It is a profoundly infectious and effectively unusual virus. The world was never ready for this sort of pandemic, so we continue to build up immunization against its spread (Verma and Prakash 2020).

COVID-19 pandemic impacts on food security

Effects of COVID-19 on agricultural livelihoods and food availability were severe as well including horticulture, fisheries, domesticated animals, and agribusiness, which prohibited the development of merchandise for poor-country farmers. The pandemic posed several major threats to foodstuff accessibility and constancy (Rume and Islam 2020; Hussain et al 2021). More than a billion people have been pushed into poverty, as approximately 87% of individuals in sub-Saharan Africa, Asia, and North Africa are poor.

Food security is an agenda of the USA in order to attain sustainable development goals by 2030, by eradicating poverty and environmental degradation (Mostafa et al. 2021). Before the pandemic, millions of people were suffering from food shortages and emergencies, but COVID-19 exacerbated the situation and expanded food security and malnutrition to billions of people around the globe.

The consequences of the food shortages remained unseen for more than a half-century, up till now as the pandemic has imposed limitations on various agricultural activities such as variation in the growing seasons of crops, changes in the livelihood strategies of framers, and human health and nutrition (Wu et al. 2021). In the past year (Jan 2020–2021), world food prices increased by approximately 20%, reflecting widespread shifts in other commodity prices as well. Although the supply prospects for most food grains are comfortable (Laborde et al. 2020).

The food dispensability is projected to be higher in 2022; prices have been volatile, due to a combination of downward changes in supply prospects for maize and soybean, limitations on exports by two major exporters of grain, and increasing demand for feed grains from bounding livestock production in East Asia, particularly China. Most of the low-developed countries (LDCs) declined food trading from developed countries due to movement restrictions, lockdown, and traveling bans, which minimized economic activities and gave a shock to both supply and demand. Due to all these reasons, the small and medium enterprise (SME) level increased among women and men (Iese et al. 2021).

Because of the state of the world food supply, export restrictions in importing countries are unjustified and could harm food security. At each country level, there are the main risks to food safety: increasing retail prices, combined with low revenues, means that households have to reduce their food consumption in terms of quantity and quality (O'Hara and Toussaint 2021). Rising food prices affect people in low- and middle-income countries because they spend more on food than people in high-income

countries. The lower income from vegetables forced farmers to reduce the number of meals and food items per day and poses a huge challenge to agricultural sustainability.

Food sanctuary catastrophes are frequently caused by piercing drops in food invention. Likewise, more than 30,000 laborers in food-processing plants in the USA and Europe constricted COVID-19, from meat-processing plants. Well-being conventions were expected to ensure laborers are in natural pecking orders and to help contain viruses (Laborde et al. 2020).

COVID-19 is not transmitted by food. On this premise, so far there is no proof that COVID-19 has a correlation with sanitation and security as on food bioactive. It is important to note that there have been no reports of infection transmission via food. As a result, according to current epidemiological evidence, this virus is not foodborne (Shahidi 2020). Coronavirus has featured the significance of primary recognition of irresistible sicknesses, 70% of their causes in people (Laborde et al. 2020).

Conclusion

The state-wise lockdown was a pragmatic and effective tool to stop the spread of the pandemic because of the absence of healing accommodations for COVID-19 during the early spread stage. The lockdown phase lessened pollution (air, water, noise, land) which enhanced the quality of air and water and brought a decrease in noise pollution due to the blackout of industrialization and transportation. The effect of the COVID-19 pandemic on the social surface was higher than on the educational facets of students' lives. The COVID-19 disease is foreseen to generate food insecurity universally. Lesser profits from crops and vegetables enforced agriculturalists to decrease the food products per day and carriages a massive task to endure yield. The lockdown delayed the ranchers' access to the marketplace restricting their fruitful capacities and trade their yield. COVID-19 is a prompt to mankind to stop misusing the world's resources. It is expected that the proper implementation of the proposed strategies (sustainable industrialization, reduction, reuse, recycling, international cooperation) would be helpful for global environmental sustainability.

Author contribution Conceptualization, Hafiz Mohkum Hammad, Hafiz Muhammad Fasihuddin Nauman, and Shah Fahad; data curation, Farhat Abbas and Rashid Jawad; formal analysis, Wajid Farhad, Hafiz Mohkum Hammad, Muhammad Shahid, Hafiz Faiq Bakhat, and Aitazaz A. Farooque; writing, Muhammad Mubeen; reviewing and editing, Shah Fahad and Artemi Cerda; resources, Hafiz Faiq Bakhat; software, Hafiz Mohkum Hammad, and Hafiz Muhammad Fasihuddin Nauman; supervision, Hafiz Mohkum Hammad and Hafiz Muhammad Fasihuddin Nauman.

Data availability Not applicable.

Declarations

Ethical approval Not applicable.

Consent to participate All authors agreed to contribute to this study.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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