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The Positive and Negative Effects of COVID-19 Pandemic on the Natural Environment in the World

Introduction

The coronavirus disease (COVID-19) had emerged from the Huanan seafood market in the Chinese city of Wuhan at the end of December 2019.¹ On 13 March 2020, the virus was declared by the World Health Organization (WHO) as a global public health emergency.² COVID-19 is an infectious disease provoked by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which is phylogenetically associated with SARS viruses.³ It suggests that the possible primary source of virus can be bats, however the intermediate source of origin and transfer to human beings is still unclear until known. The indisputable fact is that the transmission of new dangerous virus is occurred mainly through human-to-human transmission via direct interaction or droplets produced during sneezing, coughing and talking.⁴ Usually, the symptoms of

¹ WHO, *Coronavirus disease (COVID-19) pandemic*, <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> [accessed: 10.02.2021].

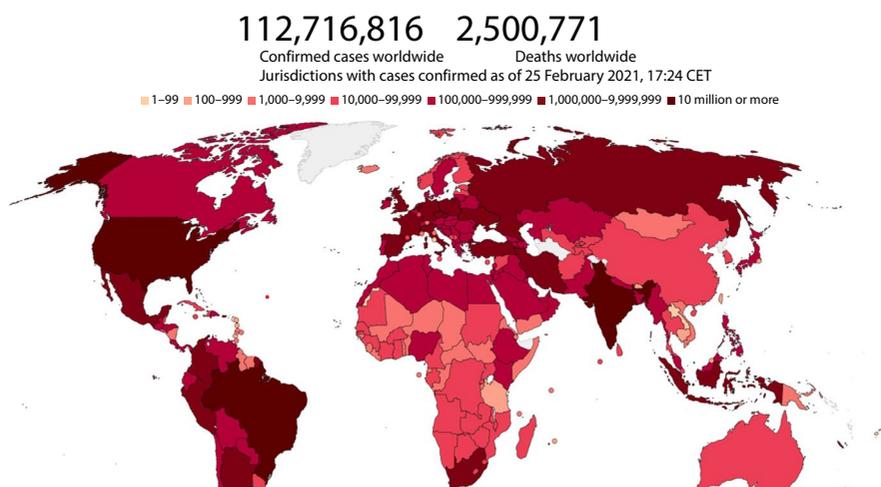
² S. Cheval, C. Mihai Adamescu, T. Georgiadis, M. Herrnegger, A. Piticar, D.R. Legates, 'Observed and Potential Impacts of the COVID-19 Pandemic on the Environment', *International Journal of Environmental Research and Public Health* 2020, vol. 17, issue 11, p. 2, DOI: 10.3390/ijerph17114140.

³ I. Chakraborty, P. Maity, 'COVID-19 outbreak: Migration, effects on society, global environment and prevention', *Science of the Total Environment* 2020, vol. 728, p. 1, DOI: 10.1016/j.scitotenv.2020.138882.

⁴ D.S. Hui, E.I. Azhar T.A. Madani, F. Ntoumi, R. Kock, O. Dar, G. Ippolito, T.D. Mchugh, Z.A. Memish, C. Drosten, A. Zumla, E. Petersen, 'The continuing 2019-nCoV epidemic threat of novel corona-

COVID-19 virus contain cough, fever, sore throat, chills, breathing difficulty, vomiting, myalgia or fatigue, nausea and diarrhea. Some cases can provide to acute respiratory distress syndrome, respiratory failure, cardiac injury and even death. Older people alongside other underlying medical conditions have the highest risk of mortality.⁵ As of 25 February 2020, the virus has spread among 216 states globally, with the death of 2.5 million people from 112.7 million confirmed cases, and the number is increasing drastically.⁶ Map 1 demonstrates the geographic distribution of COVID-19 confirmed cases and deaths in the world as of 25 February 2021.

Map 1. Geographic distribution of COVID-19 confirmed cases and deaths globally, 25 February 2021



Source: C. Sam, C. Whiteaker, H. Recht, D. Pogkas, P. Murray, D. Halford, E. Bryant, 'Mapping the Coronavirus Outbreak Across the World', 2021, Bloomberg, <https://www.bloomberg.com/graphics/2020-coronavirus-cases-world-map/> [accessed: 25.02.2021].

The World Health Organization approved a limited number of COVID-19 vaccines. On 31 December 2021, WHO issued the first emergency use validation for a Pfizer/BioNTech COVID-19 vaccine.⁷ In its turn, the European Union gave the conditional

viruses to global health – The latest 2019 novel coronavirus outbreak in Wuhan, China', *International Journal of Infectious Diseases* 2020, vol. 91, pp. 264–266, DOI: 10.1016/j.ijid.2020.01.009.

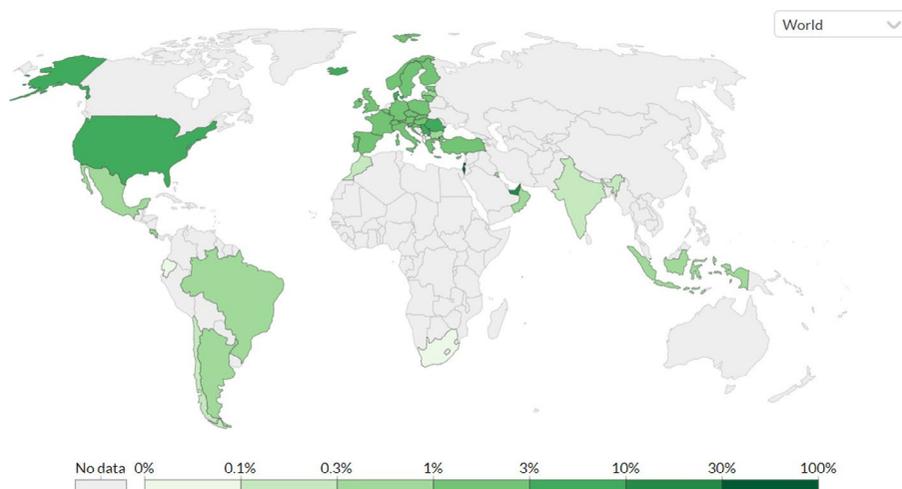
⁵ Cuiyan Wang, Riyu, Pan, Xiaoyang Wan, Yilin Tan, Linkang Xu, C.S. Ho, R.C. Ho, 'Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19). Epidemic among the General Population in China', *International Journal of Environmental Research and Public Health* 2020, vol. 17, issue 5, p. 2, DOI: 10.3390/ijerph17051729.

⁶ C. Sam, C. Whiteaker, H. Recht, D. Pogkas, P. Murray, D. Halford, E. Bryant, 'Mapping the Coronavirus Outbreak Across the World', 2021, Bloomberg, <https://www.bloomberg.com/graphics/2020-coronavirus-cases-world-map/> [accessed: 25.02.2021].

⁷ WHO, *WHO issues its first emergency use validation for a COVID-19 vaccine and emphasizes need for equitable global access*, news release, 31 December 2020, <https://www.who.int/news/item/31-12-2020-who-issues-its-first-emergency-use-validation-for-a-covid-19-vaccine-and-emphasizes-need-for-equitable-global-access> [accessed: 11.02.2021].

marketing authorization for three COVID-19 vaccines, mainly Pfizer/BioNTech, Moderna and AstraZeneca on 21 December 2020, 6 January 2021 and 29 January 2021, respectively.⁸ As of 24 February 2021, the number of fully vaccinated people (2 doses) has reached 45.55 million people globally. The leading states according the total number of people who have been fully vaccinated against COVID-19 are the United States (20.61 million), Israel (3.21 million) and Germany (1.91 million). The unconditional leader according the ranking of COVID-19 vaccine doses administrated per 100 people is Israel (90.21), following by the United Arab Emirates (58.25) and the United Kingdom (27.86). Again, the unconditional leader according the share of population fully vaccinated against COVID-19 is Israel with 37.1%.⁹ Map 2 presents the share of population fully vaccinated against COVID-19 as of 25 February 2021.

Map 2. Share of population fully vaccinated against COVID-19, 25 February 2021



Source: H. Ritchie, E. Mathieu, L. Rodés-Guirao, C. Appel, Ch. Giattino, E. Ortiz-Ospina, J. Hasell, B. Macdonald, D. Beltekian, M. Roser, *Coronavirus (COVID-19) Vaccinations*, Our World in Data, 2020, <https://ourworldindata.org/covid-vaccinations> [accessed: 25.02.2021].

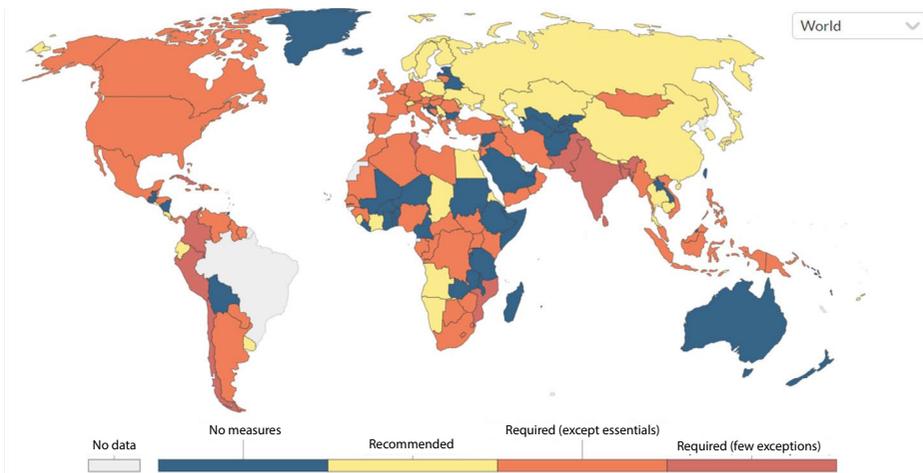
Since the beginning of COVID-19 pandemic, international and national authorities and experts have been promoting the application of non-pharmaceutical measures, such as maintaining social distance, wearing face masks and hand gloves, washing hands with soap, and frequently use of antiseptic solution. To take under control the spread of the disease and reduce the mortality rate, authorities of the affected states put restrictions on the movement of people. The majority of countries placed

⁸ European Commission, *Question and answers on COVID-19 vaccination in the EU*, https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-covid-19-vaccines-europeans/questions-and-answers-covid-19-vaccination-eu_en#01 [accessed: 11.02.2021].

⁹ H. Ritchie, E. Mathieu, L. Rodés-Guirao, C. Appel, Ch. Giattino, E. Ortiz-Ospina, J. Hasell, B. Macdonald, D. Beltekian, M. Roser, *Coronavirus (COVID-19) Vaccinations*, Our World in Data, 2020, <https://ourworldindata.org/covid-vaccinations> [accessed: 24.02.2021].

their citizens in full lockdown due to the COVID-19 pandemic. The World Economic Forum noted that as of 7 April 2020, about 3 billion people globally faced the lockdown restrictions in order to prevent the spread of COVID-19 virus.¹⁰ As of 23 April 2020, the unconditional leader among the states that imposed national lockdown is India, which restricted the movement of the largest number of people (1.3 billion), following by China (780 million) and the United States (300 million).¹¹ All the organizations, including educational institutions, cultural institutions and events, shopping malls, etc., were closed to motivate people to stay at home. Only emergency services like police, medical, fire, food supply, etc., continued their work. All the public transportation, such as truck, bus, train, subway, airplanes, etc. were suspended or putted on strict restrictions, e.g., only 50% of seat places can be occupied. The exception was the transport services of essential goods and emergency services. In Italy, it was the most extensive travel restrictions since the second World War. In London, the usually crowded bars, pubs and theatres were closed, and city inhabitants were recommended to stay at home.¹² Map 3 demonstrates the stay-at-home requirements during the COVID-19 pandemic as of 26 February 2021.

Map 3. Stay-at-home requirements during the COVID-19 pandemic, 26 February 2021



Source: H. Ritchie, E. Mathieu, L. Rodés-Guirao, C. Appel, Ch. Giattino, E. Ortiz-Ospina, J. Hasell, B. Macdonald, D. Beltekian, M. Roser, *COVID-19: Stay-at-Home Restrictions*, Our World in Data, 2020, <https://ourworldindata.org/covid-stay-home-restrictions> [accessed: 26.02.2021].

The pandemic caused an enormous international socio-economic disruption, which has a direct and indirect impact on the natural environment. This research

¹⁰ M. Somani, A.N. Srivastava, S.K. Gummadivalli, S. Sharma, 'Indirect implications of COVID-19 towards sustainable environment: An investigation in Indian context', *Bioresource Technology Reports* 2020, vol. 11, pp. 3–4, DOI: 10.1016/j.biteb.2020.100491.

¹¹ T. Rume, S.M. Didar-Ul Islam, 'Environmental effects of COVID-19 pandemic and potential strategies of sustainability', *Heliyon* 2020, vol. 6, issue 9, p. 1, DOI: 10.1016/j.heliyon.2020.e04965.

¹² *Ibidem*.

aims to explore the positive and negative consequences of the COVID-19 pandemic in terms of natural environment. The main research question of this elaboration is the following: How has the COVID-19 pandemic been affecting the natural environment in the world? The main thesis is that, besides of a huge number of death cases and other socio-economic losses, the positive impact of COVID-19 pandemic definitely prevails its negative effects. The COVID-19 environmental impact may be divided on positive and negative effects. To the first group we can include the reduction of air pollution; the reduction of water pollution; the reduction of noise pollution; decrease of energy and water consumption; and ecological restoration of tourist destinations. In its turn, the negative effects encompass the following: increase of biomedical waste generation; increase of safety equipment use; increase of food waste; and the challenges regarding the implementation of environmental initiatives.

Table 1. Positive and negative effects of the COVID-19 pandemic on the natural environment in the world

Effects of the COVID-19 pandemic on the natural environment in the world	
Positive effects	Negative effects
Reduction of air pollution; Reduction of water pollution; Reduction of noise pollution; Decrease of energy and water consumption; Ecological restoration of tourist destinations	Increase of biomedical waste generation; Increase of safety equipment use; Increase of food waste; Implementation challenges of environmental initiatives

Source: own elaboration.

Consequently, this article is consisted from four parts: (1) introduction; (2) positive effects of the COVID-19 pandemic on the natural environment; (3) negative effects of the COVID-19 pandemic on the natural environment; and (4) conclusions. The methodology of this research is based on the desk review of available materials, websites, case studies, reports and other literature published by different international and national authorities, as well as governmental and non-governmental organizations. The study encompasses the qualitative and quantitative research methods applying in order to analyze 45 relevant research elaborations. Scientific literature was collected mostly through the databases of Springer, Science Direct, Taylor and Francis, Research Gate and Google Scholar.

Positive effects of the COVID-19 pandemic on the natural environment

The international disruption caused by the COVID-19 has resulted in several effects on the natural environment and climate change. Due to the numerous restrictions of people’s movement introduced by state governments, a majority of citizens was enforced to stay and work from home, while a wide range of large-, middle- and small-scale enterprises experienced a total or partial shutdown of their activity.

Nevertheless, the global socio-economic disruptions brought a strong positive impact for the Earth's natural environment. This part presents the positive effects of the COVID-19 pandemic on the natural environment in the world, mainly the reduction of air pollution; the reduction of water pollution; the reduction of noise pollution; decrease of energy and water consumption; and ecological restoration of tourist destinations.

Reduction of air pollution

As companies, industries and transportation have closed down, it caused a rapid decrease of greenhouse gases (GHGs) emissions. In comparison with this time a year ago, levels of air pollution in New York have declined by about 50% due to the measures taken to reduce the spread of COVID-19 disease.¹³ In China, due to the shutdown of heavy industries, about 50% reductions of CO₂ and N₂O have occurred. Emissions of NO₂ constitute one of the key measurements of international economic activities, which determines a scale of reductions due to the COVID-19 pandemic in many states, i.e., China, U.S., Canada, India, Brazil, Italy, etc.¹⁴ Usually, NO₂ is caused from the fossil fuel emissions, where 80% comes from motor vehicle exhaust. It is known that NO₂ in the interaction with O₂ and H₂O causes acid rain, which in its turn, provokes a number of respiratory diseases threatening human health.¹⁵

The European Environmental Agency (EEA) reported that due to the COVID-19 lockdown, NO₂ emissions decreased by 30–60% in many European cities, i.e., Paris, Milan, Barcelona and Madrid.¹⁶ In the United States, in comparison to previous years, the level of NO₂ emissions was reduced by 25.5% during the COVID-19 period.¹⁷ The NO₂ decline also was observed in Ontario (Canada) and noted to be decreased by 80%.¹⁸ Around 54.3% decline of NO₂ was noted in Sao Paulo (Brazil). In Delhi (India), the level of NO₂ was decreased by about 70%. The levels of most harmful form of air pollution – aerosol particulates PM₁₀ and PM_{2.5} – were decreased during the national lockdown in India by 50% and 46%, respectively. Map 4 presents the pictures taken by NASA's Terra satellite, which demonstrate the dramatic changes in the levels of air pollution in India between 2019–2020 and February–March 2020

¹³ M. Henriques, 'Will Covid-19 have a lasting impact on the environment?', BBC, 27 March 2020, <https://www.bbc.com/future/article/20200326-covid-19-the-impact-of-coronavirus-on-the-environment> [accessed: 14.02.2021].

¹⁴ A. Biswal, T. Singh, V. Singh, K. Ravindra, M. Suman, 'COVID-19 lockdown and its impact on tropospheric NO₂ concentrations over India using satellite-based data', *Heliyon* 2020, vol. 6, issue 9, p. 2, DOI: 10.1016/j.heliyon.2020.e04764.

¹⁵ United States Environmental Protection Agency, *Nitrogen Dioxide (NO₂) Pollution*, <https://www.epa.gov/no2-pollution/basic-information-about-no2> [accessed: 14.02.2021].

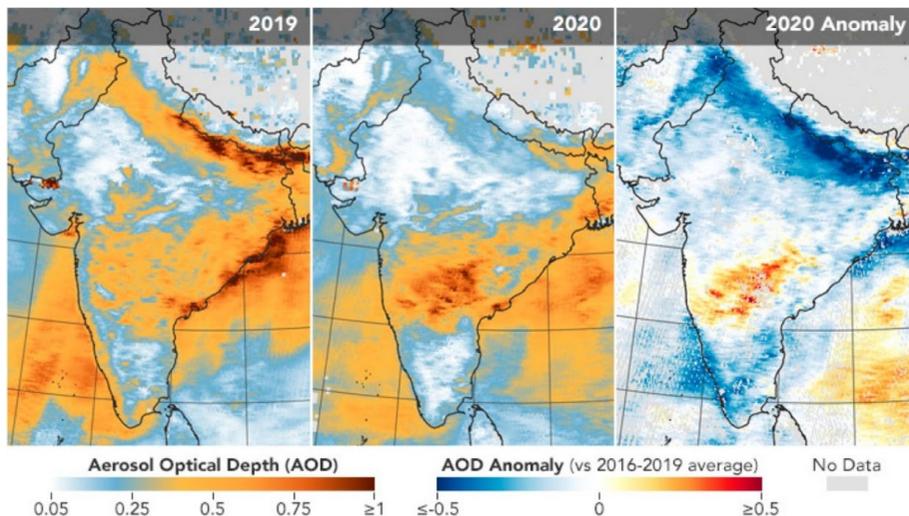
¹⁶ European Environmental Agency, *Air pollution goes down as Europe takes hard measures to combat Coronavirus*, 25 March 2020, <https://www.eea.europa.eu/highlights/air-pollution-goes-down-as> [accessed: 14.02.2021].

¹⁷ J.D. Berman, K. Ebisu, 'Changes in U.S. air pollution during the COVID-19 pandemic', *Science of the Total Environment* 2020, vol. 739, p. 2, DOI: 10.1016/j.scitotenv.2020.139864.

¹⁸ M.D. Adams, 'Air pollution in Ontario, Canada during the COVID-19 state of emergency', *Science of the Total Environment* 2020, vol. 742, p. 3, DOI: 10.1016/j.scitotenv.2020.140516.

lockdown.¹⁹

Map 4: The shape of air pollution in India in 2019-2020 and February-March lockdown, compared



Source: Nasa Earth Observatory, 'Airborne Particle Levels Plummet in Northern India', 2020, <https://earthobservatory.nasa.gov/images/146596/airborne-particle-levels-plummet-in-northern-india> [accessed: 14.02.2021].

It is assumed that the measures taken by the state governments to reduce the spread of COVID-19 disease had a dramatic impact on airline industry. Majority of states restricted international travelers from departure and entry. Due to the restrictions and decreased passengers, international flights are being cancelled by the largest aircraft companies. For example, China banned around 70% of domestic flights and 50–90% capacity of departing due to the COVID-19 pandemic, which estimated 17% of national CO₂ emissions. Moreover, due to the COVID-19 disease, in comparison with the same time one year ago, 96% of air travelling globally had declined, which imposed a significant impact on the natural environment worldwide.²⁰

Generally, decreased use of fossil fuels during the COVID-19 lockdown provided to drastic decline in the GHGs emissions that, in its turn, supported the fight against climate change. The International Energy Agency (IEA) reported that globally oil demand has declined on 435.000 barrels in the first three months of 2020 in comparison to the same period one year ago.²¹ Furthermore, worldwide coal consumption also decreased due to the reduced energy demand during the lockdown period. In

¹⁹ T. Rume, S.M. Didar-Ul Islam, *op. cit.*, p. 2.

²⁰ E. Zogopoulos, 'COVID-19: the curious case of a green virus', *Energy Industry Review*, 11 March 2020, <https://energyindustryreview.com/analysis/covid-19-the-curious-case-of-a-green-virus/> [accessed: 15.02.2021].

²¹ International Energy Agency, *Oil Market Report – March 2020*, Paris 2020, <https://www.iea.org/reports/oil-market-report-march-2020> [accessed: 15.02.2021].

India, coal-based energy generation declined on 26% with 19% decrease of total energy production after lockdown. China, the largest coal consumer, declined its coal consumption by 36% in comparison to the same period one year ago.²² According the UK-based website Carbon Brief, the pandemic cut the overall 1.600 metric tons of CO₂, which is above 4% of the global total in 2019.²³

Reduction of water pollution

Water pollution frequently occur in developing states like India and Bangladesh, where industrial and domestic wastes are burden into rivers without proper management. In the period of COVID-19 lockdown, the majority of industrial pollution sources have declined or fully stopped, which supported the reductions in water pollution. For example, the river Yamuna and Ganga have achieved a remarkable level of purity due to the absence of industrial contamination during the lockdown in India. Among 36 real-time monitoring stations of river Ganga, water from 27 stations met the requirable measures.²⁴ The improvement of water quality in Rishikesh and Haridwar (India) was acknowledged to the rapid decrease of the visitors' number and 500% decline of industrial and sewage effluents. The wondering fact is that all water parameters even met the standard of national drinking water, which still requires disinfection, but not conventional treatment. Furthermore, due to the imposed restrictions on public gathering, number of visitors and water activities were significantly reduced in most of places.²⁵

Map 5 demonstrates photos of the city of Venice taken by the European Space Agency on 19 April 2019 and 13 April 2020. Due to the COVID-19 lockdown, the Grand Canal in Venice (Italy) turned clear, and many aquatic species have appeared.²⁶ Water pollution had been also reduced in the beaches of Maldives, Thailand, Bangladesh, Indonesia and Malaysia. It is reported that the amount of food waste was decreased in Tunisia, which significantly declined the level of water and soil pollution.²⁷ Furthermore, the amount of industrial water consumption is also decreased, notably from the textile sector. A huge number of solid trashes produced from manufacturing and construction process, which is responsible for soil and water pollution, also declined. Moreover, the decrease of export-import business resulted in the solid reduction of

²² I. Ghosh, 'The emissions impact of coronavirus lockdowns, as shown by satellites', *Visual Capitalist*, 21 March 2020, <https://www.visualcapitalist.com/coronavirus-lockdowns-emissions/> [accessed: 16.02.2021].

²³ T. Rume, S.M. Didar-Ul Islam, *op. cit.*, p. 3.

²⁴ A.P. Yunus, Y. Masago, Y. Hijioaka, 'COVID-19 and surface water quality: improved lake water quality during the lockdown', *Science of the Total Environment* 2020, vol. 731, pp. 3–4, DOI: 10.1016/j.scitotenv.2020.139012.

²⁵ T. Rume, S.M. Didar-Ul Islam, *op. cit.*, p. 4.

²⁶ C. Clifford, 'The water in Venice, Italy's canals is running clear amid the COVID-19 lockdown – take a look', *CNBC Market It*, 18 March 2020, <https://www.cnbc.com/2020/03/18/photos-water-in-venice-italys-canals-clear-amid-covid-19-lockdown.html> [accessed: 18.02.2021].

²⁷ S. Jribi, H.B. Ismail, D. Doggui, H. Debbabi, , 'COVID-19 virus outbreak lockdown: what impacts on household food wastage?', *Environment, Development, Sustainability* 2020, vol. 3, issue 12, pp. 5–7, DOI: 10.1007/s10668-020-00740-y.

merchant ship movement, which supported the decline of marine pollution.²⁸

Map 5. Comparative view of the Venice area between 19 April 2019 and 13 April 2020



Source: European Space Agency, *Deserted Venetian lagoon*, 14 April 2020, http://www.esa.int/ESA_Multimedia/Images/2020/04/Deserted_Venetian_lagoon [accessed: 17.02.2021].

Reduction of noise pollution

Noise pollution is the high levels of sound produced by different human activities, such as vehicles, machines, construction work, etc., which may provide to negative effects for humans and other living creatures. Usually, noise imposes negative effects on physiological health, alongside hypertension, cardiovascular disorders and sleep shortness of human beings.²⁹ It is estimated that around 360 million people worldwide are prone to hearing loss due to noise pollution. The WHO claims that over 100 million people are exposed to high noise levels in Europe alone. Furthermore, anthropogenic noise pollution impacts on wildlife through the disruption in prey and predator avoidance and detection. Too high level of noise also imposes negative effects on the invertebrates, that support the control of environmental processes that

²⁸ T. Rume, S.M. Didar-UI Islam, *op. cit.*, p. 5.

²⁹ M.A. Zambrano-Monserrate, M.A. Ruano, L. Sanchez-Alcalde, 'Indirect effects of COVID-19 on the environment', *Science of the Total Environment* 2020, vol. 728, p. 3, DOI: 10.1016/j.scitotenv.2020.138813.

are essential for the ecosystem's balance.³⁰

The lockdown and quarantine measures imposed a number of limitations for economic activities and social life, which undoubtedly reduced the noise level, especially in big and usually crowded cities.³¹ For example, in the recent lockdown period, noise level of Delhi (India) is decreased drastically about 40–50%. Due to the COVID-19 lockdown, the noise of Govindpuri metro station (Delhi) declined from 100 dB³² to 50–60 dB.³³ Furthermore, due to travel restrictions, the number of vehicular movements and flights has drastically declined around the globe, which helped to reduce the level of noise pollution. For instance, in Germany, car traffic was reduced by more than 50%, passenger air travel was decreased by over 90%, and travelling by rail was dropped by 25%, in comparison with the usual rates.³⁴ In summary, the COVID-19 lockdown, and disruptions of economic activities reduced the noise pollution around the world drastically.

Decrease of energy and water consumption

Due to the COVID-19 lockdown, many workers have been working from homes, instead of offices. Scholars claim that people who work remotely generate much lower energy consumption due to the fact that household appliances are often more energy-efficient. In the first months of the pandemic, schools, kindergartens, shopping centers and other institutions were also closed. According to the data of Polish energy networks, the decline in electricity consumption in Poland during the lockdown estimated 12%.³⁵ On the other hand, Jacqueline Klopp from the Columbia University underlines that during the pandemic, households use a way more energy (e.g., TV, consoles, kitchen appliances, etc.). Furthermore, many people make more purchases online, which requires more energy for goods transportation. Such a situation can provide to the increased energy consumption in comparison to the period before COVID-19.³⁶

One of the most commonly-used ways to prevent the spread of infectious disease is a thorough and frequent handwashing with water and soap. Despite the increased hygiene standards, water consumption has not changed during the pandemic. *Vice versa*, water supply companies have observed a reduced demand for water in recent months. This may be related to the fact that many production plants that consumed significant amounts of this valuable fluid were temporarily closed.³⁷

³⁰ WHO, *WHO Global estimates on prevalence of hearing loss mortality and burden of diseases and prevention of blindness and deafness*, 2012, https://www.who.int/pbd/deafness/WHO_GE_HL.pdf [accessed: 19.02.2021].

³¹ M.A. Zambrano-Monserrate, M.A. Ruano, L. Sanchez-Alcalde, *op. cit.*, p. 4.

³² dB is a unit of measurement for sound.

³³ M. Somani, A.N. Srivastava, S.K. Gummadivalli, S. Sharma, *op. cit.*, p. 7.

³⁴ M. Henriques, *op. cit.*

³⁵ I. Napierała, 'Wpływ pandemii koronawirusa na środowisko', *GdziePoLek*, 15 September 2020, <https://www.gdziepolek.pl/blog/wplyw-epidemii-koronawirusa-na-srodowisko> [accessed: 20.02.2021].

³⁶ Ekologiczni, *Pandemia i ekologia. Wpływ na środowisko*, <http://ekologiczni.com.pl/pandemia-i-ekologia-wplyw-na-srodowisko/> [accessed: 20.02.2021].

³⁷ I. Napierała, *op. cit.*

Ecological restoration of tourist destinations

During the last few years, the tourism sector has been experiencing a significant growth due to transport networks and technological advancements, which contributed to global gross domestic product (GDP). It is reported that the tourism industry estimates around 8% of global GHGs emissions.³⁸ Nevertheless, the places of natural beauty (e.g., deserts, beaches, national parks, islands, forests, mountains, etc.) have been always attracting the visitors, who make a notable damage for the natural environment. To accommodate and facilitate tourists, a lot of hotels, restaurant, bars and markets are built, which was worth a lot of natural resources and energy. For example, in Spain, the carbon footprint of coastland hotel services plays the key role for the overall amount of CO₂ emissions. A wondering fact is that 2-star hotels produce the largest amount of carbon emissions. Furthermore, visitors dump various wastes at the tourist destinations, which worsens natural beauty and causes ecological imbalance.³⁹

Due to the outbreak of pandemic, the number of visitors reduced remarkably in the tourist spots around the globe. For example, Phuket (Thailand) – the most popular tourists' destination in the country – had been hosting an average 5.452 visitors per day before the lockdown, which entered into force on 9 April 2020.⁴⁰ Similarly, the local government prohibited tourist arrivals and public gathering at the Cox's Bazar sea beach (Bangladesh). In consequence, the sea water, which usually remains turbid, became pure.⁴¹ Nature gets a time to regenerate itself from the activity of human beings. At the beginning of pandemic, the reduction of water pollution caused the returning of dolphins in the canals of Venice (Italy) and the coast of Bay of Bengal (Bangladesh).⁴²

Negative effects of the COVID-19 pandemic on the natural environment

³⁸ M. Lenzen, Ya-Yen Sun, Futu Faturay, Yuan-Peng Ting, A. Geschke, A. Malik, 'The carbon footprint of global tourism', *Nature Climate Change* 2018, vol. 8, pp. 523–525, DOI: 10.1038/s41558-018-0141-x.

³⁹ R. Puig, E. Kiliç, A. Navarro, J. Albertí, L. Chacón, P. Fullana-i-Palmer, 'Inventory analysis and carbon footprint of coastland-hotel services: a Spanish case study', *Science of the Total Environment* 2017, vol. 595, pp. 244–246, DOI: 10.1016/j.scitotenv.2017.03.245.

⁴⁰ K. Cripps, 'Thailand's most popular island goes into lockdown as Covid-19 cases surge', CNN, 2020, <https://edition.cnn.com/travel/article/phuket-thailand-lockdown/index.html> [accessed: 20.02.2021].

⁴¹ M. Rahman, 'Rare dolphin sighting as Cox's Bazar locks down under COVID-19 Coronavirus!!!', YouTube 24 March 2020, <https://www.youtube.com/watch?v=gjw8ZlIIIbQ> [accessed: 21.02.2021].

⁴² T. Rume, S.M. Didar-Ul Islam, *op. cit.*, p. 6.

The COVID-19 pandemic has been bringing a lot of positive effects for the natural environment globally, but every coin has two sides. The dangerous disease caused a significant environmental damage in every country in the world. The following part exposes the most common negative effects of the COVID-19 for the natural environments. These include the following: increase of biomedical waste generation, increase of safety equipment use, increase of food waste, and finally, postponement and implementation challenges of international and national environmental initiatives.

Increase of biomedical waste generation

Since the beginning of COVID-19, medical waste production had increased globally, which created a big threat to natural environment and public health. A lot of biomedical and infectious wastes are produced in hospitals from sample collection of the potential COVID-19 patients, treatment of big number of patients, diagnosis and disinfection purposes.⁴³ For example, in Wuhan (China), it is produced more than 240 m tons of medical wastes per day in the period of COVID-19 pandemic, which exceeds the normal amount by almost 190 m tones.⁴⁴ In Ahmedabad (India), the amount of medical waste production increased from 550–600 kg/day to about 1000 kg/day during the first phase of lockdown. The city of Dhaka (Bangladesh) generates about 206 m tones of medical waste every day due to the COVID-19 outbreak.⁴⁵

The proper management of such a rapidly raised amount of hazardous waste became a major challenge to the local waste management companies. In accordance to the newest data, the SARS-CoV-2 disease can exist about 3 days on stainless steel and plastics, and one day on cardboard.⁴⁶ It means that such kind of waste requires a proper management in order to prevent the spread of the dangerous virus. Moreover, the special waste management is absolutely essential for waste produced from the hospitals, i.e., masks, needles, bandage, syringes, used tissue, gloves, and discarded medicines, etc. This type of waste should be managed properly to reduce potential risks of further infection and environmental pollution.⁴⁷

Increase of safety equipment use

In order to protect people from the viral disease, governments strongly recommend to use face mask, hand gloves and other measures of safety. Since the majority of safety equipment is disposable, it creates a large amount of healthcare waste. The outbreak of COVID-19 caused the unprecedented amount of the Personal Protective Equipment (PPE) production and consumption. For example, in China, the number

⁴³ M. Somani, A.N. Srivastava, S.K. Gummadivalli, S. Sharma, *op. cit.*, p. 8.

⁴⁴ S. Saadar, D. Rawtani, M.C. Hussain, 'Environmental perspective of COVID-19', *Science of the Total Environment* 2020, vol. 728, p. 3, DOI: 10.1016/j.scitotenv.2020.138870.

⁴⁵ M.A. Zambrano-Monserrate, M.A. Ruano, L. Sanchez-Alcalde, pp. 2–3.

⁴⁶ N. van Doremalen, T. Bushmaker, D.H. Morris, M.G. Holbrook, A. Gamble, B.N. Williamson, A. Tamin, J.L. Harcourt, N.J. Thornburg, S.I. Gerber, J.O. Lloyd-Smith, E. de Wit, V.J. Munster, 'Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1', *The New England Journal of Medicine* 2020, vol. 382, issue 16, pp. 1564–1567, DOI: 10.1056/NEJMc2004973.

⁴⁷ T. Rume, S.M. Didar-Ul Islam, *op. cit.*, p. 5.

of medical masks produced per day has reached 14.8 million since February 2020, which much more exceeds the regular numbers.⁴⁸

Unfortunately, due to the deficit of knowledge (and probably responsibility), many people throw infectious waste, such as face masks and hand gloves, in parks, streets and other public spaces. Such dumping can create clogging in water ways and solidly worsen the shape of natural ecology. It is assured that face masks and other plastic equipment constitute the source of potentially dangerous microplastic fibers, which threaten to the environment. Usually, protective suits, medical face shields and masks, gloves and other medical equipment are made from Polypropylene or Tyvek, which can persist for a long time and release toxic elements, which are harmful for both human well-being and natural environment. Responsible authorities promote the proper waste segregation and disposal of hazardous medical waste in order to prevent the risk of disease transmission to waste management workers.⁴⁹

Increase of food waste

Since the beginning of COVID-19, the problem of food waste had increased rapidly. For example, in the period of lockdown, the amount of bio-waste produced by the United Kingdom residents had increased on 33%. Such kind of behavior might be caused by the potential insecurity of food supply, and people's willingness to overcome this insecurity by making huge stocks of food with short shelf life. Moreover, in order to protect themselves from the dangerous virus, people started to use disposable packing more frequently, especially in groceries stores, which provides to the water and soil pollution by plastic. The increased use of online shopping also significantly contributed to food waste in the period of COVID-19 lockdown.⁵⁰

On the other hand, many scholars claim the exactly opposite effect. According to Dr. Ewelina Marek-Andrzejewska from the University of Life Sciences in Poznań, less food was wasted during the lockdown in Poland than before the pandemic. About 39% of respondents claimed that they wasted less food in this period. The survey found that during the lockdown, food was dumped less frequently due to expiry date, oversized meal portions, improper food storage or because the product did not taste good. Less than 10% of the value of purchased food products was thrown away. The respondents indicated in particular the lower waste of fruits, vegetables and dairy products. Dr. Marek-Andrzejewska also stresses that similar conclusions can be drawn from research in China, Tunisia and Qatar. She emphasizes that the pandemic radically changed food management habits in many countries and positively influenced the development of new habits related to saving, storing and consuming food leftovers.⁵¹ Such an attitude undoubtedly positively contributes to the

⁴⁸ O.O. Fadare, O.D. Okoffo, 'Covid-19 face masks: a potential source of microplastic fibers in the environment', *Science of the Total Environment* 2020, vol. 737, p. 1, DOI: 10.1016/j.scitotenv.2020.140279.

⁴⁹ N. Singh, Yuanyuan Tang, O.A. Ogunseitan, 'Environmentally sustainable management of used personal protective equipment', *Environmental Science & Technology* 2020, vol. 54, p. 8501, DOI: 10.1021/acs.est.0c03022.

⁵⁰ I. Napierała, *op. cit.*

⁵¹ S. Zdziebłowski, 'Dobre strony lockdownu? Badacze nie mają wątpliwości', *Wprost*, 14 Octo-

natural environment.

Implementation challenges of environmental initiatives

The COVID-19 pandemic imposes a strong impact on the implementation and adoption of international pro-environmental programs. Since, the key international resources are targeted on the fight against the COVID-19 pandemic, the global environmental and climate change issues temporarily left the top place of the international agenda. Many governments around the world partially resigned from the implementation of ambitious environmental goals (e.g., investments in renewable energy, improvement of waste management, etc.) in favor of mitigation of the results of COVID-19 disease, i.e., financing of vaccine research, purchase of vaccines, purchase of medical equipment, financial support for businesses and people who lost their jobs, etc.⁵² Due to the lockdown, many large-, small- and medium-sized businesses had a temporary shutdown, which brought terrible consequences for global and national economies, but positively affected the environment. Unfortunately, history shows that after the financial crisis of 2007–2008, the level of CO₂ emission in 2010 was restored with a significant surplus.⁵³

Due to the COVID-19 fight, the implementation of European Green Deal – the EU program aiming to make Europe climate neutral by 2050 – can face a number of challenges. Many European states are forced to postpone the previously planned climate change targets in order to ensure the recovery of national economies. Furthermore, it is likely that due to the COVID-19 pandemic, countries are unable to implement the nationally determined contributions of the 2015 Paris Agreement. If states will not be able to reduce emissions, it would cost the whole world around 149.8–792.0 trillion dollars till 2100.⁵⁴ Plans regarding the emission reduction goals under the Paris Agreement are not only postponed until 2021, but they will probably experience continuous adjustments under the new economic circumstances. Since the long-term costs of emission reduction may be raised, it is hard to assume that in the nearest future environmental sustainability and climate change will be priorities for the international society. The COVID-19 crisis also threatens local governments to meet climate change mitigation commitments set in the recent period.⁵⁵ To sum up, both international and national commitments to the emission reduction will be negatively affected.

Adopted for 2015–2030, the UN Sustainable Development Goals (SDGs) or the

ber 2020, <https://www.wprost.pl/koronawirus-w-polsce/10376503/dobre-strony-lockdownu-badacze-nie-maja-watpliwosci.html> [accessed: 22.02.2021].

⁵² S. Cheval, C. Mihai Adamescu, T. Georgiadis, M. Herrnegger, A. Piticar, D.R. Legates, *op. cit.*, pp. 5–7.

⁵³ I. Napierała, *op. cit.*

⁵⁴ Yi-Ming Wei Wei, Rong Han, Ce Wang Biying Yu, Qiao-Mei Liang, Xiao-Chen Yuan, Junjie Chang, Qingyu Zhao, Hua Liao, Baojun Tang, Jinyue Yan, Lijing Cheng, Zili Yang, 'Self-preservation strategy for approaching global warming targets in the post-Paris Agreement era', *Nature Communications* 2020, issue 11, p. 6, DOI: 10.1038/s41467-020-15453-z.

⁵⁵ D. Wilkinson, L.T. Chavez, 'How Covid-19 Could Impact the Climate Crisis', Human Rights Watch, 16 April 2020, <https://www.hrw.org/news/2020/04/16/how-covid-19-could-impact-climate-crisis> [accessed: 23.02.2021].

Agenda 2030 is the further global agenda, which faced serious consequences due to the outbreak of the COVID-19 pandemic.⁵⁶ The Agenda 2030 includes 17 SDGs embracing environmental, social and economic goals on the global scale.⁵⁷ There is no need to mention the enormous effect, which the COVID-19 disease had imposed on socio-economic aspect of sustainability. All of SDGs are, to some extent, interconnected, thus the success or failure of the socio-economic goals implementation will result in the parallel implementation of environmental goals. In its turn, SDGs related to environmental issues might face the direct impact of the pandemic due to the lack of financing and deprioritization of environmental and climate change issues on the international arena. Nevertheless, on its website, the United Nations claims that „the [sustainable development] goals provide a critical framework for COVID-19 recovery”⁵⁸, which means that there is a huge probability that the UN will use the foundation of Agenda 2030 as a strategy to overcome the consequences of the COVID-19 pandemic till 2030.⁵⁹

Conclusions

Emerged in December 2019 in the city of Wuhan in China, the COVID-19 disease had spread all over the world, and already in March 2020, WHO declared the outbreak of a global pandemic. To minimize the spread of virus, the state governments simultaneously started to close their borders and impose restrictions on people’s movement. Around 216 countries had been applying national quarantines with various degrees of strictness. Many enterprises were enforced to temporary shutdown their activities; many people lost their jobs; national economies experienced unprecedented damages. The COVID-19 vaccination can become a solution for this socio-economic collapse, but nowadays, in many countries the vaccines are unavailable or the tempo of vaccination is too slow. Many people simply afraid to get vaccinated due to the lack of knowledge and numerous rumors regarding the undesirable effects of the COVID-19 vaccination. In any case, since the beginning of 2020, the world literally ‘stopped’, and no ones knows when we will return to normal life or, probably, the world will adopt ‘a new normality’ with its restrictions and safety recommendations on a regular basis.

When the socio-economic effects of the COVID-19 pandemic is quite visible (e.g., high mortality, health insecurity, economic collapse, etc.), the impact of the COVID-19 on the natural environment requires a decent research. The key aim of this study was the evaluation of the positive and negative consequences of the COVID-19 pandemic in terms of natural environment. The main research question

⁵⁶ Sustainable Development Goals, *The Sustainable Development Agenda*, <https://www.un.org/sustainabledevelopment/development-agenda/> [accessed: 24.02.2021].

⁵⁷ Sustainable Development Goals, *17 Goals to Transform Our World*, <https://www.un.org/sustainabledevelopment/> [accessed: 24.02.2021].

⁵⁸ *Ibidem*.

⁵⁹ Sustainable Development Goals, *The Sustainable Development Goals: Our Framework for COVID-19 Recovery*, <https://www.un.org/sustainabledevelopment/sdgs-framework-for-covid-19-recovery/> [accessed: 24.02.2021].

sounds the following: How has the COVID-19 pandemic been affecting the natural environment in the world? This research investigated a range of positive and negative effects of the COVID-19 disease to the environment globally. Among positive results, we can find a significant improvement of air, water and noise condition. Since people stayed at home in the period of quarantine, the environment also restored from the destructive impact of human activity. The positive impact also encompasses a lesser consumption of energy and water, as well as an ecological renewal of tourist destinations.

The main thesis of this study is that the positive impact of COVID-19 pandemic definitely prevails its negative effects. To confirm or disprove this state, this research also elaborates all available data regarding the negative effects of the COVID-19 pandemic on the environment. These include, first of all, increase of biomedical and safety equipment waste generation. Due to the COVID-19 disease, the national governments recommended to wear masks, gloves and other protective equipment. In consequence, it produced a great amount of infectious plastic waste without a proper waste management. To overcome the possible food insecurity, people started to stock food, which resulted in food waste. Finally, since nowadays the pandemic is a number one concern, all other international and national environmental and climate change issues are deprioritized, which means that many planned environmental commitments and potential green investments will not take place in the nearest future. Under these circumstances, it is impossible to agree with the main research thesis and confirm that positive effects of the COVID-19 virus prevail its negative outcomes for the environment.

To sum up, the COVID-19 pandemic had an unprecedented impact on human life and the global economy, which ultimately affected the natural environment. The study demonstrated the positive and negative effects of the COVID-19 disease on our planet, but we need to remember that the full evaluation of the impacts is far from being possible. Since even the short-term outcomes are still ambiguously, there is no capability to estimate the long-term consequences. Furthermore, no one is able to point out the exactly (or at least approximate) date of the end of COVID-19 pandemic, thus both positive and negative influence of the COVID-19 on the environment can change dynamically.

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Pozytywny i negatywny wpływ pandemii COVID-19 na środowisko naturalne na świecie

Streszczenie

Pandemia COVID-19 wywarła bezprecedensowy wpływ na globalne procesy społeczno-gospodarcze, zagrażając życiu i zdrowiu miliardów ludzi. Aby zapobiec rozprzestrzenianiu się groźnej choroby, rządy państw nałożyły ograniczenia przemieszczania się, które poważnie wpłynęły na życie społeczne, działalność gospodarczą, podróżowanie itp. Oprócz szeregu skutków społeczno-ekonomicznych spowodowanych przez COVID-19, choroba wirusowa wywarła również wpływ na środowisko naturalne. W artykule

przedstawiono wpływ choroby COVID-19 na środowisko naturalne z podziałem na skutki pozytywne i negatywne. Pierwsza grupa obejmuje: zmniejszenie zanieczyszczenia powietrza i wody; zmniejszenie zanieczyszczenia hałasem; zmniejszenie zużycia energii i wody; oraz ekologiczną odbudowę destynacji turystycznych. Z kolei do negatywnych skutków zaliczamy: wzrost wytwarzania odpadów biomedycznych; zwiększenie wykorzystania sprzętu ochronnego; wzrost marnotrawstwa żywności; oraz wyzwania związane z wdrażaniem inicjatyw środowiskowych. Wyniki badania wykazały, że pandemia COVID-19 ma ogromny wpływ na środowisko naturalne, jednak jest zbyt wcześnie, aby stwierdzić, jaki wpływ przeważa – pozytywny czy negatywny.

Słowa kluczowe: COVID-19, koronawirus, pandemia, choroba, lockdown, ograniczenia przemieszczania się, środowisko naturalne, zdrowie publiczne, świat

The Positive and Negative Effects of COVID-19 Pandemic on the Natural Environment in the World *Abstract*

The COVID-19 pandemic caused an unprecedented impact on global socio-economic processes by threatening billions of people's lives and health. In order to prevent the spread of dangerous disease, the national governments had imposed movement restrictions, which seriously limited people's social life, economic activities, travelling, etc. Aside from a number of socio-economic effects caused by COVID-19, the viral disease also imposed its impact on the environment. This study presents the impact of the COVID-19 disease on the natural environment divided by positive and negative effects. The first group encompasses the following: the reduction of air pollution; the reduction of water pollution; the reduction of noise pollution; the decrease of energy and water consumption; and the ecological restoration of tourist destinations. In its turn, the negative effects include the following: the increase of biomedical waste generation; the increase of safety equipment use; the increase of food waste; and the challenges regarding the implementation of environmental initiatives. The results of this study demonstrated that the COVID-19 pandemic has an enormous impact on the natural environment, however it is too early to claim which kind of influence – positive or negative – prevails in this impact.

Key words: COVID-19, Coronavirus, pandemic, disease, lockdown, movement restrictions, natural environment, public health, world

Positiver und negativer Einfluss der COVID-19-Pandemie auf die Umwelt in der Welt *Zusammenfassung*

Die COVID-19-Pandemie hat einen beispiellosen Einfluss auf globale wirtschaftlich-soziale Prozesse, die das Leben von Milliarden Menschen gefährdet. Um die Ausbreitung dieser gefährlichen Krankheit zu verhindern, haben die Regierungen Bewegungseinschränkungen eingeführt, die das Sozialleben, Wirtschaftstätigkeiten, den Reiseverkehr usw. stark beeinflusst haben. Außer vielen, von COVID-19 verursachten, sozial-wissenschaftlichen Folgen, hat diese Virus-Krankheit auch eine Auswirkung auf die Umwelt. In diesem Artikel wurde der Einfluss der COVID-19-Krankheit – ihre positive und negative Auswirkungen – auf die Umwelt im globalen Aspekt dargestellt. Erste Gruppe umfasst: Reduzierung der Luft- und Wasserverschmutzung; Reduzierung des Lärms; Reduzierung

des Energie- und Wasserverbrauchs; und ökologische Aufgaben der Tourismus-Destination. Zu den negativen Auswirkungen zählen wir: Anstieg der Benutzung von Schutzausrüstung; Anstieg der Lebensmittelverschwendung; und Herausforderungen, die mit Einführung von Umweltinitiativen verbunden sind. Die Forschungsergebnisse haben nachgewiesen, dass die COVID-19-Pandemie einen riesen Einfluss auf die Umwelt hat, aber es ist noch zu früh, um festzustellen, welche Auswirkungen überwiegen, die positiven oder die negativen.

Schlüsselwörter: COVID-19, Coronavirus, Pandemie, Krankheit, Lockdown, Bewegungseinschränkungen, Umwelt, öffentliche Gesundheit, Welt

Позитивное и негативное влияние пандемии COVID-19 на окружающую среду в мире

Резюме

Пандемия COVID-19 оказала беспрецедентное влияние на глобальные социально-экономические процессы, поставив под угрозу жизнь и здоровье миллиардов людей. Чтобы предотвратить распространение опасного заболевания, правительства многих стран ввели ограничения на передвижение, что серьезно ограничило социальную жизнь людей, экономическую деятельность, поездки и т.д. Помимо ряда социально-экономических последствий, вызванных COVID-19, это вирусное заболевание повлияло также на окружающую среду. В статье охарактеризовано влияние пандемии COVID-19 на окружающую среду в мировом масштабе с разделением на положительные и отрицательные эффекты. К первой группе относятся: снижение загрязнения воздуха и воды; снижение шумового загрязнения; снижение расхода энергии и воды; и экологическое восстановление туристических мест. В свою очередь, к негативным последствиям можно отнести: увеличение образования биомедицинских отходов; увеличение использования защитных мер от COVID-19; увеличение пищевых отходов; и проблемы, связанные с реализацией экологических инициатив. Результаты этого исследования показали, что пандемия COVID-19 оказывает огромное влияние на природную среду, однако еще слишком рано утверждать, какой тип влияния – положительной или отрицательной – преобладает в этом воздействии.

Ключевые слова: COVID-19, коронавирус, пандемия, болезнь, изоляция, ограничение передвижения, окружающая среда, здравоохранение, мир

