



The role of COVID-19 pandemic in environmental changes: A brief study

Mehdi Koohdarag*¹, Dariush Ahadi-Ravoshti²

¹Department of Civil Engineering, Malekan Branch, Islamic Azad University, Malekan, Iran

²Department of Agriculture, University of Mohaghegh Ardabili, Ardabil, Iran

ARTICLE INFORMATION

Received 07 December 2020

Revised 19 December 2020

Accepted 25 December 2020

KEYWORDS

Covid-19 pandemic; Environmental pollution; Human activity; Coronavirus.

ABSTRACT

The Covid-19 pandemic was affected the human-environment relations which caused several consequences on ecosystems like environmental pollution changes. In this regard, the presented article is discusses the environmental impacts of coronaviruse spread in all over the world. For this purpose, an overview provided based on published articles about environmental effects of Covid-19. The key concept of the presented works is preparing a suitable reference for investigating the environmental influence of Covid-19 pandemic.

1. Introduction

Coronaviruses (CoV) are a group of viruses that infect humans through human and animal transmission. This is the third time in the last two decades that a new virus has caused an epidemic after Acute Respiratory Syndrome (SARS) in 2003 and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012 (Chen et al., 2020). According to the Corona (2019) virus, on December 31, 2019, the first case of unexplained symptoms of low respiratory infections was reported to the World Health Organization (WHO) in Wuhan, China. It was classified as "pneumonia of unknown cause" because the cause of the infection was unknown. On January 12, 2020, the WHO identified the corona virus as the cause of the infection in Wuhan, and later on February 11, the WHO Director-

General declared the CoV virus as "COVID-19", which stands for "Corona Virus 2019" (Nghiem et al., 2020). Covid-19 contains single-stranded RNA as nuclear material and their diameter is 65 nm - 125 nm (Lu et al., 2020). The main causes of Covid-19 concern include global-scale transmission, recurrence, significant number of deaths, infection and mortality to care providers, and the impact of multiplication on vulnerable or vulnerable groups. Covid-19 was declared a pandemic by the WHO Director-General on March 11. He also noted a 13-fold increase in positive cases in China and 114 countries with Form 1, 18,000 positive cases (Zambrano-Monserrate et al., 2020).

Human-to-human and human-to-animal transmission have been implicated in the virus (He et al., 2020). The infected person's respiratory droplets are the most likely means of transmission. These droplets carry the virus into the air and can enter the host body through the nose and

* Corresponding author.

E-mail address: mehdi_k550@yahoo.com

Assistant Professor, Academic Staff.

<https://doi.org/10.30495/geotech.2020.680489>

Available online 27 December 2020

1735-8566/© 2020 Published by Islamic Azad University - Zahedan Branch. All rights reserved.

mouth. The virus causes inflammation in the lungs, which damages the lung cells by starting an inflammatory reaction. Vomiting, diarrhea, fatigue, and high fever may be associated with severe inflammation (Lokhandwala and Gautam, 2020). Inflammatory fluids produced as a result of inflammation fill the lungs, thereby reducing coughing and breathing by reducing alveolar function. Oxygen levels in the blood may decrease, while other organs, such as the kidneys or heart, may be severely affected (Qu et al., 2020).

The WHO declared the outbreak of COVID-19 to be a pandemic, and since February 2020, affected countries have stopped their factories, transport, vehicles and aircraft to minimize the spread of the virus. Following social distance, human lock-in and limited interaction with nature proved to be a blessing to nature and the environment during crises. One of the most important environmental effects of Covid-19 disease has been a significant reduction in air pollution and a reduction in greenhouse gas emissions due to the implementation of quarantine and economic closure policies. According to statistics, air quality in major cities around the world improved significantly in March and April. In fact, air quality has improved due to reduced emissions of carbon dioxide (CO₂), nitrous oxide (NO_x) and ozone (O₃) and particulate matter (PM) by factories and vehicles (Chakraborty and Maity, 2020) in the same traffic range Global airspace dropped by 60%. In general, this decrease in the emission of various pollutants has led to a temporary decrease in carbon dioxide emissions compared to levels above the crisis (Lokhandwala and Gautam, 2020). With the Covid-19 epidemic, humanity retreats inside the house and the liberated inhuman natural world roars. Popularly, the waterways and rivers of the world look cleaner, the air is fresher, the fog disappears, the fog disperses and wildlife fills the open air, the corona virus seems to be locked in it has positive effects on the environment all over the world. Millions have worked in domestic homes, but the natural world abroad continues to roar and the natural world benefits from our absence (Verma and Prakash, 2020). Since the outbreak of COVID-19, global medical waste production has increased, posing a major threat to public health and the environment. To collect samples from patients with suspected COVID-19, diagnose, treat a large number of patients, and disinfect targets, large numbers of infectious and biomedical waste are generated from hospitals (Elavarasan and Pugazhendhi, 2020).

2. Related Studies and Research Background

Lokhandwala and Gautam (2020) stated that the global expansion of COVID-19 in a short period of time has led to a significant reduction in industrial activity, roads and tourism. Man's limited interaction with nature in this time of crisis seems to be a blessing for nature and the environment. Reports from around the world show that after the outbreak of COVID-19, environmental conditions

such as air quality and water quality in rivers are improving and wildlife is flourishing. India has always been a hub of pollution with huge populations, heavy transactions and industries polluting high economic values (AQI) in all cities. But so far the COVID-19 lock announcement has begun to improve air quality and other environmental parameters such as river water quality are positive. Sign up to retrieve this article an evidence-based insight into improving air quality and the environment during locking it becomes an epidemic before and after. Attempts have been made to use tools such as satellite imagery of the Indian atmosphere, real-time on-site monitoring results in specific locations (Ghaziabad's highest polluting city) and the Air Quality Index (AQI) using India's Central Pollution Control Board.

Elavarasan and Pugazhendhi (2020) in their study of the environmental impact of COVID-19 and potential sustainability strategies stated that the global outbreak of coronavirus in 2019 (COVID-19) will affect all parts of human life, including the physical world. Measures taken to control the spread of the virus and reduce economic activity have significant effects on the environment. The epidemic significantly improves air quality in various cities around the world, reduces greenhouse gas emissions, reduces noise and pollution, and reduces pressure on tourist destinations, which may be to help restore the environmental system. In addition, there are some negative consequences of COVID-19, such as increased medical waste, accidental use and disposal of disinfectants, masks and gloves. And the burden of untreated waste is constantly endangering the environment. It seems that economic activity will return soon after the epidemic and the situation may change.

Zambrano-Monserrate et al. (2020) in their study of the indirect effects of COVID-19 on the environment stated that the positive and negative indirect effects of COVID-19 on the environment, especially in affected countries such as China, the United States, Italy and Spain. Our research shows that there is a significant relationship between possible measures and improving air quality, clean beaches and reducing environmental noise. On the other hand, there are negative aspects, such as reduced recycling and increased waste, in addition to air, further endangering the pollution of physical spaces (catchment area). Global economic activity is expected to return in most countries in the coming months (even if it is slow), so reducing greenhouse gas concentrations over a short period of time is not a sustainable way to clean up our environment.

Rume and Islam (2020) in the study of COVID-19 and its positive effects on the environment: An updated study stated that in December 2019 in Wuhan, China, the corona virus (SARS-CoV-2) was transmitted due to transmission. It has quickly gained global attention. WHO named the infection coronavirus 2019 /COVID-19 after phylogenetic studies with SARS-CoV. The virus causes severe respiratory infections with dry cough, high fever, body aches and fatigue. The virus is transmitted primarily through respiratory droplets from a person infected with

COVID-19. The WHO declared the outbreak of COVID-19 a pandemic, and since February 2020, affected cities have closed their industries and restricted their citizens' movement to minimize the spread of the virus. Despite the negative aspects of the coronavirus in the world, coronavirus crises have a positive impact on the natural environment. Countries where citizens' movements to prevent the spread of the corona virus have been recorded have experienced significant reductions in pollution and greenhouse gas emissions. Recent research has also shown that this COVID-19 lock has drastically reduced environmental pollution worldwide.

3. Environmental Impacts COVID-19

3.1. Air quality and weather

It is astonishing to realize that millions of people die each year from polluted air, smoke and soot, which are considered slow killers. Particulate matter (PM) called PM_{2.5}, which is one of the most dangerous pollutants, is in the carcinogenic group. These particles are 2.5 microns or about one-thirtieth the width of human hair. PM_{2.5} is so small that it can travel from the lungs to the bloodstream, causing not only respiratory problems but also a heart attack and can cause premature death. The WHO estimates that more than 4 million deaths from PM_{2.5} occur worldwide each year, causing heart disease, stroke, lung cancer, chronic lung disease and infections becomes respiratory (Pei et al., 2020). The PM_{2.5} base in many cities around the world is above 100, measured in micrograms per cubic meter. After COVID-19 lock-in, PM_{2.5} levels dropped dramatically and thousands were protected from its worse effects (Berman and Ebisu, 2020).

Nitrogen dioxide (NO₂) is a toxic gas emitted from the engines of cars and factories. The WHO says that if the concentration of this gas is more than 200 micrograms per cubic meter, it can cause inflammation in the airways, which eventually leads to asthma. Now, due to the current lock, transportation is limited and factories are closed, so in cities around the world, the concentration of NO₂ in the air has dropped sharply from 5.6 micrograms per cubic meter to 0.2 micrograms per cubic meter (Adams, 2020).

Emissions of carbon dioxide (CO₂) are responsible for climate change. Transport, industry and electricity have a large share in carbon dioxide emissions. CO₂ emissions have been reduced worldwide due to the locking of the corona virus (Pei et al., 2020). Experts predict this will be the largest reduction in human CO₂ emissions since World War II. During the lock-in period, global air traffic decreased by 60%, leading to a temporary drop in CO₂ emissions from their precursor levels (Berman and Ebisu, 2020). Researchers at NASA reported that ozone concentrations in the Arctic on March 12, 2020, decreased by about 240 Dobson units compared to ozone. Concentration on March 12, 2019. Such a small level is very rare and occurs almost every decade. On March 12,

2019, NASA reported relatively higher concentrations of ozone in the Arctic. During the lock-in period (Arif et al., 2020), an unprecedented improvement in the ozone hole was observed, reported by the Copernicus Atmospheric Monitoring Service (Adams, 2020).

3.2. Water and aquatic quality

Reports indicate that not only air quality but also water quality in rivers and the body is improving during COVID-19 lock-in. Stopping the discharge of industrial effluents and other wastes into the water led to an obvious positive effect on water quality and aquatic life is now visible and has not been seen in cities for years. Clean rivers and other aquatic bodies have a significant positive impact on aquatic life. Since the lock was introduced, many species have been returning to their natural habitats. The closure of factories and commercial complexes has reduced pollution levels around the world. Not only the land animals that return, but even the sea creatures enjoy this break due to noise and water pollution. With the suspension of many voyages, while other maritime activities have been suspended, tourism has waned, leaving aquatic species in control. Marine scientists have already researched the effects of locking on marine life. The commercial fishing industry has been severely damaged by the closure of major buyers, restaurants and hotels. Social distance at sea has caused fishing vessels to anchor in ports (Rume and Islam, 2020). The absence of people on the shores does not lead to the breaking of eggs of marine animals and beaches such as turtles, and waste and plastic materials are less transported to the marine environment. Indigestion and entrapment due to plastic and marine debris, which is the most important cause of damage to marine organisms, are eliminated during this lock. Not only in the oceans but also in rivers and other aquatic bodies are cleaned, which indicates the entry of toxic and harmful substances into the water. Positive signs of this lock have been observed, but a few weeks or months of locking will not be enough to eradicate or reverse the damage caused over the years (Zambrano-Monserrate et al., 2020).

3.3. Increase in non-recyclable waste

The volume of non-recyclable waste has increased with the prevalence of COVID-19. The problem of local waste such as disposable masks and gloves and hospital waste is obvious, because in many cities, municipalities have stopped their recycling activities for fear of spreading the virus in recycling centers. Food retailers have resumed the use of plastic bags, citing health concerns about the use of paper bags by consumers. In addition, due to the recommendation of people to stay at home, many citizens have increased their consumption in the form of online food ordering and door-to-door delivery with disposable

packages. All events have created acute challenges for the waste management industry (Nghiem et al., 2020).

3.4. Ecosystem hazards

Ecosystems are natural and protected habitats are endangered during the outbreak of COVID-19 disease. Due to public closures and the implementation of quarantine policies, the conservation and monitoring of natural ecosystems has been temporarily suspended. In many countries, rangers in national parks and land and sea conservation areas are required to stay home on public holidays and leave these areas unattended. Their absence has led to an illegal increase in deforestation, wildlife hunting and hunting, although according to some experimental observations and in parallel with reduced traffic and human activity, some wild species have returned to rural areas or specific habitats such as national parks (Rume and Islam, 2020). Also, the cessation of ecotourism activities has exposed natural ecosystems to illegal harvesting and encroachment (Qu et al., 2020).

4. Reduction Environmental Strategies for COVID-19 pandemic

The COVID-19 pandemic is the first and most important global health emergency with severe consequences for health and the economy, and has raised hopes that the international community can, in practice, find long-term solutions to significantly reduce greenhouse gas emissions so that Prevent the strange and serious consequences of climate change (Chen et al., 2020). Accordingly, as long as the Covid-19 crisis keeps economic activity to a minimum, pollutant emissions will be reduced accordingly. However, it is simplistic to assume that this is a stable and sustainable environmental development, because in parallel with the resolution of the crisis and the resumption of activities, the economy is likely to emit pollutants and greenhouse gases. Return the level before that. Hence, many environmental activists called on governments to seize this opportunity to prevent pollutant emissions from returning to pre-crisis levels by reviewing regulations and newer regulations (Qu et al., 2020).

To bring about positive change in the environment, governments and individuals must adopt the following strategies (Elavarasan and Pugazhendhi, 2020):

- Inspection and maintenance of vehicles,
- Efficient public transportation system,
- Improve traffic management,
- Use environmentally friendly products,
- Minimize the use of chlorofluorocarbons (CFCs),
- Approval of renewable energy sources,
- Upgrade using waste reuse and recycling,
- Reduce the use of pesticides,
- Use the minimum amount of water required,
- Planting trees,

- Prevent deforestation,
- Wastewater treatment and disposal of suspended, inorganic and solid materials before entering the environment,
- Use of Okuzan toilets in cases where water is not needed and human excretion becomes natural fertilizers.

Data collected from several studies can be used to create better environmental policies. This lock gives us hope that there is a possibility of minimizing unnecessary human interference and returning these amazing aquatic creatures to space and their habitats. If governments build wastewater treatment plants in the right way and impose strict regulations on companies and industries to treat their waste accordingly, the environmental-friendly effects of lock-in on aquatic life can be long-lasting. To manage the environmental effects of the hospital waste increase mentioned, there are pre-set regulatory strategies, such as waste management systems to deal with hazardous medical waste, that can be used to reduce pollution from hospital waste (Nghiem et al., 2020).

5. Conclusion

The COVID-19 pandemic has caused various direct and indirect effects on the environment which can be classified as positive and negative impacts. The positive effects involve reducing the air and soil pollution. The negative effects involved the increasing soil and water pollutions (local). This article attempted to provide the brief study on COVID-19 pandemic in environmental changes. For this purpose, an overview provided based on published articles about environmental effects of Covid-19. The key concept of the presented works is preparing a suitable reference for investigating the environmental influence of Covid-19 pandemic.

Acknowledgements

The author is wishing to thank the Department of Civil Engineering for giving the opportunity of this study.

References

- Adams M.D., 2020. Air pollution in Ontario, Canada during the COVID-19 State of Emergency. *Science of The Total Environment*, 742: 140516.
- Arif M., Kumar R., Parveen S., Verma N., 2020. Reduction in water pollution in Yamuna River due to lockdown under COVID-19 Pandemic. *The Pharma Innovation Journal*, 9(12): 84-89.
- Berman J.D., Ebisu K., 2020. Changes in U.S. air pollution during the COVID-19 pandemic. *Science of The Total Environment*, 739: 139864.
- Chakraborty I., Maity P., 2020. COVID-19 outbreak: Migration, effects on society, global environment and prevention. *Science of The Total Environment*, 728: 138882.

- Chen K., Wang M., Huang C., Kinney P.L., Paul A.T., 2020. Air pollution reduction and mortality benefit during the COVID-19 outbreak in China. *medRxiv*, doi:10.1101/2020.03.23.20039842.
- Elavarasan R.M., Pugazhendhi R., 2020. Restructured society and environment: A review on potential technological strategies to control the COVID-19 pandemic. *Science of The Total Environment*, 725: 138858.
- He Y., Wang Z., Li F., Shi Y., 2020. Public health might be endangered by possible prolonged discharge of SARS-CoV-2 in stool. *Journal of Infection*, 80(5): e18-e19.
- Lokhandwala S., Gautam P., 2020. Indirect impact of COVID-19 on environment: A brief study in Indian context. *Environmental Research*, 188: 109807.
- Lu R., Zhao X., Li J., Niu P., Yang B., Wu H., Wang W., Song H., Huang B., Zhu N., Bi Y., Ma X., Zhan F., Wang L., Hu T., Zhou H., Hu Z., Zhou W., Zhao L., Chen J., Meng Y., Wang J., Lin Y., Yuan J., Xie Z., Ma J., Liu W.J., Wang D., Xu W., Holmes E.C., Gao G.F., Wu G., Chen W., Shi W., Tan W., 2020. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet*, 395(10224): 565-574.
- Nghiem L.D., Morgan B., Donner E., Short M.D., 2020. The COVID-19 pandemic: Considerations for the waste and wastewater services sector. *Case Studies in Chemical and Environmental Engineering*, 1: 100006.
- Pei Z., Han G., Ma X., Su H., Gong W., 2020. Response of major air pollutants to COVID-19 lockdowns in China. *Science of The Total Environment*, 743: 140879.
- Qu G., Li X., Hu L., Jiang G., 2020. An imperative need for research on the role of environmental factors in transmission of novel coronavirus (COVID-19). *Science of The Total Environment*, 54(7): 3730-3732.
- Rume T., Islam S.M.D.U., 2020. Environmental effects of COVID-19 pandemic and potential strategies of sustainability. *Heliyon*, 6(9): e04965.
- Verma A.K., Prakash S., 2020. Impact of COVID-19 on Environment and Society. *Journal of Global Biosciences*, 9(5): 7352-7363.
- Zambrano-Monserrate M.A., Ruano M.A., Sanchez-Alcalde L., 2020. Indirect effects of COVID-19 on the environment. *Science of The Total Environment*, 728: 138813.