



Review Paper

IMPACT OF COVID-19 ON ENVIRONMENT AND SOCIETY

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Abstract

Environmental change is one of the biggest challenges of the 21st century. In spite of all their efforts to restore the nature during the last few decades, humans could only move a few steps forward, not up to the commendable extent. But during the last few months, consequences of the COVID-19 pandemic have successfully recovered the environment to a large extent that should definitely set positive impact on global climate change. It of course changes the daily behavior of humans and the surrounding ecological system. The present review article deals with the multiple positive effects of lockdown on environment and society including biodiversity.

Keywords: Coronavirus; Environment; Family; Education; Economy.

INTRODUCTION

In humans, several corona viruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). In December 2019, a new infectious respiratory disease emerged in Wuhan, Hubei province, China and was named by the World Health Organization as COVID-19 (coronavirus disease 2019). It is caused by recently discovered a class of corona virus, known as SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). It is basically a single stranded RNA virus. The SARS-CoV-2 viral particles are spherical and have mushroom shaped protein called spikes protruding from their surface, giving the particle a crown like appearance. The spikes bind to the human cells and allowing virus to gain entry. The spike protein of novel corona virus shares 98% sequence identity with the spike protein of bat coronavirus. The researchers found that spike protein of SARS-CoV-2 binds to the cellular receptor called angiotensin converting enzyme 2, which is entry point into human cells. It has 10 to 20-fold higher binding affinity than SARS. The higher binding affinity causes higher human to human transmission [1].

It has given a severe impact on global and national economies irrespective of the level of virus impact on the people of individual nations. The novel corona virus has no border, no religion and spread beyond cast and creed. It is highly contagious in nature and easily unpredictable. World was never prepared for this kind of pandemic, where we are in a race of developing a vaccine against its spread [2].

The new COVID-19 seemed very contagious and has quickly spread globally. As on April 03, 2020, there have been a minimum of 52,869 deaths and quite 10,10,066 confirmed cases of this coronavirus pandemic. On May 18, 2020, confirmed cases increased to 46,79,511 with deaths of 3,15,005. These numbers are changing rapidly. The novel coronavirus has four stages of transmission *namely* stage-1 (imported cases), stage-2 (local transmission), stage-3 (community transmission) and stage-4 (transmission out of control). Speaking about a spread of disease among humans, the term transmission refers to the transmission of microorganisms from one infected individual to another uninfected person, either through direct contact, through droplets, or through indirect contact such as surface contamination. The detailed up-to-date information about COVID- 19, is available in the WHO website at <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>. [3].

The time between catching the virus and beginning of symptoms of the disease is known as incubation period. For COVID-19, it ranges from 1-14 days but most commonly around five days. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhea. These symptoms are usually mild and begin gradually. Some people become infected but don't develop any symptoms and don't feel unwell. Most people (about 70 %) recover from the disease without needing special treatment. Around 1 out of every 6 people who get COVID-19 becomes seriously ill and develops difficulty in breathing. Older people and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness.

COVID-19 is a zoonotic disease with intermediate host. Although the intermediate source of origin and transfer to humans is not clearly known. Intermediate host for SARS-CoV is palm civet and camel while the possible intermediate host for SARS-CoV-2 is pangolin or snakes. The reserve host for all the three is bat. Bat carries so many viruses and around 200 corona viruses without getting sick. So the primary mode of transmission is from bats to intermediate host to humans. The transmission of COVID-19 can be direct in the form of droplets produced during sneezing, coughing, speaking and accidentally inhaling the droplets in a closed proximity of an infected person. Droplets are water holding entities of diameter more than 5 μ m and these can be caught by a healthy person within a certain range of 1 m approximately. The indirect transmission is when virus is deposited on a dead surface like door bells, lift buttons, stairs, vegetables, fruits etc. which may come in contact with rest healthy persons frequently. From here the virus reaches to eyes, nose and mouth and finally leads to a new corona patient. Even fecal matter of infected person is found to be the transmitting source hence it can spread through fecal-oral transmission [2]. Studies showed that

virus takes entry to the respiratory mucosa by angiotensin receptor 2 (ACE₂) present in lower respiratory tract in abundance [4] mainly in type-2 alveolar cells. The same receptor is used by SARS-CoV [5].

WHO has published guidance on adjusting public health and social measures for the next phase of the COVID-19 responses. Some governments have suggested that the detection of antibodies to the SARS-CoV-2, the virus that causes COVID-19, could serve as the basis for an 'immunity passport' or 'risk-free certificate' that would enable individuals to travel or to return to work assuming that they are protected against re-infection. There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection. WHO continues to review the evidence on antibody responses to SARS-CoV-2 infection. Most of these studies show that people who have recovered from infection have antibodies against virus. However, some of these people have very low level of neutralizing antibodies in their blood, suggesting that cellular immunity may also be critical for recovery. At this point in the pandemic, there is not enough evidence about the effectiveness of antibody-mediated immunity to guarantee the accuracy of an immunity passport or risk-free certificate. People who assume that they are immune to a second infection because they have received a positive test result may ignore public health advice. The use of such certificates may therefore increase the risks of continued transmission.

Till now there is no report of any clinically approved antiviral drugs or vaccines that are effective against COVID-19. It has rapidly spread around the world, posing enormous health, economic, environmental and social challenges to the entire human population. The coronavirus outbreak is severely disrupting the global economy. Almost all the nations are struggling to slow down the transmission of the disease by testing and treating the patients, quarantining suspected persons through contact tracing, restricting large gatherings, maintaining complete or partial lock down etc. [6].

The COVID-19 spread around the world and severely affected the many sectors and related economies. This review article describes the impact of COVID-19 on environment and society including economics and the possible ways in which the disease can be controlled has also been discussed therein.

COVID-19 and Global Warming

From the beginning of civilization, human beings gradually started manipulating the nature as per its own benefit. In order to satisfy the demand of increasing population; industrialization and urbanization became inevitable, and the obvious significance was proved to be detrimental on the global climatic changes. The desire to drive the nature as per their own whims and desire, human beings started to destroy the nature in numerous ways by anthropogenic activities without caring for sustainable development [7]. As an inevitable consequence, environmental pollution has become a big issue of the present day. It is obvious that environmental pollution will change the distribution and burden of various vector borne infectious diseases including bacterial and viral diseases.

But, due to the unusual outbreak of COVID-19, almost every big and small cities and villages in the affected countries is under partial or total lockdown for a long period of time ranging from a few weeks up to a few months. All local and central administrations instructed to close the academic institutions and imposed a ban on free movement of their citizens outside their home and non-essential businesses in order to avoid community transmission. The various religious, cultural, social, scientific, sport, and political mass gathering events like Hajj, Olympics etc. are cancelled. Various industries are not functioning and all types of travels like airplanes, rails, buses and private vehicles are restricted or cancelled.

Meanwhile, efforts to restrict transmission of the SARS-CoV-2, by restricting the movement have had an outstanding environmental effect. Due to non-functioning and closure of industries, industrial waste emission has decreased to a large extent. Vehicles are hardly found on the roads leading almost zero emission of green-house gases and toxic tiny suspended particles to the environment. Minimal activity from industrial sites, factories and construction sectors improving the air quality. As such, aviation emissions, which accounted for 2.4% of global CO₂ emissions in 2018, according to the Environmental and Energy Study Institute (EESI) have dropped significantly [6].

With substantially less vehicular movement, air quality has improved by leaps and bounds. Numerous sources have covered how air quality indices of the globe's largest metropolitan areas have improved extensively since strict coronavirus lockdowns were issued. Even NASA satellites from outer-space show the significant reductions in air pollutants, which support Eco Watch's observation that the novel coronavirus pandemic has delivered the silver lining of decreased air pollution.

The Guardian added, "In China, the world's biggest source of carbon, emissions were down about 18% between early February and mid-March, a cut of 250m tones, equivalent to more than half the UK's annual output. Europe is forecast to see a reduction of around 390 m tones. Significant falls can also be expected in the US, where passenger vehicle traffic are the major source of CO₂, has fallen by nearly 40%.

China has witnessed a drastic reduction in emission of NO_x, CO₂ and various hydrocarbons during the coronavirus lockdown (2020) as compared to the values last year (2019). The areas of Eastern and Central China showed a significant reduction (10-30%) in NO₂ levels [8]. According to [9], there is significant reduction in the air pollution in major cities of United State of America due to lockdown. The lockdown is a highly sustainable approach to reduce the noise and injection of tropospheric and stratospheric pollutants.

That means the coronavirus crisis is so far "trigger the largest ever annual fall in CO₂ emissions in 2020, more than during any previous economic crisis or period of war." While this is encouraging news, experts say it still may not be adequate for meeting Paris Agreement goals to keep global warming from rising above 1.5 °C .

Due to lesser demand of power in industries, use of fossil fuels or conventional energy sources have been lowered considerably. Ecosystems are being greatly recovered. In many big cities the inhabitants are experiencing a clear sky and clear river water for the first time in their lives. Due to Covid-19 lockdown, a variety of birds are seen in the localities. The pollution level in tourist spots such as forests, sea beaches, hill areas etc. is also shrinking largely. Ozone layer may also be healing. The pandemic has displayed its contrasting consequence on human civilization, in the sense that, on one hand it has executed worldwide destruction, but created a very positive impact on the world environment on the other hand. Thus the lockdown acts as a healing dose for climate change, ozone depletion, human health, brown haze etc. The detailed up-to-date information about impact of COVID- 19, is available in the website at <https://www.financialexpress.com/lifestyle/science/ozone-layer-ishealing-amidst-coronavirus-gloom-ozone-cover-above-antarctica-records-substantialrecovery/1911386/>. Retrieved on April 5, 2020. Ozone layer is healing amidst coronavirus gloom ozone cover above Antarctica records substantial recovery. [10].

COVID-19 and Biodiversity

An ecosystem needs three kinds of diversity *namely* biological, genetic and functional. Biological diversity refers to the richness of species in a particular area; genetic diversity refers a way for a particular species to adapt itself to changing environments while functional diversity equates to the biophysical processes that happen within the area. The genetic diversity acts as a buffer for biodiversity [11]. Humans should understand the levels and values of biodiversity [12] for the greater interest of the globe.

Biodiversity or biological diversity refers to the existence of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in a particular habitat. The biodiversity is usually described at three levels: (a) genetic diversity, (b) species diversity and (c) ecosystem diversity. There is a necessity of ecological balance for widespread biodiversity [13]. Anthropogenic activities and unsustainable agriculture have multiple effects [14] and disturb the ecological balance [15]. The ecological balance is an indispensable need for human survival [16]. Without conserving the biodiversity and minimizing the anthropogenic activities, it is almost impossible to get the inclusive and sustainable development [7]. The sustainable development is directly related with environmental ethics and sometimes it seems to rethink and redefine the environmental ethics in modern context [17]. The climate change has huge impact on biodiversity [18].

Nature always favours and promotes the diversity and coexistence among all the organisms by providing suitable environment to all. Human is since highly evolved product of evolution hence tried always to control the environment and its own society in order to get conducive ambience. But due to overexploitation of natural resources, increased anthropogenic activities and human centric environmental approach, we are facing global warming and COVID-19 like unprecedented threats. Such global threats

are compelling the academicians, policy makers and other stakeholders to introspect their visions and actions.

Today, the World is a 'global village' due to the use of Information and Communication Technology and we are living there and deriving all the benefits from Nature. When we are deriving the benefits, we must have to bear some responsibilities. We have to develop environment centric approach to utilize the natural resources in such a manner so that we can achieve the inclusive and sustainable development with coexistence of all other species of organisms of the globe. The lockdown therefore provided us an opportunity to shift our ideology from anthropocentric or human centric worldview to eco-centric worldview.

The former worldview puts the human beings in the centre giving them the highest status, considers man to be the most capable for managing the planet earth, realizes that man is the planet's most important species and is the in-charge of the rest of nature. It emphasizes that earth has unlimited resources for humans only and a healthy environment depends upon a healthy economy. The later worldview states that the earth resources are limited and belong to all the species that exist in nature. Though humans have right to draw their requirements from the environment but certainly not the extent that degrades the environment and harms other species and living beings. This eco-centric worldview is therefore based on earth-wisdom and urges us to live on this earth as a part of it, like any other creature of nature and live sustainably. It realizes that healthy economy depends upon a healthy environment (healthy environment does not depend upon a healthy economy).

Due to lockdown, a large number of birds including vultures are clearly started to appear. Insect pollinators have appeared in abundance on crops and other plants. All these are good indication for ecological balance and biodiversity. Almost total lockdown due to COVID-19 outbreak has minimized the anthropogenic activities including overexploitation of natural resources. The major human population is bound to live in their homes, automatically prevented to cause various types of pollution. The surrounding environment is reflecting clean and green. We all are observing a clean environment where almost all animals including birds etc. have started to flourish. Almost all humans are feeling healthy without any major clinical problems. Authors observed that during present lockdown period, the water of Rapti, Saryu, Ganga and Yamuna rivers in cities also became clear and transparent due less deposition of domestic and industrial effluents. During lockdown it was not possible to estimate the water quality parameters but the transparent condition of water of these holy rivers clearly indicate that pollution level definitely reduced to a great extent. These reductions in pollution level help in flourishing the aquatic organisms including fishes.

COVID-19 and Society

The COVID-19 outbreak affects all segments of the population and is particularly detrimental to members of those social groups in the most vulnerable situations, continues to affect populations, including people living in poverty situations. For example, homeless people, because they may be unable to safely shelter in place, are

highly exposed to the danger of the virus. The detailed up-to-date information about COVID- 19, is available in the WHO website at <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> [19].

Many governments have called on youths to embrace the efforts to protect themselves and the overall population. Youths are also in a position to help those who are most vulnerable, and to aid in increasing public health and social awareness campaigns among their communities. Thus, youths are critical to limiting the virus's spread and its impact on public health, society, and the economy at large.

Social distancing (actually physical distancing) develops a new habits of survival and new approach of interaction with nears and dears. It is really creating gaps between friends and relatives. However, the mobile phones and internet are keeping people close to each other. Slowly, people are adapting to stay home and develop new habits to keep themselves engaged in professional work *vis-a-vis* domestic works [20].

Due to Covid-19 lock down, the resources are being consumed in a limited manner. People have realized that their survival needs are very less but for status in the society they were wasting the resources. I would say that the lockdown is teaching us the practical lessons how to achieve the Sustainable Development Goals (SDGs). The global shutdown is allowing the planet to heal and rejuvenate itself against the anthropogenic activities.

COVID-19 and Family life

Being forced stay home and work from home has brought the family members together. They are forced to talk, eat and play together every day, which was not possible for most of the families due to work and various responsibilities. In some instances, when one was scheduled to go early and come back during odd hours when children were sleeping, family life was different. It was heard sometimes that some of the children could meet their fathers weekly or fortnightly due to fathers' over business. Hence, the lockdown seems good for family life and social engineering.

During work from home, when people are at home every time, they take complete sleep, a basic need for good health and peaceful working. It is believed that a good sleep enhances immunity. They save the time of travel to office to and fro that provides extra hours of working which means more efficiency and productivity. Secondly, people save fuel and help in controlling the air pollution. Thirdly, there is no stress of travelling which means more efficiency.

Many countries have reported an increase in domestic violence and intimate partner violence attributed to lockdowns amid the COVID-19 pandemic. Financial insecurity, stress, and uncertainty have lead to increased aggression at home, with abusers able to control large amounts of their victims' daily life.

COVID-19 and Education

The COVID-19 pandemic has affected educational systems worldwide, leading to the near-total closures of schools, colleges, universities and other educational institutes. As of 10 May 2020, approximately 1.268 billion learners are currently affected due to

school closures in response to the pandemic. According to UNICEF monitoring, 177 countries are currently implementing nationwide closures and 13 are implementing local closures, impacting about 73.5 percent of the world's student population. School closures impact not only students, teachers, and families, but have far-reaching economic and societal consequences. The impact was more severe for disadvantaged children and their families, causing interrupted learning, compromised nutrition, childcare problems, and consequent economic cost to families who could not work.

More than one billion youth are now no longer physically in school after the closure of schools and universities across many jurisdictions. The lockdown has interrupted the regular academic session. Primary and secondary school students are most affected because most of them are cut off from the academic interactions with their teachers. The disruption in education and learning could have medium and long-term consequences on the quality of education, though the efforts made by teachers, school administrations, local and national governments to cope with the unprecedented circumstances e-learning. In response to school closures, UNESCO recommended the use of distance learning programmes and open educational applications and platforms that schools and teachers can use to reach learners remotely and limit the disruption of education.

Several universities have asked their faculties to keep giving online classes and supplying reading material through emails and other media. In a nutshell, for more mature students, the traditional class room education is turned into e-class room education system. This is a global turning point for adopting this new 'e-education system and 'Work from Home' culture which is being endorsed by institutions and individuals.

The e-education will have impact on research and its procedures. During e-education, one cannot accumulate practical experience of real laboratory work like handling of apparatus and instruments etc. Hence, the degree holder of science by e-education will be useful only for teaching, online demonstrations, model creation, online material designing and modeling etc. Most colleges and universities will be deprived of good students and funds, which may result in abandoned physical campuses. As a result, the number of excellent research centers may be reduced, leading to reduced quality and quantity of formal research. However, the publications of traditional researchers will be less effective than the ideas given by a layman through online YouTube videos and Tik Tok platforms. Funding patterns for research as well as the priorities for future research areas will be affected and changed.

COVID-19 and Employment

The COVID-19 pandemic is having a catastrophic effect on employment and earnings, in India as well as globally. The International Labour Organization (ILO) report shows that COVID-19 crisis is expected to wipe out 6.7% of working hours

globally equivalent to 195 million full-time workers in 2nd Quarter of 2020. In Asia and the Pacific will notice 7.2% *i.e.* (125 million full-time workers). ILO estimates that about 13 million people become unemployment all over the world [21].

COVID-19 will have a huge impact on labour market outcomes. The current situation is like hell for many of us because the income is totally stopped and some of the companies have removed their employees from job so that they don't have to pay for the duration of COVID-19 in the country. There are more than 30 lakh students graduated and around 40 lakh students post-graduated in India every year, and in present situation it is more difficult to ensure that each and every student will get employed. More than 4 out of 5 people (81%) in the global workforce of 3.3 billion are currently affected by full or partial workplace closures.

It reduces the full-time jobs. Salaries are not fixed. It is also likely to have impact on workers as they have stop working just to care for themselves or their families. COVID-19 already has shown its impact on manufacturing sector because of temporary factory closures.

COVID-19 and Global Supply Chain and Economy

Supply chain implies a system of organizations or operations that work together to design, produce, and deliver a product or service to a market, extending from the extraction of raw materials to the distribution of finished products or services. It plays a crucial in the automobile, IT sectors but due to Covid-19 pandemic, all the automobile, manufacturing and IT sectors had to be shut down which affected the supply chain globally. Reports on how the Covid-19 outbreak is affecting supply chain and disrupting manufacturing operations around the world are increasing daily. The Covid-19 has already forced thousands of companies to throttle down or temporarily shut down assembly and manufacturing plants in U.S. Europe, India [22].

The COVID-19 is a massive disaster in both the ways health-wise as well as economy-wise. Negative and large effects of COVID-19 will pull the economy several years back and government needs to take measures for this in an aggressive way [23]. Government will have to consider present as well as future policies for dealing this situation. It is going to hamper both, business and economy.

PREVENTION AND CONTROL OF COVID-19

COVID-19 is a global threat that requires a global responsibility for providing exact information to save the human life from novel infection. To decrease the damage connected with COVID-19, public health and infection control actions are immediately necessary to limit the global outburst of the virus. During the lockdown, staying at home and working from home norms should be followed. Since, Yoga enhances the immunity, which is a need of the hour hence it should be exercised.

COVID-19 is spread from person to person through direct contact so to prevent transmission restriction in mass gathering is an important tool to save the public health. Thus, the spread of respiratory illnesses during the mass gathering is a major public

health concerns with the potential of distribution of these infectious diseases. In order to reduce the general risk of transmission of COVID-19, WHO has recommended some precautionary measures such as avoiding close contact with people suffering from acute respiratory illness, regular hand washing with soap and water or hand sanitizer particularly after direct contact with sick people or their environment, maintaining cough etiquette, and avoiding unprotected contact with farm or wild animals etc. The people are strongly advised to avoid touching the face frequently and wash the hands for 20 seconds under running water. Social distancing and isolation or quarantine is the best way to prevent the infection.

Govt. of different countries postponed all types of religious, cultural, social, scientific, sport, and political mass gathering events in different parts of the world. Media and information technology are providing significant support to the society for prevention and control of COVID-19 outbreak. So, restricting mass gathering could be the primary preventive strategy for COVID-19. Almost all Governments are taking all precautionary steps and also sanctions massive budgets for their countries.

Till date, there are no exact antiviral treatments or vaccines for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments. Therefore, it is an urgent necessity of time to develop a safe and stable COVID-19 vaccine. Anti-viral drugs like chloroquine and hydroxychloroquine have been found to be effective against COVID-19 in laboratory studies and *in-vivo* studies [24]; [25]. A recent study revealed that remdesivir and chloroquine were highly effective in the control of 2019-nCoV *in vitro* [26 & 27]. Since SARS-CoV-2 is an RNA virus, any vaccines, effective against other RNA viruses such as measles, polio, encephalitis B and influenza, could be the most promising alternatives [28];[29]. So, research will continue to play an important role to discover new drugs or vaccines to prevent and control the COVID-19 infections.

CONCLUSION

The corona has proved that although humans are a superpower and have weapons that are capable to destroy the whole world but still if humans are creating mess with nature then even now nature is itself powerful to destroy humans with this small virus which is having very common symptoms like cold and cough.

The best way to prevent and hamper transmission is to protect yourself and others from infection by frequent washing of hands or using an alcohol based- rub frequently, not touching the face and follow social distancing norms. Use of mask is beneficial if anyone has to go out of home due to an urgent work. During the lockdown, staying at home and working from home should be followed.

Yoga is the best methods for good health which rejuvenates our body in terms of enhancing our immunity system, concentration of mind and confidence levels. Spiritual development is essential for immunity, humanity and positive personality development. There are a number of online yoga classes given by the experts, which is proving the utilization of lockdown time fruitfully. No need to worry about the future because time heals everything. If there are negative impacts, we have various positive things to learn

from this. The COVID-19 has proved that Nature has provided us with all the resources for leading a beautiful life and she nourishes us like a mother, humans should respect and nurture her. Indiscriminate development and overexploitation of natural resources should be minimized at the level of sustainability.

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