

A STUDY OF THE MULTI-FACETED IMPACT OF COVID – 19 ON THE ENVIRONMENT & PROSPECTIVE STRATEGIES

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Abstract : Every aspect of our world as well as human life has been affected by the global outbreak of Corona Virus Disease in late 2019 (COVID - 19). The environment has been greatly impacted by the countless measures adopted to control the spread of the virus and slowing down of world economy. Hence, this study aims at exploring the pros and cons of this disease on the environment with the help of various scientific data that is available. The study reveals that however adverse the pandemic may seem; it does have many positive impacts on the environment as well. The pressure on the environment in the form of varied pollution has reduced significantly and the ecosystem has got the much-needed time to restore itself. Still the negative aspects, the disease is casting on the environment cannot be ignored. The study also intends at suggesting certain strategies to minimize the negative and maximise the positive so that the global environmental sustainability may be ensured.

IndexTerms - Outbreak, COVID – 19, environment, pollution, pandemic, positive impact, ecosystem, environmental sustainability.

I. INTRODUCTION

Since December, 2019, coronavirus has been the most talked about topic due to the amount of loss it has brought about. It was first reported in Wuhan, China where it was said to spread from a seafood market. World Health Organization declared it a global pandemic in a few weeks¹. The disease was found to have close symptoms with pneumonia caused by virus² but when the samples were analysed, it was found to be a new virus, hence referred to as Novel Corona Virus. International Committee on Taxonomy of Viruses (ICTV) named it SARS-CoV-2 (severe acute respiratory syndrome-Corona Virus 2)^{3, 4, 5} as it was placed under family Coronaviridae of order Nidovirales. Till now there have been reported four strains of coronavirus viz., Alpha, Beta, Gamma and Delta⁶. As far as the source of spread is concerned, analysis of genome revealed that SARS-CoV-2 is associated with SARS viruses, and bats could be the possible primary source⁷, a few other studies suggested the virus to have originated from ant eaters/pangolins⁸ but it could not be confirmed till date. Therefore, the origin of the SARS-CoV-2 still remains controversial and needs more analyses for confirmation. Once in humans, the spread occurs rapidly through direct contact or droplets produced by coughing, sneezing and talking^{3, 5, 9}. The following figures 1 and 2, show the data reported by WHO as of June 08, 2021.

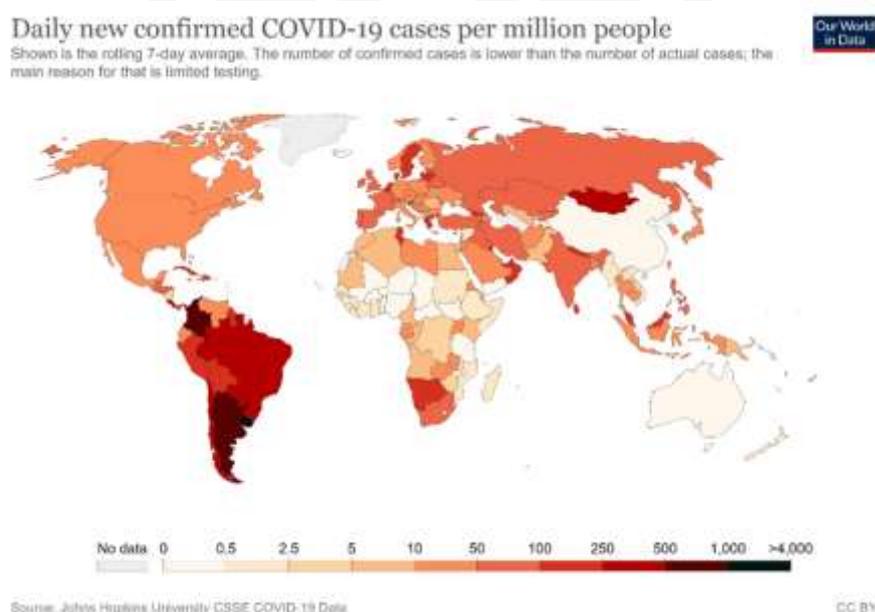


Figure 1 - Geographic distribution cumulative number of reported COVID-19 cases per 100000 populations, as of June 08, 2021 (Data source: WHO, 2021).

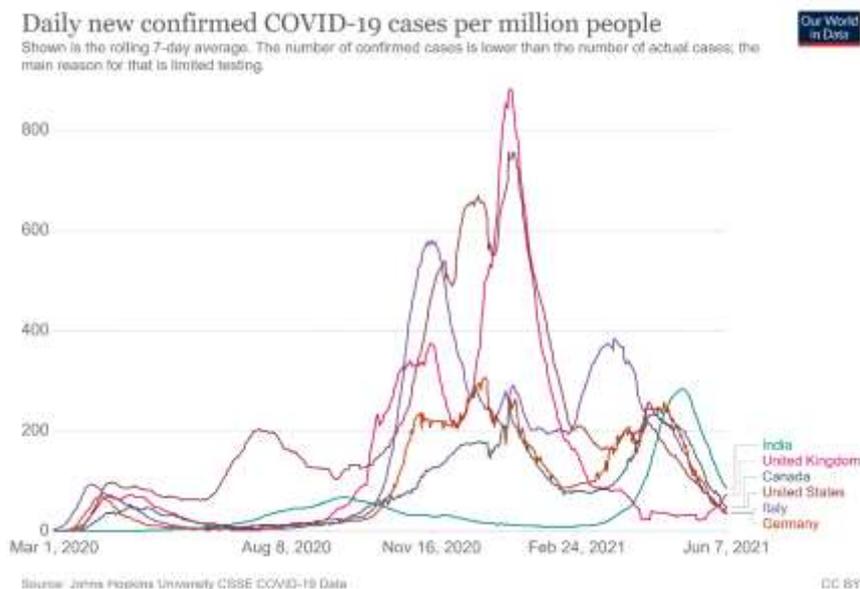


Figure 2 - Graphical Representation of Number of COVID-19 cases reported country-wise, and total deaths, from March 01, 2020 up to June 07, 2021 (Data source: WHO, 2021).

According to its symptoms, Covid – 19 has been divided into three phases¹⁰. When a person comes in contact with the virus, there are early symptoms as, fever, chills, cough, sore throat, etc. Some patients may report myalgia/fatigue, nausea, vomiting, diarrhoea^{11, 12}, gustatory dysfunction, skin rashes and discoloration on fingers or toes (COVID-Toe; painful purple or red lesion on toes of the patient) and tongue (COVID-Tongue). As the infection advances, the patient enters the second phase reporting symptoms of difficulty in breathing, pneumonia and dyspnoea. In severe cases, the patient reports cardiac injury, respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, multi-organ failure and even death^{5, 13}. Most of the people (about 80%) got recovered from the disease without taking treatment from the hospital. However, aged people, and those with some medical problems, especially high blood pressure, heart and lung problems, diabetes, or cancer, are at high risk of developing serious illness^{14, 15}. Figure 3 intends at illustrating various stage of the disease.

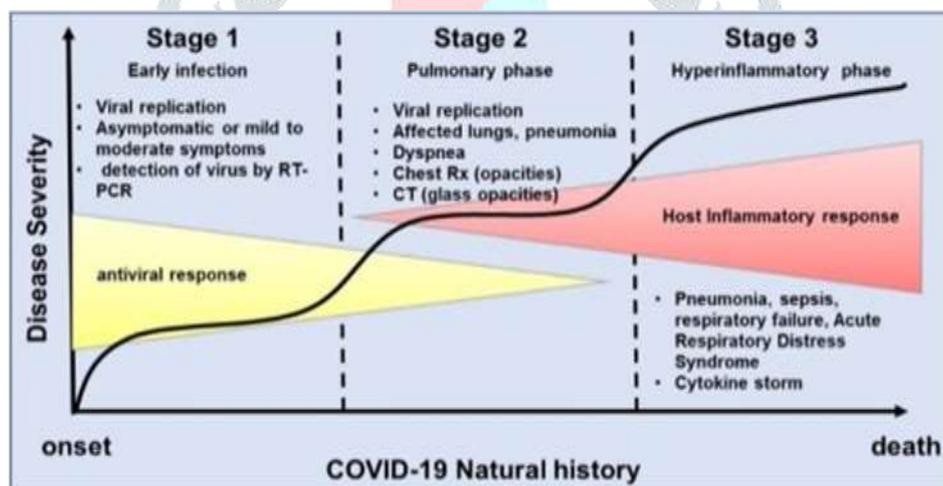


Figure 3 - Pictorial Representation of phases of Covid-19 (Data source: Biomedicine & Pharmacotherapy, 2020)

Thus, national and international suggested the use of mask, face shield, gloves, repeated washing of exposed areas especially hands with soap, social distancing and use of 70% alcohol-based sanitizer^{16, 17, 18}. Along with these individual preventive measures, there was an urgent need of a mass preventive measure to be implemented by the government which was done in the form of lockdown which restricted the movement of people. The lockdown in India started on 24th March, 2020¹⁹ as a preventive measure of COVID-19 and except emergency services like, medical, grocery, fire, police and other food supply all other sectors were closed²⁰. Italy enforced an extensive travel restriction²¹, London observed a complete closure of all the places where people used to gather in bulk like bars, theatre, etc. There have been 173,674,509 confirmed cases of COVID-19, including 3,744,408 deaths, reported to WHO as on 7th June 2021(Figure 4).

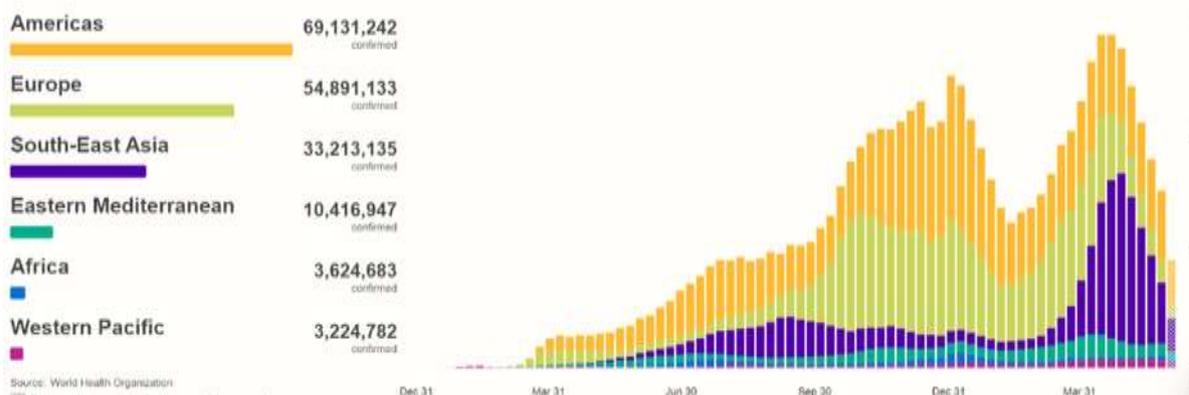


Figure 4 - Graphical Representation of Number of COVID-19 cases reported country-wise, and total deaths, from December 30, 2019 up to June 07, 2021 (Data source: WHO, 2021).

In totality, there has been caused a global disruption due to this pandemic which has adversely affected the environment. There has been a drastic reduction in all kinds of pollutions^{19, 22, 23}. But it also increased wastes of many types as lockdown affected the cleaning services to a great extent. Also medical waste has been largely accumulated^{24, 25, 26, 27}. Due to such an alarming situation, in the present study, the environmental and ecological consequences of COVID-19 have been discussed.

3.2 Data and Sources of Data

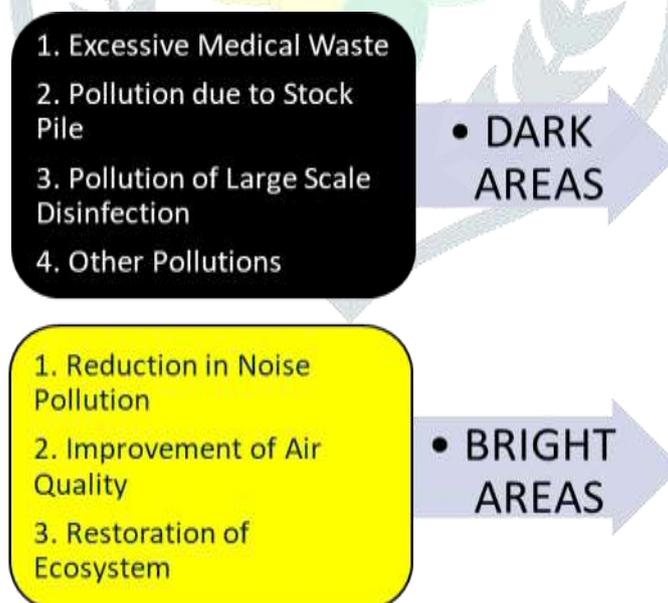
For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firms and relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE - 100 Index is taken from yahoo finance.

2. METHODOLOGY

The methodology adopted for the conduct of this study is by the review of available literature through online medium. Various case studies and information catered by different government and non-government organizations in the form of reports available on their official websites were also considered. Scientific literatures were collected through electronic means from the database of Science Direct, Springer, PubMed, Taylor and Francis, ISI Web of Knowledge, Research Gate, and Google Scholar. Hence, this study compiles the data of various studies and puts forth data along with the information pertaining to the environmental effects of COVID-19.

3. RESULTS & DISCUSSION

During the course of study, it was found that various aspects of environment have been drastically affected due to the pandemic.



a. DARK AREAS OF IMPACT OF PANDEMIC ON THE ENVIRONMENT

1. Excessive Medical Waste Generation

As soon as the pandemic started, there has been an excessive increase in the medical wastes. Firstly, the hospitals started getting crowded and later new COVID centres were established to meet the continuously increasing demand^{19, 28}. There were medical waste of all types for example, **semi-household waste** like dry paper towel, dry gauze, nylon, plastic, syringe and needle packaging, film packet plastic, mixed gypsum and gauze, paper banderol, food waste, food waste packaging, tea slag, filter tip, mixed soil and gypsum, medicine ampoule packaging; **Infectious waste** like, blood-contaminated paper towel, blood-contaminated gauze, nylon gloves, latex gloves, syringes, personal protective equipment like mask and gown; **Chemical and**

pharmaceutical waste like, used medicine ampoule, calcium hydroxide and **Sharp waste** like, needles and surgical blades and **Pathological waste** like, tissues²⁹. There was observed a global increase in such type of medical waste for example, 27% increase in biomedical waste was reported by Malaysia during the pandemic³⁰. In Dhaka, Bangladesh, 206 tonnes of medical waste are produced because of COVID-19 per day³¹. The amount of medical waste generation increased by 24.8% in Ahmedabad, India at the time of the first phase of lockdown¹⁹. Since SARS-CoV-2 virus can live on various surfaces for long durations, this waste imposes a serious concern.

2. Pollution due to Stock Pile

The government of all the countries are implementing guidelines for public to use masks, gloves and personal protective equipment kits. The governments of various countries are also quite strict about these rules and have put fine for those who don't obey these rules. With the outbreak of COVID-19, there has been an excessive increase in plastic-based PPE kits^{32, 33, 34, 35}. Since people are unaware about the severity of spread of infection through such articles, they dispose it with regular household waste and thus expose waste workers to these hazards even more³⁶. The material with which masks and items like it are made and when disposed without treatment, tends to accumulate microfibre plastic in the environment for a long time³⁷. Plastic demand in terms of packaging (40%) and other applications (17%) including medical uses has significantly increased³⁸.

3. Pollution due to large scale disinfection

Since the onset of COVID – 19, the government has been regularly disinfecting large area during and after lockdown. It is seen as an effective method of eradicating the disease-causing pathogenic microorganisms. The common disinfectant mixture consists of 62–71% ethanol, 0.5% hydrogen peroxide, or 0.1% sodium hypochlorite^{39, 40}. The injudicious use of disinfecting chemical poses great threat to the environment^{41, 42}. The toxic effect of disinfectant is harming all strata of environment including the lifeforms flourishing in that area⁴¹. For example, the application of such high volumes of disinfectants could contaminate food and water resources⁴³ or roosting habitats of free-living animals^{44, 45}.

4. Other Pollutions (Municipal pollution, water pollution, soil pollution)

COVID – 19 has also affected several other strata of environment like, water and soil. Municipal solid waste has also become a great concern. Since the onset of COVID, most of the organizations encouraged work from home; along with-it online delivery of all sorts of goods increased manifold due to which there was found a drastic increase in household waste¹⁹. The recycling process could not meet this demand and it led to high amount of accumulation of municipal waste^{28, 36}. Thus, due to disruption of routine municipal waste management, waste recovery and recycling activities, an increase in the landfilling and environmental pollutants worldwide was witnessed. Washing hands regularly with soap is suggested as a preventive measure for spread of corona virus but it is liable to have adverse effect on soil and water⁴⁶. Groundwater pollution and destruction of aquatic fauna are some of the by-products of excessive use of alcohol based products⁴⁷. Soaps can reduce re-aeration by 40%⁴⁸ and form a protective surface film which acts as an obstacle at the air-water interface⁴⁹. Accumulation of harmful pollutants in soil as a result of extensive use of soaps may deteriorate the quality of the soil^{46, 50}.

BRIGHT AREAS OF IMPACT OF PANDEMIC ON THE ENVIRONMENT

1. Reduction of Noise Pollution

Due to strict guidelines of lockdown and quarantine, there has been a decrease in commercial and transport activities²⁸. The reduction in travel has led to very few flights and trains working and also within the area there are less personal and public transport functioning. This has reduced noise pollution to a great extent. As a result, city dwellers are now enjoying the chirping of birds, which usually ranges from 40-50 dB⁵¹. For example, there is found a reduction of 90% in flights, 50% road transport and 25% trains in Germany⁵². In another example, the capital of India, Delhi saw a 40 – 50% reduced noise level during lockdown¹⁹. According to the Central Pollution Control Board (CPCB, 2020) of India, noise level of residential area of Delhi is reduced from 55 dB to 40 dB (daytime) and 45 dB (night) to 30 dB (night)⁵³.

2. Improvement of air quality

The lockdown also led to closure of industrial activities, power plants and internal and external transport and hence there was a decrease in gaseous pollutants like, Carbon monoxide, Nitrogen dioxide, Methane, Sulphur dioxide, Black carbon and Particulate matter^{54, 55, 56, 57}. Due to a decrease in 90% mobility there was observed a 30% decrease in air pollution globally especially, China, USA, France, Europe, Spain, Italy, etc)⁵⁸. To contain the virus, various measures were taken and hence flights were cancelled. Since, aviation contributes to 11% release of greenhouse gases⁵⁹, decrease in its use led to 17% reduction in pollution caused by it^{60, 61}.

3. Restoration of Ecosystem

It is estimated that the tourism industry is responsible for 8% of global GHGs emission⁶² which is due to electricity and fuels consumption, dumping of various wastes which impair natural beauty and create ecological imbalance⁶³. Due to the outbreak of COVID-19 and lockdown, the number of tourists has reduced in the tourist spots around the world²⁸. For instance, Phuket (Thailand) went into a lockdown on April 9, 2020, due to the surge of Covid-19 where more than 5000 tourists used to arrive in a day⁶⁴. Similarly, Cox's Bazar Sea beach, known as the longest unbroken natural sand sea beach in the world saw restrictions, due to which the colour of sea water changed⁶⁵. Nature gets a time to assimilate human annoyance, and due to pollution reduction recently returning of dolphins was reported in the coast of Bay of Bengal (Bangladesh) and canals, waterways, and ports of Venice (Italy) after a long decade^{65, 66}.

4. CONCLUSION

During the course of the study, it is evident that there is an urgent need to analyse our actions. COVID – 19 has led a way to introspection ourselves and our behaviour towards environment. There should be a long-term strategy for viable development of environment which shall in turn benefit mankind⁶⁷. Some suggestions are put forth as under:

a. Use of Sustainable Transport

It is important for people to understand that public transport should be adopted to reduce emissions. Besides, car-pooling, use of non-fuel transport and walking for short distances should also be adopted as they are not only environment friendly but also beneficial for health.

b. Change in Lifestyle

We need change the behaviour in our daily life and initiate optimum consumption of resources in order to reduce global carbon emission by adopting practices like; avoid processed and take locally grown food, make compost from food waste, switch off or unplug electronic devices when not used and taking fresh air breaks by switching off air-conditioners.

c. Waste Water Treatment

The water outlets of industries and households need to properly treat the discharge as to improve the quality of water that mixes with the main source. Besides, reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal. Also public should be encouraged to reduce wastage of water.

d. Waste Reduction, Recycling and Reuse

There is an urgent need to educate people, especially of developing country, on segregation, handling and disposal of waste⁶⁵. To reduce the burden of wastes and environmental pollution, both industrial and municipal wastes should be recycled and reused. Hence, circular economy or circularity systems should implement in the production process to minimize the use of raw material and waste generation⁶⁸. Moreover, hazardous and infectious medical waste should be properly managed as per the guidelines⁶⁹.



e. Renewable Industrialization

Industrialization is an integral part of development, but they need to be environment friendly hence green fuels and energy efficient technologies should be employed. A mix bag of industries should be made in such a way that waste of one industry serves as raw material for another industry⁷⁰. The places where a huge number of people work, proper distance and hygienic environment should be maintained to reduce the spread of any infectious communicable disease.

f. Use of Inexhaustible Energy

Due to the COVID-19 pandemic, global energy demand is reduced, which results in the reduction of emission and increased ambient air quality in many areas^{19, 28}. But, to maintain the daily needs and global economic growth, it is not possible to cut-off energy demand like a pandemic situation. Hence, use of renewable energy sources like solar, wind, hydropower, geothermal heat and biomass can meet the energy demand and reduces the global greenhouse gases emission⁷¹.

g. Universal Brotherhood

Global Cooperation is essential to meet the goal of a sustainable environment⁷². Hence, responsible international authority like United Nations Environment Programme (UN Environment) should take effective role to prepare time-oriented policies, arrange international conventions, and coordination of global leaders for proper implementation.

h. Ecological Reconditioning

Our ecology has not got a resting time since ages and due to the pandemic and with a drastic reduction of human activity, the ecosystem got a much-needed break. Hence, this should happen more often so that ecological restoration can take place. Tourist spots should periodically shutdown after a certain period. Moreover, ecotourism practice should be strengthened to promote sustainable livelihoods, cultural preservation, and biodiversity conservation⁷³.

5. DECLARATION OF CONFLICTING INTERESTS

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