

9. Covid-19: It's Positive and Negative Impacts on the Environment

Dr. Rupjyoti Saikia

Assistant Professor,
Department of Zoology,
Bahona College, Jorhat.

9.1 Introduction:

The world has changed in the last few months due to the rare disaster known as COVID-19 pandemic. This is an ongoing global pandemic of corona virus disease 2019 (COVID-19), caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The virus was first identified in December 2019 in Wuhan, China. The World Health Organization declared a Public Health Emergency of International Concern regarding COVID-19 on 30 January 2020, and later declared a pandemic on 11 March 2020. So far, COVID-19 has caused the deaths of more than 3 million people worldwide. As of 13 June 2021, more than 175 million cases have been confirmed, with more than 3.79 million confirmed deaths attributed to COVID-19, making it one of the deadliest pandemics in the history.

COVID-19 is affecting people's health in different ways. Most infected people develop mild to moderate illness and recover without hospitalization. Most common symptoms of this disease include fever, dry cough and tiredness. Among less common symptoms include aches and pains, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, a rash on skin or discoloration of fingers or toes. Severe cases can lead to cardiac injury, respiratory failure, acute respiratory distress syndrome and even death.

The pandemic has resulted in significant global, social and economic disruption. It has led to widespread supply shortages exacerbated by panic buying, agricultural disruption and food shortages. However, there have also been decreased emissions of pollutants and greenhouse gases. Numerous educational institutions and public areas have been partially or fully closed and many events have been cancelled or postponed. Misinformation has circulated through social media and mass media, and political tensions have been exacerbated. The pandemic has raised issues of racial and geographic discrimination, health equity and the balance between public health imperatives and individual rights.

India is one of the most affected countries from corona virus pandemic in all sectors. Healthcare is the epicenter during this unprecedented global pandemic. In the first quarter of the fiscal year 2021, India's Gross Domestic Product collapsed by 23.9% amid the corona virus lockdown. The pandemic has led to an unprecedented shutdown of business, industries and services. This has wreaked havoc on the job landscape in India. According to the Centre for Monitoring Indian Economy (CMIE) about 21 million salaries employees lost their jobs during April-August. According to an analysis by Scroll, during the first two months of the lockdown, India's vulnerable section lost incomes amounting to as much as Rs 4 lakh crores, or nearly 2% of the country's annual GDP.

The ongoing pandemic has also affected people's mental health majorly. According to the report compiled by a group of researchers at Jindal Global School of Law during the period of March 19 till May 2, suicide was the leading cause of over 300 non-corona virus deaths in India due to the distress triggered by the nationwide lockdown.

Indian travel and tourism industry is one of the worst-impacted sectors by the corona virus pandemic. The pandemic has also disrupted the education sector as people are forced to stay at home. The schools and colleges remain closed ever since the nationwide lockdown was imposed. Many children are struggling to keep up with the challenges of online classes. Students and teachers in cities, towns and villages scramble to cope with the demands of the times. On the other hand, livelihoods of street vendors which depend on being in public places have been hit hard by the unprecedented lockdown. With the absence of people, the city's vendors lost their source of income. Many were unable to feed their families, which led to starvation and deprivation. Even after the lockdown restrictions were lifted, many street vendors reported a drastic decrease in income as compared to the times before the pandemic outbreak.

Changes came into our life due to the lockdown already commenced impacting our environment in myriad ways. Both the positive and negative effects of Covid-19 are reflected on the environment and the climate. Doctors and researchers are noticing some curious and unexpectedly positive side effects of the abrupt shifts in human behavior in response to the covid-19 pandemic. Skies are bluer, fewer cars are crashing, crime is falling and some other infectious diseases are fading from hospital emergency departments. In these circumstances, this study intended to explore the positive and negative environmental consequences of the COVID-19 pandemic and propose possible strategies as future guideline for environmental sustainability.

9.2 Environmental Impacts of COVID-19:

The global disruption caused by the COVID-19 has brought about several effects on the environment and climate. Both positive and negative environmental impacts are discussed below:

9.2.1 Positive Effects of COVID-19 on the Environment:

A. Air Quality and Climate:

Air comprises the immediate environment of human beings, which is vital for their survival. With 91% of the global population living in places where the air quality is poor, with Air Quality Index (AQI) exceeding the permissible limits, the possible health effects of the degraded air quality had the largest footprints attributable to the pervasive, pernicious, prolonged, and constant exposure to pollution. The World Health Organization (WHO) estimated that the outdoor air pollution kills 7 million people each year worldwide and more than 80% urban population is exposed to unhealthy air. It is shocking that millions of people die every year because of polluted air, smog and soot which are considered to be slow killers. The locking down of cities has significantly improved the environmental quality with a sharp drop in air pollution levels across several countries.

As industries, transportation and companies have closed down, it has brought a sudden drop of greenhouse gases (GHGs) emissions. It is assumed that, vehicles and aviation are key contributors of emissions and contribute almost 72% and 11% of the transport sector's GHGs emission respectively. The measures taken globally for the containment of the virus are having a dramatic impact on the aviation sector. Many countries restricted international travelers from entry and departure. Due to the decreased passengers and restrictions, worldwide flights are being cancelled by commercial aircraft companies.

The reduced consumption of fossil fuels during lockdown lessens the GHGs emission, which helps to combat against global climate change. Besides, global coal consumption is also reduced because of less energy demand during this period. Due to corona virus lockdown the emission of carbon dioxide has decreased worldwide which is responsible for the climate change. The experts are predicting this to be the biggest decline in anthropogenic carbon dioxide emissions after World War-II. Scientists estimated that this reduction have saved many million lives.

The Ongoing COVID-19 lockdown across the world is showing a direct relation between air pollution levels and economic activities such as industrial activities, transportation and energy production along with the small-scale interferences at city levels. This suggests that clean energy-based system has to be adopted as the corona outbreak ends.

B. Water Quality and Aquatic Life:

Water pollution is a common phenomenon of a developing country like India and Bangladesh, where domestic and industrial wastes are dumped into rivers without treatment. Reports are indicating that COVID-19-induced lockdown not only improved the air quality but water quality in rivers and water bodies are also improved. Lockdown has been able to achieve what the governments could not for decades. The stoppage of discharging industrial effluents and other wastes into water bodies led to an apparent positive effect on water quality. India's holiest river Ganga has been one of the most polluted rivers in the world. Waste from domestic and industrial setups along the banks of this river cost the government in millions without any success. But during lockdown, a 40–50% improvement has been observed in the water quality of the Ganga River and the water has become fit for drinking after decades. Similarly, its sister river the Yamuna has been improved as well.

The improvement of water quality at Haridwar and Rishikesh was ascribed to the sudden drop of the number of visitors and 50% reduction of sewage and industrial effluents. In Venice, the water are looking clearer after the two months of COVID-19 lockdown and aquatic life is now visible which hasn't been seen for many years in the cities.

Clean rivers and other water bodies have a significant positive effect on the aquatic life. Many species are returning to their natural habitats since induction of the lockdown. With many cruisers suspended, the tourism subdued while all other marine activities being suspended, consequently, the aquatic species are taking controls in their hands. Commercial fishing industries have been hit hard due to the closure of main buyers, the restaurants and hotels. The indigestion and entanglement due to the plastic and marine debris which are the leading causes of injuries to sea creatures will be wiped out during this lockdown.

Not just the oceans but even the rivers and other water bodies are clearing out indicating lesser toxic and harmful materials entrance to these water bodies. There have been visible positive signs of this lockdown but few weeks or months of lockdown will not be enough to eradicate or reverse the damage caused during many years. The lockdown gives us hope that there is a possibility of minimizing the unnecessary human interferences and letting these wonderful creatures back in their space and habitats. Data gathered by several studies can be utilized for devising better environmental policies. If the governments construct sewage treatment plants in the right manner and make strong regulations for the companies and industries to treat their wastes accordingly, then the lockdown induced ecofriendly impact on aquatic life can be long lasting.

C. Reduction of Noise Pollution:

Environmental noise pollution is well-defined as an undesirable sound generated by various anthropogenic, transports, industrial and commercial activities and is the major source of discomfort for the environment and human health. Prolonged exposure to noise pollution has been shown to cause a range of health problems such as stress, tinnitus, cognitive impairment, cardiovascular disease, and hearing loss, lack of sleep, fatigue, and poor concentration, difficulties in communication and productivity losses from working places. It is reported that, globally around 360 million people are prone to hearing loss due to noise pollution. Moreover, anthropogenic noise pollution has adverse impacts on wildlife through the changing balance in predator and prey detection and avoidance. Unwanted noise also negatively affects the invertebrates that help to control environmental processes which are vital for the balance of the ecosystem. The worldwide imposition of quarantine measures by governments has confined the people to their homes which has not only decreased the use of private and public transportation but has also led to a significant dropdown in commercial activities. All these changes have caused a considerable drop in the noise level in most cities in the world. For instance, noise level of Delhi the capital of India, is reduced drastically around 40-50% in the recent lockdown period. As a result, city dwellers are now enjoying the chirping of birds, which usually ranges from 40-50 dB. Due to travel restrictions, the number of flights and vehicular movements has drastically reduced around the world which has ultimately reduced the level of noise pollution. With cruises temporarily being on hold, oceans are more in a state of calm. This calmness and decrease in ocean noise is likely to reduce the stress of aquatic creatures. Similarly, the noise pollution from shipping and powerful blasts from the seismic air gun tests, used to locate the deposits of gas and oil in the deep oceans, must be traumatizing for marine life. Noise levels from shipping traffic are generally 20-200 Hz and disturb the aquatic life which is decreased by six decibels with a significant reduction below 150 Hz.

Though the current reduction seems to be a short-term phenomenon, proper and a long-term strategy is needed to ensure and maintain the environmental noise level within the WHO's permissible limits.

D. Ecological Restoration and Assimilation of Tourist Spots:

Over the past few years, tourism sector has witnessed a remarkable growth because of technological advancements and transport networks which contribute significantly to global gross domestic product.

The places of natural beauty such as beaches, islands, national park, mountains, desert and mangroves are usually attracting the tourists and make a huge harsh. In coastal areas, beaches function as important natural capital assets and provide essential services such as tourism, recreation, sand, land, and source of livelihood to coastal communities. Besides providing valuable and intrinsic values, the sandy beaches and dunes are sentinel, shielding the heavy impacts of waves and preventing the furious winds from destroying crops, homes and other livestock. However, the non-responsible and improper use by people has caused these places to present pollution problems, which impair natural beauty and create ecological imbalance. It is estimated that the tourism industry is responsible for 8% of global GHGs emission. To facilitate and accommodate them, lots of hotels, motel, restaurant, bar and market are built, which consume lots of energy and other natural resources. Due to the outbreak of COVID-19 and local restrictions, the number of tourists has reduced in the tourist spots around the world. Nature gets a time to assimilate human annoyance and due to recent reduction of pollution, returning of dolphins was reported in the coast of Bay of Bengal of Bangladesh and canals, waterways and ports of Venice of Italy after a long decade. The beaches of Salinas (Ecuador), Barcelona (Spain) and Acapulco (Mexico) now look cleaner and with clear waters. The effect of Covid-19 lockdown on the surface water quality found that the water quality of Vembanad Lake of Kerala, increased significantly.

All these studies suggest that the virus crisis has brought with it the unintended benefits for the environment and mankind.

E. Slow Moving Life:

Mobility has been stopped all over the world during COVID-19 lockdown. All modes of mobility like public transport, micro-mobility and individual auto commuting have seen a melodramatic diminution across the globe. COVID-19 Community Mobility Reports, which use anonymous, aggregated geolocation data from mobile phones to chart movement trends over several weeks, provide perceptions into changes in mobility patterns. These reports illustrated the trends in movements in most busy places including workplaces, markets, parks, places of residence, entertaining venues and pharmacies etc.

The data collected from the mobile phones of people by this community depicts that people have reduced their movement after the COVID-19 pandemic. Decreased mobility has been observed across the globe especially in countries such as Italy, USA, Germany, UK, Canada, China, India and Saudi Arabia.

According to data from TomTom Traffic Index (TTTI), which provides detailed insights on live and historic road crowding levels in cities around the world, traffic levels have greatly been reduced in this ongoing pandemic.

In India, according to All India Motor Transport Congress (AIMTC) daily movement of trucks has been reduced to less than 10% of normal levels. Reduced road transport and fewer air travels across the globe considerably decreased fuel consumption. However, this pandemic is a great opportunity for us to learn that how urban traffic and transportation can be monitored to reduce the expenditure of fuel, its consumption and maintain a healthy environment.

F. Animals on Street:

The environmental changes brought by the corona virus were first visible from space. Then, as the disease and the lockdown spread, they could be sensed in the sky above our heads, the air in our lungs and even the ground below our feet. While humans are restricted to their homes, the wild animals all over the planet seem to have come to reclaim their territory. The emergence of wild animals in urban areas is mostly because of peace and calm, which attracts them to the residential areas.

G. Feathers Flock Together:

While the home confinement rules and social distancing has stopped the movement of peoples outside, at the same time, this global lockdown has allowed birds and wildlife to flourish and enjoy all the freedom of nature. Reports confirmed that a growing flock of thousands of flamingos beating their black and pink-lined wings has been seen splashing over the glistening water of Nartan Lagoon of the Adriatic coast. According to park authorities, since January 2020, the number of these birds has been found to increase by 3-fold up to some 3,000. Similarly, the wildlife seems to have regained all their absolute rights and is enjoying the freedom of nature. Similar cases were found in the Indian beaches with flocks of flamingos flying to these beaches with the number increasing by more than 25% compared with previous years.

H. The Vegetation is Growing Better:

Healthy plant growth is observed with improved air quality. Due to less human interference, plants are exposed to better air quality and clean water. The amount of oxygen and other nutrients required for their growth are not polluted and hence allow plants to grow and harvest healthy produce which is essential for improving the food cycle of the planet.

9.2.2 Negative Effects of Covid-19 on the Environment:

A. Covid-19 and the Global Economy:

Although the territorial colonization ended long ago, this existing global health crisis can serve as a reminder that the colonization of economics, medicine and politics are still alive. In addition to its immediate effects on the lives and health outcomes, it is now clear that the corona virus outbreak is likely to have long-lasting effects on the global economy. Loss of lives by any sort of pandemic causes irretrievable damage to the society; however, the Covid-19 pandemic apart from taking a huge toll on the global lives has severely demobilized the global economy. To limit further transmission, governments at local, regional, national and global levels have decided to undergo complete lockdown. Owing to the complete lockdown and cross-border closure, all the flights, railway services, trucks, buses and all other types of vehicular transports are suspended. Nearly all the Covid-19-traumatized nations, industries, and entire commercial, educational, religious and sports institutions are closed. All these restrictions are negatively affecting global economies. Moreover, increased prices, lost income and overburdened social safety nets will further push the more vulnerable groups into poverty and increase the financial barriers.

With the production level gone down, the economy of many so-called powerful countries is facing the threat of high inflation. Especially, the gross domestic product (GDP) projections have already been revised downwards in most of the developed countries amid the disruption in production. Most business sectors especially those in tourism, aviation, and hospitality industries are facing serious challenges with a real threat of significant declines in insolvencies, revenue and job losses.

B. Effect of Covid-19 on Energy Resources:

In the global energy systems, coal stands one of the major fuels accounting for up to 40% of the electricity generation. The global coal production was estimated to have increased by 2.7% in 2018 with the annual production of 8.1 billion tons in 2019. The increase was mainly driven by three major coal-producing countries such as China, India, and Australia, which together accounts for 70% of global production. Owing to the corona virus lockdown and other government policies during the on-going Covid-19 pandemic, the global coal market is likely to fall from \$816.5 billion in 2019 to \$722.8 billion in 2020. This significant decline in the global output is mainly because of the economic slowdown across the countries caused by the global lockdown to stem the spreading of the Covid-19 pandemic. Similarly, the global oil demand was strongly hit, showing a decline of 5% in the first quarter of 2020. This drastic reduction was mainly because of the curtailments in mobility and aviation which alone accounts for more than 60% of the global oil demand. Likewise, the electricity demand has also shown a significant reduction (>20%) due to lockdown measures, with knock-on effects on the power mix.

C. Impacts on Biodiversity:

Although affecting all the sectors of human life, the Covid-19 pandemic propagates exponentially and impacts other global resources at an accelerating pace. Reports suggest that there is reduced human pressure on natural ecosystems and wildlife. The protected areas have witnessed a significant decline in the number of visitors, caused mainly by the travel ban and park closure, reducing the stress on the wildlife. Besides some of the positive effects (all though temporary), it is quite unclear how the conservation biology will fare in the pandemic aftermath. At present, most of the protected areas appear to be safe and biodiversity seems to be benefitting from the reduced human activities. However, threats persist especially in the areas where the enforcement has weakened. Although greenhouse gas emissions, environmental pollution and many other anthropogenic impacts on the wild nature will ricochet, the support and funding for conservation purposes have to compete with a wide range of priorities for financial resources. The forest sector is the main contributor to the development of society and for social and economic recovery in the aftermath of any crisis. Forests by-products function as essential sources and support the livelihood during the crisis, by delivering necessary products, such as hygiene and sanitary items, respirator papers, ethanol for sanitizer, biomass for heating and papers for parcel packaging. The negative effects of the Covid-19 pandemic on production and trade of forest and forest by-products will put many of the key livelihoods and industrial sectors at risk. Moreover, the forest sector has high rural to urban migration; however, the Covid-19 pandemic is leading to reverse migration, which has the potential to spread the disease to the remote, distant and unprepared areas.

Furthermore, the effect of this global pandemic on forest-based industries will have instant consequences for forest owners and traders arising primarily from the persistent decline in product runoff and sales.

D. Increase of Biomedical Waste Generation:

The biomedical waste (BMW) generation from COVID-19 patients is increasing throughout the world since the outbreak of COVID-19 which is a major threat to public health and environment. For sample collection of the suspected COVID-19 patients, diagnosis, treatment of huge number of patients and disinfection purpose lots of infectious and biomedical wastes are generated from hospitals. India is producing approximately 550 tons of biomedical waste per annum.

During epidemic in Wuhan, China, the city produced 240 tons of medical waste per day. Such a sudden rise of hazardous waste and their proper management has become a significant challenge to the local waste management authorities.

According to the recent report, the SARS-CoV-2 virus can exist a day on cardboard and up to 3 days on plastics and stainless steel. So, waste generated from the hospitals should be managed properly to reduce further infection and environmental pollution, which is now a matter of concern globally.

Dedicated vehicles must be employed to collect COVID-19 ward waste and its sanitization. The proper monitoring is quite essential while disposing of COVID-19 waste so the workers should not get infected by it. For discarding the BMW properly, it is important to know the composition so that its proper disposal can be ensured.

Some of the promising ways to get rid of BMW is incineration at high temperatures between 800°C and 1200 °C, which kills the pathogens and also reduces organic matter up to 90%. High temperature pyrolysis and medium temperature microwave technique are two primary alternative thermal technologies that are available to deal with biomedical waste. Chemical disinfection may also be used to pre-treat COVID-19 waste before mechanical shredding.

E. Municipal Solid Waste Generation and Reduction of Recycling:

Increase of municipal organic and inorganic waste generation has direct and indirect effects on environment. Due to the pandemic, quarantine policies established in many countries have led to an increase in the demand of online shopping for home delivery, which ultimately increase the amount of household wastes from shipped package materials.

However, waste recycling is an effective way to prevent pollution, save energy and conserve natural resources. But many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA, UK, Italy and other European countries restricted recycling programs in many cities.

As a result of disruption of routine municipal waste management, waste recovery and recycling activities increases the land filling and environmental pollutants worldwide.

F. Impact on Soil and Water Ecosystems:

The components of the ecosystem are intertwined with each other. With every person washing hands more regularly with soap, mass disinfection by government and local bodies and production of single-use plastics containing bisphenol A (BPA) are destined to have negative impacts on soil and water quality. Alcohol containing products spilled in the water are toxic to aquatic fauna and spill in soil may also pollute the groundwater. Discharged detergents cause foam in water bodies. Soaps can reduce re-aeration by 40%. These substances form a protective surface film which acts as an obstacle at the air-water interface. Soap can prevent the growth and development of algae and aquatic plants. Accumulation of harmful pollutants in soil as a result of extensive use of soaps may deteriorate the quality of the soil.

The increase in soapy discharge over a short period of time, increase the amount of pollutants and alter the chemistry of grey-water. Such domestic effluent will pollute the river, lakes and oceans. This unwelcoming chain of events is going to be a serious issue in the near future.

G. Ecological Perspectives of Covid 19:

Amidst corona pandemic, particularly during the lockdown phase, some positive effects were observed in the wildlife. The wildlife was at peace with less flow of humans and tourists. However, a significant increase in poaching of wild animals in some areas was observed during the lockdown period, especially in the areas which were not protected or not marked to any specific wildlife area. If left unregulated, the poaching of ungulates and small animals may lead to a depletion of the prey base for predators. This might in turn, result in increase in human-animal conflicts.

Along with humans, animals such as dogs, cats, rabbits, mink and even tigers and lions are getting infected with corona virus which is an indicative of the fact that corona virus can transfer from human to animals. Further, stray animals like dogs and cats are amongst the sufferers owing to the absence of waste food due to restaurants and shops being closed. Also, they are being abandoned by their owners due to unfounded fears that they may spread COVID-19. The worst possibility is that the stray animals might eat disposed masks and gloves, which can become lethal.

H. Safety Equipment Use and Haphazard Disposal:

To protect from the viral infection, presently peoples are using face mask, hand gloves and other safety equipment, which increase the amount of healthcare waste. Since the outbreak of COVID-19, the production and use of plastic based PPE is increased worldwide. However, due to lack of knowledge about infectious waste management, most people dump these in open places and in some cases with household wastes. Such haphazard dumping of these trashes creates clogging in water ways and worsens environmental pollution. Though, experts and responsible authorities suggest for the proper disposal and segregation of household organic waste and plastic based protective equipment, but mixing up these wastes increases the risk of disease transmission and exposure to the virus of waste workers.

I. Other Effects on the Environment:

Recently, huge amount of disinfectants is applied into roads, commercial and residential areas to exterminate SARS-CoV-2 virus. Such extensive use of disinfectants may kill non-targeted beneficial species which may create ecological imbalance. Moreover, the virus was detected in the COVID-19 patient's faces and also from municipal wastewater in many countries including Australia, India, Sweden, Netherlands and USA. So, additional measures in wastewater treatment are essential, which is challenging for developing countries. China has already strengthened the disinfection process by increasing use of chlorine to prevent SARS-CoV-2 virus spreading through the wastewater. But, the excessive use of chlorine in water could generate harmful by-product.

9.3 Conclusion:

COVID-19 pandemic is a global health emergency with severe consequences on health and economy, but it has also brought some positive environmental effects that may serve as an example and inspiration for future behavioral changes that would help to bring positive changes in environment. Environmental changes are arguably the most vital and severe challenge of the twenty-first century. The current global pandemic has forced people to introspect and imagine a different world. The lockdowns show that a world with cleaner air is possible. The ongoing pandemic across the world is showing a direct relation between pollution levels and bigger economic activities such as industrial activities, transportation and energy production along with the small-scale interferences at city levels. This indicates that clean energy-based system has to be adopted as the corona outbreak ends. Without pollution control, the waste products from consumption, heating, agriculture, mining, manufacturing, transportation and other human activities will degrade the environment. Therefore, proper strategies should be adopted to control environmental degradation.

The lockdown gives us hope that there is a possibility of minimizing the unnecessary human interferences in environment. To bring positive changes in the environment, governments and individuals should adopt the strategies like inspection and maintenance of vehicles, efficient public transport system, improving traffic managements, using eco-friendly products, minimizing the use of Chlorofluorocarbons (CFCs), adopting renewable energy sources, promoting reusing and recycling of wastes, decreasing the use of pesticides, using minimum required amount of water, plantation of trees, avoiding deforestation, treatment of sewage and removing solid, suspended and inorganic materials from it, before it enters the environment and use of Ecosan toilets where no water is required and human excreta is converted into natural fertilizers. Like the previous catastrophes on the planet Earth, the humans will win over this pandemic in due course of time. However, people should know the limits to which they can thrust nature before it is too late. Despite the continuous efforts by governmental and non-governmental organizations to restore and repair nature, humans can only move a few steps forward and yet there are enormous challenges. However, being a blessing in disguise, the Covid-19 pandemic has successfully recovered the environment to a much larger extent and has improved the mutually effective link between nature and humans. While at the same time the lockdown and social distancing have contributed positively toward the environment, though, it is essential to take into account the negative effects such as mortality, impacts on social aspects and the dramatic economic effects as well.

At present, it is important to control the disease, reduce the transmission, and proactively save lives. Although the positive impacts on the environment may be temporary, the governmental, non-governmental organizations and the individuals should be united and propose time-oriented effort that can strengthen environmental sustainability and save the earth from the effects of global climate change.

To tackle the ongoing and future impacts of COVID-19, there is need to frame policy guidelines and implement them at International and National levels for proper management of waste and waste water treatment, to develop safety guidelines and ensure their implementation for doctors, sanitary workers and hospital staff to keep them healthy and to avoid any viral spread; to drive awareness programs and campaigns at various levels including schools, colleges, villages etc. to avoid spread of wrong information and misconceptions and to guarantee proper implementation of various guidelines; to understand environmental and ecological impacts of COVID-19 with intensive research efforts so that in future such adversities may be tackled in a more effective way; to develop database of elderly people who might require more care, proper and timely treatment due to COVID-19 and to ensure their health and care in future; to understand the mental stress and psychology of children who had been forced to live in locked conditions in home and to develop environment and safe conditions for their outing, games and sports activities.

9.4 References:

1. Khan, I., Shah, D., & Shah, S. S. (2021). COVID-19 pandemic and its positive impacts on environment: an updated review. *International Journal of Environmental Science and Technology*, 18, 521–530.
2. Rume, T. & Didar-Ul Islam, S.M. (2020). Environmental effects of COVID-19 pandemic and potential strategies of sustainability. *Heliyon*, 6(9), 4965.
3. Kumar, A., Malla, M. A., & Dubey, A. (2020). With Corona Outbreak: Nature Started Hitting the Reset Button Globally. *Front. Public Health*, doi.org/10.3389/fpubh.2020.569353.
4. Ankit. Kumar, A., Jain, V., Deovanshi, A., Lepcha, A., Das, C., Bauddh, K., & Srivastava, S. (2021). Environmental impact of COVID-19 pandemic: more negatives than positives. *Environmental Sustainability*, doi.org/ 10.1007/s42398-021-00159-9.
5. Mehta, R. (2020). 10 Impacts of Coronavirus on the Environment. Sustainable development goals. Retrieved from the EARTH5R website <https://earth5r.org/impacts-corona-virus-environment>.
6. Roshan, P., (2020). COVID-19 impact on India: Multiple sectors affected in six months of lockdown. Retrieved from the website. <https://www.moneycontrol.com/news/photos/india/covid-19-impact-on-india-multiple-sectors-affected-in-six-months-of-lockdown-5882081.html>.