

2. Impact of Covid 19 on Environment

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Abstract:

The global outbreak of coronavirus disease 2019 (COVID-19) is affecting every part of human lives, including the physical world. The measures taken to control the spread of the virus and the slowdown of economic activities have significant effects on the environment. Therefore, this study intends to explore the positive and negative environmental impacts of the COVID-19 pandemic, by reviewing the available scientific literatures.

This study indicates that, the pandemic situation significantly improves air quality in different cities across the world, reduces GHGs emission, lessens water pollution and noise, and reduces the pressure on the tourist destinations, which may assist with the restoration of the ecological system. In addition, there are also some negative consequences of COVID-19, such as increase of medical waste, haphazard use and disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment. It seems that, economic activities will return soon after the pandemic, and the situation might change. Hence, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that the proper implementation of the proposed strategies might be helpful for the global environmental sustainability.

Keywords:

Environmental assessment, Environmental pollution, Environmental management, Environmental sustainability, COVID-19, Public health, Lockdown, GHGs emission, Biomedical waste.

2.1 Introduction:

The outbreak of coronavirus disease-2019 (COVID-19) first emerged at the end of December 2019, from the Hunan seafood market in Wuhan City of China and declared as an international public health emergency in a couple of weeks by the World Health Organization (WHO, 2020a). It is an infectious disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Islam et al., 2020; Nghiem et al., 2020; Wang et al., 2020). Genomic analysis revealed that SARS-CoV-2 is phylogenetically associated with SARS viruses, and bats could be the possible primary source (Chakraborty and Maity, 2020). Although the intermediate source of origin and transfer to humans is not clearly known, the rapid human to human transmission capability of this virus has been established (Hui et al., 2020).

The transmission of the virus mainly occurred through person-to-person via direct contact or droplets produced by coughing, sneezing and talking (Islam et al., 2020; Li et al., 2020; Wang et al., 2020). As of September 06, 2020; the virus has claimed to spread 216 countries, areas or territories with the death of 876, 616 humans from 26,763,217 confirmed cases (WHO, 2020a), and the number is increasing rapidly.

2.2 Positive Environmental Effects:

- **Reduction of Air Pollution and GHGs Emission:**

As industries, transportation and companies have closed down, it has brought a sudden drop of greenhouse gases (GHGs) emissions. Compared with this time of last year, levels of air pollution in New York has reduced by nearly 50% because of measures taken to control the virus (Henriques, 2020). It was estimated that nearly 50% reduction of N₂O and CO occurred due to the shutdown of heavy industries in China (Caine, 2020). Also, emission of NO₂ is one of the key indicators of global economic activities, which indicates a sign of reduction in many countries (e.g., US, Canada, China, India, Italy, Brazil etc.) due to the recent shut down (Biswal et al., 2020; Ghosh, 2020; Saadat et al., 2020; Somani et al., 2020). Usually, NO₂ is emitted from the burning of fossil fuels, 80% of which comes from motor vehicle exhaust (USEPA, 2016). It is reported that NO₂ causes acid rain with the interaction of O₂ and H₂O, and several respiratory diseases suffered by humans (USEPA, 2016).

The European Environmental Agency (EEA) predicted that, because of the COVID-19 lockdown, NO₂ emission dropped from 30-60% in many European cities including Barcelona, Madrid, Milan, Rome and Paris (EEA, 2020). In the US NO₂ declined 25.5% during the COVID-19 period compared to previous years (Berman and Edisu, 2020). The level of NO₂ demonstrated a reduction across Ontario (Canada) and found to be reduced from 4.5 ppb to 1 ppb (Adams, 2020). Up to 54.3% decrease of NO₂ was observed in Sao Paulo of Brazil (Nakada and Urban, 2020). It was also stated that, the levels of NO₂ and PM_{2.5} reduced by almost 70% in Delhi, the capital of India (Thiessen, 2020). Overall, 46% and 50% reduction of PM_{2.5} and PM₁₀ respectively, was reported in India during the nationwide lockdown (IEP, 2020).

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 (Henriques, 2020). The measures taken globally for the containment of the virus are also 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.

For instance, China reduces almost 50–90% capacity of departing and 70% domestic flights due to the pandemic, compared to January 20, 2020, which ultimately deducted nearly 17% of national CO₂ emissions (Zogopoulos, 2020). Furthermore, it is reported that 96% of air travel dropped from a similar time last year globally due to the COVID-19 pandemic (Wallace, 2020), which has ultimate effects on the environment. Overall, much less consumption of fossil fuels lessens the GHGs emission, which helps to combat against global climate change.

According to the International Energy Agency (IEA), oil demand has dropped 435,000 barrels globally in the first three months of 2020, compared to the same period of last year (IEA, 2020). Besides, global coal consumption is also reduced because of less energy demand during the lockdown period (Figure 5). It is reported that, coal-based power generation reduced 26% in India with 19% reduction of total power generation after lockdown (CREA, 2020). Again, China, the highest coal consumer in the world, dropped 36% compared to same time of the preceding year (early February to mid-march) (CREA, 2020; Ghosh, 2020). According to UK based climate science and policy website Carbon Brief, recent crisis of COVID-19 reduces 25% CO₂ emission in China, and nonetheless below the normal limit more than two months after the country entered lockdown (Evans, 2020). They also projected that, the pandemic could cut 1,600 metric tons of CO₂, equivalent to above 4% of the global total in 2019 (Evans, 2020)

2.3 Negative Environmental Effects:

2.3.1 Increase of Biomedical Waste Generation:

Since the outbreak of COVID-19, medical waste generation is increased globally, 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 (Somani et al., 2020; Zambrano-Monserrate et al., 2020). For instance, Wuhan in China produced more than 240 metric tons of medical wastes every day during the time of the outbreak (Saadat et al., 2020), which is almost 190 m tonnes higher than the normal time (Zambrano-Monserrate et al., 2020). Again, in the city of Ahmedabad of India, the amount of medical waste generation is increased from 550-600 kg/day to around 1000 kg/day at the time of the first phase of lockdown (Somani et al., 2020). Around 206 m tonnes of medical waste are generated per day in Dhaka, the capital of Bangladesh because of COVID-19 (Rahman et al., 2020). Also other cities like Manila, Kuala Lumpur, Hanoi, and Bangkok experienced similar increases, producing 154–280 m tonnes more medical waste per day than before the pandemic (ADB, 2020). 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 published literature, it is reported that the SARS-CoV-2 virus can exist a day on cardboard, and up to 3 days on plastics and stainless steel (Van-Doremalen et al., 2020). So, waste generated from the hospitals (e.g., needles, syringes, bandage, mask, gloves, used tissue, and discarded medicines etc.) should be managed properly, to reduce further infection and environmental pollution, which is now a matter of concern globally.

2.3.2 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. It is reported that, in USA, trash amount has been increasing due to increased PPE use at the domestic level (Calma, 2020). Since the outbreak of COVID-19, the production and use of plastic based PPE is increased worldwide (Singh et al., 2020). For instance, China increased the daily production of medical masks to 14.8 million since from February 2020, which is much higher than before (Fadare and Okoffo, 2020).

However, due to lack of knowledge about infectious waste management, most people dump these (e.g., face mask, hand gloves etc.) in open places and in some cases with household wastes (Rahman et al., 2020). Such haphazard dumping of these trashes creates clogging in water ways and worsens environmental pollution (Singh et al., 2020; Zambrano-Monserrate et al., 2020).

It is reported that, face mask and other plastic based protective equipment are the potential source of microplastic fibers in the environment (Fadare and Okoffo, 2020). Usually, Polypropylene is used to make N-95 masks, and Tyvek for protective suits, gloves, and medical face shields, which can persist for a long time and release dioxin and toxic elements to the environment (Singh et al., 2020). Though, experts and responsible authorities suggest for the proper disposal and segregation of household organic waste and plastic based protective equipment (hazardous medical waste) but mixing up these wastes increases the risk of disease transmission, and exposure to the virus of waste workers (Ma et al., 2020; Somani et al., 2020; Singh et al., 2020).

2.3.3 Municipal Solid Waste Generation, And Reduction of Recycling:

Increase of municipal waste (both organic and inorganic) generation has direct and indirect effects on environment like air, water and soil pollution (Islam et al., 2016). 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 (Somani et al., 2020; Zambrano-Monserrate et al., 2020). However, waste recycling is an effective way to prevent pollution, save energy, and conserve natural resources (Ma et al., 2019). But, due to the pandemic many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA restricted recycling programs in many cities (nearly 46%), as government worried about the risk of COVID-19 spreading in recycling facilities (Somani et al., 2020). United Kingdom, Italy, and other European countries also prohibited infected residents from sorting their waste (Zambrano-Monserrate et al., 2020). Overall, due to disruption of routine municipal waste management, waste recovery and recycling activities, increasing the landfilling and environmental pollutants worldwide.

2.3.4 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 (Islam and Bhuiyan, 2016). Moreover, SARS-CoV-2 virus was detected in the COVID-19 patient's faeces and also from municipal wastewater in many countries including Australia, India, Sweden, Netherlands and USA (Ahmed et al., 2020; Nghiem et al., 2020; Mallapaty, 2020). So, additional measures in wastewater treatment are essential, which is challenging for developing countries like Bangladesh, where municipal wastewater is drained into nearby aquatic bodies and rivers without treatment (Islam and Azam, 2015; Rahman and Islam, 2016). China has already strengthened the disinfection process (increased 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 (Zambrano-Monserrate et al., 2020).

2.4 Potential Strategies of Environmental Sustainability:

It is assumed that, all of these environmental consequences are short-term. So, it is high time to make a proper strategy for long-term benefit, as well as sustainable environmental management.

The COVID-19 pandemic has elicited a global response and make us united to win against the virus. Similarly, to protect this globe, the home of human beings, united effort of the countries should be imperative (Somani et al., 2020). Therefore, some possible strategies are proposed for global environmental sustainability (Figure 6).

a. Sustainable Industrialization: Industrialization is crucial for economic growth; however, it's time to think about sustainability. For sustainable industrialization, it is essential to shift to less energy-intensive industries, use of cleaner fuels and technologies, and strong energy efficient policies (Pan, 2016). Moreover, industries should be built in some specific zones, keeping in mind that waste from one industry can be used as raw materials of the other (Hysa et al., 2020). After a certain period, industrial zones should have been shut down in a circular way to reduce emission without hampering the national economy. Again, industries especially readymade garments (RMG) and others where a huge number of people work, proper distance and hygienic environment should maintain to reduce the spread of any infectious communicable disease.

b. Use of Green and Public Transport: To reduce emissions, it is necessary to encourage people to use public transport, rather private vehicles. Besides, people should encourage to use bicycle in a short distance, and public bike sharing (PBS) system (like China) should be available for mass usage, which is not only environment friendly but also beneficial for health.

c. Use of Renewable Energy: Use of renewable energy can lower the demand of fossil fuels like coal, oil, and natural gas, which can play an important role in reducing the GHGs emissions (Ellabban et al., 2014; CCAC, 2019). 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 (Somani et al., 2020; Zambrano-Monserrate et al., 2020). 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 GHGs emission (Ellabban et al., 2014).

d. Wastewater Treatment and Reuse: To control the challenges of water pollution, both industrial and municipal wastewater should be properly treated before discharge. Besides, reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal.

e. Waste Recycling and Reuse: 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 generation (Hysa et al., 2020).

Moreover, hazardous and infectious medical waste should be properly managed by following the guidelines (WHO, 2020c). It is now clear that majority of the people (especially in developing countries) have a lack of knowledge regarding waste segregation and disposal issues (Rahman et al., 2020). So, government should implement extensive awareness campaign through different mass media, regarding the proper waste segregation, handling and disposal methods.

g. Ecological Restoration and Ecotourism: For ecological restoration, tourist spots should periodically shutdown after a certain period. Moreover, ecotourism practice should be strengthened to promote sustainable livelihoods, cultural preservation, and biodiversity conservation (Islam and Bhuiyan, 2018).

h. Behavioral Change in Daily Life: To reduce the carbon footprint and global carbon emission, it is necessary to change the behavior in our daily life and optimum consumption or resources like; avoid processed and take locally grown food, make compost from food waste, switch off or unplug electronic devices when not used, and use a bicycle instead of a car for short(er) distances.

i. International Cooperation: To meet the sustainable environmental goals and protection of global environmental resources, such as the global climate and biological diversity, combined international effort is essential (ICIMOD, 2020). 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.

2.5 References:

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