International Journal of Research and Ethics (2020) 3(1):42-47
https://doi.org/10.51766/ijre.v3i1.3

Review Open Access

Contribution of the COVID-19 pandemic to the reduction of greenhouse gas emissions in China

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Published online: 29 July 2020.

Abstract

Background: According to climate change, the Chinese government has decided to reduce national greenhouse gas (GHG) emissions by 2020. Coincidentally, the world has been facing an expected outbreak linked to a harmful form of the corona virus. COVID-19 (SARS-COV-2 family) has spread and affected the whole world and resulted in high incidence and death rate. in fact, China announced, as the first country, the appearance of the virus and declared a state of emergency. In the absence of a vaccine against COVID-19, the only solution was to apply confinement which led to the shutdown of the Chinese economy. **Methods:** An extensive search was based on scientific databases such as Google scholar and Science Direct. **Results:** The Coronavirus health crisis contributed to reducing GHG emissions in China, thus showing the positive side of the COVID-19 pandemic, which is reflected in the decrease of mortality rate linked to pollution. **Conclusion:** Although the Coronavirus is a deadly virus in the event of prolonged exposure to pollutants, it has contributed to the enhancement of air quality and the reduction of concentrations of pollutants including GHGs.

Keywords: Greenhouse gases emissions, global warming, air pollution, COVID-19 pandemic in China.

Introduction

Global climate change is becoming more evident, measures to surveille and decrease GHG emissions present the great challenge for all countries in the last year (Wang et al., 2012). GHGs such as carbon dioxide (CO2), nitrous oxide, methane and others warm the surface and atmosphere, with significant negative environmental and health consequences (Ramanathan & Feng, 2009). GHGs are considered the major cause of global warming and then of air pollution, which causes more deaths each year, with approximately 7.2 million deaths according to the World Health Organization (WHO) (Cai et al., 2018). Human emissions of greenhouse gases from industrial and economic activities have augmented global temperatures by 1°C since pre-industrial times (Ritchie & Roser, 2017). Reducing GHG emissions will be extremely complex to achieve in a global framework and success is still far from guaranteed (Grubb, 1990). China, in particular, showed a fast urbanization and rapid growth of China's urban economy which lead to a huge production of greenhouse gases (H. Wang et al., 2014). This global pandemic has crippled China's operations, reducing greenhouse gas emissions and air pollution. The state of air quality in China was compared with the current state after the crisis, to show that the forced shutdown of industrial and human activities caused by the COVID-19 pandemic contributed to the prevention of air as well as the prevention of infection (Isaifan, 2020).
In this review we aim to explain how the coronavirus health crisis has contributed to reducing GHG emissions in China, thus showing the positive side of the COVID-19 pandemic, which is manifested by the decrease of mortality rate related to the pollution.

Methods

The search was based on scientific databases such as Google scholar and Science Direct. The pre-selection was made after examining the title and the abstract, following the use of keywords such as [greenhouse gases emissions; global warming; air pollution and corona virus in China]. Several eligibility criteria were considered, only articles satisfying the following points were retained:

- Articles written in English;
- Studies that deal more with environmental rating than health;
- Calendar: Articles dealing with GHG emissions (before 2019), those of COVID-19 in China (2019-2020), and articles analyzing the relationship between the corona virus and the reduction of GHG emissions in China (December 2019-March 2020).

Results and discussion

At the end of December 2019, in China, the new corona virus outbreak was first reported in the Wuhan seafood wholesale market, with more than 100,000 infections (Li et al., 2020), with around 5,000 deaths worldwide through early March (Kraemer et al., 2020). In the absence of treatment for this virus and the increased number of infections and deaths, WHO internationally declared COVID-19 a public health emergency (Li et al., 2020). A recent statistical study recently provided a descriptive and exploratory analysis of all COVID-19 cases diagnosed across China as of the end of February 11, 2020, this global health crisis forced the Chinese

government to declare a state of emergency and to confine its industrial and industrial and anthropogenic activities. Confinement is an effective decision against this pandemic, but despite the ability to reduce infections and mortality, there are other side effects, such as the Chinese economic crisis and environmental impact (Tahir & Masood, 2020).

China has selected confinement as the only solution in order to control the spread of the virus and reduce the number of infections. To solve the current problem of global warming, several studies on climate change have identified the association between human activities and greenhouse gas emissions as a key element (Nordhaus, 1991).

China accounts for 41.04% of total direct GHG emissions, with 3,060.18 Mt of CO2 equivalent, making it the largest net producer of GHG emissions (Chen & Zhang, 2010). With these emissions resulting from Chinese activities, this country has been confronted with the problem of air pollution and its negative effects on public health (Isaifan, 2020). The drop in emissions of pollutants, particularly greenhouse gases, resulting from the cessation of economic and industrial activities, is undoubtedly one of the few positive effects of the COVID-19 health crisis. In 2019, China's global GHG emissions fell from 85 Mt CO2eq/year to 1,628 Mt CO2eq/year (Jia et al., 2019), they recorded the highest number of GHG emissions, with an estimate of 4.1 Mt CO2eq/year, followed by Hubei, with 2.2 Mt CO2eq/year, and last is Shandong, with 1.0 MtCO2eq /year (Jia et al., 2019). A notable change in CO_2 emission -as the main GHG also a major air pollutant (Watts & Kommenda, 2020) was revealed between 2019 and previous years (Anjum, 2020; Liu, 2016; K. Wang et al., 2013; Wang & Jiang, 2019; Yi et al., 2011).

The concentrations of GHG emissions are markedly lower than last year in China. In 2020, it recorded a great decrease in GHG emissions which reached -10.3% in the first quarter of the same year (Liu et al., 2020). Even though cities began to lock down in the last week of January, average transport emissions in that month still increased by 7.4% in January due to an earlier onset of the rush. Spring Festival trips compared to 2019 (Jia et al., 2019). Daily NOX and CO2 emissions in 2019 were reduced by 30 and 38%, respectively, from January 1 to Chinese New Year 2019, with emissions rebounding 20 days later when the holidays ended and people returned their work. The largest decrease was recorded in CO2 emissions due to reduced activities in the energy and industrial sectors, while emissions from the transport sector fell much less due to high demand travel during the holidays. While 2020 showed much faster decreases than 2019 over the same period, due to a significant reduction in emissions from the transport sector compared to the energy and industrial sectors during the COVID-19 lockdown period, these emissions were reduced by 58 and 51 % for NOX and CO2, respectively, and are estimated to be 50 and 40% lower than in 2019, respectively.(Liu et al., 2020; Wang & Jiang, 2019; Zheng et al., 2020). The difference between China's emissions for 2019-2020 was much smaller in March (-7.8%) than in February (-19.3%)(Liu et al., 2020), Cement production emission(-81.7%), global industry emissions (-10.1%), steel production (-1.7%), steel industry (-23,9 %), production of chemicals (-4,2 %), power Generation (-6.8%), Ground transportation emissions (-34.2%), fishing and shipping (-13.3%) and other industries with a percentage of (-13.6%) (Anjum, 2020; Liu, 2016; Ritchie & Roser, 2017).

A few weeks after the announcement of confinement, China recorded a notable drop in CO2 emissions, 15 to 40% observed in industrial sectors (Liu et al., 2020). Whereas if the situation were normal, this country would probably have emitted around 400 million tons of CO2. (Molintas, 20 20). China's NO2 emissions, from the combustion of oil, coal, natural gas and

other fuels as well as city vehicle exhaust, were significantly lower in the first quarter of 2020 compared with the same period. period in 2019 (Wang & Su, 2020). To assess the impacts of the COVID-19 pandemic on air quality in China, a new study compared the number of COVID-19 cases and deaths with air pollution levels (Isaifan, 2020). Findings suggest that pollutants are associated with increased mortality compared to less polluted areas, the link between exposure to pollutants and the impact of COVID-19 needs to be considered, people exposed to more pollution tend to be more infected, which is confirmed by U.S. government scientists(Wu et al., 2020). A study in the United States tracked spatial variation in long-term average exposure to air pollutants and COVID-19 per 1 million people per county. Visual inspection suggests higher mortality rates for COVID-19 in areas with high population density and high exposure to pollutants (Wu et al., 2020). The COVID-19 pandemic poses a serious threat, but its near-term contribution to reducing emissions is significant. First, the measures adopted to control the virus have not only slowed the rate of spread but also reduced GHG emissions (Wang & Su, 2020). In addition, several studies carried out on the virus have demonstrated that exposure to pollutants is the main factor increasing the risk of infection. on the other hand, the cessation of industrial and economic activities on a national scale has minimized emissions and therefore the exposure of people to pollutants. The lockdown protected public health, targeted the virus and the number of pollutant-related deaths. It is worth highlighting the importance of strengthening air pollution regulations during and after the COVID-19 crisis to protect human health. Continued economic growth in the context of globalization has led to an increase in global GHG emissions, even though a greenhouse gas per se is not the only pollutant from industrial sectors that are responsible for a large part global pollutant and are at the origin of the climate change. Given that COVID-19 is an active pandemic, it was difficult to draw conclusions with very limited data at this time (Anjum, 2020). A study examined the impact of the COVID-19 pandemic, in short time, on the environment of China on the perceived level of GHG emissions and mortality rates due to pollution and to the COVID-19 pandemic. The various data showed that although the Coronavirus is a deadly virus in the event of prolonged exposure to pollutants, it has contributed to the enhancement of air quality and the reduction of the concentrations of pollutants including GHGs (Wang & Su, 2020). But unfortunately, these positive effects can only be observed during period of lockdown.

Conclusion

The 2020 COVID-19 outbreak is an exceptional event and a global public health emergency. The virus has caused large numbers of deaths and economic losses, but we must remember that it has improved air quality not only in China but worldwide.

- **Ethics statement:** N/A.
- **Conflict of interest:** The authors declare that they have no competing interests.

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Citation: Bada, H., Lahkim, M., & Belmouden, A. (2020). Contribution of the COVID-19 pandemic to the reduction of greenhouse gas emissions in China : Covid-19 reduces gas emissions. *(IJRE) International Journal of Research and Ethics (ISSN 2665-7481)*, *3*(1). https://doi.org/10.51766/ijre.v3i1.3

https://doi.org/10.51766/ijre.v3i1.3

Submission: ijre.association-mare.org/