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COVID-19 Pandemic Lockdown: Be a Reference for Global Environment

Md. Ahosanul Haque Shahid[1], Md. Shahjahan Ali Sarker[2], Md. Mehedi Hasan[3], Taslima Nasrin[4]
[1, 2]*Bangladesh Agricultural University, Department of Microbiology & Hygiene, Bangladesh*
[3]*Department of Narcotics Control, Security Services Division, Ministry of Home Affairs, The People's Republic of Bangladesh*
[4]*Manarat International University, Department of Business Administration, Bangladesh*

Abstract: ***Up to 2020, increases in the number of greenhouse gases produced since the beginning of the industrialization epoch caused average global temperatures on the Earth to rise, causing effects including the melting of glaciers and rising sea levels. In various forms, human activity caused environmental degradation and anthropogenic impact. But the COVID-19 pandemic has caused industrial activity to shut down and canceled flights and other journeys, slashing greenhouse gas emissions and air pollution around the world. If there is something positive to take from this terrible crisis, it could be that it's offered a taste of the air we might breathe in a low-carbon future. There's clear water in the Venice canals, blue skies over Delhi, and wild animals are roaming boldly in locked-down cities. To this date, there is no review about how this COVID-19 lockdown period helps the environment to heal itself. So, this review will give summarized information on environment healing for this COVID-19 lockdown. It could be a reference for scientists, policy makers, global leaders who would works on environmental issues in the future.***

Keywords: Greenhouse, COVID-19, Pandemic, Lockdown.

I. INTRODUCTION

Urbanization and industrialization along with economic development have led to an increase in energy consumption and waste discharges. The global environmental pollution, including greenhouse gas emissions and acid deposition, as well as water pollution and waste management is considered as international public health problems. Environmental pollutants have various adverse health effects such as perinatal disorders, infant mortality, respiratory disorders, allergy, malignancies, cardiovascular disorders, increase in stress oxidative, endothelial dysfunction, mental disorders, and various other harmful effects [1-2]. Numerous studies have exposed that environmental particulate exposure has been linked to increased risk of morbidity and mortality from many diseases, organ disturbances, cancers, and other chronic diseases [3-4].

Pollution reaches its most serious proportions in the densely settled urban-industrial centers of the more developed countries [5]. Kan (2009) originated the fact about China that, it has environmental problems, including outdoor and indoor air pollution, water shortages and pollution, desertification, and soil pollution, which have become more pronounced and are subjecting Chinese residents to significant health risks [6]. McGeehin et al., 2004 reported that the U.S. population from infectious diseases to diseases such as cancer, birth defects, and asthma, many of which may be associated with environmental exposures [7].

Over the last three decades, there has been increasing global concern over the public health impacts attributed to environmental pollution [8]. World leaders investing lots of money to decrease environmental pollution. Not only world leaders but also scientists are organizing new thoughts for minimizing pollution. But nothing happens as day by day industrial civilization is trying to touch their best effort in this era. So all the efforts are going to vain. The surprisingly most important thing is, during this lockdown period a 29.9 kb virus which is called COVID-19 diseases done this work very effectively [9]. The ongoing global outbreak of coronavirus disease (Covid-19), declared as a public health emergency of international concern by the World Health Organization (WHO), led to unprecedented public health responses in many countries around the world including travel restrictions, curfews, and quarantines [10]. The oil industry and airlines are floundering in this new world, and carbon emissions are falling fast. So this review is conducted to establish a concept about the changes in the environment during this lockdown period.

II. CHANGES IN AIR

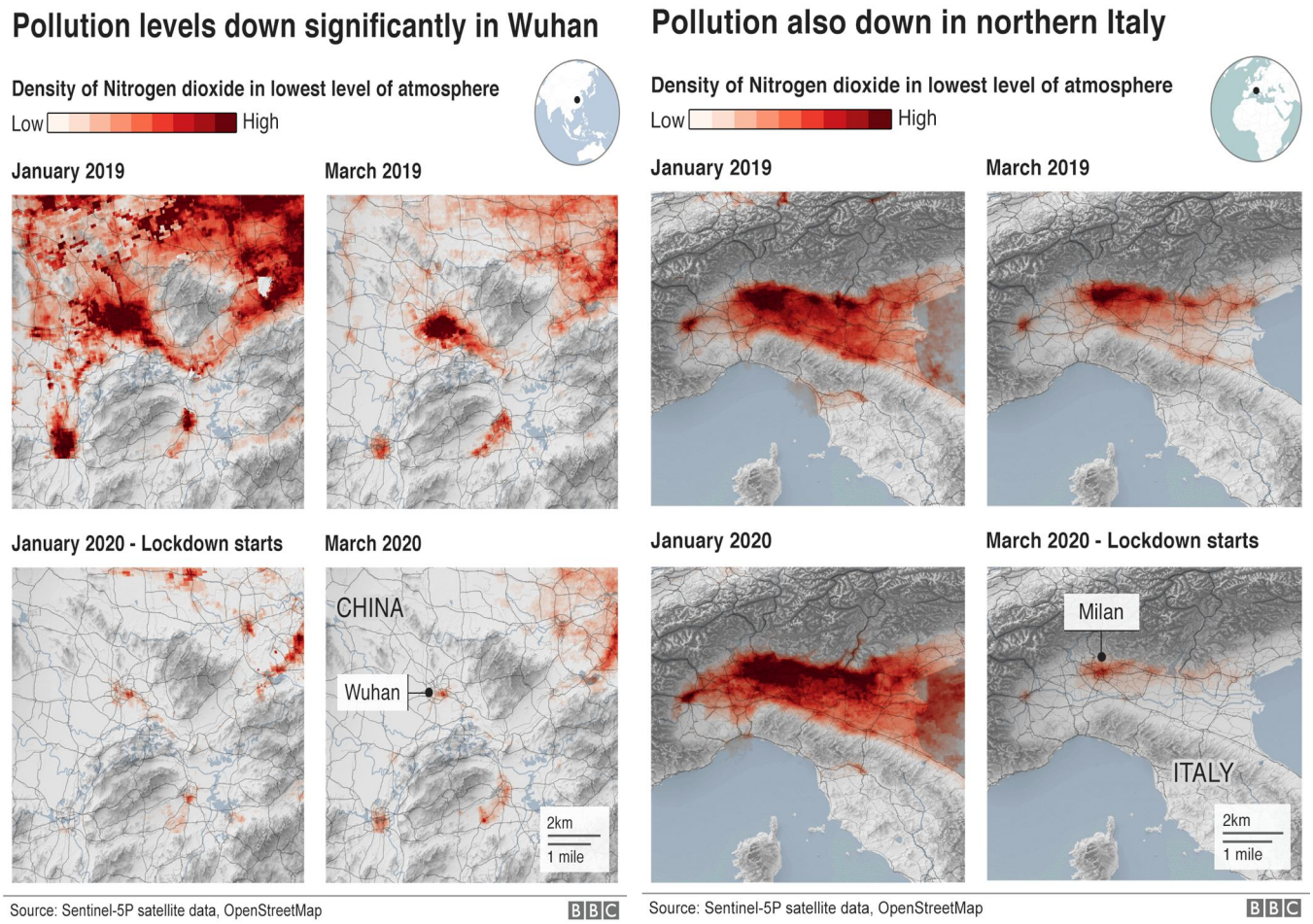
From two new studies of Bauwens et al., 2020 and Xiaoqin et al., 2020, it is found that nitrogen dioxide pollution over northern China, Western Europe, and the U.S. decreased by as much as 60 percent in early 2020 as compared to the same time last year [11,12].

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A. In China

Xiaoqin and his team analyzed levels of nitrogen dioxide and several other types of air pollution measured by 800 ground-level air quality monitoring stations in northern China [12]. They found particulate matter pollution decreased by an average of 35 percent and nitrogen dioxide decreased by an average of 60 percent after the lockdowns began on January 23. Moreover, air traffic in China dropped in mid- February by 80% compared to January 2020 [13]. The BBC reported that the city of Wuhan, where the deadly virus was first identified, saw a 44% reduction in air pollution levels from January to March from the same period last year that are show details in Figure 1.

Figure 1. Wuhan and Northern Italy's Pollution levels



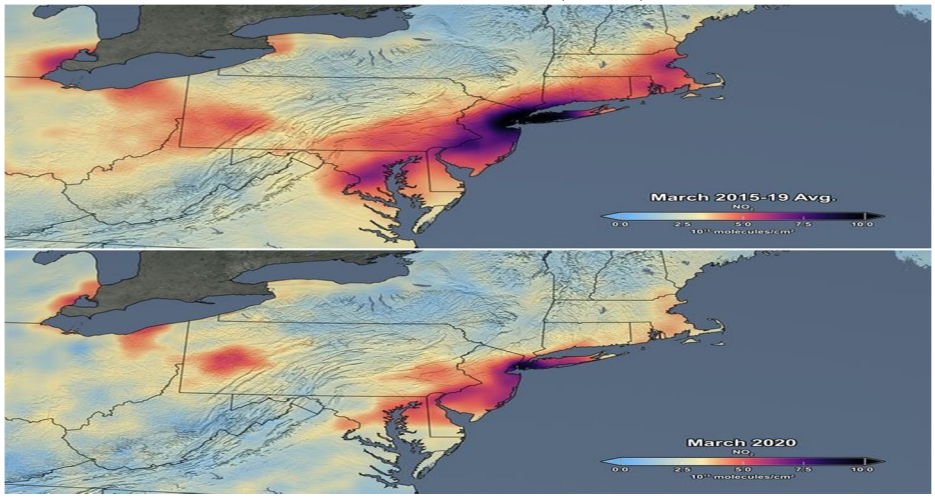
B. In Europe and USA

Xiaoqin and his colleague also found that nitrogen dioxide pollution decreased by an average of 40 percent over Chinese cities and by 20 to 38 percent over Western Europe and the United States during the 2020 lockdown, as compared to the same time in 2019 (Xiaoqin and Brasseur, 2020). The Guardian says, Los Angeles saw its longest stretch of clean air on record, over 18 days from March 7 to 28. PM2.5 concentration levels were down by 31% from the same time last year, and down 51% from the average of the previous four years. NASA revealed that NO_2 pollution over New York and other major metropolitan areas in the north-eastern USA was 30% lower in March 2020, compared to the monthly average from 2015 to 2019. BBC reported that USA Gasoline and Jet fuel demand also decrease due to lockdown. In Europe, London and Madrid both experienced reductions in their PM2.5 compared to 2019 during their lockdown periods says BBC. There is another hot spot for COVID-19 that is Italy where less production of NO_2 is also seen during the lockdown period than at the same time as the previous year that are given in Figure 2 in details.

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Figure 2. The average concentration of NO_2 over northeastern US in March of 2015-19 (top) and the average concentration measured in March 2020 (bottom).



C. In Iran

Xiaoqin and his colleague says NO_2 pollution did not decrease over Iran, one of the earliest and hardest-hit countries. The authors suspect this is because complete lockdowns weren't in place until late March and before that, stay-at-home orders were largely ignored. The authors did see a dip in emissions during the Iranian New Year holiday after March 20, but this dip is observed during the celebration every year [14,15].

D. In South Korea

Image: EPA-EFE/NASA

South Korea's air quality ranks among the worst of the Organization for Economic Cooperation and Development (OECD) countries, with some of the highest levels of particulate matter pollution. Last year in March, the government declared air pollution a "social disaster." The South Korean capital Seoul saw a 54% drop in PM2.5 levels from February 26 to March 18 from the previous year.

E. In India

India is one of the world's most-polluted countries and an average resident is exposed to air pollution that exceeds the World Health Organization's target for annual PM2.5 exposure by more than 500%. The Indian capital New Delhi which frequently tops the world's most polluted city lists saw a 60% reduction in PM2.5 levels from March 23 to April 13 from the same period in 2019. Both New Delhi and the country's commercial center Mumbai experienced their best March air quality on record in 2020. NO_2 went from 52 per cubic meter to 15 in the same period also a 71% fall. Mumbai, Chennai, Kolkata, and Bangalore have also recorded a fall in these air pollutants [16].

Like NO_2, carbon dioxide emissions (CO_2) have also been slashed in the wake of the COVID-19 crisis. When economic activity stalls, so do CO_2 emissions. In fact, the last time this happened was during the 2008-2009 financial crisis. In China alone, emissions have fallen by around 25% when the country entered a lockdown, according to Carbon Brief [17]. According to The Guardian, China the world's biggest source of carbon, emissions were down about 18% between early February and mid-March a cut of 250m tonnes, equivalent to more than half the UK's annual output. Europe is forecast to see a reduction of around 390m tonnes. Significant falls can also be expected in the US, where passenger vehicle traffic its major source of CO_2 has fallen by nearly 40%.

III. CHANGES IN WATER

According to The Chinese Ministry of Ecology and Environment there is much improved of surface water quality during this period. They say the amount of Phosphorous and Ammonia level reduce for this lockdown [18]. Shortly after Italy entered a lockdown, images of crystal clear canals in Venice were shared around the world [19]. The pristine blue waters are a far cry from their usual muddy appearance. And with cruise ships docked, for the time being, our oceans are also experiencing a drop in noise pollution, lowering the stress levels of marine creatures like whales and making for a much more peaceful migration.

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IV. DISCUSSION

Satellite image presented by NASA are only for last March which indicates a huge difference of NO_2 at the same time of 2019. But as most of the developed industrial country start to shut-down their cities from around the middle of February (Table 1) and remain close all March and April, so during this period environment not only influenced by industrial area but also by the airport, travel area and so on. One study says, driving and aviation are key contributors to emissions from transport which makes up 23% of global carbon emissions, contributing 72% and 11% of the transport sector's greenhouse gas emissions respectively.

Table 1: Different countries 1st COVID-19 case with Localized and National lockdown dates

Country name	First case	National recommendation	Localized lockdown	National lockdown
China	31-Dec-2020		24-Feb-2020	
Thailand		20-Mar-2020	25-Mar-2020	
Japan	16-Jan-2020	20-Feb-2020		
South Korea	19-Jan-2020	23-Feb-2020		
Taiwan	21-Jan-2020	25-Mar-2020		
Macau	21-Jan-2020	2-Feb-2020		
Hong Kong	22-Jan-2020	8-Feb-2020		
Singapore	22-Jan-2020	13-Mar-2020		
Nepal	24-Jan-2020		23-Mar-2020	24-Mar-2020
Malaysia	24-Jan-2020	13-Mar-2020		18-Mar-2020
Australia	25-Jan-2020	13-Mar-2020	24-Mar-2020	
Sri Lanka	26-Jan-2020	25-Jan-2020	18-Mar-2020	20-Mar-2020
India	29-Jan-2020	19-Mar-2020	22-Mar-2020	25-Mar-2020
Iran	19-Feb-2020			5-Mar-2020
Pakistan	26-Feb-2020			24-Mar-2020
New Zealand	28-Feb-2020	21-Mar-2020		23-Mar-2020
Bangladesh	8-Mar-2020		19-Mar-2020	23-Mar-2020
Uzbekistan	15-Mar-2020		24-Mar-2020	27-Mar-2020
East Timor	22-Mar-2020			28-Mar-2020
Laos	24-Mar-2020			30-Mar-2020
Myanmar	27-Mar-2020		24-Mar-2020	
France	24-Jan-2020	8-Mar-2020		17-Mar-2020
Germany	27-Jan-2020	18-Mar-2020	20-Mar-2020	23-Mar-2020
Finland	29-Jan-2020	16-Mar-2020	28-Mar-2020	
UK	31-Jan-2020	22-Mar-2020		23-Mar-2020
Sweden	31-Jan-2020	11-Mar-2020		
Russia	31-Jan-2020	5-Mar-2020	11-Mar-2020	28-Mar-2020
Italy	31-Jan-2020		21-Feb-2020	12-Mar-2020
Spain	1-Feb-2020	9-Mar-2020		14-Mar-2020
Belgium	4-Feb-2020	12-Mar-2020		17-Mar-2020
Switzerland	25-Feb-2020			13-Mar-2020
Croatia	25-Feb-2020			19-Mar-2020
Austria	25-Feb-2020	13-Mar-2020		16-Mar-2020
Romania	26-Feb-2020	12-Mar-2020		23-Mar-2020
Norway	26-Feb-2020		16-Mar-2020	
Greece	26-Feb-2020	11-Mar-2020	17-Mar-2020	23-Mar-2020
Netherlands	27-Feb-2020	15-Mar-2020		23-Mar-2020
Estonia	27-Feb-2020	13-Mar-2020		30-Mar-2020
Denmark	27-Feb-2020	13-Mar-2020		18-Mar-2020
Lithuania	28-Feb-2020	13-Mar-2020		24-Mar-2020
Monaco	29-Feb-2020			17-Mar-2020
Luxembourg	29-Feb-2020			15-Mar-2020
Ireland	29-Feb-2020	12-Mar-2020		28-Mar-2020
Czech Republic	01-Mar-2020			16-Mar-2020
Portugal	2-Mar-2020	12-Mar-2020		24-Mar-2020
Andorra	2-Mar-2020	11-Mar-2020	14-Mar-2020	18-Mar-2020
Ukraine	3-Mar-2020	12-Mar-2020	17-Mar-2020	

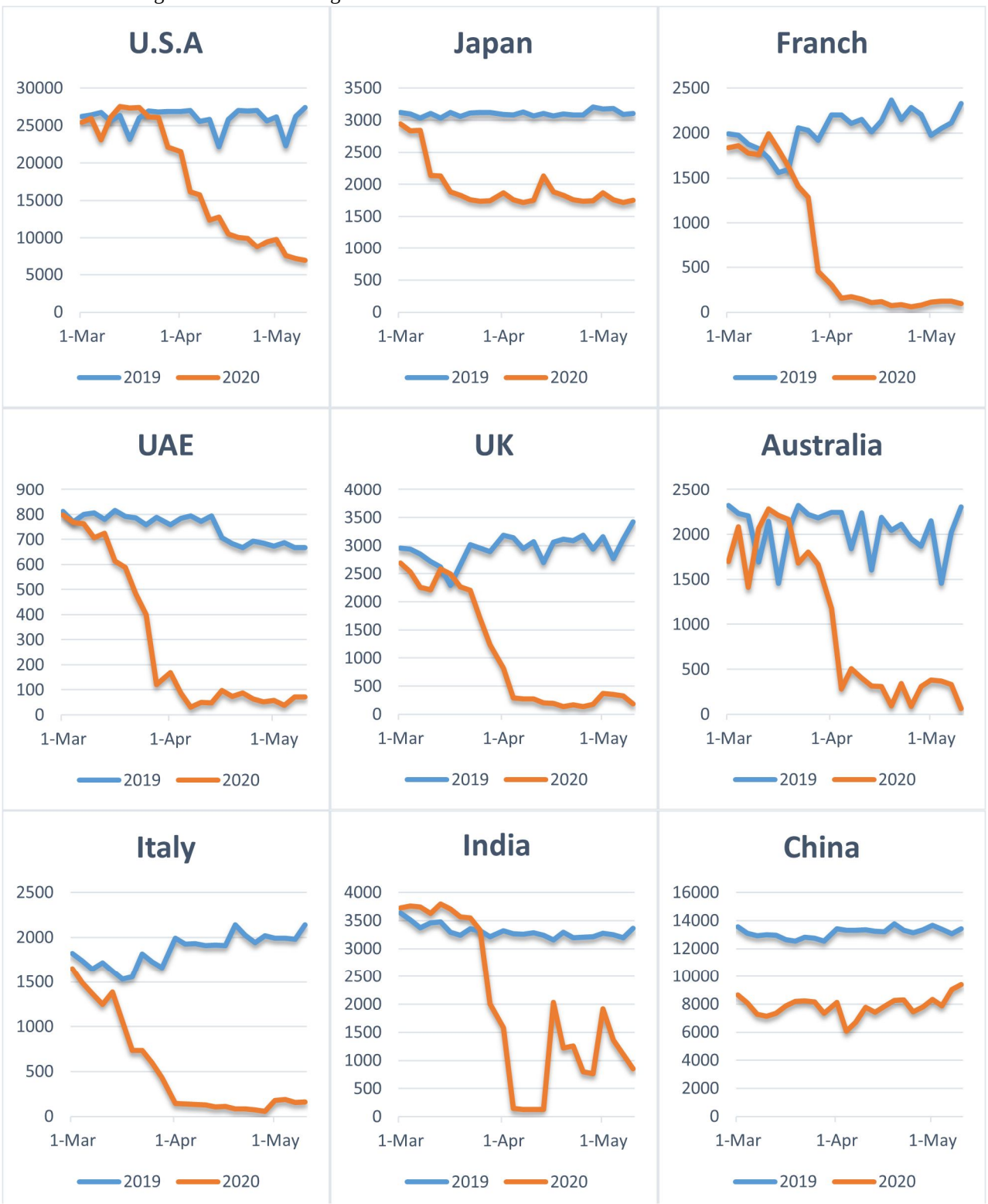
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Poland	4-Mar-2020	12-Mar-2020		24-Mar-2020
Liechtenstein	4-Mar-2020			16-Mar-2020
Slovenia	5-Mar-2020	9-Mar-2020		16-Mar-2020
Serbia	6-Mar-2020	13-Mar-2020		17-Mar-2020
Moldova	8-Mar-2020			25-Mar-2020
Bulgaria	8-Mar-2020	13-Mar-2020	18-Mar-2020	20-Mar-2020
Cyprus	9-Mar-2020	15-Mar-2020		24-Mar-2020
Slovakia	6-Mar-2020	9-Mar-2020		15-Mar-2020
Albania	6-Mar-2020		21-Mar-2020	31-Mar-2020
Montenegro	17-Mar-2020	16-Mar-2020		24-Mar-2020
USA	23-Jan-2020	16-Mar-2020	17-Mar-2020	
Canada	22-Jan-2020	13-Mar-2020	24-Mar-2020	
Brazil	26-Feb-2020	15-Mar-2020	17-Mar-2020	
Ecuador	1-Mar-2020	11-Mar-2020		17-Mar-2020
Dominican Republic	1-Mar-2020		17-Mar-2020	
Chile	3-Mar-2020		25-Mar-2020	
Argentina	3-Mar-2020			20-Mar-2020
Peru	6-Mar-2020			16-Mar-2020
Costa Rica	6-Mar-2020	15-Mar-2020		24-Mar-2020
Colombia	6-Mar-2020			25-Mar-2020
Paraguay	8-Mar-2020		16-Mar-2020	30-Mar-2020
Panama	10-Mar-2020	13-Mar-2020		25-Mar-2020
Honduras	11-Mar-2020			20-Mar-2020
Bolivia	11-Mar-2020		16-Mar-2020	22-Mar-2020
Cuba	12-Mar-2020		31-Mar-2020	
Cayman Islands	13-Mar-2020		28-Mar-2020	
Aruba	13-Mar-2020		21-Mar-2020	29-Mar-2020
Venezuela	14-Mar-2020		16-Mar-2020	17-Mar-2020
Trinidad and Tobago	14-Mar-2020			29-Mar-2020
Suriname	14-Mar-2020		29-Mar-2020	
Saint Lucia	14-Mar-2020		30-Mar-2020	
Guatemala	14-Mar-2020		22-Mar-2020	
Bahamas	16-Mar-2020			23-Mar-2020
Barbados	17-Mar-2020			28-Mar-2020
Bermuda	19-Mar-2020			28-Mar-2020
El Salvador	19-Mar-2020			21-Mar-2020
Haiti	20-Mar-2020			21-Mar-2020
Grenada	22-Mar-2020			30-Mar-2020
Dominica	22-Mar-2020			28-Mar-2020
Saint Kitts and Nevis	25-Mar-2020			31-Mar-2020
Nigeria	28-Feb-2020		30-Mar-2020	
Senegal	2-Mar-2020		30-Mar-2020	
South Africa	1-Mar-2020	15-Mar-2020		26-Mar-2020
Togo	6-Mar-2020			20-Mar-2020
Ivory Coast	11-Mar-2020		30-Mar-2020	
Kenya	13-Mar-2020			27-Mar-2020
Ethiopia	13-Mar-2020		28-Mar-2020	
Rwanda	14-Mar-2020			21-Mar-2020
Namibia	14-Mar-2020			27-Mar-2020
Ghana	14-Mar-2020		30-Mar-2020	
Congo	15-Mar-2020			31-Mar-2020
Tanzania	16-Mar-2020		28-Mar-2020	
Mauritius	18-Mar-2020			23-Mar-2020
Djibouti	18-Mar-2020			23-Mar-2020
Zimbabwe	20-Mar-2020			30-Mar-2020
Angola	20-Mar-2020			27-Mar-2020
Uganda	21-Mar-2020			31-Mar-2020
Eritrea	21-Mar-2020			31-Mar-2020
Guinea-Bissau	25-Mar-2020			28-Mar-2020

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In China, 1st March, April, and May the departure number of flight is 8646, 8104, 8336 whereas it was 13563, 13417, and 13660 in 2019 on the same date. In USA it is 25414, 21533, 9782 and 26186, 26883, 26116 was in 2020 and 2019 respectively. And in Italy the flight number is 1650, 146, 174 in 2020 and 1819, 1990, 1992 in 2019. Other most traveled countries are in same decreasing condition. The details are shown in Figure. 3.

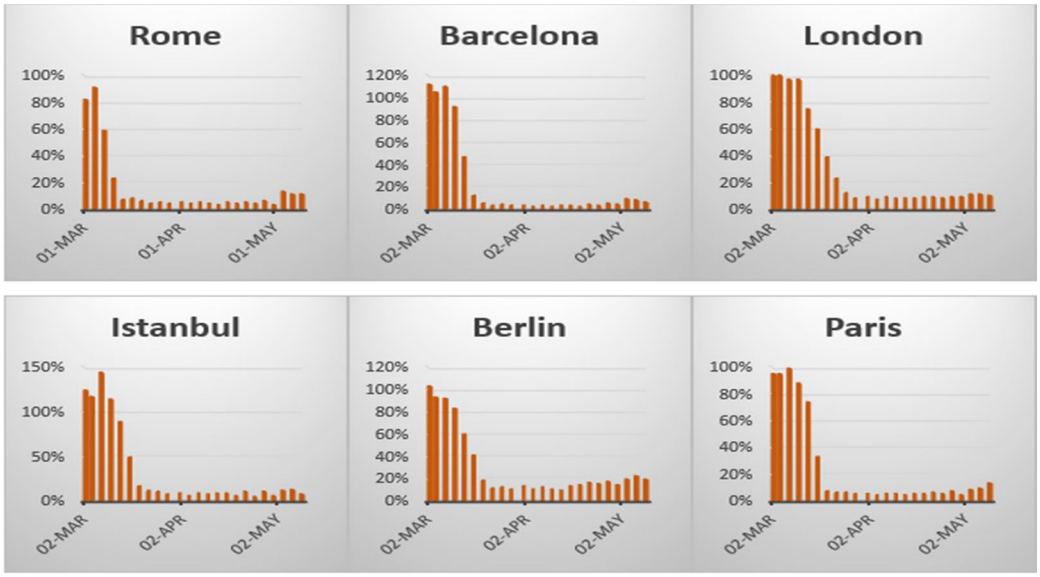
Figure 3: Number of flights around the world decrease for localized or National lockdown



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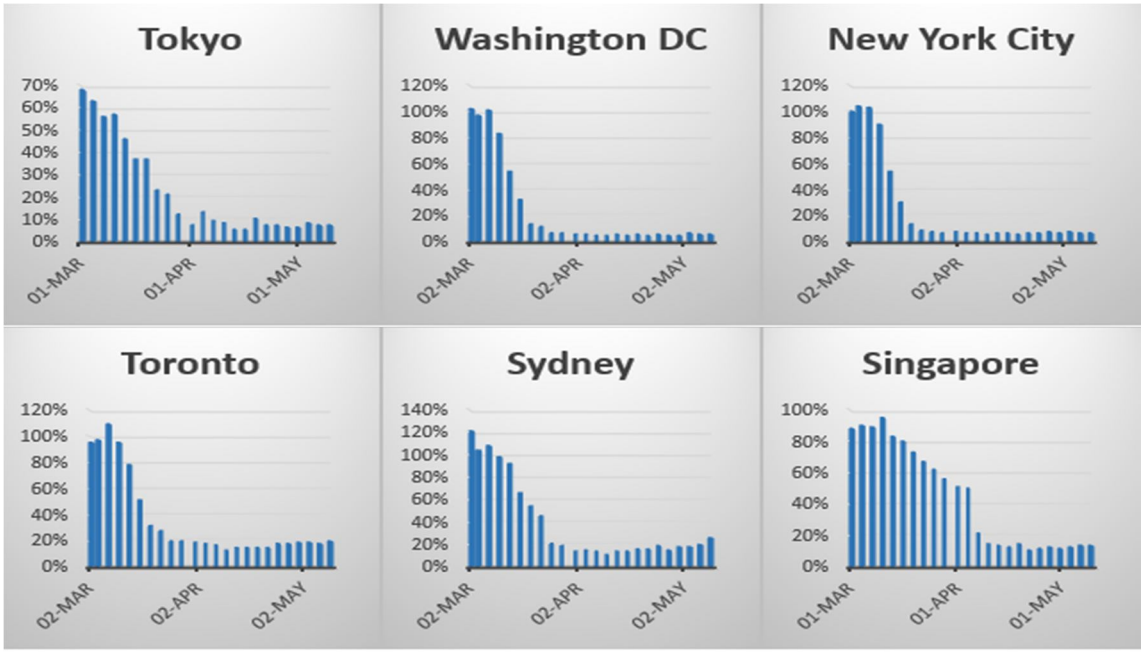
Italy declared National lockdown on 12 March. Before that day on 1st march the percentage of city travel was 82% but on 13 March it just sudden fall down and become 7%. In Spain, as they declare the National lockdown on 14 March. On 2nd march in Barcelona city travel was 112% but it starts to decline after 9 March when they declare National recommendation and by 16 march it stands in 12%. On the other hand USA don't declare any National lockdown rather they give localized lockdown from 17 march. So on Washington DC 2nd march city travel was 102% whereas it just drastically fall down and become 13% on 19%. Other busiest cities are presenting same dramatic reduction of travel percentage whether there presents any official National lockdown or not (details shown are in Figure. 4).

Figure 4. Travel has plummeted around in major cities for lockdown



So, analyzing the flight reduction number and travel decline rate (details are shown in figure 5), it can be assumed greenhouse gas emissions not only present in northern China, Italy, and USA for over March but also must be present on other developed countries throughout the whole lockdown period. Moreover, other changes on environment also present over this period.

Figure 5. Travel has declined in major cities without official lockdown



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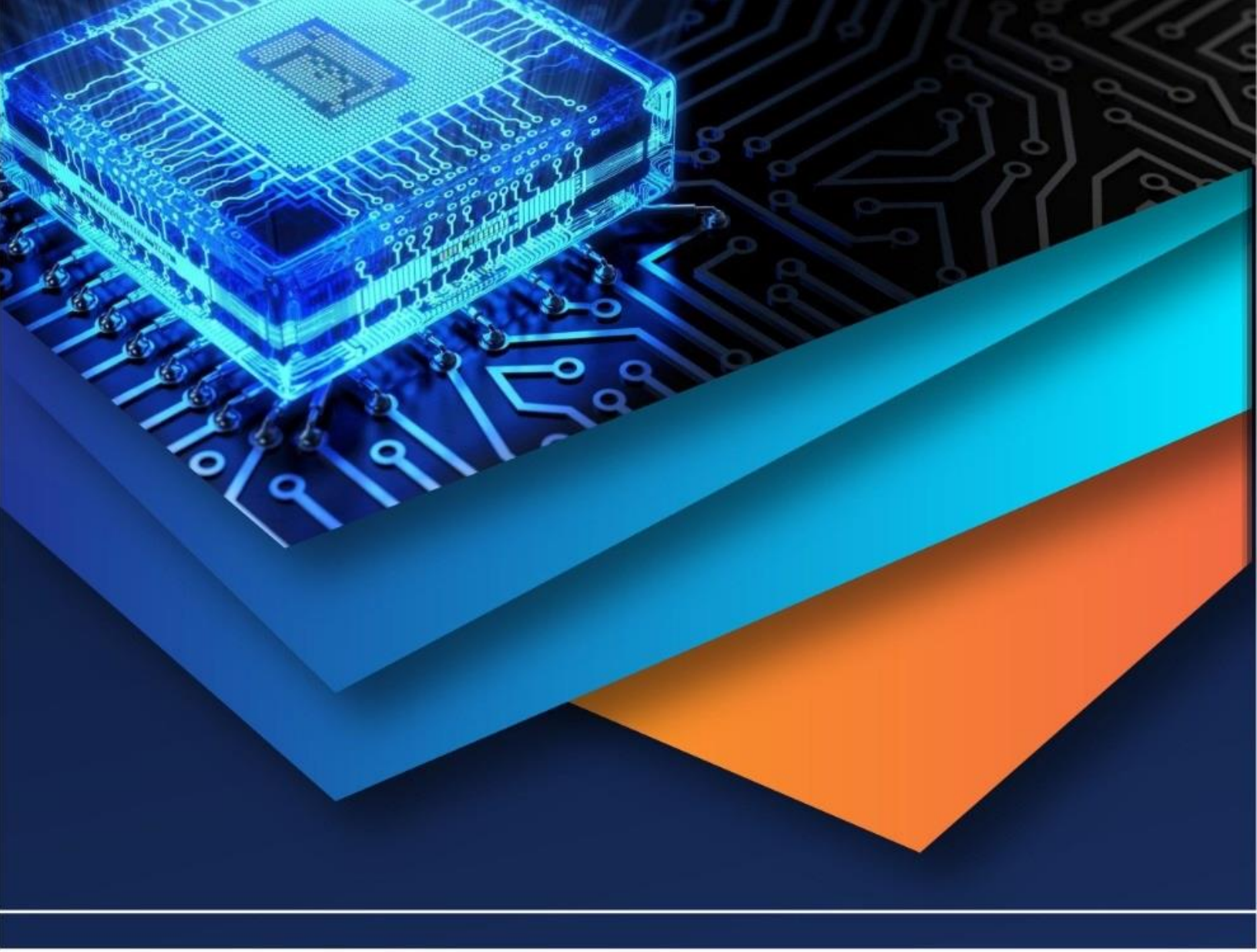
V. CONCLUSION

So further studies will be needed to evaluate the effects of the temporary lockdowns on global climate. As some cities lifting lockdown but these 100 days have changed the way we think about change. Ultimately, whether this pandemic is good or bad for the environment depends not on the virus, but on humanity. If there is no political pressure on governments, the world will go back to unsustainable business as usual rather than emerge with a healthier sense of what is normal. It could be a reference for scientists, policy makers, global leaders who would works on environmental issues in the future.

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