

Technical Report 15



'A world without man-made pollution' - lessons learnt from COVID-19 and sustaining the pollution decline for the sake of future generations

SM Arnold¹, Pasyodun Koralage Buddhika Mahesh², Sameera Senanayake³, Dimuth Peiris⁴, Withanage Iresha Udayangani Jayawickrama^{5*}, Sathira Perera⁶, Thilanka Bandara¹, Nalin Ariyaratne⁷, Naveen Soysa¹, Samantha Ananda¹, Inoka Suraweera¹

¹ Ministry of Health, Sri Lanka; ² University of Melbourne, Australia; ³ Queensland University of Technology, Australia; ⁴ University of Keele, United Kingdom; ⁵ University of Lincoln, United Kingdom; ⁶ University of New South Wales, Australia; ⁷ University of Warwick, United Kingdom

*Correspondence: dr.iresha@yahoo.com

 <https://orcid.org/0000-0003-4213-3728>

DOI: <https://doi.org/10.4038/jccpsl.v26i5.8360>

Received on 21 May 2020

Accepted on 24 May 2020

Highlights

- Environmental pollution is associated with a higher disease burden.
- Children are more susceptible to the ill effects of environmental pollution.
- There has been eye-opening evidence on the higher burden of COVID-19 with increased air pollution.
- Due to the limited human activities in lockdown periods of COVID-19, significant reductions of environmental pollution have been observed.
- Immediate actions are needed to sustain the declined environmental pollution.

Background

It is said that the human health and health of the planet are interconnected. If we do not care for one, the other would get affected (1). Prior to COVID-19, environmental pollution was leading the world towards a catastrophic end. Around 7 million people have been dying annually from conditions due to air pollution (2). Poor air quality has been causing deaths by aggravating asthma, emphysema, bronchitis,

allergies, etc. Other than these diseases, greater occurrence of non-communicable diseases (NCD) such as cardiovascular disease, diabetes and cancer are attributed to air pollution. These in return have been associated with a high economic burden (3-4).

Air pollution, unsafe water and unsafe sanitation have been causing a significant disease burden (5). In addition to the air, water and soil pollution, noise pollution has been affecting human health by many

means such as stress-related ailments, high blood pressure, sleep disruption, etc (6). With the rising global carbon emissions prior to COVID-19, the world was heading towards the consequences of climate change (7-9).

The agents responsible for air pollution (e.g. nitrogen dioxide, particulate matter (e.g. PM_{2.5}) particles and carbon dioxide) as well as those responsible for water and soil pollution have been mainly emitted due to man-made activities. These include emissions of vehicles, industrial effluents and improper waste disposal. Activities like wildlife trafficking and deforestation too have been known to make air, soil and water pollution worse (10).

Why children are more susceptible to ill effects of environmental pollution

There are many reasons why children are more susceptible for ill effects of man-made pollution. When per unit of body weight is concerned, they inhale more air than adults. Similarly, as they are more active, they breathe in more air. Pollutants (e.g. air pollutants) interfere with biological processes of their still developing lungs. Their immature bodies are not able to handle and excrete toxicants like in adults. Their brains are still developing and neurotoxic pollutants can interfere with cognitive development (11). In addition, as they are shorter, they breath air closer to the ground where more toxicants settle; and their mouth breathing is higher while the filtering processes of the nasal passages are not as effective as in adults (12). In 2016, nearly 940,000 children have died due to air, water and chemical pollution. Nearly two thirds of these deaths happened in children below 5 years of age (13).

If we consider air pollution as an example, preterm births, reduced lung growth and lung functions are associated with it. Pollutants in general are linked with a vast range of adverse outcomes including low birth weight, asthma, neurodevelopmental disorders and cancer (14). Thus, children are adversely affected by environmental pollution since their birth, leading to negative effects such as birth-complications, reduced overall quality of life,

hampering of academic performance and chronic NCDs in adult life.

The impact of pollution on COVID-19

Pollution worsens the burden of epidemics. Concurrently, the COVID-19 burden was also aggravated by pollutants, which may increase the risk of contracting the disease as well as its complications. For example, PM_{2.5} particles weaken the immune system, promote inflammation with the respiratory tract and also go deep into the body increasing the risk of high blood pressure, heart disease, breathing problems and diabetes, which in turn increase complications among COVID-19 patients. In an analysis in the USA, it was revealed that an increase of one microgram per cubic meter of PM_{2.5} in the air could increase the COVID-19 death rate by 15%. As an example, the 1904 deaths in Manhattan by 4 April would have had 248 fewer deaths, had the particle levels averaged just one unit lower over the past two decades from the current value of 11 micrograms per cubic meter (15). Higher contagion rates of some areas of Northern Italy were suggested to have had associated with 'atmospheric particulate pollution acting as a carrier and booster' (1).

Impact of lockdown on pollution

Lockdowns have limited the human activities, thus minimising the opportunities for polluting the environment. Around February 2020, the nitrogen dioxide (NO₂) levels over Asian and European cities and industrial areas were 40% lower than that compared to the same period in 2019 (16). Even within the first 2 weeks of lockdown, in 27 countries, a 20% decrease in air pollution – including ground-level nitrogen dioxide, and fine particulate matter (PM_{2.5}) was observed (17). NASA revealed that NO₂ 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 (16). By 16 April, cities including Paris, Madrid, Milan and Rome have observed a drop in NO₂ by 50% or more (18). A notable drop in NO₂ levels over Wuhan and Indian cities has been observed in 2020 when compared to

2019 (19, 20). A fall in carbon dioxide has also been noted (10).

With COVID-19 pandemic, water pollution has decreased around the world. As an example, in 27 out of 36 monitoring units of Ganga River in India, it was found that the water quality had been improved with dissolved oxygen (more than 6 mg/litre), biochemical oxygen demand (less than 2 mg/litre), total coliform levels (less than 5000 per 100 ml) and pH (between 6.5 and 8.5) (21). Similarly, the Venice canal in Italy was found to be crystal clear (22).

Impact of the reduced pollution

Reduced pollution creates an impact equivalent to the drastic changes that would have otherwise been needed. As an example, in China, reduction of even 10% of NO₂ emissions is the same as removing 48,000 cars off the road. (16). Similarly, reducing the monthly NO₂ emissions from electricity generation by 10% would be equivalent to turning off 500 coal power stations for a year (16).

The impact of the lack of pollution saves lives otherwise lost due to pollution. As an example, in China, reduction in air pollution is estimated to save up to 77,000 lives under the age of five and individuals over 70 years (19). The Ganga River was found to be suitable for bathing as well as for propagation of wildlife and fisheries (21). The noise reduction in Italy has been close to 30 decibels. Both in Italy and Wuhan-China, the residents have revealed that they saw and heard birds which had been rare occurrences. In some parts of the world, even a distant earthquake of 5.5 magnitude could now be picked due to the lack of noise pollution (6).

Public health implications- why we should act now

Even though COVID-19 previewed a world without pollution, global pandemics do not solve the pollution issue in the long run (6). The decline in carbon emissions is unlikely to retain, without a concerted effort (7). Unless necessary steps are taken, the effect would remain only for a few months with a small impact in the long-term (23).

It is proven that “interventions are more effective if they take place during the moment of change”. According to a Japanese study, when people were forced to use public transport instead of driving their vehicles by closing all the motorways, the practice sustained even after the motorways were re-opened. Similar findings were obtained in Switzerland in discouraging the use of personal vehicles (24).

The potential way forward in reducing the man-made pollution was apparent during this period. It is shown that transport makes up 23% of global carbon emissions. Cutting unnecessary travel therefore contributes to a decline in carbon emissions, as driving contributes to 72% of the transport sector's greenhouse gas emissions (24). Thus, scientists believe it to be a grave mistake if governments resume work with non-renewable energy without moving for cleaner options (20). If we act now, the efforts could be sustained for younger generations to improve their quality of life.

Recommendations- way forward

The following are proposed as examples of measures to ensure the sustainability of the current decline in environmental pollution.

• Limiting the unnecessary vehicle movements

Promoting more online services, technological advances in conducting meetings within institutions through online platforms, making public transport widely available and introducing road tax for entering the city limits in order to discourage private vehicles with minimum passengers and promoting green-transport systems like bike pathways imply methods for limiting unnecessary vehicle movements. In many countries including France, Colombia, Spain and Italy, cycling and bike lanes are being promoted to reduce unnecessary fuel-based vehicle movements and traffic and improve air quality (25).

• Promoting renewable energy sources

Promotion of solar energy with relevant tax exemptions, and promotion of electric vehicles

coupled with household solar panels are some ways of limiting fossil-based fuel consumption, thus minimizing effluents like nitric oxide, PM 2.5, and carbon dioxide. As a global example, Indonesian Ministry of Planning has identified a low-carbon growth pathway which would yield millions of additional jobs and a greener poverty reduction by 2045. The Global Commission on Adaptation has stated that each 1 dollar spent for a resilient infrastructure (e.g. with low-carbon) would provide a 4-dollar benefit (26).

• Waste management

The COVID-19 pandemic has proven the impact of the first R (reduce) of the 3Rs concept (Reduce, Reuse and Recycle) beyond doubt. Promotion of recycling through local authorities, promotion of recycling agencies, revision of laws and regulations related to waste disposal are areas needing attention on waste management. Local authorities should have a regular sustainable system of waste collection and management. Waste management protocols must be implemented at institutional level. Public must be educated on preventing indoor air pollution and outdoor burning. High level inputs need to be directed towards behavioural conduct and attitudinal changes, which is a long process.

• Prevention of deforestation and wildlife trafficking

Appreciation of those who are involved in the promotion of planting trees, inculcating the habit of nature preservation through inclusions into the school curricula, empowering the institutions related to conservation of forests and wildlife and proper implementation of laws on deforestation, replanting of forests are example of some measures that can be done.

• Promotion of organic fertilizers

The restricted imports, particularly the agricultural produce, may have a positive impact on countries like Sri Lanka, where there is adequate rainfall and land which can be used by the public to improve local

production. This may improve the living conditions and food safety of rural populations in the long run. In this process, environment protection must be concerned by applying measures like promotion of organic fertilizers.

• Ensuring no-harm principle in economic investments

Especially in the post-COVID period, the environmental impact must be given adequate attention. The importance of adhering to the “no-harm” principle while engaging in major investments has been emphasized in the United States, in responding to the impact of COVID-19. The “no-harm” includes considerations on impacts on health of citizens as well as on the climate (27).

- Promotion of environmental monitoring must be taken in strengthening the environmental monitoring services.
- Encouragement of research and innovations related to environmental perspectives must be encouraged.
- Environmental health must be recognised as an integral component in health service delivery at national, provincial, district and divisional levels.

Author Declaration

Acknowledgement: Authors like to acknowledge Dr Sapumal Dhanapala for highlighting the importance of the topic covered and for his all guidance and encouragement in drafting the manuscript. Authors also acknowledge Prof Kumudu Wijewardene for reviewing the manuscript before submission.

Author contributions: All authors (SMA, PKBM, SS, DP, WIJ, SP, TB, NA, NS, SA and IS) involved in planning the manuscript and in literature search. SMA and PKBM drafted the manuscript and all authors contributed to editing it.

References

- Kumar A, Burston J & Karliner J. *The deadly link between COVID-19 and air pollution 2020*. World Economic Forum, 15 April 2020. Available from: <https://www.weforum.org/agenda/2020/04/the-deadly-link-between-covid-19-and-air-pollution/>.
- WHO. *7 million premature deaths annually linked to air pollution*: World Health Organization, 2020. Available from: <https://www.who.int/mediacentre/news/releases/2014/air-pollution/en/>. Accessed 25 March 2020.
- Chen S & Bloom DE. The macroeconomic burden of non-communicable diseases associated with air pollution in China. *PLoS One* 2019; 14(4): e0215663. DOI: 10.1371/journal.pone.0215663.
- Dutheil F, Baker JS, Navel V. COVID-19 as a factor influencing air pollution? *Environmental Pollution* 2020; 263: 114466. DOI: 10.1016/j.envpol.2020.114466.
- Ritchie H & Roser M. *Air pollution*. Our world in data. Available from: <https://ourworldindata.org/air-pollution>. Accessed 25 March 2020.
- Koren M. *The pandemic is turning the natural world upside down 2020*. The Atlantic, 2 April 2020. Available from: <https://www.theatlantic.com/science/archive/2020/04/coronavirus-pandemic-earth-pollution-noise/609316/>.
- Worland J. *Global air pollution has fallen due to the coronavirus outbreak, but experts warn it is not a silver lining 2020*. Time, 1 April 2020. Available from: <https://time.com/5812741/air-pollution-coronavirus/>.
- Butler CD. Climate Change, Health and Existential Risks to Civilization: A Comprehensive Review (1989-2013). *International Journal of Environmental Research and Public Health* 2018; 15(10): 2266. DOI: 10.3390/ijerph15102266.
- Chen Y, Liu A, Cheng X. Quantifying economic impacts of climate change under nine future emission scenarios within CMIP6. *Science of the Total Environment* 2020; 703: 134950. DOI: 10.1016/j.scitotenv.2019.134950.
- The Guardian. *Climate crisis: in coronavirus lockdown, nature bounces back – but for how long?* The Guardian, 9 April 2020. Available from: <https://www.theguardian.com/world/2020/apr/09/climate-crisis-amid-coronavirus-lockdown-nature-bounces-back-but-for-how-long>.
- WHO. *Children and air pollution*. World Health Organization, 2020. Available from: <https://www.who.int/airpollution/news-and-events/how-air-pollution-is-destroying-our-health/children-and-air-pollution>. Accessed 26 March 2020.
- Goldizen FC, Sly PD, Knibbs LD. Respiratory effects of air pollution on children. *Pediatric Pulmonology* 2016; 51(1): 94-108. DOI: 10.1002/ppul.23262.23262.
- Landrigan PJ, Fuller R, Fisher S, Suk WA, Sly P, Chiles TC, et al. Pollution and children's health. *Science of the Total Environment* 2019; 650: 2389-94. DOI: 10.1016/j.scitotenv.2018.09.375.
- American Lung Association. *Children and air pollution 2020*. Available from: <https://www.lung.org/clean-air/outdoors/who-is-at-risk/children-and-air-pollution>. Accessed 25 March 2020.
- Gardiner B. *Pollution made COVID-19 worse. Now, lockdowns are clearing the air 2020*. National Geographic, 8 April 2020. Available from: <https://www.nationalgeographic.com/science/2020/04/pollution-made-the-pandemic-worse-but-lockdowns-clean-the-sky/>.
- Monks P. *Coronavirus: lockdown's effect on air pollution provides a rare glimpse of low-carbon future 2020*. The Conversation, 15 April 2020. Available from: <https://theconversation.com/coronavirus-lockdowns-effect-on-air-pollution-provides-rare-glimpse-of-low-carbon-future-134685>.
- Perkins M. *Economic lockdown causes big reduction in air pollution globally 2020*. The Sunday Morning Herald, 18 April 2020. Available from: <https://www.smh.com.au/national/economic-lockdown-causes-strong-reduction-in-air-pollution-globally-20200416-p54kij.html>.
- McMahon J. *New data show air pollution drop around 50 percent in some cities during coronavirus lockdown 2020*. Forbes, 16 April 2020. Available from: <https://www.forbes.com/sites/jeffmcmahon/2020/04/16/air-pollution-drop-surpasses-50-percent-in-some-cities-during-coronavirus-lockdown/#4863d493557b>.
- Energy Matters. *Coronavirus is helping solve the global pollution problem 2020*. Energy Matters, 25 March 2020. Available from: <https://www.energymatters.com/news/coronavirus-is-helping-solve-the-global-pollution-problem>.

- energymatters.com.au/renewable-news/corona-virus-is-helping-solve-the-global-pollution-problem/.
20. Wright R. *The world's largest coronavirus lockdown is having a dramatic impact on pollution in India 2020*. CNN, 1 April 2020. Available from: <https://edition.cnn.com/2020/03/31/asia/coronavirus-lockdown-impact-pollution-india-intl-hnk/index.html>.
 21. The Economic Times. *Lockdown: health of River Ganga improves 2020*. The Economic Times, 2 April 2020. Available from: <https://economictimes.indiatimes.com/news/politics-and-nation/lockdown-health-of-river-ganga-improves/articleshow/74946264.cms?from=mdr>.
 22. Wray M. *Coronavirus lockdown eases pollution, Venice canal runs clear 2020*. Global News, 16 March 2020. Available from: <https://globalnews.ca/news/6683226/climate-change-coronavirus/>.
 23. Yosufzai R. *How the coronavirus crisis is helping improve the environment across the world 2020*. SBS NEWS, 21 March 2020. Available from: <https://www.sbs.com.au/news/how-the-coronavirus-crisis-is-helping-improve-the-environment-across-the-world>.
 24. Henriques M. *Will COVID-19 have a lasting impact on the environment? 2020*. BBC, 27 March 2020. Available from: <https://www.bbc.com/future/article/20200326-covid-19-the-impact-of-corona-virus-on-the-environment>.
 25. Climate and Clean Air Coalition. *Cities champion cycling to head off traffic as COVID-19 restrictions ease 2020*. Climate and Clean Air Coalition, 13 May 2020. Available from: <https://www.ccacoalition.org/en/news/cities-champion-cycling-head-traffic-covid-19-restrictions-ease>.
 26. Mountford H. *Responding to coronavirus: low-carbon investments can help economies recover 2020*. World Resources Institute, 12 March 2020. Available from: <https://www.wri.org/blog/2020/03/coronavirus-economy-low-carbon-investments>.
 27. Lashof D. *US coronavirus response: 3 principles for sustainable economic stimulus 2020*. World Resources Institute, 20 March 2020. Available from: <https://www.greengrowthknowledge.org/blog/us-coronavirus-response-3-principles-sustainable-economic-stimulus>.