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Global Warming, Air Pollution, Health and Medical Education

Globalne ocieplenie, zanieczyszczenie powietrza, zdrowie i edukacja medyczna

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Abstract: A new field of biomedical ethics is opening up, concerning what should be done to reduce the direct and indirect impacts of greenhouse gas emissions on human health. Some of these impacts could be described as 'direct', in the form of fatalities and illnesses due to the increasingly frequent heatwaves in many countries of recent years, ascribable to anthropogenic climate change. Other impacts are mediated through the air pollution that results from emissions from vehicles in the form of a cocktail of carbon oxides including carbon monoxide, nitrogen dioxide and particulates. Most of the world's cities have streets with unsafe pollution levels, and one child's death in Britain has been officially ascribed to air pollution (BBC 2020). This presentation aims to validate the above claims about the impacts of emissions on health, and to suggest remedies. The early phasing out of vehicles powered by internal combustion engines is the ultimate remedy for the latter set of impacts, while the urgent replacement of energy generated from fossil-fuel sources with renewable energy is the best way to remediate the former set. More immediate remedies for air pollution include restricting the use of roads and streets in urbanised areas by vehicles to bicycles and light vehicles with small engines. Medical and nursing education should include the diagnosis and treatment of pulmonary conditions resulting from increased levels of carbon oxides, nitrogen oxides and particulates. Medical and nursing practice should focus on the early identification of vulnerable adults and children at risk from air pollution, and warnings against walking, running or cycling along the most polluted thoroughfares.

Keywords: air pollution, related crises, human health, toxic highways, medical and nursing education, curtailment of toxic emissions

Streszczenie: Obserwujemy obecnie początki nowej gałęzi etyki biomedycznej dotyczącej tego, co należy zrobić, aby ograniczyć bezpośredni i pośredni wpływ emisji gazów cieplarnianych na zdrowie człowieka. Niektóre z tych skutków można określić jako „bezpośrednie”, dotyczą one śmiertelnych ofiar i chorób spowodowanych coraz częstszymi falami upałów w wielu krajach w ostatnich latach, które można przypisać antropogenicznej zmianie klimatu. Inne skutki wynikają z zanieczyszczenia powietrza będącego efektem emisji z pojazdów w postaci mieszaniny tlenków węgla, obejmującej tlenek węgla, dwutlenek azotu i cząstki stałe. W większości miast świata obserwujemy na ulicach niebezpiecznym poziom zanieczyszczeń, a śmierć jednego dziecka w Wielkiej Brytanii oficjalnie przypisano zanieczyszczeniu powietrza (BBC 2020). Niniejsza prezentacja ma na celu zweryfikowanie twierdzeń na temat wpływu emisji na zdrowie ludzi oraz zaproponowanie środków zaradczych. Wczesne wycofywanie pojazdów napędzanych silnikami spalinowymi jest ostatecznym lekarstwem na wskazaną powyżej drugą grupę skutków, natomiast pilne zastąpienie energii wytwarzanej ze źródeł paliw kopalnych energią odnawialną jest najlepszym sposobem zaradzenia pierwszej grupie skutków. Najbardziej pilne środki zaradcze w przypadku zanieczyszczenia powietrza obejmują ograniczenie korzystania z dróg i ulic na obszarach zurbanizowanych przez pojazdy emitujące znaczące zanieczyszczenia, na rzecz rowerów i lekkich pojazdów z małymi silnikami. Edukacja

medyczna powinna obejmować diagnostykę i leczenie schorzeń płuc wynikających ze zwiększonego stężenia tlenków węgla, tlenków azotu i cząstek stałych. Praktyka lekarska i pielęgniarska powinna skupiać się na wczesnej identyfikacji nieświadomych dorosłych i dzieci, narażonych na ryzyko zanieczyszczenia powietrza. Ponadto powinna ostrzegać przed chodzeniem, bieganiem i jazdą na rowerze najbardziej zanieczyszczonymi arteriami komunikacyjnymi.

Słowa kluczowe: zanieczyszczenie powietrza, kryzysy powiązane, zdrowie ludzkie, toksyczne autostrady, edukacja medyczna, emisja substancji toksycznych

Introduction

Bioethics has traditionally been concerned with issues surrounding the health and the healing of individuals, and also with international issues such as the case for pharmaceutical companies to permit Low Income countries to manufacture generic drugs for conditions such as HIV. Now, however, it is time for a new field of biomedical ethics to open up, concerning what should be done to reduce the direct and indirect impacts of anthropogenic greenhouse gas emissions and other emissions on human health. This field (for which the name 'Atmospheric Bioethics' might be in place) would be concerned both with international agreements about emissions, mitigation and safety levels, and also with local policies to limit areas of high pollution and protect vulnerable people from their worst effects.

Some of the more direct impacts of anthropogenic emissions include the effects on human health of heatwaves and wildfires, which have increased in intensity and in frequency because of climate change. They also include the effects of storms, flooding and of drought, which, as well as driving many from their homes, have led to malnutrition and vulnerability to disease. These impacts form a significant part of the case for strong and early action to tackle greenhouse gas emissions, and to replace fossil-fuel energy generation and diesel- and petrol-based transport respectively with renewable energy and electric-powered vehicles.

Other impacts of anthropogenic emissions are mediated through air pollution,

attributable in part to the same causes, and in part to emissions other than greenhouse gas emissions. Here I have in mind emissions of carbon monoxide, of oxides of nitrogen (and in particular nitrogen dioxide), and of particulates, which are emitted partly from domestic and industrial fires, partly from the exhaust fumes of diesel-powered vehicles, and partly from the erosion of tyres in the course of ordinary road-use. While these problems used to be seen as no more than local ones, they are now recognised to form a worldwide problem, most of the world's cities having streets and highways with unsafe levels of atmospheric pollution (Health Effects Institute 2020). Even people who deny that climate change is caused by humanity cannot cogently deny that the fumes from road and rail traffic and the particles and gases emitted from domestic and industrial fires and from diesel engines are causing air pollution worldwide. In part, this is a problem arising from social systems of modern transport, modern industry and modern waste disposal.

1. Air Pollution

Writing in British newspaper *The Guardian*, Fiona Harvey cites the State of Global Air report as estimating that in 2019, 1.7 million deaths occurred due to exposure to airborne particulate matter in as many as 7,239 cities worldwide, with exposures being highest in South and East Asia, Africa and the Middle East. The report adds that 92 percent of the world's human population lives in areas that exceed one of the key World Health Organisation targets for exposure

to particulates (Harvey 2022; Health Effects Institute 2020, 2023).

She also discloses that serious levels of nitrogen dioxide are blighting numerous cities in relatively prosperous countries. The world's worst cities for this kind of pollution are Shanghai, Moscow, Tehran and St. Petersburg, with Ashgabat (capital of Turkmenistan) and Minsk (capital of Belarus) not far behind. Other seriously affected cities include Cairo, Istanbul and Ho Chi Minh City. In these cities, traffic pollution, often from older fleets of vehicles, seems to be the main source of the problem (Harvey 2022). But it is not only mega-cities that are affected; so are other cities, towns, and most arterial roads. The World Health Organisation estimates that ambient (outdoor) air pollution both in cities and in rural areas caused 4.2 million premature deaths worldwide in 2016, with some 91 percent of these deaths occurring in low- and middle-income countries. They add that in addition to outdoor air pollution, indoor smoke is a serious health risk for some 2.4 billion people who cook and heat their homes with biomass, kerosene fuels and coal (WHO 2022).

Meanwhile in the United Kingdom, the Royal College of Physicians (RCP) estimated in 2016 that approximately 40,000 premature deaths and over 20,000 hospital admissions could be attributed to air pollution every year (Royal College of Physicians 2016, 2022). As for the effects of these pollutants, the British government explains that nitrogen dioxide "irritates the airways of the lungs, increasing the symptoms of those suffering from lung diseases," while "fine particles can be carried deep into the lungs, where they can cause inflammation and a worsening of heart and lung disease" (DEFRA 2022). In case this might possibly seem a tolerable level of harm and disease, it is worth highlighting a study conducted by US researchers in Canada, one of the cleanest, least polluted countries on earth. Despite the relatively clean air of Canada, this study found that nearly 8000 Canadians were dying prematurely each year

from outdoor air pollution, and that even in the cleanest areas people were experiencing an adverse impact on their health (Fuller 2022).

Further evidence from at least 100 countries of a link between air pollution and human health emerged with the disclosure by Andrew Gregory that there is a strong correlation between air pollution and resistance to anti-biotics, with increases in air pollution being accompanied by increased anti-biotic resistance. While the study cited by Gregory did not study why these phenomena are correlated, the suggestion is that some of the particulates (particles less than 2.5 micrometres in diameter) may contain antibiotic-resistant bacteria, inhalation of which by humans could contribute to rising levels of resistance to anti-biotics (Gregory 2023, 1-2).

Gary Fuller has further disclosed that in the summer of 2022 a UK review warned that air pollution contributes to dementia, and also that a US review highlighted how asthma can start through exposure to air pollution from traffic. He adds that, although UK and several other European countries are committed to reducing both average particle pollution and total air pollution, the evidence of all these studies "underlines the need for action to improve air pollution everywhere, and especially in places where young and vulnerable people are liable to be affected" (Fuller 2022, 2). Subsequently, in early September 2022, BBC news bulletins reported that scientists have discovered the way in which air pollution is capable of contributing to the cells of human bodies becoming cancerous.

Nor are human beings the only victims of air pollution. BBC Radio reported, during the "World at One" programme of 31st January 2023, that the black kites, for which the Indian city of Delhi is well known, often fall out of the sky because of air pollution there. Other urban species are likely to be similarly affected. Altogether, alongside the contemporary crises of climate change

and of biodiversity loss, air pollution amounts to yet a further global crisis.

2. Legal Recognition of Air Pollution in Britain

Many people must have died from air pollution in Britain during the twentieth century. I can remember walking to school through the streets of Watford in 1952 through smog (a combination of sulphurous smoke and fog) too thick to allow people to see the way more than ten yards in front of them, which extended throughout the Greater London area (an area of which the town of Watford was at the outer fringe). There were many casualties at that time, whose deaths will have been ascribed to conditions like asthma or pneumonia. Fortunately a series of Clean Air Acts reduced air pollution for some decades.

Subsequently in 2018, a coroner (Philip Barlow, presiding over an inquiry into a recent fatality) found that the death in 2013 of a nine-year-old girl, Ella Adoo-Kissi-Debra, who lived close to the South Circular Road in Lewisham (south London), was due to “asthma, contributed to by exposure to excessive air pollution.” During the three years prior to her death, Ella had had multiple seizures and had been admitted to hospital 27 times, and in 2021 had been classified as disabled. The coroner said, in the course of his verdict, that levels of nitrogen dioxide near Ella’s home “exceeded World Health Organization and European Union guidelines,” adding that there was “a recognised failure to reduce the levels of nitrogen dioxide, which possibly contributed to her death,” and also that another possible contribution was the “lack of information given to Ella’s mother.” The unlawful levels of pollution were detected at a monitoring station one mile from Ella’s home (BBC 2020).

The coroner also advocated the adoption within Great Britain of legally binding targets for particulate matter, so that the United Kingdom can comply with World Health Organization guidelines. Significantly, he also recognised that there is “no safe level

of particulate matter” in the air. Roger Harabin, the BBC environment analyst, commented that this was an historic verdict, pinning Ella’s untimely death on the air that she breathed. On the sources of air pollution, he added that besides emissions from vehicles, other sources include gas boilers, construction equipment, and paint and dust from brakes and tyres. Sadiq Khan, who as mayor of London was named as an interested party in the inquest, called the outcome “a landmark moment,” commenting that “today must be a turning point so that other families do not have to suffer the same heartbreak as Ella’s family” (BBC 2020).

An earlier inquest, held in 2014, had concluded that Ella’s death was caused by “acute respiratory failure and severe asthma,” but in 2018 Judge Mark Lucraft, QC, ruled with two other judges that the 2014 conclusions should be quashed, and that a fresh inquest must be held (BBC 2019). Sarah Woolnough, chief executive of Asthma UK and the British Lung Foundation, called on the government, after the new inquest, to outline a public health plan to protect against “toxic air” immediately. She saw fit to add that “Today’s verdict sets the precedent for a seismic shift in the pace and extent to which the government, local authorities and clinicians must now work together to tackle the country’s air pollution crisis” (BBC 2020). True to his word, Sadiq Khan has subsequently introduced London’s ‘Ultra-Low Emissions Zone’, controversially extended in August 2023 to the whole of Greater London (Cerrer and Wood 2023).

These tragic events bring out the role of both nitrogen dioxide and of particulate matter in urban air pollution; yet these phenomena are replicated in thousands of towns and cities worldwide. To focus on an individual case as an example of a global crisis may appear selective, granted the vast diversity of circumstances attendant on urban pollution across developed and developing countries. But it is individual cases of this kind that can galvanise national and sometimes international authorities to take action, and

alert the public to the role of vehicle, industrial and household emissions in more than one global crisis. The global character of air pollution in particular shows how societies worldwide need to change direction, granted that tipping points of a social character, like the generation of intolerable toxicity-levels in cities across the globe, are at risk of being transgressed.

3. Linking the Air Pollution Crisis to the Climate Crisis and the Biodiversity Crisis: a Single Global Emergency

The World Health Organisation estimates that there are 7 million premature deaths every year due to the combined effects of outdoor and household air pollution, with millions more falling ill from breathing polluted air. More than half of these deaths are recorded in developing countries (WHO 2022). Thus the impact of air pollution bears comparison with that of climate change in terms of human casualties.

The two crises are also related through having overlapping causes. Thus emissions from vehicles and from domestic and industrial fires (including fires from waste disposal) contribute centrally to both of them. This overlap considerably reduces the point of the kind of climate denial that rejects the causal link between human activity and climate change, granted that the millions of deaths and illnesses resulting from air pollution are manifestly due to a large subset of what almost all scientists agree to be the causes of climate change. Indeed it would be amazing if climate deniers were to stage a campaign to preserve those emissions (methane emissions in particular) that are standardly blamed as among the causes of climate change but not normally blamed for air pollution!

Thus the two crises of climate change and air pollution can readily be seen as comprising a single emergency, poised to get rapidly worse in the absence of strong concerted action. But should biodiversity loss and

species extinctions be considered another aspect of the same problem?

Once again, there are overlapping causes. Rising levels of greenhouse gases lead both to the melting of ice-caps and glaciers and to stress on the creatures (such as polar bears) that depend on them. They also lead both to ocean acidification and to the bleaching of coral reefs, with losses to the biodiversity of oceans in general and coral reefs in particular (WWF 2023). They further lead to forest die-back and to losses of the even vaster biodiversity of rainforests (Boulton, Lenton and Boers 2022).

Admittedly some biodiversity losses are due more to unsustainable agriculture and unsustainable technology rather than to greenhouse gases. This is probably the case, for example, with the recent losses to the populations of pollinators such as monarch butterflies and honey-bees (Mathews 2010), while other examples are due as much to unsustainable forestry (and deforestation) as to changing rainfall patterns. But these losses resemble climate change in involving direct harm to human beings (Mathews 2010); and the unsustainable practices that underline them are all of a piece with the unsustainable forms of energy generation that underlie climate change.

With biodiversity loss, the losers clearly range more widely than the human victims of climate change, since they include many non-human species. Yet there are plentiful non-human victims of climate change as well, such as those creatures whose habitats are eroded by droughts and wildfires or by storms and floods, and which have to move to new habitats further from the equator, when they do not run out of habitats altogether. Besides, the concerns of most contemporary people extend beyond the interests of human beings to those of (at least) sentient creatures, allowing the adverse impacts of both climate change and biodiversity loss to be recognised as disastrous where these creatures and their losses are

concerned, as well as through the human harm and suffering involved.

So the three crises just mentioned (climate change, biodiversity loss and air pollution) thus have strongly overlapping causes, including both greenhouse gases and unsustainable technology-based practices, and involve overlapping impacts, including widespread human and non-human deaths and illness. Further, their impacts also involve dislocations of the chain of nature, as natural systems approach their tipping points, and as vital links in that chain (think of pollinators) come close to breakage.

4. Some Remedies

To return to the air pollution crisis, the early phasing out of vehicles powered by internal combustion engines is the ultimate remedy for the impacts on human health deriving from nitrogen dioxide, carbon monoxide and particulates, while (as a prior step) the phasing out of vehicles with diesel engines would go a long way towards curtailing particulate-related pollution. Countries such as China in which until recently many people have travelled by bicycle could at the same time consider persuading people to return to that mode of transport, as has been done in some European cities such as London.

Meanwhile the urgent replacement of energy generated from fossil-fuel sources with renewable energy is the best way to remediate the rising concentrations of carbon dioxide and other greenhouse gases, which could enhance human health through limiting the frequency and intensity of heatwaves, wildfires, storms and droughts. The beneficial impacts of such a change to renewable energy use would have different impacts in different places, reducing the risk of hurricanes in the Caribbean and eastern America, of droughts in Africa, of wildfires in Australia and western Canada, and of strong winds carrying particles from desert sands to places like Beijing in China. Warmer temperatures having been causing problems for people whose work cannot be

performed indoors, and have been exacerbating the intensity of typhoons and tropical storms; the rise in temperatures needs at least to be halted, and if possible to be reversed. Human health would benefit from all these changes.

More immediate remedies for air pollution include charging for the use of petrol- and diesel-powered vehicles in urbanised areas, and restricting the use by vehicles of roads and streets in these areas to bicycles and light vehicles with small engines. This would already substantially reduce levels of air pollution, although not as much as the changes proposed above.

Other remedies include improvements to medical and nursing education, so that the impacts of air pollution can be better identified and treated. Thus medical and nursing education should include the diagnosis and treatment of pulmonary conditions resulting from increased levels of carbon oxides, nitrogen oxides and particulates, and of other pollution-related conditions such as resistance to antibiotics. At the same time, medical and nursing practice should newly focus on the early identification of vulnerable adults and children at risk from air pollution, and warnings against walking, running or cycling along the most polluted thoroughfares. In these ways, tragedies such as the one that befell Ella Adoo-Kissi-Debrah and her family can be prevented, together with parallel tragedies affecting thousands of others.

Conclusions

To overcome air pollution, the use of both petrol- and diesel-powered vehicles should be phased out and replaced by that of electrically powered vehicles, as well as by walking and cycling. Simultaneously the generation of electricity needs to change from fossil-fuel sources to renewable ones. Here renewable sources should exclude nuclear energy generation because of the long-term pollution involved in storing its waste-products and in decommissioning nuclear power stations. Preliminary steps could

include restricting the use of the most polluted roads to the least polluting of vehicles, and denying their use to other vehicles.

Attention has also been drawn above to improvements in medical and nursing education and practice, needed in consequence of pollution-related ailments and deficiencies. These changes would give the victims of air pollution a greater chance of survival and of being restored to good health.

Meanwhile, and with as little delay as possible, internationally concerted actions need to take into account not only mitigating greenhouse gases and adaptation to their irreversible impacts, but also the preservation of natural systems before their tipping points are transgressed. International collaboration should also focus on the amelioration of unsustainable polluting systems of energy generation, transport, agriculture, forestry and technology to make them into sustainable systems, so that the air pollution crisis and the other related crises are simultaneously controlled and (if possible) contained and curtailed.

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References

- BBC (British Broadcasting Company). 2019. "Ella Kissi-Debrah: New Inquest into Girl's 'Pollution' Death." May 02, 2019. <https://www.bbc.co.uk/news/uk-england-london-48132490>.
- BBC (British Broadcasting Company). 2020. "Ella Adoo-Kissi-Debrah: Air Pollution a Factor in Girl's Death, Inquest Finds." December 16, 2020. <https://www.bbc.co.uk/news/uk-england-london-55330945>.
- Boulton, Chris A., Lenton, Timothy M. and Boers, Niklas, "Pronounced loss of Amazon rainforest resilience since the early 2000s." Accessed August 09, 2023. <https://www.nature.com/articles/s41558-022-01287-8>.
- Crerar, Pippa, and Zoe Wood. "PM putting progress on clean air at risk—Khan." *The Guardian*, August 28, 2023, 1 and 4. Accessed August 30, 2023. <https://www.theguardian.com/environment/2023/aug/28/no-10s-ulez-stance-reverses-decades-of-clean-air-progress-says-sadiq-khan>.
- DEFRA. 2022. "Effects of Air Pollution." Accessed August 09, 2023. <https://uk-air.defra.gov.uk/air-pollution/effects>.
- Fuller, Gary. 2022. "Even Low Levels of Air Pollution Can Damage Health, Study Finds." *The Guardian*, August 12, 2022. <https://www.theguardian.com/environment/2022/aug/12/even-low-levels-of-air-pollution-can-damage-health-study-finds>.
- Gregory, Andrew. 2023. "Air pollution linked to global rise in deadly resistance to antibiotics." *The Guardian*, August 8, 2023. <https://www.theguardian.com/society/2023/aug/07/air-pollution-linked-rise-antibiotic-resistance-imperils-human-health>.
- Harvey, Fiona. 2022. "Major Cities Blighted by Nitrogen Dioxide Pollution, Research Finds." *The Guardian*, August 17, 2022. <https://www.theguardian.com/environment/2022/aug/17/major-cities-blighted-by-nitrogen-dioxide-pollution-research-finds>.
- Health Effects Institute. 2020. "State of Global Air 2020." Accessed August 04, 2022. <https://www.stateofglobalair.org/sites/default/files/documents/2022-09/soga-2020-report.pdf>.
- Health Effects Institute. 2023. "Air Pollution." Accessed August 09, 2023. <https://www.healtheffects.org/air-pollution>.
- Mathews, Freya. 2010. "Planetary Collapse Disorder: The Honeybee as Portent of the Limits of the Ethical." *Environmental Ethics* 32(4): 353-367. <https://doi.org/10.5840/enviroethics201032440>.
- Royal College of Physicians. 2016. "Every breath we take: the lifelong impact of air pollution." Accessed August 09, 2023. <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>.
- Royal College of Physicians. 2022. "Clean Air Day 2022." Accessed August 09, 2023. <https://www.rcplondon.ac.uk/guidelines-policy/clean-air-day-2022#:~:text=Prescribing%20clean%20air%20is%20central,every%20year%20in%20the%20UK>.
- WHO (World Health Organization). 2022. *Ambient (Outdoor) Air Pollution*, December 19, 2022.

[https://www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health).
WWF (World Wildlife Fund). 2023. "Everything
You Need to Know about Coral Bleaching—And

How We Can Stop It." Accessed August 09, 2023.
<https://www.worldwildlife.org/pages/everything-you-need-to-know-about-coral-bleaching-and-how-we-can-stop-it>.