

Pollution and One Health

For decades, pollution and its harmful effects on people's health, economic growth and the planet have been neglected both by Governments and in the international development agenda.¹ Pollution is well known to adversely impact human health, biodiversity, climate, and ecosystem health, and should thus be a key concern for G20 countries, especially as they consider, develop and implement a One Health approach. The recent 2020 Leaders' Pledge for Nature, signed by seven (7) of the G20 countries, supports this approach and calls for One Health policies to address health and environmental sustainability in an integrated fashion.²

Of the pollution agenda, exposure to fine particulate matter (PM_{2.5}; i.e. air pollution) and Lead (Pb) are currently responsible for the highest burden of disease³ and are of significant concern to biodiversity and ecosystem health. Therefore, actions to address these pollutants should be prioritized.

1. *Pollution (contaminated air, water and soil) is the largest environmental risk factor for premature death on the planet, responsible for 9 million deaths each year or 1 in 6 deaths⁴.*
 - Exposures to contaminated air, water and soil kill more people than smoking, hunger, natural disasters, war, AIDS, or malaria.⁵ In some countries, pollution accounts for one in four deaths.⁶
 - 9 million is a conservative estimate, as the health impacts of many pollutants have not been fully quantified.⁷ This has been reaffirmed in the 2020 EU Chemicals Strategy for Sustainability: Toward a Toxic-Free Future.
 - A 2019 ranking of global premature pollution-related deaths placed six G20 countries—India, China, Indonesia, the United States, Russia, and Brazil—in the top 10, with a combined death toll of over 4.8 million people per year.⁸
 - There is evidence that exposure to pollution, especially PM_{2.5}, makes COVID19 health outcomes worse.⁹
2. *Pollution is one of to the top five direct drivers of biodiversity loss.¹⁰*
 - Acid rain, mercury deposition, pesticides, herbicides, nitrogen and ammonia accumulations degrade soil and ecosystems and the species that depend on them.¹¹
 - Lead poisoning is a significant cause of death of some rare or endangered species, including Californian Condors.¹²
 - Pollution from nutrients, sewage and industrial effluents create dead zones in the marine and freshwater environments where oxygen levels cannot support life.¹³
 - Polychlorinated biphenyls banned many years ago remain a legacy threat to cetacean populations, such as killer whales, affecting their reproduction and immune function.¹⁴
 - Three species of vultures in India suffered population losses of >96% following poisoning with the veterinary medicine diclofenac as they consumed contaminated livestock carcasses.¹⁵

3. *Many pollutants bioaccumulate up the food chain.*
 - The best known example is prevalence of elevated levels of mercury in fish, especially large pelagic species such as tuna and shark, though elevated levels of cadmium and lead have also been documented in fish tissue.¹⁶
 - Heavy metals and other toxicants, such as lead, cadmium, arsenic have also been documented in food, including rice, wheat, dairy, eggs, chocolate and, particularly troublingly, in baby food such as infant cereal.¹⁷
4. *Pollution has adverse implications for antimicrobial resistance.*
 - Industrial effluent, especially heavy metals such as lead, cadmium, and pharmaceuticals may contribute to antimicrobial resistance.¹⁸
 - For example, case studies have documented increase in prevalence of anti-microbial resistance genes in Brazilian dairy cows that consumed heavy metal contaminated water, with consequences for their productivity.¹⁹
5. *Pollution compromises delivery of key ecosystem services - provision of clean air, water and food - in both urban and rural locations.*
 - Excessive nutrient loads in surface and groundwater and soil cause a decline in water and air quality and soil productivity.²⁰
 - Air pollution has been documented to induce structural and function changes to surfaces of leaves, affecting growth and flowering.²¹
 - Heavy metal bioaccumulation in both prey and predators, from insects and mice to loons, condors, raptors, pelagic fish, sharks, and alligators, can disrupt reproductive and feeding capacity, disturbing ecosystem balance and further putting endangered species at risk of extinction²².
6. *Pollution undermines ecosystem resilience to climate change, whilst climate change increases the vulnerability of ecosystems to pollution.*²³
 - Reducing pollution and other local stressors is important for managing coral reef resilience in the face of climate change.²⁴
 - Polar bears already struggling to contend with melting sea ice and access to prey are also exposed to high concentrations of persistent organic pollutants.²⁵
 - Climate change may increase releases of pollutants as temperature rises, sea ice melts and extreme weather becomes more frequent. There may be increases in uses of DDT to combat increased incidence of vector borne disease.²⁶
7. *Lead (Pb) is particularly worrisome because:*
 - *One third of all children are lead poisoned* - up to 800 million children globally have blood lead levels at or above 5 micrograms per decilitre ($\mu\text{g}/\text{dL}$), a level that the United States Centers for Disease Control and Prevention have stated requires intervention.²⁷ According to the World Health Organization, there is no safe level of lead exposure.²⁸
 - Despite the global phaseout of leaded gasoline and efforts underway to ban lead paint, blood lead levels remain high, especially in low- and middle-income countries.²⁹

- Additional and significant sources of lead exposure are emerging, such as lead contaminated spices, cookware, and pottery.³⁰
- Lead permanently reduces intelligence, thereby draining economic growth, hindering prosperity and reducing lifetime earnings.³¹
- Lead kills 900,000 people each year.³²
- As outlined above, the impact of lead on biodiversity, the food chain, and implications for antimicrobial resistance are also highly concerning.

8. Pollution mitigation and prevention yields large returns on investment for human health and the economy. Data from the Lancet Commission on Pollution and Health, 2017:

- Pollution-related diseases reduce GDP in low- to middle-income countries by up to 2% per year.
- Up to 7% of health spending in heavily polluted, rapidly developing middle-income countries goes to care for people made sick by pollution.
- In the US, air pollution control has returned an estimated US \$30 in economic benefit (range, \$4–\$88) for every dollar invested since 1970—an aggregate benefit of \$1.5 trillion against an investment of \$65 billion.
- Programs to halt lead exposures are do-able and cost-effective, and can have an enormous impact on health, economic growth, and security. The removal of lead from gasoline and the resulting increases in the American population’s IQ and productivity have returned an estimated \$200 billion (range, \$110-\$300 billion) to the American economy each year since 1980—an aggregate benefit to date of over \$6 trillion.

9. *Recommendations for G20 countries*

The intersection of pollution with health, biodiversity, ecosystems, climate change, and economic growth and the rapid pace at which results can be seen, felt, and measured make pollution mitigation a valuable policy target.

As we “build back better” post-COVID-19, G20 countries should take a One Health approach that puts human health, biodiversity, climate and the environment at the heart of their recovery strategies, and commit to preventing and reducing pollution in order to ensure clean air, water, and soil for people and nature.

G20 leaders and countries should:

- Commit to reducing both global childhood lead (Pb) poisoning and fine particulate matter (PM_{2.5}) concentrations both by at least 50% by 2030 in the G20 2020 Communique and in the G20 Health Ministers Commitments;
- Prioritize, mainstream, and fund pollution prevention and mitigation nationally and internationally. For instance, integrate pollution and health planning into country and city planning processes, including nationally determined contributions, and through holistic approaches to transport, infrastructure, urban planning, food production, health, industry, construction and biodiversity conservation;

- Promote circular economy principles and solutions where it can reduce pollution, improve health and have benefits for biodiversity and ecosystem services. Decoupling development from the consumption of non-renewable resources will minimize the generation of pollution and other forms of waste by recycling and reuse;
- Establish systems to monitor pollution, its health effects and effectiveness of interventions;
- Increase research on the prevalence and impacts of pollution on human, animal, and plant health;
- Design and implement programs that reduce pollution and save lives;
- Facilitate regular inter-ministerial exchange of best practices and science-based knowledge pertaining to pollution and health;
- Rapidly phase out incentives for polluting industries, with aggressive targets and timetables and ensuring investment and training in effective law enforcement.

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