

Climate change, biodiversity and mental health

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Climate change is closely linked to rising levels of atmospheric carbon dioxide and methane due to human activities, and soaring temperatures might themselves pose a risk to natural carbon sequestration in the land. This editorial introduces three papers in the current issue exploring the adverse effects on mental health of climate-related loss of biodiversity and cultural heritage markers and the beneficial effects of adopting a plant-based diet. It also suggest three simple steps that clinicians can themselves take to act against climate change: choosing and recommending a plant-based diet, reducing personal use of fossil fuels and integrating climate change in discourse in all areas of their professional work.

Close to temperature tipping point

We are living through extraordinary times, not only because of the COVID-19 pandemic, but also because of increasing geopolitical challenges. Yet even these threats are dwarfed by the enormity of the climate change crisis, with its implications for the future of humanity. Our planet has soaring temperatures and plummeting biodiversity, with consequences for the generation of future pandemics.¹

Antarctic ice cores show a tight coupling between climate changes and carbon dioxide (CO₂) levels in the atmosphere over the past 800 000 years. The recent rise in atmospheric CO₂ is hugely anomalous compared with natural shifts over time. The concentration of CO₂ was stable over the last millennium until the early 19th century, when it started to rise, and its concentration is now nearly 40% higher than it was before the industrial revolution. Other measurements (e.g. isotopic data) confirm that the increase must be due to emissions of CO₂ from fossil fuel usage and deforestation.^{2–4}

The atmospheric concentration of methane (CH₄), another important greenhouse gas, has more than doubled from its pre-industrial level. This is mainly due to the increase in emissions from fossil fuels, ruminant animals and landfills, which in total now exceed natural emissions from wetlands and other sources. Concentrations of these planet-warming gases are now higher than in any period measured by modern instruments or by ice cores dating back 800 000 years.^{2–4}

Meanwhile, the average temperature of the Earth's surface has increased by about 0.85°C (1.4°F) in the past 100 years. The increase in average global temperature is rapidly gathering pace, with the past decade up to 0.39°C warmer than the long-term average, compared with a 0.07°C average increase per decade stretching back to 1880. Indeed, average temperatures in 2020 were about 1.25°C above pre-industrial levels.⁵

Furthermore, the buffer against carbon emissions that we currently receive from the biosphere is more fragile than previously thought. Land ecosystems are fast approaching a 'temperature tipping point' beyond which they could switch from soaking up CO₂ to releasing it into the atmosphere. The temperature tipping point of the terrestrial biosphere lies not at the end of the century or beyond, but within the next 20 to 30 years. On current trends, the first year to exceed 1.5°C above the 1850 to 1900 average will probably occur within the 2020s. We need to curb global warming now (rather than in some mid- to long-term future) in order to keep to the goals that were set by the Paris Climate Accord, or the land carbon sink will not continue to offset our emissions and buy us time.⁶

Effects of climate change in LMICs

The consequences of climate change are having more severe impacts in low- and middle-income countries (LMICs) than in countries in the OECD in terms of extreme weather events such as wildfires, hurricanes, droughts and flooding. Climate change affects food production, increases food insecurity, reduces biodiversity and health, and its negative impact is aggravated by poverty. LMICs experience exceptionally high levels of climate-sensitive livelihoods, governance challenges, conflict and extremely limited access to either general health or mental health services. Research studies have demonstrated that several climate-related exposures, including heat, humidity, rainfall, drought, wildfires and floods, are associated with psychological distress, worsened mental health, higher mortality among people with pre-existing mental health conditions, increased psychiatric hospital admissions and increased suicide rates.⁷

Biodiversity loss

Through its impact on habitat change, environmental overexploitation and pollution, climate change is having serious effects on biodiversity.⁸ The paper by Cianconi et al⁹ in this issue is a

timely examination of what is currently known about the impact of biodiversity loss on well-being, risk factors for mental disorders, and psychopathology. Adverse consequences should be viewed within the context of cultural and religious beliefs, community structures and the experience of previous urban or rural exposures over the life course, as well as socioeconomic variables such as age, gender and occupation. One cited study indicates that people living in the lowest amount of green space had a 24% chance of developing schizophrenia. Unfortunately, most research on this topic has been in high-income countries, with relatively few studies in LMICs. The authors highlight the concept first introduced by Albrecht et al¹⁰ of 'psychoterratic syndromes', which include phenomena such as eco-anxiety, eco-guilt, eco-paralysis, ecological grief and solastalgia due to concerns about the deteriorating biosphere and the future of later generations.

Impacts, coping and adaptation in Africa

The paper by Atwoli et al¹¹ in this issue examines the impact of climate change on African cultural heritage markers. These include the loss of land and livelihoods and the physical and mental health consequences for the population, especially vulnerable groups such as internally displaced people and refugees. The authors highlight the growing phenomenon of 'homesickness', experienced as a result of the environment changing so much that 'home' no longer looks familiar. There is a risk that cultural ties between people and their land are disintegrating, although some communities are developing coping strategies from indigenous and local knowledge to withstand climate change impacts. These include weather forecasting systems based on changes in animal behaviour, diversification of livestock and crops, and cattle stress-management techniques.

Although much research remains to be done, there is increasing evidence that giving people exposure to areas with greater plant diversity may reduce stress, improve cognitive functions such as memory and attention, and increase positive social interactions and social cohesion; it may also improve mood, self-esteem and subjective well-being and increase academic performance, imagination and creativity, improve sleep and reduce rates of mental disorders.

Clearly, as well as more research, and more adaptation to global warming, we all need to work together to halt and reverse planetary warming. As Atwoli et al¹¹ point out, the onus is on the richer countries to amend their behaviour, which is largely responsible for the global temperature increase to date. Their behaviour has had its greatest impact on LMICs where there are fewest health workers available to help deal with the consequences. Because of their self-interest, richer countries greatly compound the shortage of health workers in LMICs. They have failed to produce a sustainable supply of health

workers themselves, although they promised to do so in the World Health Organization Code of Practice on the International Recruitment of Health Personnel,¹² and they have increased recruitment from LMICs at times of pandemic.^{13,14}

Dietary and other changes we could all make

It is easy to feel helpless, or to consider that only governments can solve the problem, but there are at least three steps each of us might consider, both individually and in the organisations with which we are involved. The first is to move towards a more wholefood-based diet, as urged in the paper by Pye et al,¹⁵ which could potentially mitigate greenhouse gas emissions by up to 80%. Pye and colleagues summarise the numerous physical and mental health benefits of a plant-based diet, so it should not be regarded as a deprivation but rather as an opportunity! The second is to reduce the personal use of fossil fuels, both directly by reducing air travel and using public transport and bicycles instead of cars, and indirectly by using platforms such as Zoom for conferences and meetings instead of personal travel. Governments could subsidise better insulation in buildings and increase the use of geothermal and solar power. The third step is to integrate climate change discourse into clinical practice, service development, training (including continuing professional development), research and policy development. Doctors led the move away from cigarette smoking by giving up smoking themselves, and there is an even more important leadership role now needed from every doctor, and especially every psychiatrist, to urgently address climate change before it becomes too late to leave a survivable planet for future generations.¹⁶

Data availability

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Climate change, biodiversity loss and mental health: a global perspective

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Climate change can have various psychopathological manifestations which have been more actively addressed by scientific research only in recent years. Indeed, extreme weather events and environmental changes have been shown to be associated with a range of mental health problems. Following the destruction of ecosystems, biodiversity loss can cause mental distress and emotional responses, including so-called 'psychoterratic' syndromes arising from negatively felt and perceived environmental change. Studies investigating relationships between biodiversity and mental health reveal a complex landscape of scientific evidence, calling for a better understanding of this challenging issue.

The World Health Organization (WHO) has described climate change as one of the greatest health threats of the 21st century.¹ It identifies climate change as one of several factors behind the loss of biodiversity, along with habitat change, environmental overexploitation and pollution.²

Biodiversity is a multifaceted concept belonging to ecology and it has been defined as the 'variability among living organisms from all sources, including terrestrial, marine and other aquatic

ecosystems, and the ecological complexes of which they are part'.³ An ecosystem is a complex dynamic group of various living organisms acting as a whole functioning unity. The diverse groups of ecosystems, the species living within those ecosystems and the genetic variations within each population, in addition to the processes involving their functioning, constitutes what is called biodiversity.⁴ With regard to mental health, the relationship between biodiversity and psychology can be summarised in three types of relationship: biodiversity and well-being, biodiversity and mental health, and biodiversity loss and mental disorders. The objective of this perspective paper is to point out what the evidence shows about those relationships and to highlight further fields of investigation.

Biodiversity and well-being

Holistic and biophilic theories see nature as a source of health due to humans' innate emotional affinity for other living organisms. The conservation of natural resources, including biodiversity, has been identified as necessary for the promotion of good health.⁵ From Lovell et al's pioneering study, it is clear how difficult it is to identify benefits of nature on mental health. Indeed, their review suggests some caution in making a definitive correlation between biodiversity richness and health, as