

Climate change harms health in all populations.<sup>1</sup>

Heat-related illness and deaths are increasing worldwide, from heatstroke, adverse pregnancy outcomes, worsened kidney function, and adverse mental health effects.<sup>1, 2</sup> For those working outdoors, heat limits physical work and labour productivity, undermining livelihoods.<sup>1</sup> Extreme weather events cause illness (eg, through particulate pollution from fires, or water contamination from floods), direct injury (eg, physical injury and drowning), and chronic malnutrition by reducing agricultural output and increasing infections.<sup>1, 3</sup>

Climate change means many infectious diseases expand into previously safe areas and could increase pandemic risk.<sup>1</sup> Loss of physical assets and damage to infrastructure affect essential health and social services and socioeconomic wellbeing. Together, these factors drive population migration, political upheaval, and economic damage, all of which impact health. For these reasons the 2009 *Lancet* Commission on managing the health effects of climate change<sup>3</sup> described climate change as the “greatest global health threat of the 21st century”. However, it was wrong, both qualitatively and temporally. The threat is now to our very survival and to that of the ecosystem upon which we depend. Grave impacts of climate change are already with us and could worsen catastrophically within decades. A UN Environment Programme report states there is “no credible pathway to 1.5°C in place” today.<sup>4</sup>

Between 1955 and the end of 2021, greenhouse gases (GHG) have trapped the energy equivalent of 374 zettajoules of heat in our oceans and atmosphere, the energy equivalent of 6.23 billion Hiroshima bombs.<sup>5</sup> Rising surface and ocean temperatures increase sea levels and drive more frequent and severe extreme weather events. Record rainfall, heatwaves, fires, and floods have escalated globally in the past 20 months, far faster than anticipated.<sup>6, 7</sup> Future heating is likely to strike even faster and harder. A fifth of the carbon dioxide (CO<sub>2</sub>) we emit today will be heating the planet in 33 000 years, and 7% in 100 000 years;<sup>8</sup> even if emissions ceased today and CO<sub>2</sub> was drawn from our atmosphere, impacts will continue for millennia.<sup>9</sup>

But human activity has also triggered multiple interacting positive feedback loops.<sup>10</sup> Heating causes release of methane (83 times as powerful a GHG as CO<sub>2</sub> in its first 20 years) from carbonate rocks, and from fermentation of wetlands and from melting methane hydrates; there is net release of CO<sub>2</sub> from rainforests; global energy gain increases due to loss of reflection from shrinking snow and ice mass; and wildfires release CO<sub>2</sub> and carbon monoxide, which extends methane's atmospheric half-life. Black soot from wildfires warms the stratosphere; Australian wildfires in 2019 alone heated the global lower stratosphere by 0.7°C and that above Australia by 3°C.<sup>11</sup>

All this has been triggered with just 1.2°C global warming above preindustrial levels. Without immediate action, the Intergovernmental Panel on Climate Change estimates that global warming could reach 3.2°C (2.2–3.5°C) by 2100.<sup>12</sup>

Plausible, substantial, and sudden accelerations in sea level could arise from collapsing ice sheets.<sup>10</sup> In 2022, summer Arctic temperatures reached 32.5°C and Antarctic temperatures had the greatest increase on record.<sup>13</sup> Sudden changes in the position of the Northern Jet Stream and in the function of major ocean circulations risk dramatic changes in global weather patterns.<sup>14</sup>

But such impacts do not occur in isolation, and their correlation amplifies associated harms, including that to our economies.<sup>1</sup> In 2021, climate-related extreme events induced measurable economic losses of US\$253 billion, about half of which were uninsured.<sup>15</sup> The 2022 heatwave cost Italy €3 billion, and the cost of the 2022 floods in Pakistan has been estimated at \$40 billion or 12% of its \$346 billion gross domestic product.<sup>16</sup>

Yet, despite the scientific consensus and the lived experience, governments of nations with excess emissions have not responded adequately. In 2021, global GHG emissions rose 6%, and reached a record high.<sup>1</sup> Investment in renewable power has supplemented, not displaced, fossil fuel use, which continues to rise steeply. Fossil fuel companies follow strategies that would lead to production exceeding by 103% fuel levels consistent with limiting global average surface temperature rise to 1.5°C in 2040.<sup>1</sup> In 2022, the \$834 billion profits projected for 28 oil companies will fund their plans to make climate targets unreachable, while governments fail to provide policies and commitments to achieve those targets.<sup>17</sup> Even if the “aspirations” (not commitments) to action made at the 2021 international Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) negotiations were honoured, emissions would not fall, but rise by a further 13.7% by 2030.<sup>18</sup> Only 15 countries (plus Russia and the EU) have a legal commitment to any net zero target at all. The EU claims it will reach net zero by 2050, but its members are not yet aligned on the 2030 targets of the European Green Deal.<sup>18</sup> Russia's target is 38 years away, while the target for non-binding ambitions of eight other countries is also 2060 and India's is for 2070. The UK Climate Committee says the UK Government has a net zero strategy in place, but policies for achieving it are not ambitious enough.<sup>19</sup>

Immediate action will reduce imminent global harms and represents an opportunity. Removing fossil fuel subsidies and progressively taxing production could provide substantial funding for renewable power generation and home insulation.<sup>20</sup> Self-reliance on a green distributed energy system would enhance diplomatic and military security, reduce energy poverty, dampen energy price shocks, and stop almost the entire global population (99%) from breathing air that exceeds WHO air quality limits and threatens their health.<sup>21</sup> Governments can pursue policies to promote socioeconomic equality too, create green jobs, and protect the poor from rising energy bills. With removal of subsidies governments could tax obesogenic unhealthy foods and shift to more sustainable, equitable, low-carbon food systems, making agriculture more resilient, and saving health-service costs.<sup>20</sup>

All these actions remain possible. Appropriate and immediate action is now imperative. All of us must play our part. Countries responsible for most of the GHG emissions, now and in the past, must accelerate commitments to the climate change goals agreed in the Paris Agreement of 2015.<sup>22</sup> They should not set their own net zero deadlines, when many populations will suffer even if net zero was reached today. Low-emission countries must make their clean energy plans based on renewable sources. Imaginary boundaries between countries will not stop the climate migration that will come, if we do not act today. As the COP27 climate negotiations conclude, action at the required pace and scale cannot be delayed. The 2022 Intergovernmental Panel on Climate Change could not be clearer: “half measures are no longer an option...and any further delay risks our missing a brief and rapidly closing window to secure a liveable future”.<sup>23</sup>

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