

Bhutan: Information sheet on climate change, air pollution, and health

Climate change and air pollution are closely related and pose significant risks to human health, health systems, environments, and economies. Climate change impacts social and environmental determinants of health – clean air, safe drinking water, secure and sufficient food, housing, education and livelihoods – which directly affect human health. Greenhouse gases (GHGs), air pollution, and black carbon emitted from energy, industry, transport, household, agricultural, and waste management sectors harm both environments and population health. Countries have a unique opportunity to improve the environment, population health and wellbeing by integrating meaningful health and air pollution mitigation activities into Nationally Determined Contributions (NDCs). This information sheet provides an overview of some of the main health impacts of climate change in Bhutan alongside opportunities to reduce GHG emissions and air pollution and thus promote public health.

Ambient air pollution from human activities was responsible for approximately 25 deaths per 100,000 from particulate air pollution ($PM_{2.5}$) in Bhutan in 2021 [1]. Of these deaths, 28 percent came from fossil fuel burning, with 17 percent from coal burning alone, and 29 percent from biomass burning (Figure 1) [1]. The estimated economic value of these premature deaths was nearly US\$75.5 million [1]. The World Health Organization (WHO) reports for Sustainable Development Goal Indicator 3.9.1 (Mortality from air pollution) that deaths attributable to ambient air pollution in Bhutan represent 15 percent of chronic obstructive pulmonary disease, 23 percent of ischemic heart disease, 22 percent of lower respiratory infections, 15 percent of ischemic stroke, and 9 percent of lung cancer deaths [2]. The majority of these household and ambient air pollution-related deaths can be prevented by shifting to renewable energy sources that avoid the combustion of fossil fuels and biomass, while reducing GHG emissions.

BHUTAN'S ENGAGEMENT ON CLIMATE CHANGE, AIR POLLUTION, AND HEALTH

Bhutan is a high mountain country highly vulnerable to the impacts of climate change and air pollution. Bhutan's Constitution mandates universal access to health as part of its commitment to Gross National Happiness (GNH) [3]. Bhutan's guiding principles for climate change feature "the recognition of intergenerational equity and provision of a safe and healthy environment and for present

and future generations of the people of Bhutan intergenerational equity, as articulated in Articles 5.1 and 5.2 of the Constitution of Bhutan [3]." Health, psychological well-being, and ecological diversity and resilience are among the nine domains of Bhutan's GNH. Bhutan's second Nationally Determined Contribution (NDC) includes multiple health references [4], and its

National Adaptation Plan (NAP) process featured a technical report on human health [5]. Bhutan's NAP aims "to protect the health, lives, livelihoods and happiness of the people of Bhutan from the adverse impacts of climate change by building adaptive capacity and enhancing resilience to reduce vulnerability and by integrating adaptation actions into the development planning process at all levels." Bhutan integrates air quality into broader commitments on carbon neutrality and sustainable development, reflected in policies, renewable energy initiatives, and emissions reduction efforts, and engages with but has not yet joined the Climate and Clean Air Coalition (CCAC). Bhutan has adopted Long-

Term Low Emissions Development Strategies (LT-LEDS) targeting transport, industrial, human settlement, energy, biodiversity, and food sectors [6], and has committed to build a climate-resilient health system by joining the Alliance for Transformative Action on Climate and Health (ATACH) [7]. In addition, Bhutan endorsed the COP28 Declaration on Climate and Health, in which countries committed to "take health into account, as appropriate, in designing the next round of Nationally Determined Contributions..." [8]. These policy objectives can be further strengthened in Bhutan's third NDC, providing benefits for public health, wellbeing, development, and the economy.

SOURCES OF HEALTH-HARMING AIR POLLUTANTS IN BHUTAN

Particulate matter (PM) or particle pollution is a mixture of airborne solid particles and liquid droplets. Out of these, PM_{2.5} (inhalable particles 2.5 micrometres or smaller in diameter) are particularly harmful to health, increasing the risk of heart, cardiovascular, lung, and neurological disease, and cancer, amongst others. Black carbon, or soot, is a powerful pollutant and a short-lived climate pollutant (SLCP), also known as super pollutants. Methane (CH₄) is a GHG, an SLCP, and a major contributor to ground level

ozone, which has powerful impacts on both human health and climate change. Polluting emissions share the same general sources as GHG emissions – namely energy/power, transport, industry, and waste sector combustion, and agriculture. The leading sector sources of PM_{2.5} in Bhutan are residential buildings, industry, anthropogenic dust, and agriculture [9]; while the lead sector sources of black carbon include buildings, transport, waste, and industry [10] (Table 1).

Table 1: Bhutan sector sources of PM2.5, Black Carbon, and Methane

PM _{2.5} (source: State of Global Air [9])		Black Carbon (source: Community Emissions Data Systems [10])		Methane (source: Community Emissions Data Systems [10])	
Residential buildings	32.8 %	Buildings	48.7 %	Agriculture	54.6 %
Industry	13.9 %	Transport	18.1 %	Waste	29.9%
Agriculture	10.2 %	Waste	16.6 %	Energy	12.4 %
Anthropogenic dust	10.6 %	Industry	11.5 %	Buildings	2.6 %
Energy	8.2 %	Energy	2.9 %	Transport	.29 %
Transport	5.4 %	Agriculture	1.4 %	Industry	.11 %

Sources: State of Global Air 2024 [9]; Community Emissions Data System for Historical Emissions 2024 [10].



POTENTIAL FOR HEALTH BENEFITS RESULTING FROM MITIGATION IN BHUTAN

While Bhutan is a relatively minor emitter of GHGs, it stands to gain major and immediate benefits from climate change mitigation efforts. By targeting leading sources of GHG emissions, and reducing PM_{2.5}, black carbon, methane, and other super pollutants, Bhutan can achieve near-term climate gains while improving its air quality, public health, and the economy. Strengthening the links between climate and GHG mitigation policy, and air pollution and health objectives, including through Bhutan's third NDC could help guide policy and planning to save thousands of lives, promote healthier populations, improve well-being, and boost productivity. These targeted actions to reduce emissions can lead to substantial health benefits:

- **Avoiding death and disease associated with human-caused air pollution:**

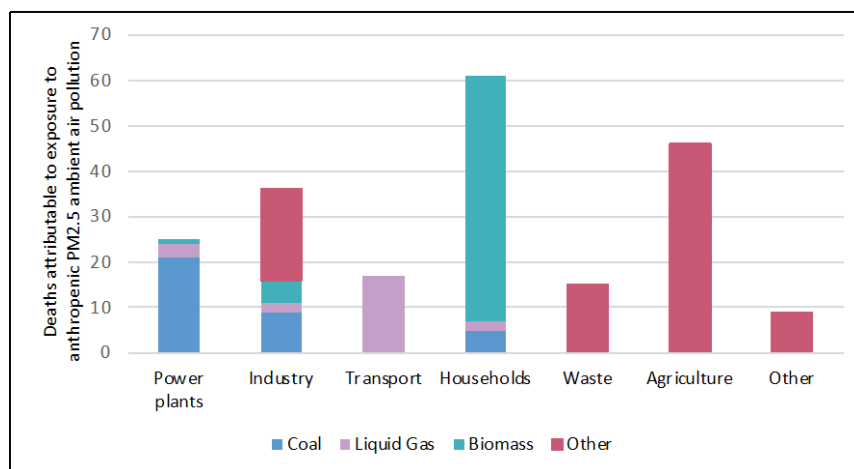
In addition to helping reduce climate change-related threats to people's health and wellbeing, interventions to reduce the use of dirty fuels would have major benefits to people's health. Replacing dirty fuels with clean renewable energy sources, as well as increasing energy efficiency, can significantly

reduce exposure to air pollution, which increases the risk of asthma, respiratory infections, cardiovascular disease, cancer, dementia, and many other adverse health outcomes. If supported through adequate technology transfer, capacity building, and finance, the deployment of clean renewables can also help reduce energy poverty, providing clean fuel sources in remote locations.

- **Sectors with the highest potential to save lives through improved air quality:**

Household sector: Bhutan has the opportunity to prevent 30 percent of air pollution-related deaths caused by exposure to household-derived outdoor air pollution, by promoting the transition to clean renewable energies in the household sector. Household air pollution-related deaths in 2021 were slightly lower in urban settings at 84 deaths per 100,000 compared to rural settings at 113 deaths per 100,000 [1]. Targeted interventions in the household sector can also help avoid more deaths coming from exposure to air pollution inside people's homes.

Figure 1: Deaths attributable to exposure to anthropogenic PM2.5 ambient air pollution in Bhutan by sector and source of emissions in 2021



Source: *The 2024 Report of the Lancet Countdown on Health and Climate Change* [1].

HEALTH IMPACTS OF CLIMATE CHANGE AND NEEDS FOR ADAPTATION IN BHUTAN

People in Bhutan face growing threats to their health and wellbeing due to climate change. Complementing mitigation efforts, adequate adaptation measures can help address these threats and save thousands of lives every year. Including these opportunities in Bhutan's NDC and National Adaptation Plans offers an opportunity to build resilience and protect communities.

- **Health impacts from heat exposure:**

As temperatures rise, populations in Bhutan face growing risks of disease and mortality associated with heat exposure. Elderly populations, those with underlying chronic health conditions (including cardiovascular disease, heart disease, diabetes), and very young children are most at risk. From 2014-2023, each infant under the age of one and adult over the age of 65 in Bhutan were exposed to an average 8 and 9 heatwave days per year, respectively. This is an approximate 80 percent and 350 percent increase in heatwave days compared to annual averages from 1986-2005 [1]. Rising temperatures and aging populations resulted in a 340 percent increase in average annual heat-related

deaths among adults over 65 from 1990-1999 to 2014-2023 [1]. Without climate change, the increase would have been just 140 percent (driven mostly by a growth in the size of the over-65 population), showing how much rising temperatures have worsened heat-related mortality [1].

- **Labour productivity loss due to heat exposure:**

Beyond presenting a direct risk to health, exposure of workers to high temperatures also reduces labour productivity, as workers' capacity to do physical labour decreases, and they need to take more breaks. In the period between 2014 and 2023, heat exposure of local workers caused the loss of over 19 million potential labour hours on average annually in Bhutan – a 36 percent increase in the loss of potential labour hours due to heat exposure from the 1990s [1]. This translates to an estimated US\$23.9 million in potential income lost annually due to heat exposure between 2014 and 2023, with the agricultural sector bearing 86.7 percent of the total impact (losing approximately US\$20.5 million) [1].

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ABOUT THIS REPORT

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ABOUT THE LANCET COUNTDOWN

The Lancet Countdown: Tracking Progress on Health and Climate Change is an international research collaboration tracking the world's response to climate change, and the health benefits that emerge from this transition. The Lancet Countdown was established in partnership with Wellcome, which continues to provide core financial support. Based at University College London (UCL), it brings together over 300 researchers from academic institutions and United Nations (UN) agencies and publishes its findings annually in The Lancet journal ahead of the UN Climate Change Conference.

The data in this report can be explored in further detail in the [Lancet Countdown's Data Platform](#). For more information, including previous annual reports, visit www.lancetcountdown.org.

ABOUT UNDP

The United Nations Development Programme (UNDP) is the United Nations' lead agency on international development. We support countries and communities as they work to eradicate poverty, implement the Paris Agreement on climate change and achieve the Sustainable Development Goals. We advocate for transformative change and connect countries to the resources they need to help people build a better life. Working with a broad network of experts and partners in 170 countries, UNDP helps nations to build integrated, lasting solutions for people and planet. Learn more at undp.org or follow at @UNDP.

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ABOUT GCHA

The Global Climate and Health Alliance (GCHA) unites and mobilizes the health community worldwide and accelerates climate action to protect and improve health for all. With 200+ organizational members, from every region and reaching over 125 countries, we work at the frontline of a global movement of health professionals and health and development organizations dedicated to promoting a healthy, equitable, and sustainable future for all. We address the climate crisis through evidence-based advocacy, policy, movement building, research and strategic communications.



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