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

Climate change and air pollution are closely related and pose significant risks to human health, environments, and economies. Climate change directly harms health while also impacting social and environmental determinants of health – clean air, safe drinking water, secure and sufficient food, housing, education and livelihoods. Greenhouse gases (GHGs), air pollution, black carbon, and methane emitted from energy, industry, transport, household, agricultural, and waste management sectors harm both environment 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 info sheet provides an overview of some of the main health impacts of climate change in Zambia to help shape adaptation plans while also identifying opportunities to reduce GHG emissions and air pollution – and thus promote public health.

Ambient air pollution from human activities was responsible for close to 1,900 deaths from particulate air pollution ($PM_{2.5}$) in Zambia in 2021 [1]. Of these deaths, 17 percent came from fossil fuel burning and 45.5 percent from biomass burning (Figure 1) [1]. The estimated economic value of these premature deaths was approximately US$293 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 Zambia represent 9 percent of chronic obstructive pulmonary disease, 10 percent of ischemic stroke, 17 percent of ischemic heart disease, 5 percent of lung cancer, and 13 percent of lower respiratory infection deaths [2]. Most of these deaths can be prevented by shifting to renewable energy sources that avoid the combustion of fossil fuels and biomass, while reducing GHG emissions.

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

Zambia is highly vulnerable to the impacts of climate change, particularly due to frequent droughts, floods, extreme temperatures, and its slow adaptive capacity. The 2023 National Adaptation Plan for Zambia includes health as one of nine sectors [3], and the Zambia Health National Adaptation Plan of 2017 notes that biomass energy for indoor cooking and lighting are correlated with "adverse health effects especially on the respiratory system" [4]. In 2018, the Zambia Institute of Environmental Management (ZIEM) implemented "air pollution monitoring in household mining towns to improve the long-term environmental sustainability of communities," targeting women-predominant communities that depend on fire for cooking and kerosene for lighting [5]. Zambia committed to build a climate-resilient health system by joining the Alliance for Transformative Action on Climate and Health (ATACH) [6] and also joined the Global

Methane Pledge in 2024 [7]. Zambia's second NDC highlighted a series of ambitious health adaptation actions and committed to strengthening the institutional capacity of the health sector to respond to climate change through the 2020 National Climate Change Learning Strategy [8]. In addition, Zambia 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*...". [9] These policy objectives can be further strengthened in Zambia's third NDC, providing benefits for public health, wellbeing, development, and the economy.

SOURCES OF HEALTH-HARMING AIR POLLUTANTS IN ZAMBIA

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 other illnesses. 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, SLCP, and 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 Zambia are fires, industry, residential buildings, and energy [10]; while the lead sector sources of black carbon include buildings, industry, transport, energy, and waste; and the leading sector sources of methane are agriculture, energy, waste, buildings, and transport [11] (Table 1).

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

$PM_{2.5}$ *(source: State of Global Air* [10])		Black Carbon *(source: Community Emissions Data Systems* [11])		Methane *(source: Community Emissions Data Systems* [11])	
*Other fires	55.2 %	Buildings	82.5 %	Agriculture	33.3 %
Industry	11.0 %	Industry	8.6 %	Energy	28.3 %
Residential buildings	9.9 %	Transport	6.7 %	Waste	23.7 %
Energy	7.8 %	Energy	1.1 %	Buildings	14.0 %
**Windblown dust	4.3 %	Waste	.8 %	Industry	.55 %

Sources: State of Global Air 2024 [10]; Community Emissions Data System for Historical Emissions 2024 [11]. Note: non-agricultural, **: not anthropogenic.*

POTENTIAL FOR HEALTH BENEFITS RESULTING FROM MITIGATION IN ZAMBIA

Climate change mitigation efforts could provide major opportunities for the health of local populations in Zambia. By targeting leading sources of GHG emissions, and reducing $PM_{2.5}$, black carbon, methane, and other super pollutants, Zambia 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 Zambia's third NDC, could help shape policy and plans that 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:

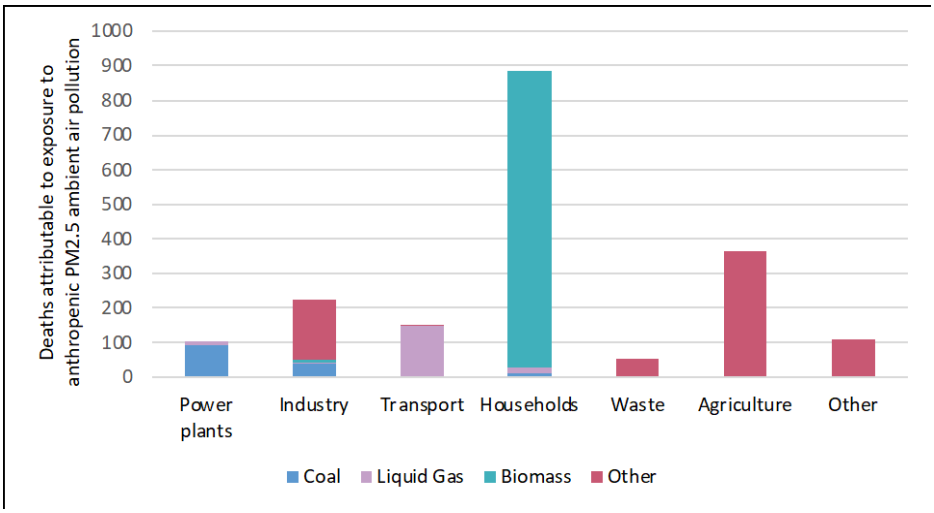
Replacing dirty fuels with clean renewable energy sources, as well as increasing energy efficiency, can significantly reduce exposure to air pollution, which increases the risk of asthma, respiratory infections, cardiovascular disease, cancer, dementia, and many other adverse health outcomes. If supported 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 from improved air quality:

Household sector: With 93.5 percent of its household energy supply coming from biomass, Zambia has the opportunity to prevent each year close to 900 deaths caused by exposure to household-derived outdoor air pollution, by promoting the transition to clean renewable energies in the household sector [1]. In addition to this, interventions in the household sector can also help avoid thousands more deaths coming from exposure to air pollution inside people's homes.

Transport sector: Air pollution from the use of fossil fuels in the transport sector was responsible for 8 percent of all air pollution-related deaths in 2021. With nearly 100 percent of road transport supplied by fossil fuels, these deaths could be prevented by transitioning to zero-emissions transport systems, including by promoting the use of zero-emission public transport, electric vehicles, and active travel [1]. Active travel, in turn, can have major health benefits by increasing physical activity.

Figure 1: Deaths attributable to anthropogenic PM2.5, ambient air pollution in Zambia by sector and emission source 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 ZAMBIA

People in Zambia 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 Zambia's NDC and National Adaptation Plan offers a unique opportunity to build resilience and protect communities:

- Health impacts from heat exposure:

As temperatures rise, populations in Zambia 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 to 2023, the total number of heatwave days experienced by infants under the age of one and adults over the age of 65 in Zambia were approximately 330 percent and 248 percent higher than annual averages from 1986-2005 [1].

In 2023 alone, each infant under the age of one and adult over the age of 65 in Thailand were exposed to close to 13 heatwave days per year. This represents an increase of approximately 152 percent in comparison to annual averages from 1986-2005 [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 426 million potential labour hours annually on average in Zambia – over 2x the loss of potential labour hours due to heat exposure from the 1990s 11]. This translates to nearly US$478 million in potential income lost annually due to heat exposure between 2014 and 2023, with the agricultural sector bearing 85 percent of the total impact, respectively (in total losing approximately US$406 million) [1].

- Growing risk of transmission of infectious diseases:

The rising temperatures and changes in humidity and precipitation patterns caused by climate change are changing the likelihood of transmission of infectious diseases transmitted by vectors (like mosquitoes or ticks). Climatic conditions in Zambia have remained highly suitable for the transmission of dengue by *Aedes aegypti* mosquitoes, at a climate-defined transmission potential (R0) of 1.26, increasingly from a yearly average of 1.08 in 1951-1960 [1]. Conditions are however also becoming increasingly suitable for the transmission of dengue by *Aedes albopictus* mosquitoes, the transmission potential for which has increased by 94 percent, from 0.08 on average in 1951-1960, to 0.16 in 2014-2024 [1]. Zambia also remains increasingly suitable for malaria transmission, West Nile virus, chikungunya, and zika, with slight increases in the number of suitable months and R_0, respectively [1].

- Drought and extreme weather impacts:

Climate change is changing precipitation patterns and, alongside increased incidence of extreme heat events, is increasing incidence of droughts. Droughts have multiple and pervasive impacts on health, including threatening crop yields, undermining food security, water security and sanitation, increasing the risk of malnutrition, promoting the transmission of infectious diseases, and

causing erosion. From 2019 to 2023, 78 percent of Zambia's land area experienced increasing extreme droughts for at least 1 month on average per year, 58 percent for at least 3 months, and 22 percent for at least 6 months [1].

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ABOUT THIS REPORT

This information sheet was developed with support from the Clean Air Fund and Wellcome. It was produced in collaboration between the Lancet Countdown and the United Nations Development Programme (UNDP), and with invaluable contributions from the World Health Organization (WHO) and the Global Climate and Health Alliance (GCHA).

The data in this document comes from the 2024 Report of the Lancet Countdown, with specific focus on the findings for Zambia. Please reference this report when using this data:
Romanello M, Walawender M, Hsu SC et al. The 2024 report of the Lancet Countdown on health and climate change: Facing record breaking threats from delayed action. Lancet 2024; published online October 2024. https://doi.org/10.1016/S0140-6736(24)01822-1

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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