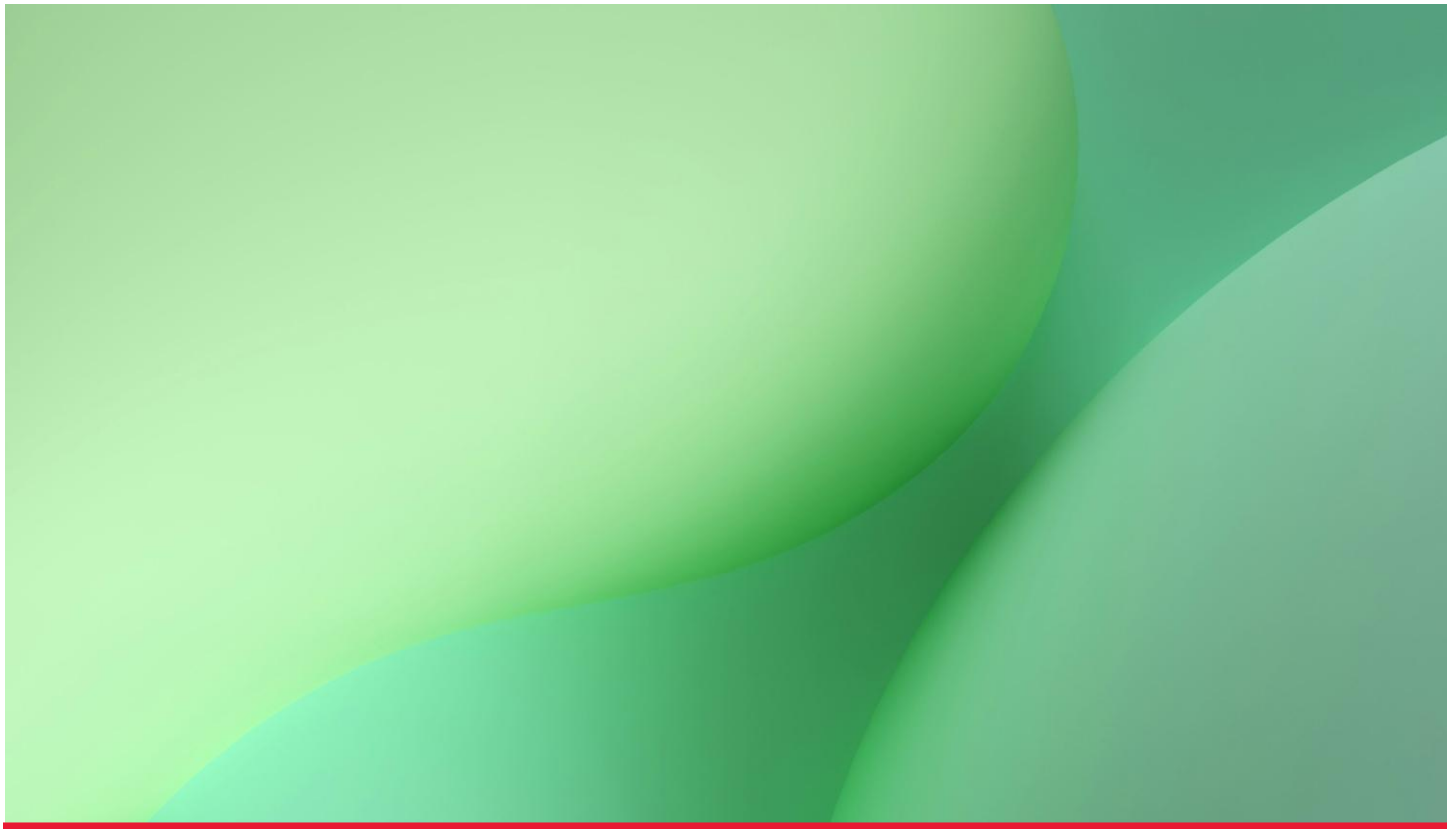

DISCUSSION BRIEF 2026

Heat, health and increasing cost of living
A call for action

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Executive Summary

Climate change is already happening and its impacts around the world are severe.

Extreme heat and heatwaves are by far the deadliest and most worrisome impacts of climate change. Although extreme heat is a well-known phenomenon in many parts of the world, human-caused climate change is already increasing the frequency and intensity of extreme heat periods with projections for 2030 and beyond painting a worrisome picture for the future. The hazardous effects of extreme heat on the human body are manifold and can reach from mildly irritating impacts such as dizziness or dehydration to life-threatening impacts such as chronic kidney failure or deadly heatstrokes While the link between heat impacts on health and economic impacts on countries' economies has been established recently, the quantification of the monetary impacts of heat and health on individuals has been limited. However, this is crucial to understand how heat and health impacts are weakening households' and individuals' economic situations in the short and long term, and how those monetary consequences are shaped by different pre-existing factors.

Feel the heat: reduced incomes, increased living costs

In this study, we establish the link between heat, health and cost of living which will then be applied to eight different country contexts namely Bangladesh, Brazil, France, India, Indonesia, Italy, Nigeria and South Africa. We propose an integrated focus on the monetary effects on individuals and households along two dimensions: decrease of income and increase in private healthcare costs.

- **Income reduction** is caused by individuals' response to heat stress, which can result in slowing down work, taking longer breaks, or limiting working hours during certain times of the day. The recovery period after experiencing heat impacts can take up to several weeks. This can have severe consequences for income, especially for informal sector workers not covered by social protection where employees get paid on an hourly basis or per piece where loss of working hours directly translates into loss of income.
- **Increasing cost of living** is caused by the treatment of heat impacts on health requiring medical attention especially in country contexts with a high share of private medical out-of-pocket expenditures.

Heat as a serious risk for health and loss of income across countries

Our results show that the impact of extreme heat on human health leads to a serious risk of substantial reductions in income across heat affected countries. Losses are especially high in agriculture and construction as working in both sectors requires physically demanding outside work where access to shade and cooling is limited. The consequences are massive income losses resulting from the loss of working days due to severe heat impacts on the health of workers. As the country examples demonstrate, segments of the population in several countries where informal labour predominates are at risk of falling below the poverty line. Bangladesh, India, Indonesia and Nigeria face the highest absolute losses of working hours leading to cumulative losses of 19+ days of work lost per year in the agriculture and construction sector with severe heat risks projected for the near-future for most parts of the countries. This is particularly worrisome as all four countries share a relatively high rate of informality in agriculture and construction as well as relatively low pay in agriculture, especially for women. Brazil faces high losses as well with cumulative losses of about 7 days of work per year due to health impacts from heat with significant heat risks for the Northern part of the country where losses in productivity are projected to up to 80% during heatwaves under SSP2-4.5 scenario. South Africa, France and Italy face losses of about 1 working day per year in agriculture and construction. All three countries share low rates of informality as well as moderate heat risks across the countries. However, the health impacts from heat lead to significant reductions in GDP each year with losses up to 25 billion USD due to an increase in mortality, minor restricted activity days and an increase in morbidity. Already countries classified as upper-middle income economies such as Indonesia or South Africa report high levels of poverty (with 68% of the population earn below 8.30 USD per day) with losses of working days from heat adding upon the risk of falling further behind the poverty line.

Out-of-pocket expenditures and strong public health systems

The dependency of health systems on private medical out-of-pocket expenditure can be an indicator of increased financial risks due to health impacts from heat for individuals. Already, Bangladesh as well as Nigeria have high shares of medical out-of-pocket expenditures between 72 - 79%. Brazil, India as well as Indonesia and Italy have reduced dependencies on medical out-of-pocket expenditures between 22 - 44%. France and South Africa have low dependency on medical out-of-pocket expenditures between 7 - 9%. Critically, absolute per capita medical out-of-pocket expenditure has risen sharply across almost all analyzed countries since 2000, meaning even where the relative share has declined (India, Indonesia, Brazil), individuals are still paying significantly more individually. As heat-related illness incidents will increase due to climate change and corresponding healthcare needs are projected to rise, the need for strong public health systems with reduced dependency on individuals' medical out-of-pocket expenditures for treating such illnesses is evident alongside the need for strong social protection coverage including healthcare.

The need for a governance triangle of climate, health, and labour policy

To address these challenges at the international level, an integrated approach across climate, health, and labour market policy is required. Ideally, this would give rise to a self-reinforcing governance triangle that places the protection of the individual at the heart of a proactive adaptation policy. Given the current momentum in global adaptation governance, the framework of the UNFCCC in particular offers different entry points for promoting further action on heat-related health impacts and their social costs. Among the key entry points are the current debate on indicators related to the Global Goal on Adaptation as well as the preparation and implementation of the Belem Health Action Plan (BHAP), Nationally Determined Contributions (NDCs), (Health)-National Adaptation Plans ((H)-NAPs) and the initial efforts to operationalise Loss and Damage financing. As a cross-cutting topic, adaptation finance remains among the highest priorities to help ensure more and better adaptation finance for health. With respect to local and national activities, compensation for the loss of working time due to heat, as well as insurance solutions that also address gender inequalities, are early examples from the countries examined in this Discussion Brief that could become necessary elements of good practice.

In a complementary manner, the processes of international climate policy mentioned above should be systematically leveraged to protect living standards. This social obligation arises from the role of climate change as a driver, but also from the current dynamics of global, national, and local adaptation policies. Central to this is enabling access to adequate adaptation finance, which has already been identified in recent years as a key challenge and, in light of the globally widespread heat crises, requires additional financial resources as well as clear guidelines on how these can be used efficiently in the service of comprehensive health protection.

Key recommendations

- **Integrating health into UNFCCC adaptation and loss and damage architecture:** The finalisation of the Global Goal on Adaptation and related indicators serves as a crucial entry point for enabling proactive action on negative heat-related health impacts. In addition, the BHAP needs to be the starting point to further integrate health into UNFCCC architecture with allocated funding as well as concrete actions for countries to develop heat-health action plans.
- **Moving from adaptation planning to comprehensive health-sensitive action:** The Belem Action Mechanism (BAM) for Just Transition needs to include the transition from informality to formality to cover income losses from heat under social protection policies. Health equity metrics and social cost accounting should be established as a standard NDC component to fill the gap and raise awareness for countries to act upon the challenges. To enable concrete action, the streamlining of the nexus into NAP and HNAP approaches can help to create an impactful basis for enabling funding via international climate finance, including Green Climate Fund, Adaptation Fund and other relevant multilateral climate funds. Finally, losses and damages from heat-related health impacts need to be considered as an integral part of the framework of Loss and Damage mechanisms.
- **Incorporating climate change and health considerations into labor regulations:** As part of the establishment of a self-reinforcing governance triangle of climate, health, and labour policies, strengthened cooperation between the three policy areas is needed. This requires reflecting future projections of heat developments as part of local labour policies, or the integration of heat-related social protection including state-subsidised parametric insurances. Existing heat protection labour laws should

be linked to social protection schemes that include not only heat impact prevention in labour regulations but also monetary compensation for losses incurred including the building of strong public health systems linked to social protection coverage of healthcare costs reducing the reliance on private medical out-of-pocket expenditures.

- **Tackling informality and gender-based vulnerabilities:** Informality poses a high risk for individual monetary impacts of heat. Further action is needed to support the transition from informal to formal sector employment in affected economies. In addition, gender-based vulnerabilities need to be addressed: men and women experience different vulnerabilities in the context of heat, with men having higher shares in affected sectors and women earning less. Heat impacts on loss of income need to be included in gender action plans, with gender-specific action on the transition from the informal to formal sector as well as tackling the gender pay gap shown in median hourly earnings.
- **Strengthen data availability on heat, health and cost of living nexus:** A strong evidence base is key for targeted policy action. Ensuring the data availability on expected losses for key sectors such as agriculture and construction beyond 2030 for all countries can strengthen the case for evidence-based policy interventions such as targeted social protection schemes for vulnerable groups as well as linking the projections for extreme heat and heatwaves to medical out-of-pocket expenditures. More research is needed on the effects of heat and health on country specific health systems financial capacities and challenges as well as the individual effects of rising health care costs on individuals.

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List of abbreviations

AC	Air-conditioning
AF	Adaptation Fund
AR6	Sixth Assessment Report (IPCC)
BAM	Belém Action Mechanism
BHAP	Belém Health Action Plan
COP	Conference of the Parties (UNFCCC)
FRLD	Fund for Responding to Loss and Damage
GCF	Green Climate Fund
GDP	Gross Domestic Product
GGA	Global Goal on Adaptation
HNAP	Health National Adaptation Plan
ILO	International Labour Organization
ILOSTAT	International Labour Organization Statistics (database)
INPS	Istituto Nazionale della Previdenza Sociale (Italy's National Social Security Institute)
IPCC	Intergovernmental Panel on Climate Change
L&D	Loss and Damage
LDC	Least Developed Country
LDCF	Least Developed Countries Fund
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
NELD	Non-Economic Loss and Damage
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing Power Parity
RCP2.6	Representative Concentration Pathway 2.6
RCP8.5	Representative Concentration Pathway 8.5
SIDS	Small Island Developing States
SSP1	Shared Socioeconomic Pathway 1
UAE	United Arab Emirates
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WBGT	Wet-Bulb Globe Temperature
WHO	World Health Organisation
WMO	World Meteorological Organization

1 Introduction

The year 2025 was one of the hottest years on record followed immediately by 2024 and 2023. Consecutively, in late June 2026 Europe experienced an unprecedented heatwave with extreme hot temperatures. France recorded its hottest day ever recorded with temperatures up to 43.8 °C, Spain recorded its hottest June and the list goes on (WMO 6/29/2026). Global annual temperature rise is now estimated at 1.44 °C compared to pre-industrial levels. This development is caused by humans contributing to the most dangerous and devastating development of this century and beyond – climate change. It is already visible and the impacts it is causing are severe with extreme heat being by far the deadliest consequence of climate change, claiming approximately 546,000 annual deaths (for years 2012 – 2021) (Romanello et al. 2025d). Between 1992 and 2013, the economic toll of extreme heat driven by anthropogenic climate change reached an estimated 16 – 50 trillion USD globally. These losses are distributed unequally between regions, with region in the bottom income decile losing about 8% of GDP per capita per year, and regions in the top income decile losing about 3.5% of GDP per capita per year (Callahan and Mankin 2022). Between 1981 and 2010 an estimated 1.4% of loss of working hours occurred due to heat, which is the equivalent of around 35 million full-time jobs. The resulting GDP loss from the loss of working hours alone amounts to 280 billion USD in purchasing power parity (PPP) terms (ILO 2019).

This discussion brief focuses on the causes of such losses. When temperatures rise above a tolerable level the physical health of human beings is severely affected. It can cause heat strokes, respiratory and cardiovascular disease, mental health impacts, kidney failure, and death. Consequently, people experiencing such impacts can suffer from various long-term effects, moreover the recovery period can take time (up to several months in severe cases). This discussion brief showcases that the monetary effects on individuals and households can be as severe: extreme heat can contribute to an increase of the cost of living while being responsible for a decrease in income through a loss of working hours and productivity.

The “cost of inaction” is significant and is felt especially by people least responsible for it. Not only are the effects experienced differently across regions, but the vulnerability to the monetary effects also differs across population groups. Poverty places people at great risk of financial loss during extreme heat events. The majority of low-income households suffers from systemic inequalities causing poor housing with poor insulation, restricted access to cooling spaces such as green or blue areas (these inequalities are especially pronounced in urban environments), and insufficient financial resources restricting access to air-conditioning or medical out-of-pocket expenditures to treat heat impacts. Heat risks are not distributed evenly; they compound existing structural vulnerabilities (Osberghaus and Abeling 2022). The elderly, children, people with disabilities or chronic illness, and pregnant people face acute health risks, which escalate when intersected with poverty. Labor market patterns further amplify this exposure and income loss.

Women are disproportionately concentrated in informal, heat-exposed agricultural work (e.g., Bangladesh), while men often dominate poorly protected, heat-exposed construction roles (e.g., Brazil). In both contexts, low wages and weak worker protections translate physical heat exposure directly into income volatility. A gender-responsive lens on the heat–health–livelihoods nexus highlights structural inequities and points to the need for targeted policy measures to reduce gender-differentiated risks. More research is needed to deepen the understanding of the effects on people’s pocket as well as adequate policy action. Good practises exist showcasing it is possible to act upon challenges created by heat. However, projections paint a worrisome picture for the future. Increased political attention is needed to strengthen efforts for mitigation of emissions now, before it is too late.

This discussion brief summarizes the impacts from heat on health as well as the associated costs of heat on individuals in chapter 2. In chapter 3 a methodology is introduced for creating risk dashboards, quantifying the monetary impacts of heat which is then applied to eight country case studies namely Bangladesh, Brazil, France, India, Indonesia, Italy, Nigeria and South Africa. The risk dashboards created are supported by country specific deep-dives and individual information available on the nexus. In chapter 4 good practises from policy making are shown with chapter 5 concluding with policy recommendations based on the findings.

2 Heat, health and the increase in cost of living

2.1 How heat impacts human health

Extreme heat is not a new phenomenon although the unprecedented extreme heat events are caused by human made climate change (Lee et al. 2023). The impacts of heat on the human body and health have been the subject of research for several decades producing a vast amount of literature, especially in the field of medical research (e.g. WHO 1969). Climate change is projected to increase the frequency and severity of heat and heatwaves globally. Already, between 2020 and 2024, climate change most likely caused 16 out of 19 annual life-threatening heatwave days. Since the 1990s, heat-related deaths increased 63%, reaching approximately 546,000 deaths annually between 2012 – 2021 (Romanello et al. 2025d). The known effects remain vast and potentially life threatening, depending on the heat intensity and time exposure[1].

A recent study by International Labor Organization (ILO) provides a detailed overview of the direct impacts of heat on workers' health and safety. The publication differentiates between mild effects such as heat fatigue, heat rash, heat syncope (causing fainting due to low blood pressure), heat cramp (muscle spasm) and heat oedema (swelling in extremities) and serious effects. While mild effects are discomforting, serious effects such as heat exhaustion, heatstroke, fluid/electrolyte disorders, cardiovascular impacts/disease, respiratory impacts/disease and acute/chronic kidney injury can be life-threatening. Mental health impacts are frequently observed with increased anxiety and psychological distress. Finally, the likelihood of accidents and injuries increases during hot temperatures, as well as the likelihood of removing safety clothing or equipment to cool down. Additionally, recovery time must be considered. No universal guideline lists recovery time for each physical impact. However, a few guidelines (mainly intended for military personnel or athletes) recommend returning to work after one week, and only after several weeks to months for severe heat-related illness. Otherwise, permanent damages to the body are risked (ILO 2024).

There are several factors contributing to the vulnerability of certain population groups to the impacts of heat mentioned above. ILO 2024 categorizes them into four main categories: individual, environmental, pharmacological and pathological. Individual factors encompass pregnancies, disabilities, advanced age or low physical fitness. Environmental factors encompass heavy clothing, physical work and radiant heat from machineries. Pharmacological factors, such as the intake of certain medicine, and pathological factors, such as acute or chronic illness, could decrease bodies' capability to withstand heat stress (ILO 2024).

Even though heat has an impact across all population groups, certain groups are more vulnerable to the impacts such as young children, the elderly, people with disabilities, people with acute or chronic diseases, pregnant people, outside workers as well as low-income people (ILO 2019, 2024; WHO 2026; Romanello et al. 2025e).

2.2 How heat health impacts affect cost of living

Little research has been done concerning individual monetary consequences of heat impacts on health. While the link between increasing heat and economic impacts on countries' economies has been established recently (Borg et al. 2021; Wyman 2024), the quantification of the monetary impacts individuals is limited. However, this quantification is crucial to understand how heat and health impacts weaken households' and individual's short- and long-term economic situation, and how pre-existing factors shape monetary consequences. The following

[1] The body core temperature of up to 37.5 °C is considered normal, 37.5 – 38 °C is considered borderline hyperthermia with everything above 38 °C is considered hyperthermia and everything above 39 °C extreme hyperthermia ILO 2024. Already in 1969 WHO recommended to not exceed 38 °C core body temperature for prolonged daily periods during manual work WHO 1969.

section establishes the link between heat, health, and cost of living, introducting indicators applied to eight different country contexts.

2.2.1 Contextual factors

Although extreme heat events will likely increase globally according to IPCC AR6, exposure, frequency and intensity differ across regions, especially concerning differences in wet-bulb globe temperatures (WBGT)[2] (Lee et al. 2023).

According to ILO 2019, the risk of income loss due to heat is elevated for people in the informal sector or self-employed. They rely on payment corresponding to the exact time working; a loss of working hours directly translates to lost income. Therefore, the situation of individuals in different employment situations differs severely. Not only does the sector in which the individual is employed matter (see section 2.2.2 for a sector specific description) but also the informality vs. formality. Individuals employed in the formal sector experience heat impacts as well. The difference is if they are employed hourly (which again would translate into a loss of income) or on a monthly fixed wage, where productivity loss would not directly translate into income loss.

Women face disproportionate risks of losses of income due to heat cause by higher informality rates and unpaid care burdens reducing paid hours during heat. Often, women are represented above average in informal or casual work (e.g., agriculture, street vending, domestic work, home-based production), where heat-related reductions in working time or production translate directly into lost earnings and cooling or social protection is limited (ILO 2019). Gender specific roles such as unpaid carework with childcare, eldercare, and water/food provisioning can become more time-consuming during heatwaves (e.g., queuing for water, caring for ill family members). Further, safety and mobility constraints can increase risk: early-morning or late-evening shifts are common heat-avoidance strategies but concerns about personal security limit women's ability to shift hours or shift transportation (UN Women 2020). Lastly, the gender pay gap as well as discriminatory social norms leave women with lower average earnings and limited possibility to accumulate assets. Pregnancy-related maternity leave causes income losses where no social protection exists. Pregnant women are especially vulnerable, as overexposure to heat leads to serious health impacts.

2.2.2 Reduction of income

As outlined, heat can have several impacts on health. As a result, employees often experience a loss in productivity and / or direct losses of working hours. This is especially the case for certain sectors, such as agriculture, construction and other sectors relying on heavy outside work. Other sectors relying on heavy manual work indoors can still be affected by a lack of cooling, such as health-workers, factory workers, and workers wearing heavy protection equipment in industry. Individuals experiencing heat stress slow down work, take longer breaks, or limit working during certain times completely. An ILO study estimated the percentages of lost working hours across sectors on a country level for 1995 and projected to 2030 using the RCP2.6 scenario which projects a global average temperature rise of 1.5°C by 2100 (ILO 2019).

The recovery period after experiencing heat impacts can take up to several weeks. This has severe consequences on income, especially if the employee is not covered by a health insurance guaranteeing or continuous payment in case of illness. If chronic disease develops, or chronic health impacts are experienced, the employee's capability to continue working the same job might be limited or hazardous. Unfortunately, there are no studies examining loss due to chronic heat related diseases yet.

2.2.3 Increase in cost

So far the usage of air-conditioning (AC) is considered the most effective way to cool down residential spaces (Turek-Hankins et al. 2021), yet only a small share of the heat affected population has access to it due to financial restrictions (Khosla 2025). Still, the overall usage of AC is projected to increase in the upcoming years (UNEP

[2] The WBGT is calculated to demonstrate the effect of temperatures on the human body. It is mainly used to assess the conditions for outside physical activity such as in sports or manual outdoor work. Through the combination of air temperature, evaporation rate as well as wind the WBGT is more precise than air temperature (Kong and Huber 2025)

2023). Using an AC comes with high costs in terms of purchase, installation and energy consumption and maintenance. A study from 2025 finds that AC ownership on average increases the energy consumption by 36%. While high-income households allocate between 0.2% - 0.25% of their overall expenditures to AC, the poorest households might spend up to 8% of their expenditures on electricity for AC (Cian et al. 2025). In India, the financial burden of owning and using an AC is now being referred to as "heat poverty" (Kapoor 2024).

An understudied yet possibly essential adaptation measure to heat is the usage of water for cooling. A study from 2026 finds that water is replacing the usage of AC in lower income households without AC (March et al. 2026). Research from informal settlements reveals that prices for water tend to be higher in informal settlements than in formal settlements (WRI 2019) which would exacerbate the cost pressure on residents if using more water would be a widespread heat adaptation measure. More research is needed on the monetary effects of the increase in water usage to withstand extreme heat.

Shifting work to the nighttime is a common recommendation to avoid the heat effects (Nelson et al. 2024) yet evidence arises that this shift can increase the danger of accidents, can lead to sleep-deprivation and long-term mental health effects as well as reducing the feeling of security for women and other marginalized groups. Additionally, the yield generated in nighttime for agriculture or fishery can be considerably lower than yield from daytimes, as shown by a recent article about the situation in Brazilian Amazon region fishery (Horn-Muller 2024).

Heat can have life threatening effects on health. As such the treatment of those effects can require medical attention. Only recently the effect of heat illness treatment on the increase of hospitalisation and out-of-pocket medical expenditures has been recognized. A recent study from 2023 finds that out-of-pocket medical expenditures in China can increase by 2.2 – 6.1% between 2041 – 20260 depending on the climate scenario (Li et al. 2023). Although a global study is not available, these findings suggest that countries with a high reliance on out-of-pocket medical expenditures and low rates of universal health-care might transfer the increase in health treatments to individual households.

2.2.4 Cascading effects

Some effects can only be indirectly linked to heat, yet their impact can be as important as direct linked. Food price inflation, for example, has been observed to be directly impacted by higher temperatures. A 2024 study highlighted an increase of 0.32–1.18 % in headline inflation and 0.92–3.23% in food inflation due to rising temperature in both high- and low-income economies by 2035 (Kotz et al. 2024). Some studies observed a link between the loss of employment due to a company's economic performances and toits supply chains affected by heat, increase of costs or the loss of revenue (Bui et al. 2024; Kimmich et al. 2025). Yet the link is understudied and more research is needed to estimate the number of jobs being lost due to heat. Power outages occur during heatwaves when high electricity demand overloads systems. Bangladesh experienced up to 10 hours daily power outage during a recent heatwave in April 2026 caused by the overload of the electricity grid due to high demand. This high demand was mainly driven by increase in AC usage. However, high fossil fuel dependencies for electricity production (as in the case of Bangladesh) show a contradiction with heatwaves being tackled by increasing the usage of AC which in turn is contributing to the pollution of CO2 emissions (Das 2026).

The overall cost of healthcare might be affected by heat in the future as well. A study from Australia estimated a potential 10% increase in healthcare cost by mid-century 2046–2052 under RCP4.5 scenario for the city of Perth (TONG et al. 2021). It is likely that those increases will be felt by the public as those costs will be diverted to increases in healthcare cost shares for individuals, although no global estimations are available yet. Lastly, the economic impact of heatwaves on the GDP is estimated at 0,97% losses in income worldwide (corresponding to about 1 trillion USD in 2024) (Romanello et al. 2025e). Culminative GDP losses of 5 – 7% are projected for 2026 – 2030 for the most exposed economies according to Allianz research 2026. The heatwave in 2023 cost approximately 0,6% of GDP worldwide with regional fluctuations (Subran et al. 2023). It is unclear so far whether economic impacts will result in individual losses of income or the increase of cost of living. While more research is needed on the heat, health and cost of living nexus, research on other external factors causing economic losses for countries GDPs shows that GDP losses eventually cause "cost-of-living crisis" with stagnating wages and increase in prices (Hodgson 2022).

3 Selected country insights

Methodology

As shown in section 1 the cost of living can be impacted through various ways by heat. In the following section, two factors from the above listed were selected to show the level of risk a country is exposed to. Due to limitations in data availability not all factors were possible to quantify. The two chosen factors are visualized through dashboards for the following countries: Bangladesh, Brazil, France, India, Indonesia, Italy, Nigeria and South Africa. The dashboards created for these countries are supported by additional information on the specific country contexts. The two factors selected reflect the two-fold ways the cost of living can be impacted by heat i.e. through a decrease of income and an increase in cost of living. The "loss of income" is visualized through three data points using data from ILO and corresponding ILO database ILOSTAT: loss of working hours per country and sectors for 1995 vs. 2030 projection (under RCP2.6 scenario) (ILO 2019), median hourly earnings of employees by sex and economic activity (local currency in USD)(ILOSTAT 2026d)[3][4] translated into PPP using a worldbank data based calculator[5] and the proportion of informal employment[6] in total employment by sex and economic activity (ILOSTAT 2026e) (if not available for a country instead "Informal employment rate by sex in %" is shown (ILOSTAT 2026c). The expected annual losses of working days is calculated using the basis of 250 working days a year and 8 hours paid work per day times the % of losses expected using ILO 2019.

As pointed out, it is likely that the overall medical out-of-pocket expenditures will increase with more heat in the upcoming years. Therefore, the share of medical out-of-pocket expenditures from total healthcare cost per country is displayed in % using data from Worldbank 2026f. The visualization for the heat risk is taken from the World Bank climate knowledge portal "Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization per country" under RCP2.6 scenario projected for 2020 - 2039 (Worldbank 2026h)[7].

Some challenges and limitations should be noted. While the analysis includes 2030 projections under the RCP2.6 scenario for the loss of working hours, the other data points included reflect the most recent available year. Further, the local currencies are translated to PPP in USD which is a common way to account for differences in cost of living between countries. Conclusions based on the illustrative calculations should therefore be interpreted with caution. In addition, some countries are missing from the dataset on informal employment as a share of total employment by sex and economic sector. In these cases, only aggregated figures on informal employment by sex could be included. Finally, no global estimate of the projected increase in medical out-of-pocket expenditure is currently available. The country level data on out-of-pocket spending as a share of total health expenditure should therefore be treated as indicative only.

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[3] Definition ILOSTAT of "median hourly earnings": "The earnings of employees relate to the gross remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as annual vacation, other type of paid leave or holidays. Earnings exclude employers' contributions in respect of their employees paid to social security and pension schemes and also the benefits received by employees under these schemes. Earnings also exclude severance and termination pay. The median is the middle value, with half of employees earning less and half earning more" ILOSTAT 2026d.

[4] Local currency converted to USD with online converter on 01.06.2026 https://www.xe.com/

[5] PPP was calculated using the local currency per country translated to USD with https://chrislross.com/PPPConverter/ (last checked on 07.07.2026)

[6] Definition ILOSTAT of "informal employment": "Informal employment comprises persons who in their main or secondary jobs were (a) own-account workers, employers and members of producers' cooperatives employed in their own informal sector enterprises; (b) own-account workers engaged in the production of goods exclusively for own final use by their household (e.g. subsistence farming); (c) contributing family workers, regardless of whether they work in formal or informal sector enterprises; or (d) employees holding informal jobs, whether employed by formal sector enterprises, informal sector enterprises, or as paid domestic workers by households" ILOSTAT 2026e.

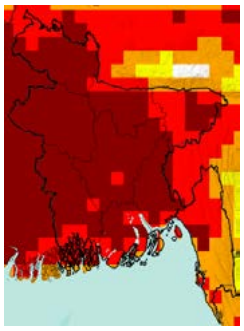
[7] Description of the map: "The map shows the level of risk when combining temperature (hazard) and population (exposure), for different periods into the future and different warming scenarios. Risk Categorizations are calculated to account for both climate conditions (in this case temperature-based) and high population densities (high exposure to harsh climate conditions)" Worldbank 2026h.

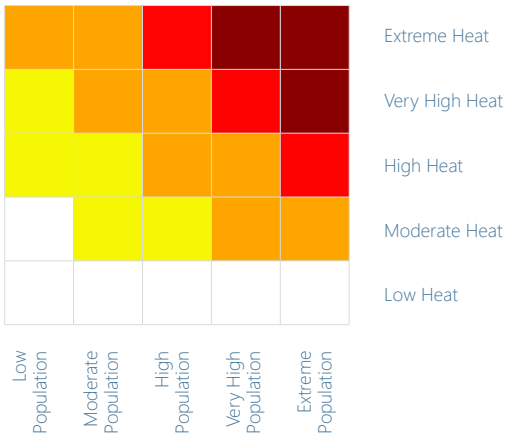
Bangladesh

COUNTRY RISK PROFILES

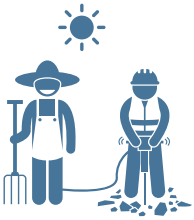
Risk Factor Categorization

Bangladesh, 2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014





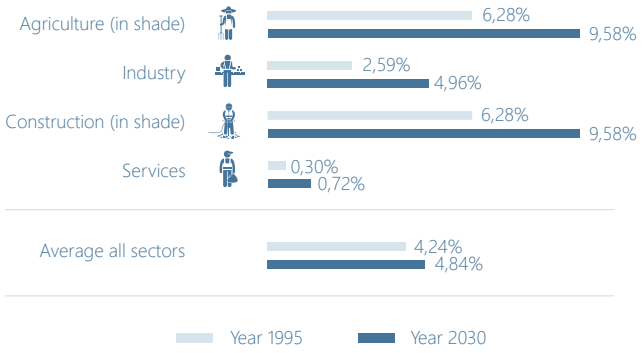
Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization



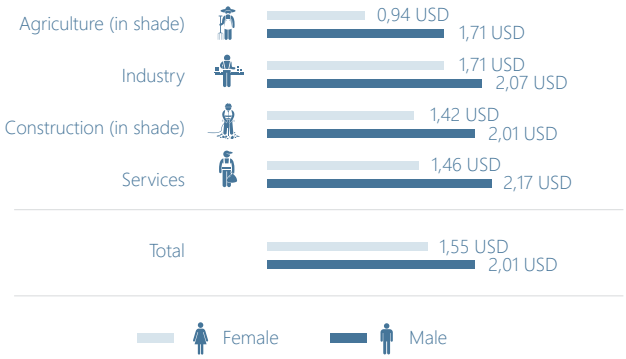
23.75 days

Annual losses of working hours in agriculture / construction due to heat

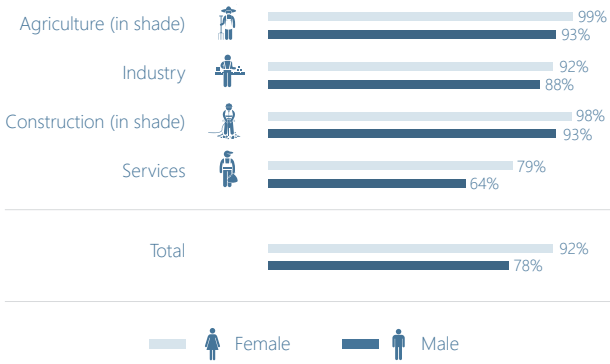
Loss of working hours due to heat 1995 vs. 2030 by sector in %



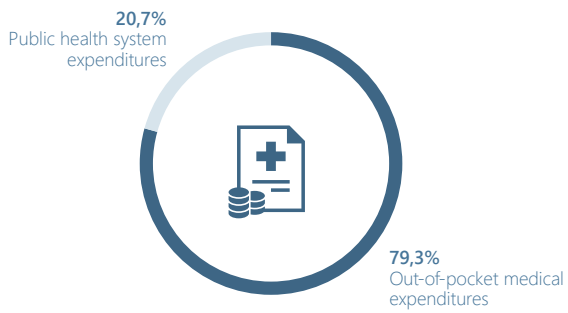
Median hourly earnings of employees by sex and sector in USD (PPP) in 2024



Proportion of informal employment in total employment by sex and sector in % in 2024



Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

Bangladesh is extremely vulnerable to extreme heat risks ranking second in exposure to elevated temperatures with the capital Dhaka being an exceptionally affected urban heat island (Worldbank 2024). Under SSPI – RCP2.6 scenario for 2020 – 2039, the majority of the country is highly vulnerable to humidity-based heat. According to the same projection, the number of hot days exceeding 30°C will range between 183 – 239 days annually (Worldbank 2026a). Already, Bangladesh experiences losses at 4.24% across all sectors per year on average with projections up to 4.84% in 2030 under RCP2.6 scenario (ILO 2019). According to Bardhan et al. 2024 this can increase to up to 50% experienced losses in productivity during extreme heatwaves.

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in Bangladesh, the daily median income based on eight hours of paid work per day is low, at 12.40 USD (PPP) per day for women and 16.08 USD (PPP) for men in 2024. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of current and future heat exposure, more people could fall below the recently revised poverty line of 3 USD (PPP) per day. With the current share of the population earning less than 3 USD per day being at 5.9% in 2022 (World Bank 2025a). This is particularly concerning because a 2022 study found a strong correlation between heat exposure and poverty in Bangladesh, with nearly all densely populated divisions that have high poverty rates being most exposed to annual heatwaves reenforcing the vicious cycle of heat risk and poverty (Amadio et al. 2022).

Sectors at risk

The agriculture and the construction sector are particularly at risk with losses already at 6.28% and projected to 9.58%. The rate of women in agriculture is slightly higher than men (56%) (ILOSTAT 2026a) with women earning only around half of men's median hourly wages and being employed informally in most cases (99%). Although women in construction are equally affected by lower pay and a higher informality rate (98%) the overwhelming majority of employees in construction are men (98%) (ILOSTAT 2026b).

Medical out-of-pocket expenditures

In 2023, the medical out-of-pocket expenditure accounted for 79% of total health expenditure in Bangladesh, continuing a steady rise from 62% in 2000 which translates to a relative increase of about 27% (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 157 USD (PPP) in 2023, which constitutes a 833% increase since 2000 (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), Bangladesh's heavy reliance on private out of pocket spending is likely to increase the financial burden of individual households.

Cascading effects

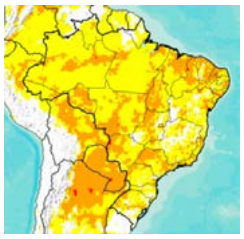
According to the recent Lancet Countdown, the potential income lost from loss of working hours and productivity due to extreme heat was 24 billion USD in 2024 which is equivalent to 5% of GDP (Romanello et al. 2025a). Recurring power outages due to insufficient infrastructure already increase the heat exposure of people working or being inside such as in factories or residential homes in Bangladesh (Zami 2026).

Brazil

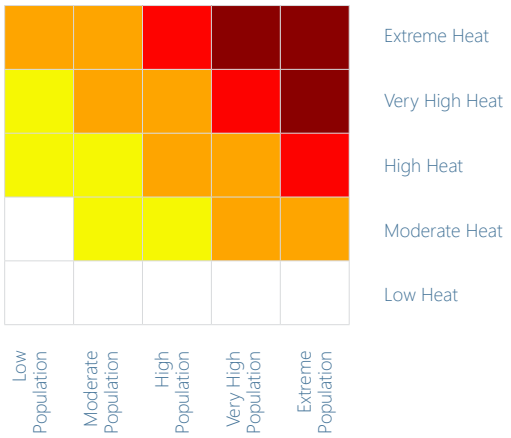
COUNTRY RISK PROFILES

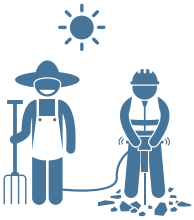
Risk Factor Categorization

Brazil, 2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

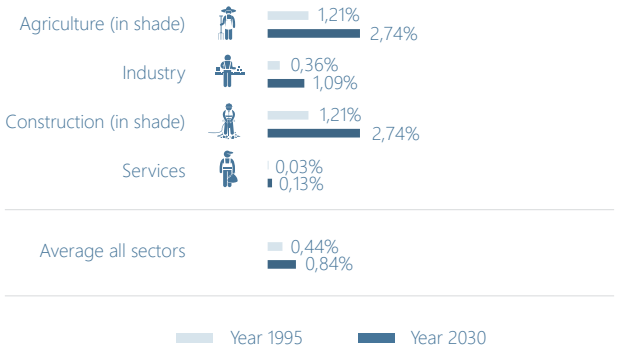




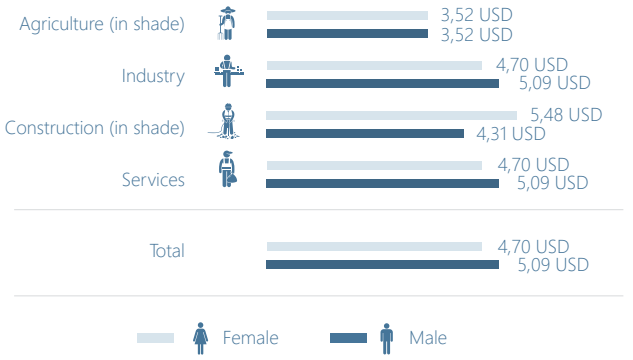
6.75 days

Annual losses of working hours in agriculture / construction due to heat

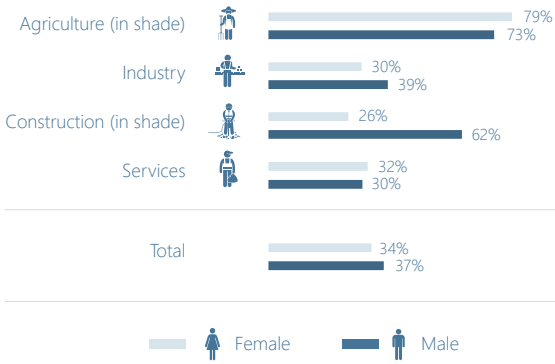
Loss of working hours due to heat 1995 vs. 2030 by sector in %



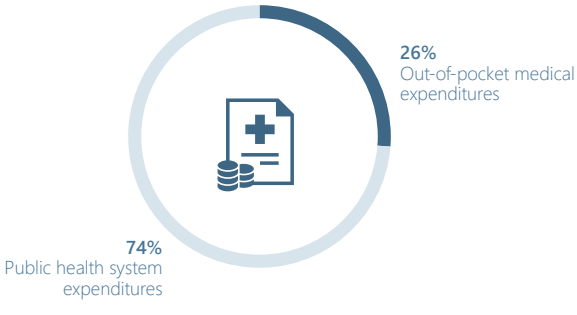
Median hourly earnings of employees by sex and sector in USD (PPP) in 2025



Proportion of informal employment in total employment by sex and sector in % in 2025



Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

Brazil is vulnerable for extreme heat risks. Under the SSPI – RCP2.6 scenario for 2020 – 2039, the majority of the country is vulnerable to humidity-based heat with moderate risk across the North-East and high risk in cities such as Manaus and Rio de Janeiro. According to the same projections, the number of hot days exceeding 30°C will range between 204 – 262 days annually (Worldbank 2026b). Already, Brazil experiences losses at 0.44% across all sectors per year on average with projections up to 0.84% (nearly doubling) in 2030 under RCP2.6 scenario (ILO 2019). A recent study estimates that under the SSP2-4.5 scenario, some regions of Brazil, particularly the North, Central-West and Northeast, could see long-term productivity losses of up to 80% in physically demanding sectors between 2075 and 2099 (Dantas et al. 2025).

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in Brazil, informality is elevated with 34% of women being employed informally and 37% of men. Median incomes at 37.60 USD (PPP) for women and 40.72 USD (PPP) for men in 2025 based on eight hours of paid work per day shows an improvement with wages being increased by 26% for the bottom poor (Worldbank 2025a). According to the World Bank classification, Brazil is considered to be an upper-middle-income economy where the adjusted poverty line of earning below 8.30 USD a day is considered. In 2023, 23.4% of Brazil's population was considered poor earning less than 8.30 USD a day. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of future heat exposure, more people could fall below the poverty line in the future.

Sectors at risk

The agriculture and the construction sector are particularly at risk with losses already at 1.21% and projected to 2.74%. The rate of women in agriculture is lower than men (18%) (ILOSTAT 2026a) with women earning the same as men on average with slightly increased levels of informality compared to men. In construction, men earn less than women with higher shares in informality and additionally the overwhelming majority of employees in construction being men (95%) (ILOSTAT 2026b).

Medical out-of-pocket expenditures

In 2023, medical out-of-pocket expenditure accounted for 26% of total health expenditure in Brazil, continuing a steady relative decrease by 27% since 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 543 USD (PPP) in 2023, which constitutes a 96% increase since 2000 (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), the expected per capita expenditures will most likely increase as well although Brazil's health system is overall less reliant on medical out-of-pocket expenditures.

Cascading effects

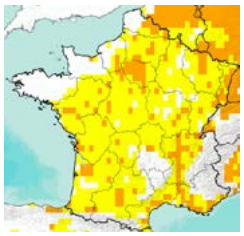
According to the recent Lancet Countdown the potential income lost from loss of working hours and productivity due to extreme heat was 17.7 billion USD in 2024 which is equivalent to 1% of GDP (Romanello et al. 2025b). Under SSP2-4.5 scenario between 2075 and 2099 total daily losses could increase to 228 million USD corresponding to 83 billion USD annual losses caused by losses in productivity (Dantas et al. 2025).

France

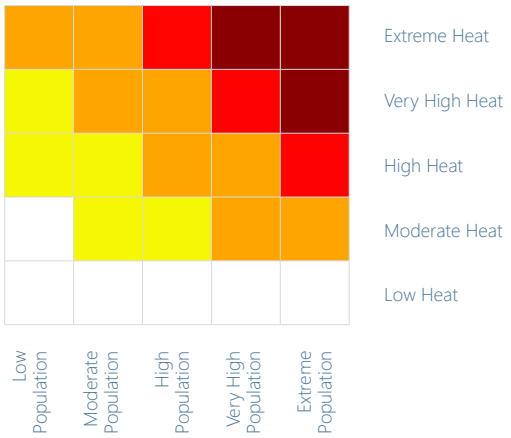
COUNTRY RISK PROFILES

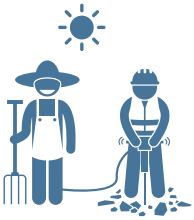
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

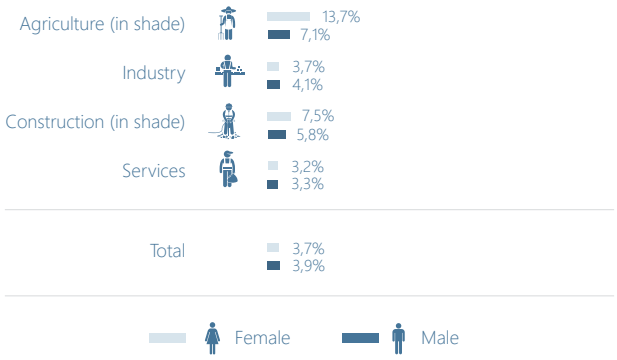




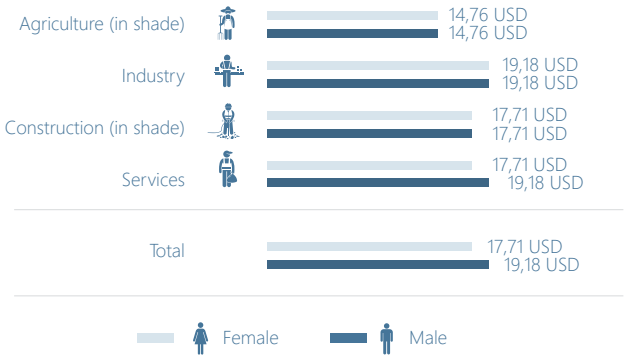
0,00 days

Annual losses of working hours in agriculture / construction due to heat

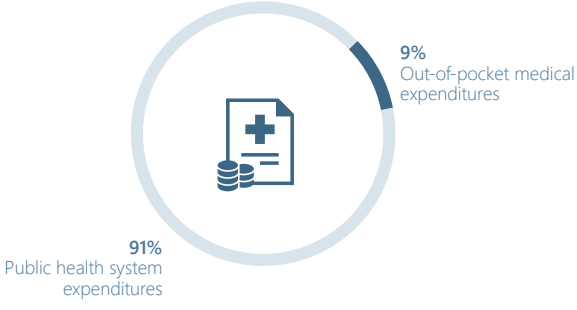
Proportion of informal employment in total employment by sex and sector in % in 2025



Median hourly earnings of employees by sex and sector in USD (PPP) in 2025



Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

France is vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039 parts of the country are at moderate risk from humidity-based heat, especially the Parisian area, the Mediterranean coast and other urban areas. The number of hot days exceeding 30°C will range between 8 – 19 days (Worldbank 2026a). No data on loss of working hours is available for France.

Medical out-of-pocket expenditures

In 2024, medical out-of-pocket expenditure accounted for 9% of total health expenditure in France, continuing a light increase from 7% in 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 633 USD (PPP) in 2024, with the expenditure sharply increasing by more than 300% since 2000 (Worldbank 2026g).

Increased risk of poverty

The rate of informality is between 3.7% for women and 3.9% for men in France. Working in the informal sector is precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Especially workers with no formal contract in France are exposed to higher heat associated risks. Particularly, construction workers and workers in the service sector such as food delivery are at risk of losing money during heatwaves if working hours are being reduced. France has already occupational heat and health measures in place, yet those regulations only benefit the formal sector (Habhoub 2026).

Cascading effects

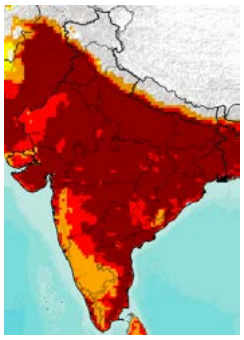
Between 2015 and 2019, the economic impact of heat impacts on health in France amounted to 25.5 billion EUR, mainly through an increased mortality, minor restricted activity days and an increase in morbidity (Adélaïde et al. 2021). During the most recent heatwave in June 2026, it became clear that France's housing situation is particularly hazardous for low-income, sub-urban residents as their housing is poorly insulated, referred to as "heat traps" (Chrisafis 2026). A recent study found that the loss of economic output due to heat reduces tax revenues are estimated at 1.8% for France (Allianz research 2026). Historically, the usage of air-conditioning in France is low. However, the most recent heat fuels the debate whether France should embrace and support the instalment of residential and public AC. Potentially the instalment of AC in France could reduce morbidity during heatwaves by one fifth, although robust data is lacking. However, concerns about the increase in costs are partially causing a reluctance for residential instillment (Euronews 2026). Further, the losses of animals in the livestock sector were significant during the latest heatwave. According to Reuters, dairy production output was 15 – 20% less than usual and hundreds of thousands of poultry dying in France due to heat. These losses could cause higher food prices in the short term for customers in France contributing to inflation (La Hamaide et al.). Heat-related losses of potential labour hours doubled from the baseline of 1990 – 1999, reaching 90 million hours in 2024 with the construction sector being especially affected with 47% of these losses (Romanello et al. 2025c).

India

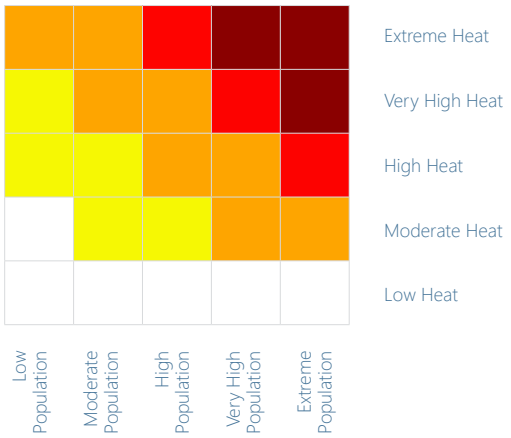
COUNTRY RISK PROFILES

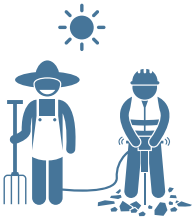
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

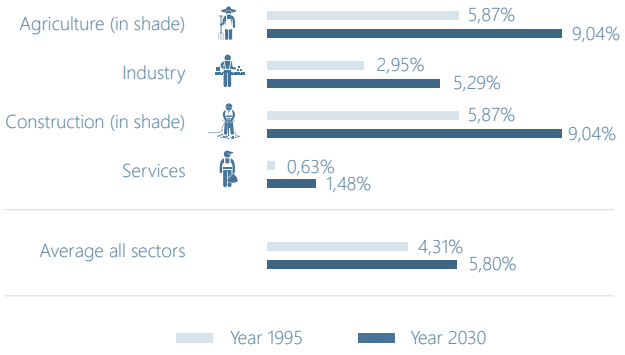




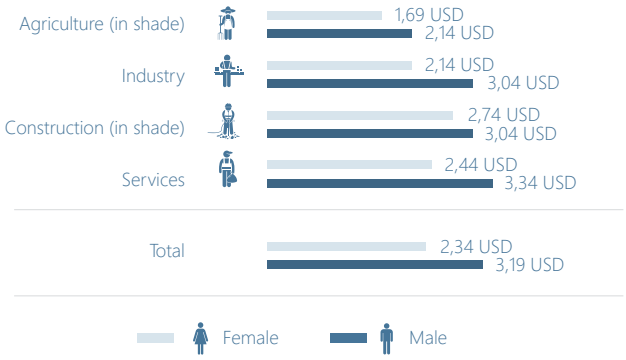
22.5 days

Annual losses of working hours in agriculture / construction due to heat

Loss of working hours due to heat 1995 vs. 2030 by sector in %



Median hourly earnings of employees by sex and sector in USD (PPP) in 2025

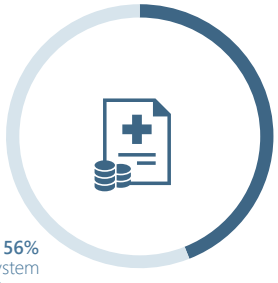


Informal employment rate by sex in 2025

86% Male

90% Female

Out of pocket medical expenditures rate compared to overall health expenditures in 2023



44%
Out-of-pocket medical expenditures

56%
Public health system expenditures

Heat exposure risk

India is extremely vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039, the majority of the country is highly vulnerable to humidity-based heat with extremely high risk for the whole country except the North as well as parts of the South-West. According to the same projection the number of hot days exceeding 30°C will range between 183 – 230 days annually (Worldbank 2026c). Already, India experiences losses at 4.31% across all sectors on per year on average with projections up to 5.80% in 2030 under RCP2.6 scenario (ILO 2019).

Sectors at risk

The agriculture as well as the construction sector are particularly at risk with losses already at 5.87% and projected to 9.04%. The rate of women in agriculture is slightly lower than men (44%) (ILOSTAT 2026a) with women earning around 20% less than men. Although women in construction are equally affected by lower pay, the overwhelming majority of employees in construction are men (92%) (ILOSTAT 2026b). Unfortunately, no gender disaggregated data is available for the informality rate per sector in India. Overall, the informality rate in India is very high especially among women (90% of women and 86% men).

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in India, daily median incomes are low, at 18.72 USD (PPP) per day for women and 25.52 USD (PPP) for men in 2025, based on eight hours of paid work per day. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of future heat exposure, more people could fall below the worldbank poverty line of 4.30 USD per day (the 4.30 USD poverty line is applied to India as it is classified as lower-middle income economy). Currently, 23.9% of Indias population earns less than 4.20 USD per day with potential future income losses due to heat intensifying the risk of falling behind this poverty line in India.

Medical out-of-pocket expenditures

In 2023, medical out-of-pocket expenditure accounted for 44% of total health expenditure in Bangladesh, continuing a steady relative decrease by 39% (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 151 USD (PPP) in 2023, a steady increase by 194% (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), India's reliance on private out of pocket spending is likely to increase the financial burden of households. Anecdotal evidence arises from a newspaper article describing how 40% of urban and 60% of rural households experiencing a heatstroke among a member of the household have to take loans or sell assets to pay medical bills (Shukla 2026).

Cascading effects

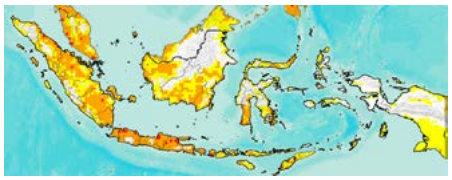
According to the recent Lancet Countdown the potential income lost from loss of working hours and productivity due to extreme heat was 194 billion USD in 2024 (Romanello et al. 2025d) translating to about 5% of Indias GDP.

Indonesia

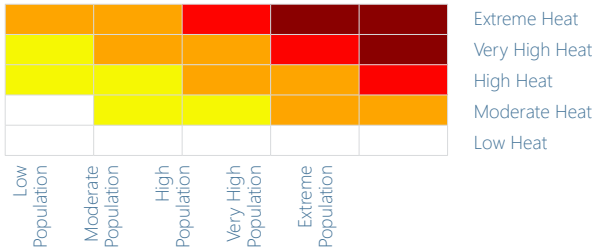
COUNTRY RISK PROFILES

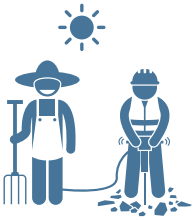
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

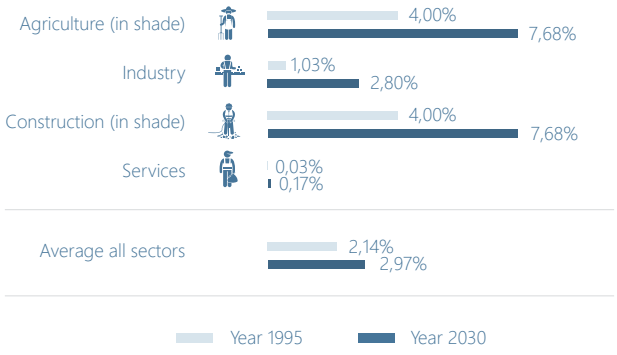




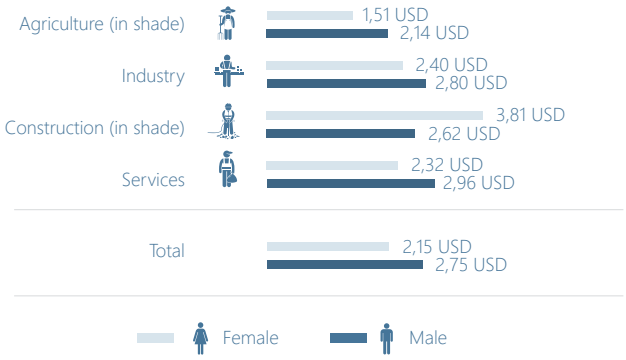
19 days

Annual losses of working hours in agriculture / construction due to heat

Loss of working hours due to heat 1995 vs. 2030 by sector in %



Median hourly earnings of employees by sex and sector in USD (PPP) in 2025

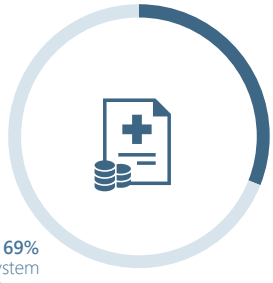


Informal employment rate by sex in 2025

80% Male

83% Female

Out of pocket medical expenditures rate compared to overall health expenditures in 2023



31%
Out-of-pocket medical expenditures

69%
Public health system expenditures

Heat exposure risk

Indonesia is vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039, the majority of the country is at moderate to high risk to humidity-based heat with elevated risk for Java and Sumatra. The number of hot days exceeding 30°C will range between 145 – 194 days (Worldbank 2026d). Already, Indonesia experiences losses at 2.14% across all sectors on per year on average with projections up to 2.97% in 2030 under RCP2.6 scenario (ILO 2019).

Sectors at risk

The agriculture and the construction sector are particularly at risk with losses already at 4% and projected to 7.68%. Women in agriculture make up 36% of total employment in agriculture (ILOSTAT 2026a) with women earning 30% less than men. Men make up 98% of total employment in the construction sector with lower median hourly wage compared to women. Unfortunately, no gender disaggregated data is available for the informality rate per sector in Indonesia. Overall, the informality rate in Indonesia is very high especially among women (83% of women and 80% men).

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in Indonesia, median incomes are low, at 17.20 USD PPP) per day for women and 22 USD (PPP) for men in 2023, based on eight hours of paid work per day. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of future heat exposure, more people could fall below the Indonesia specific poverty line of 8.30 USD income per day as Indonesia is classified as an upper-middle income economy (Worldbank 2025b). Currently, 68.3% of Indonesia's population earns less than 8.30 USD per day with the potential losses in income intensifying the risk of falling behind this line in Indonesia further.

Medical out-of-pocket expenditures

In 2023, medical out-of-pocket expenditure accounted for 31% of total health expenditure in Indonesia, continuing a steady decrease by 31% since 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 129 USD (PPP) in 2023, constituting a significant increase by 207% since 2000 (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), Indonesia's reliance on private out of pocket spending is likely to increase the financial burden of households although the steady decline in per capita spending can be considered a positive development.

Cascading effects

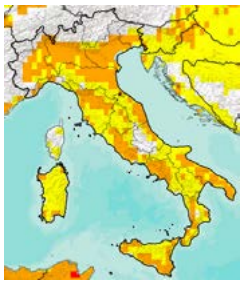
According to the 2024 Lancet Countdown the potential income lost from loss of working hours and productivity due to extreme heat was 21.7 billion USD in 2023 which is equivalent to 1.5% of GDP (Romanello et al. 2024a).

Italy

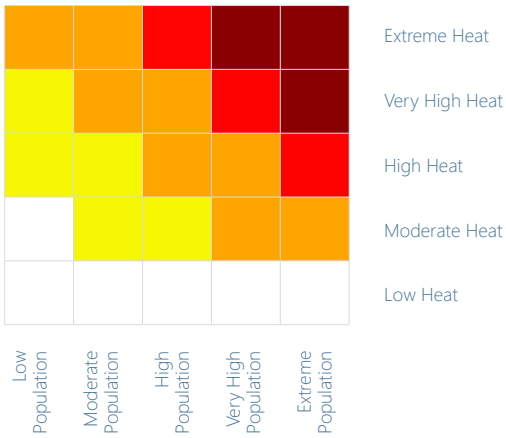
COUNTRY RISK PROFILES

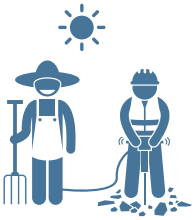
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

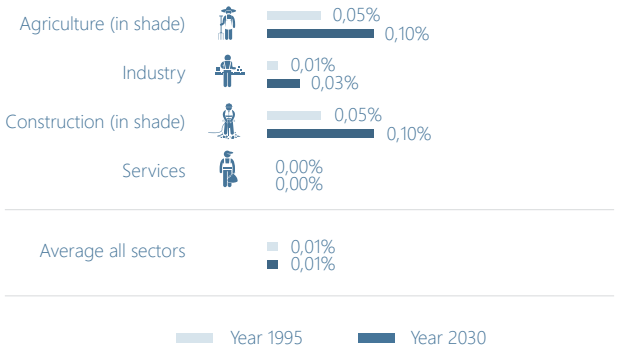




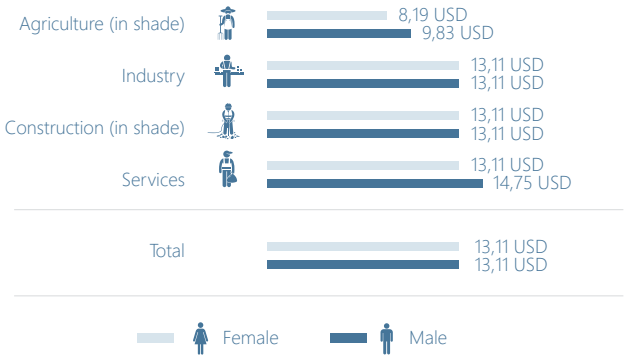
0.25 days

Annual losses of working hours in agriculture / construction due to heat

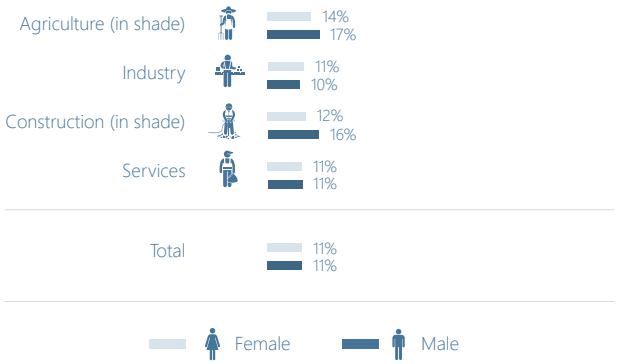
Loss of working hours due to heat 1995 vs. 2030 by sector in %



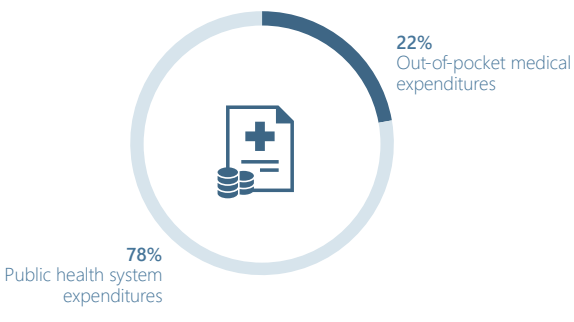
Median hourly earnings of employees by sex and sector in USD (PPP) in 2025



Proportion of informal employment in total employment by sex and sector in % in 2025



Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

Italy is vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039 parts of the country are at moderate risk from humidity-based heat, particularly the Mediterranean coast as well as the Central North. According to the same projections the number of hot days exceeding 30°C will range between 21 – 40 days annually (Worldbank 2026a). Italy is projected to experience losses at 0.01% across all sectors per year on average in 2030 under RCP2.6 scenario (ILO 2019).

Sectors at risk

The agriculture as well as the construction sector are particularly at risk with losses already at 0.05% and projected to 0.1%. The rate of women in agriculture is about one fourth (26%) (ILOSTAT 2026a) with women earning less than men's median hourly wages, while being employed informally less than men (14% for women and 17% for men). Women in construction earn more than men's median hourly earnings while being employed informally less than men (12% for women and 16% for men) with the majority of construction workers being men (91% for men and 9% for women) (ILOSTAT 2026b).

Medical out-of-pocket expenditures

In 2024, medical out-of-pocket expenditure accounted for 22% of total health expenditure in Italy, continuing a light decrease from 26% in 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 1,113 USD (PPP) in 2024, while medical out of pocket spending increased sharply by more than 100% between since 2000 (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), Italy's reliance on private out of pocket spending is likely to increase the financial burden of households.

Increased risk of poverty

The informal sector is employing about 11% of employees among men and women. The agricultural sector together with the construction sector have above average rates of informality posing a greater risk of income losses due to heat. Working in the informal sector is precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). In Italy, seasonal migrant workers in agriculture are among the most vulnerable to heat impacts and related poverty risks. Often the housing is organized by the employer who provides poorly insulated temporary housing units grouped into informal settlements close to the agricultural fields. Due to the dependency on the employer and the informality associated with the employment, the employees are unprotected by labour regulations and dependent on the income. Whenever the working hours are reduced because of health impacts or health impact prevention the risk of losing money is significantly increased, especially during heatwaves with exceptionally high temperatures (Santos 2026). There have been several cases reported in Italy where seasonal migrant workers have been reported dead from heat exhaustion working in agriculture (Issa 2026; Prandi 2024). The families staying behind in the workers' home countries heavily depend on the remittances send to them leaving them extremely vulnerable in the case of a sudden death.

Cascading effects

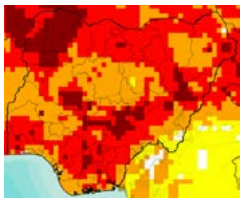
A recent study by Climate Analytics found that the occurrence of a heatwave together with a drought increased the at-risk-of-poverty rate in Europe by about 1.1% between 2004–2022 on average (an additional 5.6 million persons) including Italy (Schleypen et al. 2026). If the current trajectory of a 2.7°C warming by 2100 is kept the income losses across Europe could increase to 27%, mostly fuelled by the increase of energy consumption and energy prices as well as childcare payment to mitigate last-minute school closing and shifting to more expensive transportation means such as cars to avoid train cancellation due to heat.

Nigeria

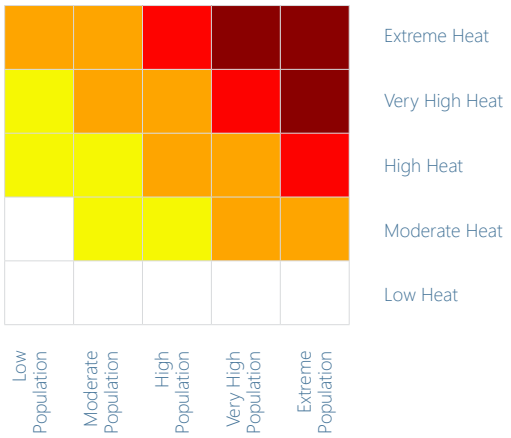
COUNTRY RISK PROFILES

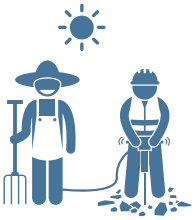
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

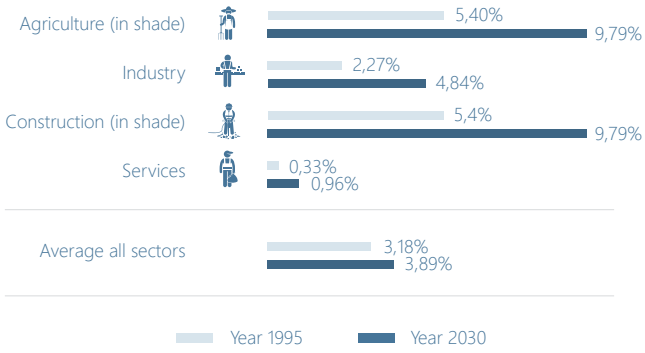




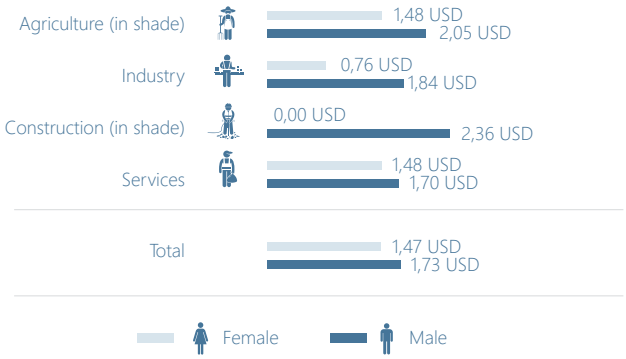
24.25 days

Annual losses of working hours in agriculture / construction due to heat

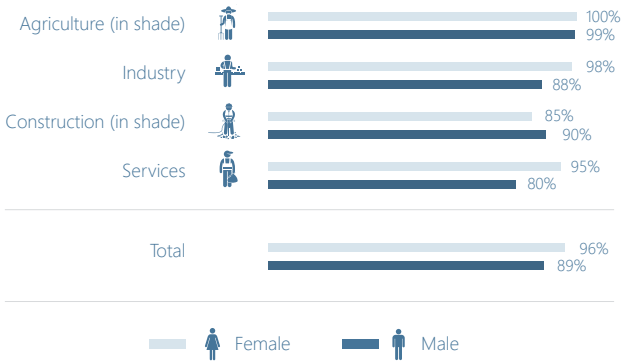
Loss of working hours due to heat 1995 vs. 2030 by sector in %



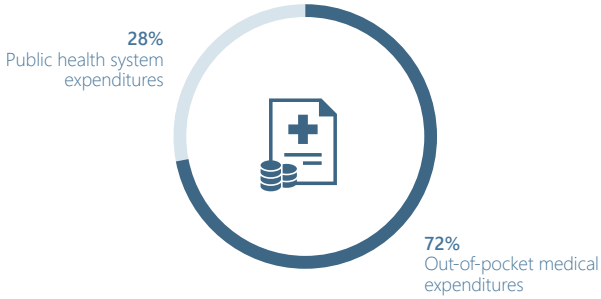
Median hourly earnings of employees by sex and sector in USD (PPP) in 2025



Proportion of informal employment in total employment by sex and sector in % in 2025



Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

Nigeria is extremely vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039 the majority of the country is highly vulnerable to humidity-based heat – especially the North-West, East and Central-South part of the country at high to extreme risk. According to the same projections the number of hot days exceeding 30°C will range between 264 – 207 days annually (Worldbank 2026e). Already, Nigeria experiences losses at 3.18% across all sectors per year on average with projections up to 3.89% in 2030 under RCP2.6 scenario (ILO 2019).

Sectors at risk

The agriculture as well as the construction sector are particularly at risk with losses already at 5.40% and projected to 9.79%. The rate of women in agriculture is slightly lower than men (37%) (ILOSTAT 2026a) with women earning only around two thirds of men's median hourly wages, and being employed informally in most cases (100%). No data exists on the median hourly earnings for women in construction whilst the informality rate is lower in women than in men (85% in women and 90% in men). The overwhelming majority of employees in construction are men (98%) (ILOSTAT 2026b).

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in Nigeria, median daily incomes are low, at 11.76 USD (PPP) per day for women and 13.84 USD (PPP) for men in 2024, based on eight hours of paid work per day. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of future heat exposure, more people could fall below the recently revised poverty line of 3 USD per day with the current share of the population earning less than 3 USD per day at 41.8% in 2022. This is particularly concerning as the distribution of poverty is unequal in Nigeria with North of Nigeria 57.4% and the South 21.2%. With the North having an extreme heat risk and experiencing high levels of poverty the area could fall into a worrisome cycle of poverty leading to less heat protection leading to higher heat risk leading to more poverty (Worldbank 2025c).

Medical out-of-pocket expenditures

In 2023, medical out-of-pocket expenditure accounted for 72% of total health expenditure in Nigeria, continuing an increase by 15% (relative) since 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 187 USD (PPP) in 2023, while medical out of pocket spending increased by around 300% since 2000 (Worldbank 2026g). As heat intensifies in the future and related health expenditures are expected to rise (see section 2), Nigeria's heavy reliance on private out of pocket spending is likely to increase the financial burden on households.

Cascading effects

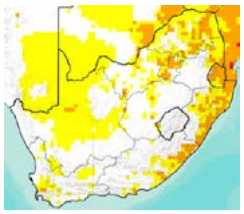
According to the 2024 Lancet Countdown the potential income lost from loss of working hours and productivity due to extreme heat was 15 billion USD in 2024 which is equivalent to 3% of GDP (Romanello et al. 2024b).

South Africa

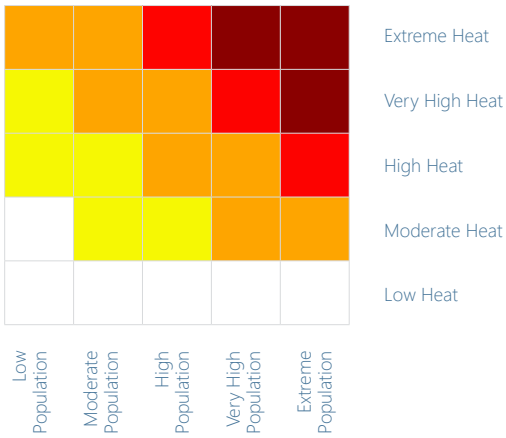
COUNTRY RISK PROFILES

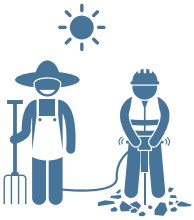
Risk Factor Categorization

2020-2039, SSP1-2.6, Historical Ref. Period: 1995-2014



Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization

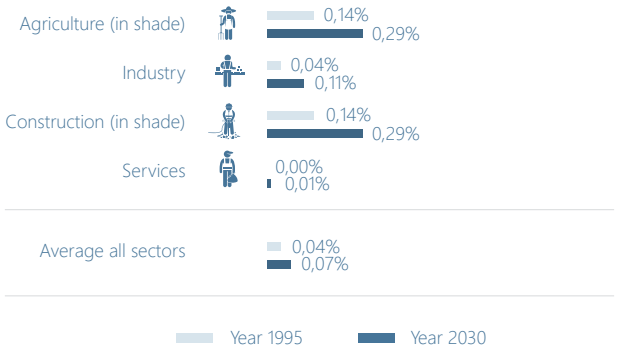




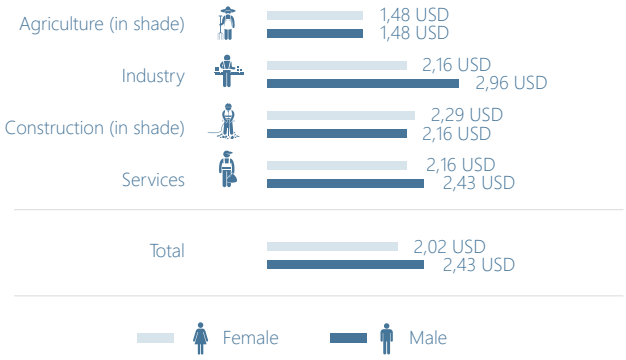
0.7 days

Annual losses of working hours in agriculture / construction due to heat

Loss of working hours due to heat 1995 vs. 2030 by sector in %



Median hourly earnings of employees by sex and sector in USD (PPP) in 2025

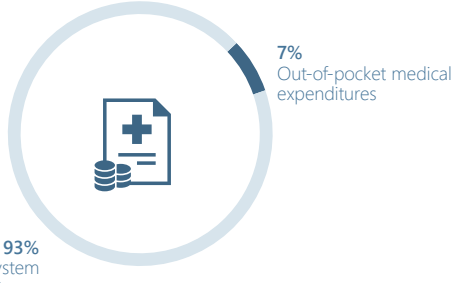


Informal employment rate by sex in 2025

35% Male

35% Female

Out of pocket medical expenditures rate compared to overall health expenditures in 2023



Heat exposure risk

South Africa is partially vulnerable to extreme heat risks. Under SSPI – RCP2.6 scenario for 2020 – 2039 parts of the country are at moderate risk to humidity-based heat, especially the East coast, Northeast of the country, and major cities such as Cape Town, Durban or Johannesburg. The number of hot days exceeding 30°C will range between 77 – 108 days (Worldbank 2026h). Already, South Africa experiences annual losses at 0.04% across all sectors, on average with projections up to 0.07% in 2030 under RCP2.6 scenario (ILO 2019).

Sectors at risk

The agriculture as well as the construction sector are particularly at risk with losses already at 0.14% and projected to 0.29%. Unfortunately, no data is available for employment by sector and sex. However, informality rate is equal among women and men (each 35%) with women earning slightly less in agriculture and men earning slightly less in construction.

Increased risk of poverty

Working in the informal sector is already precarious with limited social protection and labour rights regulation. Additionally, the majority of informal workers earn less than the median income (globally between 54% - 80% of informal workers earn less than the median income (OECD 2024)). Across sectors in South Africa, median incomes are low, at 16.16 USD (PPP) per day for women and 19.44 USD (PPP) for men in 2015 (no recent data available), based on eight hours of paid work per day. If more than half of informal workers already earn below the median and are likely to lose substantial working hours because of future heat exposure, more people could fall below poverty line. As upper-middle income country (classified by World Bank) the poverty line of less than 8.30 USD is applied with 66.2% of the population below that line in 2014 (for 2021 it was projected that this increased to 68.1%). In 2014, 31.2% were below the 3 USD poverty line (Worldbank 2025d).

Medical out-of-pocket expenditures

In 2023, medical out-of-pocket expenditure accounted for 7% of total health expenditure in South Africa, continuing a steady decrease by 50% since 2000 (Worldbank 2026f). Annual per capita medical out-of-pocket expenditure reached 90 USD (PPP) in 2023, with only a minor increase since 2000 (Worldbank 2026g). Since South Africa's health system is not reliant on medical-out of-pocket expenditures the risk of increasing expenditures due to heat posing an extreme burden on the population is limited.

Cascading effects

According to the recent Lancet Countdown the potential income lost from loss of working hours and productivity due to extreme heat was 24 billion USD in 2024 which is equivalent to 0.05% of GDP (Romanello et al. 2024c).

4 Policy responses – international and national

Policy responses tackling the nexus of heat, health and cost of living can come from different international and national directions from labor policies, health policies and climate policies. The most significant current momentum in international action is still in international climate policy. However, a coherent approach needs an integrated governance triangle comprising health, labor and climate policy.

4.1 International labor regulations

The ILO developed a regulatory framework on heat stress at work, requiring all ILO member states to develop national occupational safety and health policies and workplace-level measures regardless of ratification status. In 2025 the WHO in collaboration with WMO issued a technical report outlining concrete actions to reduce workplace heat stress (WHO and WMO 2025). Even though these regulations can apply to the informal sector, no specific regulation targets it. Furthermore, while frameworks prevent heat stress, none target subsequent monetary losses. Addressing this requires considering labor regulations for social protection.

So far, no international regulation targets compensation for heat-induced monetary losses. Instead, international labor standards outline basic social protection for formal and informal sector, applicable to heat stress. For instance, the Social Protection Floors Recommendation, 2012 (No. 202) (ILO 2012) recommends national authorities provide basic income security during sickness. Additionally, the Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204) pushes to include informal workers in social protection (ILO 2015).

4.2 International health policy

International health policy initiatives can mitigate heat-driven cost-of-living pressures on exposed populations by combining financial protection in health systems with stronger links to international climate policy and multilateral climate funds. Medical out-of-pocket expenditures differ across countries, yet all countries analyzed here share a similar pattern: rising shares of total health expenditures or rising per capita spending. The WHO offers guidance to shift responsibility healthcare costs from individuals to the system prioritizing universal healthcare through public funding. This requires universally including heat impacts on health in services covered by public health insurances (which is not the case in every country yet).

Certain measures not yet classified as health intervention could be included, such as installing public cooling centres for the sake of public health or subsidizing the instalment of cooling units in residential buildings for the most vulnerable population. This reduces heat risks at home, leading to cost reductions and increased health due to better sleep and recovery time.

4.3 International climate policy

The UNFCCC framework offers entry points for promoting action on heat related health impacts and social costs: the Global Goal on Adaptation, the Belém Health Action Plan, NDCs, NAPs and Loss and Damage. As a cross-cutting topic, adaptation finance remains a high priorities to ensure better adaptation finance for health (see (Wilkens and Tänzler 2025; Foundation S - The Sanofi Collective et al. 2025).

Global Goal on Adaptation

Established under Article 7 of the Paris Agreement, the Global Goal on Adaptation (GGA) framework agreed upon at COP28 (2023) includes seven thematic targets, including health and four-dimensional targets covering implementation. While the framework sets the direction, measuring progress remains debated. The UAE–Belém work programme developed adaptation indicators, narrowing over 9,500 suggestions to roughly 100. At COP30, Parties adopted 59 Belém Adaptation Indicators. Although a significant milestone, discussions continue ensuring further refinement, expected at COP31 in late 2026.

Health is one of the seven thematic targets in the GGA framework. Key advocated health indicators include reduced heat mortality, healthcare access under climate stress, and early warning systems. While heat-related mortality serves as a strong proxy for adaptation adequacy, civil society and research organizations ask to embed cross-sectoral health considerations, as health impacts arise across food, water, infrastructure, and ecosystem targets.

The Belém Health Action Plan (BHAP) and its Implementation

Historically neglected within the UNFCCC, health gained priority when COP30 launched the BHAP (n Health Day (13 November 2025) in Belém, Brazil), co-led by the Brazilian Ministry of Health and the WHO, endorsed two dozen countries. The Plan is a voluntary, non-binding framework; hence health remains formally outside UNFCCC negotiating tracks. However, three interconnected action lines - guided by health equity, climate justice, and participatory governance- help develop normative power. The BHAP explicitly calls for redirecting adaptation finance towards health systems, given only about 1% of climate finance currently goes to health (UN 2025). Challenges concerning the integration of health into the UNFCCC architecture still remain. The BHAP advocates formally integrating health into UNFCCC adaptation workstreams such as the Global Goal on Adaptation or the NAP process. By promoting heat and health action plans as concrete implementation modalities (following WHO European Office models), the BHAP encourages countries to build resilient, inclusive health systems.

NDC improvements – health, economic and social costs

The current NDC cycle towards the 2028 global stocktake represents a critical window. However, 2025 NDC updates indicate health integration remains limited. The Global Climate and Health Alliance's assessment of 2025 submissions identified significant ambitions gaps alongside good practices (Climate and Health Alliance 2025). The WHO published technical guidance integrating health into NDCs in 2025, covering climate-health impacts. Yet, the nexus of heat, health and cost of living remains unquantified in NDCs.

The NAP process

The UNFCCC NAP process is the primary formal mechanism mainstreaming adaptation into national planning. Updated NAP Technical Guidelines (as of July 2025) explicitly reference the protecting human life, avoiding healthcare costs and preventing heat-related productivity losses as adaptation targets. The NAP process is a key opportunity to integrate health into national climate planning — including dedicated Health NAPs (h-NAPs). However, actual funding of health-related projects under the GCF, AF and LDCF remains low, especially for heat or cost of living related projects (see Wilkens/Tänzler 2025). Currently many NAPs address heat as a sub-category rather than as a chronic systemic risk. This framing crucially affects the resource allocation.

The health dimension of Loss & Damage

Loss and Damage (L&D) is politically contested, but increasingly relevant as irreversible heat-health impacts accumulate. Losses and damages disproportionately affect populations in LDCs and SIDS with the least adaptive capacity. Linking the heat-health burden to climate justice narratives is technically sound and politically resonant within the UNFCCC. The Fund for responding to Loss and Damage (FRLD) committed 250 million USD in grants for its start-up phase (2025–2026) (Source). Health-related losses and damages—including mortality, morbidity, and mental health impacts—need articulation as a fundable category within FRLD implementation modalities. Heat-health action plans and disaster preparedness represent relevant interventions, previously included in WHO inputs to the Warsaw International Mechanism on L&D (Source). Heat-related health impacts (e.g., reduced quality of life, loss of cultural practices tied to outdoor work, mental health burden) fit within the underexplored non-economic loss and damage (NELD) framework. Advancing climate attribution for health outcomes strengthens the evidentiary basis for L&D claims, closing current gaps in understanding.

4.4 Selected good practises in case study countries

Local and national good practises showcase how heat impacts on people can be addressed with a monetary component. The following good practises illustrate potential entry points for response measures comprising dedicated compensation schemes and insurance solutions:

- **Wage supplementation scheme in case of work time reduction**: Since 2016, Italy's "Cassa Integrazione Guadagni Ordinaria" (engl. ordinary wage supplementation scheme) compensates employers if working time reduced due to heat. The threshold is 35°C perceived or actual temperature with 80% of wage being covered by the INPS (Italy's National Social Security Institute) (Biblus 2025; INPS 7/28/2022)
- **Unemployment-weather scheme:** Since 2025, France recognizes heat as a reason for temporary unemployment in the construction sector , entitling workers to monetary compensation for work stoppages (Government France 2025).
- **Parametric heat insurance for informal sector women workers:** From 2023 - 2025 SEWA piloted an initiative in three Indian regions. Women from the informal sector paid an annual premium for payouts when temperatures exceeded 40°C (SEWA 2025)
- **Heat-pregnancy insurance:** Launched in June 2026, the first parametric heat insurance targets pregnant women in the informal sector of India, Thailand and Sierra Leone. It uses lower temperature thresholds than usual parametric heat insurances to reduce exposure and associated risks (HERA 2026).
- **AC rebate incentive:** Through targeted incentives to buy more energy efficient AC unit the environmental effects of AC units are being tackled including lowering the financial burden for households to purchase the AC as well as decreasing electricity usage and therefore decreasing the usage costs. This program is expected to launch in summer 2026 supported by the clintonhealthaccess initiative in collaboration with Tata Power-Delhi Distribution Limited (Clintonhealthaccess 2026).

5 Conclusions and recommendations

Climate change is intensifying heat events, threatening public health, and the associated costs are not only projected to rise significantly from a macroeconomic perspective. There is a serious risk of substantial reductions in living standards across many vulnerable societies — above all because day-to-day working life in key sectors such as agriculture and construction can no longer be managed as it once was. The consequence is massive income losses resulting from the loss of working days, alongside rising costs for individual health expenditure. As the country examples demonstrate, segments of the population in a number of countries where informal labor predominates are at risk of falling below the poverty line.

To address these challenges at the international level, an integrated approach across climate, health, and labor market policy is required. Ideally, this would give rise to a self-reinforcing governance triangle that places the protection of the individual at the heart of a proactive adaptation policy. Compensation for the loss of working time due to heat, as well as insurance solutions that also address gender inequalities, are early examples from the countries examined in this Discussion Brief that could become necessary elements of good practice. In a complementary manner, various processes of international climate policy should be systematically leveraged to protect living standards. This social obligation arises from the role of climate change as a driver, but also from the current dynamics of global, national, and local adaptation policies. Central to this is enabling access to adequate adaptation finance — which has already been identified in recent years as a key challenge and, in light of the globally widespread heat crises, requires additional financial resources as well as clear guidelines on how these can be used efficiently in the service of comprehensive health protection.

As a result, we suggest the prioritisation of the following recommendations:

- **Integrating health into UNFCCC adaptation and loss and damage architecture:** The finalisation of the Global Goal on Adaptation and related indicators serves as a crucial entry point for enabling proactive action on negative heat-related health impacts. In addition, the BHAP needs to be the starting point to further integrate health into UNFCCC architecture with allocated funding as well as concrete actions for countries to develop e.g. heat-health action plans.
- **Moving from adaptation planning to comprehensive health-sensitive action:** The Belém Action Mechanism (BAM) for Just Transition needs to include transition from informality to formality to cover income losses from heat under social protection policies. Health equity metrics and social cost accounting should be established as standard NDC component to fill the gap and raise awareness for countries to act upon the challenges. To enable concrete action the streamlining of the nexus into NAP and HNAP approaches can help to create a impactful basis for enabling funding via international climate finance including GCF, AF and other relevant multilateral climate funds. Finally, losses and damages from heat – health impacts need to be considered as integral part of the framework of L&D mechanisms.
- **Incorporating climate change and health consideration into labor regulations:** As part of the establishment of a self-reinforcing governance triangle of climate-health-labor policies there a strengthened cooperation between the three policy areas is needed. This requires reflecting future projections of heat developments as part of local labor policies or the integration of heat-related social protection including state subsidized parametric insurances. Existing heat protection labor laws should be linked to social protection schemes with not only heat impact prevention in labor regulations but including monetary compensation for occurred losses.
- **Tackling informality and gender based vulnerabilities:** Informality poses a high risk for individual monetary impacts of heat. Further action is needed to support the transition from informal to formal sector employment in affected economies. In addition, gender based vulnerabilities needs to be addressed: Men and women experience different vulnerabilities in the context of heat with men having higher shares in affected sectors and women earning less money, heat impacts on loss of income needs to be included in gender action plans with gender specific action on the transition from the informal to formal sector as well as tackling the gender pay gap shown in median hourly earnings.

- **Improve delivery of and access to funding:** As countries develop their funding pipelines for adaptation and health, international funding mechanisms can play a greater role in improving access to climate and health finance. By clarifying investment priorities and facilitating more direct access to international funds, these mechanisms can encourage and support increased action at the national level, creating, public health systems adapted to the 21st Century and saving lives.
- **Channel funding to country priorities:** As country priorities are further defined and updated (e.g., through NDCs, NAPs and HNAPs), multilateral climate funds can work together to better integrate targeted investment on adaptation and health. As a starting point a priority could be to scale up the already existing grant-based finance that does not exacerbate the debt crisis and undermine the ability of the most impacted countries to invest in health, climate, and economic wellbeing.
- **Intensifying cross-sectoral collaboration:** The nexus of adaptation and health finance needs to be addressed from both sides – the climate side as well as the health side. Intensifying cross-sectoral as well as cross-organisational collaboration could scale up investments as well as deepening the understanding of the interconnectedness and co-benefits of collaboration.
- **GGA indicators:** The proposed list of 100 GGA indicators published recently includes 10 indicators specifically on health appearing to be ambitious. Finalising those indicators and keeping the ambitious pathway at COP30 in November 2025 is key for scaling up adaptation and health finance now and in the near future towards the second Global Stocktake in 2028.
- **Strengthen data availability on heat, health and cost of living nexus:** A strong evidence base is key for targeted policy action. Ensuring the data availability on expected losses for key sectors such as agriculture and construction beyond 2030 for all countries can strengthen the case for evidence-based policy interventions such as targeted social protection schemes for vulnerable groups as well as linking the projections for extreme heat and heatwaves to medical out-of-pocket expenditures. More research is needed on the effects of heat and health on country specific health systems financial capacities and challenges as well as the individual effects of rising health care costs on individuals.

Publication bibliography

Adélaïde, Lucie; Chanel, Olivier; Pascal, Mathilde (2021): Health effects from heat waves in France: an economic evaluation. In *PubMedCentral*. Available online at https://pmc.ncbi.nlm.nih.gov/articles/PMC8310615/.

Allianz research (2026): Too hot to grow: The economic costs of extreme heat. Available online at https://www.allianz.com/en/economic_research/insights/publications/specials_fmo/260528-heat-economics.html.

Amadio, M.; Bosch, L.; Tiwari, S.; Wambile, A. (2022): Present and Future Climate Risk Across Bangladesh. Integrated findings on hazards, exposure, and poverty-driven vulnerability. Worldbank. Available online at https://documents1.worldbank.org/curated/en/099510510202294540/pdf/P17675700ec9e30840bac500ef53a58ea15.pdf.

Bardhan, Mondira; Patwary, Muhammad Mainuddin; Imran, Sardar Al; Billah, Sharif Mutasim; Hasan, Mehedi; Disha, Asma Safia et al. (2024): Estimating economic losses from perceived heat stress in a global south country, Bangladesh. In *Urban Climate* 56, p. 102072. DOI: 10.1016/j.uclim.2024.102072.

Biblus (2025): CIGO: come accedere alla Cassa integrazione per il rischio caldo. Available online at https://biblus.acca.it/decreto-cassa-integrazione-caldo-eccessivo/.

Borg, Matthew A.; Xiang, Jianjun; Anikeeva, Olga; Pisaniello, Dino; Hansen, Alana; Zander, Kerstin et al. (2021): Occupational heat stress and economic burden: A review of global evidence. In *Environmental research* 195. DOI: 10.1016/j.envres.2021.110781.

Bui, Thanh-Huong; Bui, Ha-Phuong; Pham, Thi Mai-Anh (2024): Effects of temperature on job insecurity: Evidence from Australia. In *Economic Analysis and Policy* 82, pp. 264–276. DOI: 10.1016/j.eap.2024.03.011.

Callahan, Christopher W.; Mankin, Justin S. (2022): Globally unequal effect of extreme heat on economic growth. In *Science advances* 8 (43), eadd3726. DOI: 10.1126/sciadv.add3726.

Chrisafis, Angelique (2026): 'It's like a furnace': French struggle with heat-trap homes as climate inequality grows. In *The guardian*, 6/25/2026. Available online at https://www.theguardian.com/world/2026/jun/25/french-heat-trap-homes-climate-inequality-grows.

Cian, Enrica de; Falchetta, Giacomo; Pavanello, Filippo; Romitti, Yasmin; Sue Wing, Ian (2025): The impact of air conditioning on residential electricity consumption across world countries. In *Journal of Environmental Economics and Management* 131, p. 103122. DOI: 10.1016/j.jeem.2025.103122.

Clintonhealthaccess (2026): In New Delhi, rebates target first-time buyers to transform India's AC market at entry point. Available online at https://www.clintonhealthaccess.org/case-study/in-new-delhi-rebates-target-first-time-buyers-to-transform-indias-ac-market-at-entry-point/.

Dantas, Leydson Galvíncio; Oliveira, Beatriz Fátima Alves de; Cremonese, Cleber; Bitencourt, Daniel Pires; Da Silveira, Ismael Henrique (2025): Projected productivity losses and economic costs due to heat stress under climate change scenarios in Brazil. In *Scientific reports* 15 (1), p. 39775. DOI: 10.1038/s41598-025-23487-w.

Das, Nandini (2026): South Asia's heatwave and ongoing energy crisis. Available online at https://climateanalytics.org/comment/south-asias-heatwave-and-ongoing-energy-crisis.

Euronews (2026): To use air con or not? The facts behind the politicised battle to stay cool in Europe, 6/26/2026. Available online at https://www.euronews.com/my-europe/2026/06/26/to-use-air-con-or-not-the-facts-behind-the-politicised-battle-to-stay-cool-in-europe.

Foundation S - The Sanofi Collective; Reaching the Last Mile; The Rockefeller Foundation; SEEK Development; adelphi consult; AfriCatalyst (2025): Resourcing Climate and Health Priorities. Mapping of International Finance Flows, 2018-2022. Available online at https://www.rockefellerfoundation.org/wp-content/uploads/2025/01/Resourcing-Climate-and-Health-Priorities-Full-Report-Final.pdf.

Government France 2025: Décret n° 2025-482 du 27 mai 2025 relatif à la protection des travailleurs contre les risques liés à la chaleur. Available online at https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000051676074?__cf_chl_f_tk=1OhS3DBWbbuDAGFKiRR874o_Hki83gMOHsN5WeOVDfs-1783424620-1.0.1.1-6J8gmzbBSL71Dto8jfn85WN4psfkFqMYGR94zBriFIA.

Habhoub, Hamza (2026): 'I don't have a choice': Paris workers struggle under historic heatwave. In *France24*, 6/24/2026. Available online at https://www.france24.com/en/france/20260624-i-don-t-have-a-choice-paris-workers-struggle-under-historic-heatwave, checked on 7/7/2026.

HERA (2026): HERA launches the world's first heat-pregnancy insurance to protect expectant mothers from extreme heat. Available online at https://heranow.org/hera-launches-the-worlds-first-heat-pregnancy-insurance-to-protect-expectant-mothers-from-extreme-heat/.

an Hodgson (2022): Cost-of-Living Crisis: How Does It Impact Companies and Consumers?

Horn-Muller, A. (2024): Workers farm at night to avoid intense heat – but it can lead to other negative effects. In *The guardian*, 12/11/2024. Available online at https://www.theguardian.com/environment/2024/dec/11/farm-workers-night-heat?CMP=share_btn_url.

ILO (2012): Social Protection Floors Recommendation, 2012 (No. 202). Available online at https://normlex.ilo.org/dyn/nrmlx_en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:3065524.

ILO (2015): Transition from the Informal to the Formal Economy Recommendation, 2015 (No. 204). Workers' Guide. Available online at https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_dialogue/@actrav/documents/publication/wcms_545928.pdf.

ILO (2019): Working on a warmer planet. The impact of heat stress on labour productivity and decent work. Geneva. Available online at https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40dgreports/%40dcomm/%40publ/documents/publication/wcms_711919.pdf.

ILO (2024): Heat at work: Implications for safety and health. Geneva. Available online at https://www.ilo.org/sites/default/files/2024-07/ILO_OSH_Heatstress-R16.pdf.

ILOSTAT (2026a): Agriculture - Employment by ILO sector and sex (thousands) - Annual. Available online at https://rshiny.ilo.org/dataexplorer84/?lang=en&segment=indicator&id=EMP_TEMP_SEX_IND_NB_A&classif1=IND_SECTOR_TOTAL+IND_SECTOR_AGRICULTURE&channel=ilostat, updated on 6/11/2026.

ILOSTAT (2026b): Construction - Employment by ILO sector and sex (thousands) - Annual. Available online at https://rshiny.ilo.org/dataexplorer58/?lang=en&segment=indicator&id=EMP_TEMP_SEX_IND_NB_A&classif1=IND_SECTOR_TOTAL+IND_SECTOR_CONSTRUCTION&channel=ilostat, updated on 6/11/2026.

ILOSTAT (2026c): Informal employment rate by sex in % - Annual. Available online at https://rshiny.ilo.org/dataexplorer71/?lang=en&segment=indicator&id=EMP_NIFL_SEX_RT_A&channel=ilostat.

ILOSTAT (2026d): Median hourly earnings of employees by sex and economic activity (local currency) -- Annual. Available online at https://rshiny.ilo.org/dataexplorer05/?lang=en&segment=indicator&id=EAR_EHRM_SEX_ECO_NB_A&channel=ilostat, checked on 6/1/2026.

ILOSTAT (2026e): Proportion of informal employment in total employment by sex and economic activity. Available online at

https://rshiny.ilo.org/dataexplorer93/?lang=en&segment=indicator&id=SDG_B831_SEX_ECO_RT_A&channel=ilostat, checked on 6/1/2026.

INPS (7/28/2022): Domande di CIGO con causale “eventi meteo” - Temperature elevate. Istruzioni operative. Available online at https://olympus.uniurb.it/index.php?option=com_content&view=article&id=28519%3Ainps2999_22&catid=6&Itemid=137.

Issa, Ouardani (2026): Moroccan farm worker dies in Italy amid extreme heat. In *Yabiladi*, 7/1/2026. Available online at https://en.yabiladi.com/articles/details/197798/moroccan-farm-worker-dies-italy.html.

Kapoor, Cheena (2024): ‘Heat Poverty’: A Growing Threat in India. Edited by John Hopkins Bloomberg School of Public Health. Available online at https://globalhealthnow.org/2024-07/heat-poverty-growing-threat-india, checked on 5/27/2026.

Khosla, Radhika (2025): The role of cooling standards in adaptation to extreme heat. Available online at https://thedocs.worldbank.org/en/doc/8dccee9af27ee9024d6b13251016de8b-0050062025/original/Radhika-Khosla-Climate-adaptation-cooling.pdf.

Kimmich, Christian; Weyerstraß, Klaus; Czypionka, Thomas; Fauster, Norman FRM; Kinner, Maurice; Laa, Elisabeth et al. (2025): Economic impact of labor productivity losses induced by heat stress: an agent-based macroeconomic approach. In *Climatic Change* 178 (3). DOI: 10.1007/s10584-025-03879-7.

Kong, Qinqin; Huber, Matthew (2025): A global high-resolution and bias-corrected dataset of CMIP6 projected heat stress metrics. In *Scientific data* 12 (1), p. 246. DOI: 10.1038/s41597-025-04527-6.

Kotz, Maximilian; Kuik, Friderike; Lis, Eliza; Nickel, Christiane (2024): Global warming and heat extremes to enhance inflationary pressures. In *Commun Earth Environ* 5 (1). DOI: 10.1038/s43247-023-01173-x.

La Hamaide, Sybille de; Olive, Noemie; Trompiz, Gus: Heatwave kills hundreds of thousands of poultry in France. In *Reuters*. Available online at https://www.reuters.com/business/environment/record-heat-causes-mass-poultry-deaths-france-2026-06-24/.

Lee, Hoesung; Calvin, Katherine; Dasgupta, Dipak; Krinner, Gerhard; Mukherji, Aditi; Thorne, Peter W. et al. (2023): IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.

Li, Xue; Smyth, Russell; Yao, Yao (2023): Extreme temperatures and out-of-pocket medical expenditure: Evidence from China. In *China Economic Review* 77, p. 101894. DOI: 10.1016/j.chieco.2022.101894.

March, Hug; Meehan, Katie; Domene, Elena; Satorras, Mar; Saurí, David (2026): Why water security matters to cities under extreme heat in the Global North. In *npj urban sustainability* 6 (1), p. 15. DOI: 10.1038/s42949-025-00317-6.

Nelson, Gerald C.; Vanos, Jennifer; Havenith, George; Jay, Ollie; Ebi, Kristie L.; Hijmans, Robert J. (2024): Global reductions in manual agricultural work capacity due to climate change. In *Global change biology* 30 (1), e17142. DOI: 10.1111/gcb.17142.

OECD (2024): Breaking the Vicious Circles of Informal Employment and Low-Paying Work.

Osberghaus, Daniel; Abeling, Thomas (2022): Heat vulnerability and adaptation of low-income households in Germany. In *Global Environmental Change* 72, p. 102446. DOI: 10.1016/j.gloenvcha.2021.102446.

Prandi, Stefania (2024): ‘Working here is hell’: latest death of farm worker in 40C heat shocks Italy. In *The guardian*, 8/27/2024. Available online at https://www.theguardian.com/global-development/article/2024/aug/27/indian-migrant-worker-death-heat-stress-italy.

Romanello, M.; Walawender, M.; Hsu, SC. et al. (2024a): Indonesia. Lancet Countdown on Health and Climate Change Data Sheet 2024.

Romanello, M.; Walawender, M.; Hsu, SC. et al. (2024b): Nigeria. Lancet Countdown on Health and Climate Change Data Sheet 2024. Available online at https://lancetcountdown.org/wp-content/uploads/2024/10/Lancet-Countdown-2024_NIGERIA.pdf.

Romanello, M.; Walawender, M.; Hsu, SC. et al. (2024c): South Africa. Lancet Countdown on Health and Climate Change Data Sheet 2024. Available online at https://lancetcountdown.org/wp-content/uploads/2024/10/Lancet-Countdown-2024_SOUTH-AFRICA.pdf.

Romanello, Marina; Walawender, Maria; Hsu, Shih-Che; Moskeland, Annalyse; Palmeiro-Silva, Yasna; Scamman, Daniel et al. (2025a): Bangladesh. Lancet Countdown on Health and Climate Change Data Sheet 2025. In *Lancet (London, England)* 406 (10521), pp. 2804–2857. Available online at https://lancetcountdown.org/wp-content/uploads/2025/10/Bangladesh_Lancet-Countdown_2025_Data-Sheet-1.pdf.

Romanello, Marina; Walawender, Maria; Hsu, Shih-Che; Moskeland, Annalyse; Palmeiro-Silva, Yasna; Scamman, Daniel et al. (2025b): Brazil. Lancet Countdown on Health and Climate Change Data Sheet 2025. In *Lancet (London, England)*. Available online at https://lancetcountdown.org/wp-content/uploads/2025/10/Brazil_Lancet-Countdown_2025_Data-Sheet-1.pdf.

Romanello, Marina; Walawender, Maria; Hsu, Shih-Che; Moskeland, Annalyse; Palmeiro-Silva, Yasna; Scamman, Daniel et al. (2025c): France. Lancet Countdown on Health and Climate Change Data Sheet 2024. Available online at https://lancetcountdown.org/wp-content/uploads/2025/10/France_Lancet-Countdown_2025_Data-Sheet.pdf.

Romanello, Marina; Walawender, Maria; Hsu, Shih-Che; Moskeland, Annalyse; Palmeiro-Silva, Yasna; Scamman, Daniel et al. (2025d): India. Lancet Countdown on Health and Climate Change Data Sheet 2025. Available online at https://lancetcountdown.org/wp-content/uploads/2025/10/India_Lancet-Countdown_2025_Data-Sheet-2.pdf.

Romanello, Marina; Walawender, Maria; Hsu, Shih-Che; Moskeland, Annalyse; Palmeiro-Silva, Yasna; Scamman, Daniel et al. (2025e): The 2025 report of the Lancet Countdown on health and climate change: climate change action offers a lifeline. In *Lancet (London, England)* 406 (10521), pp. 2804–2857. DOI: 10.1016/S0140-6736(25)01919-1.

Santos, Ana (2026): Nowhere to cool down: Farm workers in Italy find little respite from heatwave, 6/29/2026. Available online at https://www.infomigrants.net/en/post/72122/nowhere-to-cool-down-farm-workers-in-italy-find-little-respite-from-heatwave.

Schleypen, Jessie Ruth; Saeed, Fahad; Zimmer, Anne; Brück, Tilman (2026): Compound dry-and-hot extremes exacerbate income inequality and poverty in Europe. In *Global Environmental Change* 97, p. 103106. DOI: 10.1016/j.gloenvcha.2025.103106.

SEWA (2025): Parametric Heat and Rainfall Insurance for Informal Women Workers. Documenting VimoSEWA's climate insurance prototype in Ahmedabad and surrounding districts. Available online at https://www.sewainsurance.org/wp-content/uploads/2025/12/Parametric-Heat-and-Rainfall-Insurance-for-Informal-Women-Workers.pdf.

Shukla, Prateek (2026): Heatwave May Melt 4% Of GDP, Raise Medical Bills, Dent Productivity. Extreme heat has already accounted for around $159 billion in lost productivity, roughly 5.4 per cent of India's income. In *NDTV*, 4/24/2026. Available online at https://www.ndtv.com/india-news/heatwave-may-melt-4-of-gdp-raise-medical-bills-dent-productivity-india-imd-heat-warning-11401334.

Subran, Ludovic; Gröschl, Jasmin; Zimmer, Markus (2023): Global boiling: Heatwave may have cost 0.6pp of GDP. Allianz. Available online at https://www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/economic-research/publications/specials/en/2023/august/heatwaves/2023_08_04_Heatwaves_EconImplications.pdf.

TONG, Michael Xiaoliang; WONDMAGEGN, Berhanu Yazew; WILLIAMS, Susan; Hansen, Alana; Dear, Keith; Pisaniello, Dino et al. (2021): Hospital healthcare costs attributable to heat and future estimations in the context of climate change in Perth, Western Australia. In *Advances in Climate Change Research* 12 (5), pp. 638–648. DOI: 10.1016/j.accre.2021.07.008.

Turek-Hankins, Lynée L.; Coughlan de Perez, Erin; Scarpa, Giulia; Ruiz-Diaz, Raquel; Schwerdtle, Patricia Nayna; Joe, Elphin Tom et al. (2021): Climate change adaptation to extreme heat: a global systematic review of implemented action. In *Oxford Open Climate Change* 1 (1), Article kgab005. DOI: 10.1093/oxfclm/kgab005.

UN (2025): Fast facts on climate and health. Available online at https://www.un.org/sites/un2.un.org/files/health_fastfacts-2025.pdf.

UN Women (2020): GENDER,CLIMATE & SECURITY. Sustaining inclusive peace on the frontlines of climate change. Available online at https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/Library/Publications/2020/Gender-climate-and-security-en.pdf.

UNEP (2023): Keeping Cool in an Increasingly Hotter World: UNEP Spotlight. United Nations Environment Programme. Available online at https://doi.org/10.59117/20.500.11822/44243.

WHO (1969): Health factors involved in working under conditions of heat stress. Report of a WHO scientific group. Technical report series 412. Available online at https://iris.who.int/server/api/core/bitstreams/2c4a1278-edc3-4076-8646-458066bf5d16/content.

WHO (2026): Heat and health. Available online at https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health.

WHO; WMO (2025): Climate change and workplace heat stress. Technical report and guidance. Available online at https://iris.who.int/server/api/core/bitstreams/5334aba1-063d-4163-94ae-a1154bb48e83/content.

Wilkens, Mathilde; Tänzler, Dennis (2025): The nexus of adaptation and health finance. Mapping multilateral climate funds' investments and national needs. Edited by adelphi research gGmbH. Available online at https://adelphi.de/system/files/document/adelphi-research-2025_briefing-2025-the-nexus-of-adaptation-and-health-finance_final_v2.pdf.

WMO (6/29/2026): Record-breaking heat spreads through Europe. Available online at https://wmo.int/media/news/record-breaking-heat-spreads-through-europe.

Worldbank (2024): An Unsustainable Life: The Impact of Heat on Health and the Economy of Bangladesh. Available online at https://openknowledge.worldbank.org/server/api/core/bitstreams/23816c65-706c-42ab-89ee-d2a8df05f5eb/content.

Worldbank (2025a): Poverty & Equity Brief Bangladesh. Available online at https://documents1.worldbank.org/curated/en/099408104212512419/pdf/IDU-c56b9657-74d2-45ab-ba59-3dd8d12ff803.pdf.

Worldbank (2025b): Poverty & Equity Brief Brazil. Available online at https://documents1.worldbank.org/curated/en/099516404212531759/pdf/IDU-219d2fbb-9fdf-4efb-8504-5addb6c841fd.pdf.

Worldbank (2025c): Poverty & Equity Brief India. Available online at https://documents1.worldbank.org/curated/en/099722104222534584/pdf/IDU-25f34333-d3a3-44ae-8268-86830e3bc5a5.pdf.

Worldbank (2025d): Poverty & Equity Brief Indonesia. Available online at https://documents1.worldbank.org/curated/en/099638104212531827/pdf/IDU-ce8e75a0-8938-429b-9d85-765d7d9bd950.pdf.

Worldbank (2025e): Poverty & Equity Brief Nigeria. Available online at https://documents1.worldbank.org/curated/en/099253204222517873/pdf/IDU-3e010784-3371-4dcb-b923-112e98052ed9.pdf.

Worldbank (2025f): Poverty & Equity Brief South Africa. Available online at https://documents1.worldbank.org/curated/en/099542004222542658/pdf/IDU-04a1d9dd-2c1b-4a98-966b-167694c0f255.pdf.

Worldbank (2026a): Bangladesh - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/bangladesh/heat-risk.

Worldbank (2026b): Brazil - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/brazil/heat-risk, checked on 6/24/2026.

Worldbank (2026c): India - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/india/heat-risk.

Worldbank (2026d): Indonesia - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/indonesia/heat-risk.

Worldbank (2026e): Nigeria - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/nigeria/heat-risk.

Worldbank (2026f): Out-of-pocket expenditure (% of current health expenditure). Available online at https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS, checked on 5/27/2026.

Worldbank (2026g): Out-of-pocket expenditure per capita, PPP (current international $). Available online at https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS.

Worldbank (2026h): Projected Categorization of Annual Temperature and Humidity-Based Heat + Population Risk Categorization. Available online at https://climateknowledgeportal.worldbank.org/explore#country.

Worldbank (2026i): South Africa - Compounded Heat Risks. Available online at https://climateknowledgeportal.worldbank.org/country/south-africa/heat-risk.

WRI (2019): Unaffordable and Undrinkable. Rethinking Urban Water Access in the Global South. Available online at https://wri.org.cn/sites/default/files/2022-08/unaffordable-and-undrinkable_0.pdf.

Wyman, Oliver (2024): Quantifying the Impact of Climate Change on Human Health. Insight Report. World Economic Forum. Available online at https://www3.weforum.org/docs/WEF_Quantifying_the_Impact_of_Climate_Change_on_Human_Health_2024.pdf.

Zami, MD. Tahmid (2026): Garment workers face heat risks in Bangladesh as energy cuts curb cooling, 5/21/2026. Available online at https://www.japantimes.co.jp/environment/2026/05/21/climate-change/heat-bangladesh-garment-workers/.