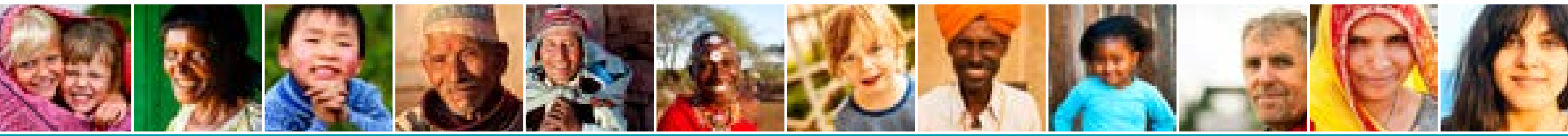
CLIMATE AND HEALTH COUNTRY PROFILE – 2015

# SRI LANKA

World Health Organization

United Nations Framework Convention on Climate Change



## OVERVIEW

The Democratic Socialist Republic of Sri Lanka is an island country in South Asia. A lower-middle income country, Sri Lanka has managed to reduce poverty and rapidly grow the economy in recent years [World Bank Country Overview, 2016]. The island has a mountainous south-central area, bordered by a large coastal plain, with a largely tropical and warm climate.

Climate change and variability in Sri Lanka may lead to higher temperatures, storm surges and increased rainfall variability. These in turn may impact agriculture and food security, water resources and human health. Increasing temperatures could encourage spread of vector-borne diseases such as malaria and dengue fever. Polluted surface water, secondary to floods and extreme weather events, increases the risk of vector borne, rodent borne, food and water borne diseases [Sri Lanka Second National Communication to UNFCCC, 2011]. Extreme weather events and sea level rise may lead to coastal erosion and loss of land, threaten livelihoods and economic activities, and force migration.

Sri Lanka's contribution to global emissions is low, less than 0.1% of global greenhouse gas emissions [Sri Lanka INDC, 2015]. In 2011, the country launched a National Climate Change Adaptation Strategy,[a] which includes 'Enabling Climate Resilient and Healthy Human Settlements' as one of five key strategic components, and encompasses urban planning, public health, drinking water, waste management and pollution control.[a] Sri Lanka aims to conditionally reduce emissions by up to 23% by 2030 [INDC].

## SUMMARY OF KEY FINDINGS

- In Sri Lanka, under a high emissions scenario, mean annual temperature is projected to rise by about 3.7°C on average from 1990 to 2100. If global emissions decrease rapidly, the temperature rise is limited to about 1.1°C [page 2].
- In Sri Lanka, under a high emissions scenario, and without large investments in adaptation, an annual average of about 65,600 people are projected to be affected by flooding due to sea level rise between 2070 and 2100. If global emissions decrease rapidly and there is a major scale up in protection the annual affected population could be limited to less than 100 people [page 3].
- The risk of vector-borne diseases such as malaria and dengue fever in Sri Lanka will increase towards 2070 under both high and low emissions scenarios [page 3].
- In Sri Lanka, under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to about 22 deaths per 100,000 by 2080 compared to the estimated baseline of under 1 death per 100,000 annually between 1961 and 1990 [page 4].

## OPPORTUNITIES FOR ACTION

Sri Lanka is about to launch the National Adaptation Plan on climate change 2015–2024 which incorporates health sector adaptation. Sri Lanka is currently implementing projects on health adaptation to climate change. Additionally, action is being taken to build institutional and technical capacities to work on climate change and health and the costs to implement health resilience to climate change have been partially estimated and included in planned allocations. Country reported data (see section 6) indicate there remains opportunities for action in the following areas:

### 1) Adaptation

- Conduct a new vulnerability and adaptation assessment in the health sector to identify current needs (previous assessment was undertaken some time ago).
- Develop an integrated disease surveillance and response system which includes climate information.
- Implement activities to increase climate resilience in the health sector.

2) Mitigation

- Conduct a valuation of the health co-benefits of climate change mitigation policies.

| | |
|---|---|
| **DEMOGRAPHIC ESTIMATES** | |
| Population (2013)[b] | 20.52 million |
| Population growth rate (2013)[b] | 0.5 % |
| Population living in urban areas (2013)[c] | 18.3 % |
| Population under five (2013)[b] | 8.3 % |
| Population aged 65 or over (2013)[b] | 8.5 % |
| **ECONOMIC AND DEVELOPMENT INDICATORS** | |
| GDP per capita (current US$, 2013)[d] | 3611 USD |
| Total expenditure on health as % of GDP (2013)[e] | 3.2 % |
| Percentage share of income for lowest 20% of population (2010)[d] | NA |
| HDI (2013, +/- 0.01 change from 2005 is indicated with arrow)[f] | 0.750 ▲ |
| **HEALTH ESTIMATES** | |
| Life expectancy at birth (2013)[g] | 75 years |
| Under-5 mortality per 1000 live births (2013)[h] | 10 |

a Sri Lanka National Climate Change Adaptation Strategy (2011-2016) http://www.climatechange.lk/adaptation/Files/Strategy_Booklet-Final_for_Print_Low_res(1).pdf
b World Population Prospects: The 2015 Revision, UNDESA (2015)
c World Urbanization Prospects: The 2014 Revision, UNDESA (2014)
d World Development Indicators, World Bank (2015)
e Global Health Expenditure Database, WHO (2014)
f United Nations Development Programme, Human Development Reports (2014)
g Global Health Observatory, WHO (2014)
h Levels & Trends in Child Mortality Report 2015, UN Inter-agency Group for Child Mortality Estimation (2015)

# 1 CURRENT AND FUTURE CLIMATE HAZARDS

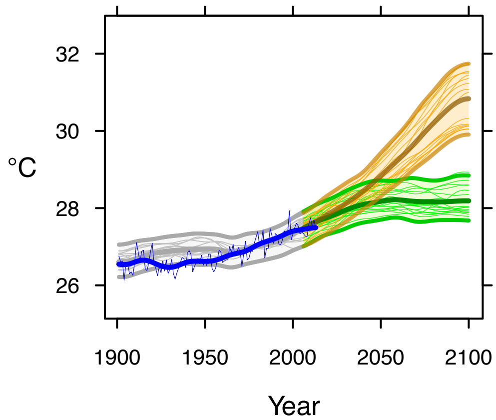
Due to climate change, many climate hazards and extreme weather events, such as heat waves, heavy rainfall and droughts, could become more frequent and more intense in many parts of the world.

Outlined here are country–specific projections up to the year 2100 for climate hazards under a 'business as usual' high emissions scenario compared to projections under a 'two-degree' scenario with rapidly decreasing global emissions. Most hazards caused by climate change will persist for many centuries.

## COUNTRY-SPECIFIC CLIMATE HAZARD PROJECTIONS

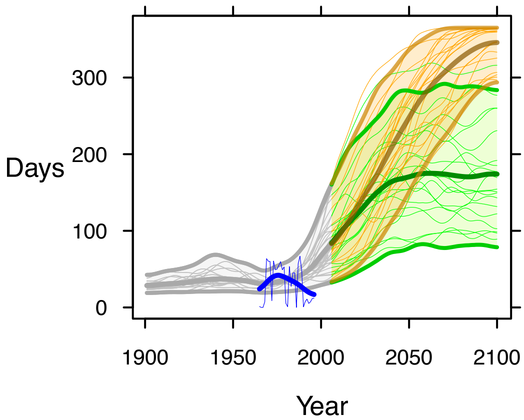
The model projections below present climate hazards under a high emissions scenario, Representative Concentration Pathway 8.5 [RCP8.5] (in orange) and a low emissions scenario, [RCP2.6] (in green).[a] The text boxes describe the projected changes averaged across about 20 models (thick line). The figures also show each model individually as well as the 90% model range (shaded) as a measure of uncertainty and, where available, the annual and smoothed observed record (in blue).[b,c]

### MEAN ANNUAL TEMPERATURE



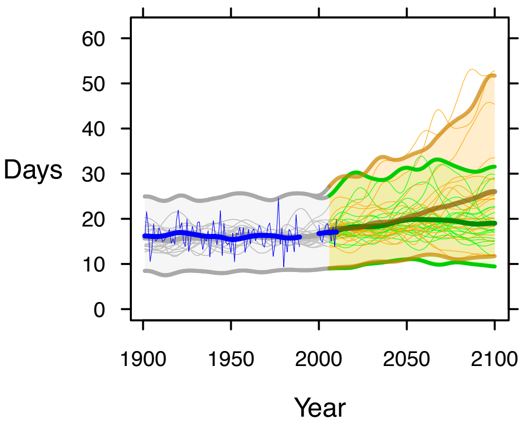

Under a high emissions scenario, mean annual temperature is projected to rise by about 3.7°C on average from 1990 to 2100. If emissions decrease rapidly, the temperature rise is limited to about 1.1°C.

### DAYS OF WARM SPELL ('HEAT WAVES')



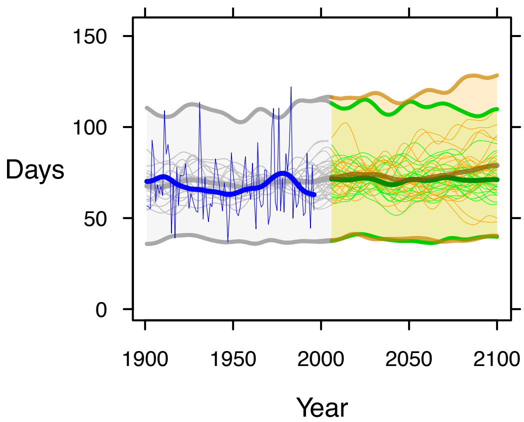

Under a high emissions scenario, the number of days of warm spell[d] is projected to increase from about 25 days in 1990 to about 350 days on average in 2100. If emissions decrease rapidly, the days of warm spell are limited to about 175 on average.

### DAYS WITH EXTREME RAINFALL ('FLOOD RISK')




Under a high emissions scenario, the number of days with very heavy precipitation (20 mm or more) could increase by about 10 days on average from 1990 to 2100, increasing the risk of floods. Some models indicate increases outside the range of historical variability, implying even greater risk. If emissions decrease rapidly, the risk is much reduced.

### CONSECUTIVE DRY DAYS ('DROUGHT')




Under a high emissions scenario, the longest dry spell is indicated to increase by about 9 days on average, from about 70 days on average in 1990, with continuing large year-to-year variability. If emissions decrease rapidly, the increase is limited to about 1 day on average.

a Model projections are from CMIP5 for RCP8.5 (high emissions) and RCP2.6 (low emissions). Model anomalies are added to the historical mean and smoothed.
b Observed historical record of mean temperature is from CRU-TSv.3.22; observed historical records of extremes are from HadEX2.
c Analysis by the Climatic Research Unit and Tyndall Centre for Climate Change Research, University of East Anglia, 2015.
d A 'warm spell' day is a day when maximum temperature, together with that of at least the 6 consecutive previous days, exceeds the 90th percentile threshold for that time of the year.

# 2 CURRENT AND FUTURE HEALTH RISKS DUE TO CLIMATE CHANGE

Human health is profoundly affected by weather and climate. Climate change threatens to exacerbate today's health problems – deaths from extreme weather events, cardiovascular and respiratory diseases, infectious diseases and malnutrition – whilst undermining water and food supplies, infrastructure, health systems and social protection systems.

## EXPOSURE TO FLOODING DUE TO SEA LEVEL RISE

Severity of climate change scenario

| | Without Adaptation | With Adaptation |
|---|---|---|
| RCP2.6 | 15,300 | <100 |
| RCP8.5 | 65,600 | 100 |

* Medium ice melting scenario ** Values rounded to nearest '00

In Sri Lanka, under a high emissions scenario, and without large investments in adaptation, an annual average of about 65,600 people are projected to be affected by flooding due to sea level rise between 2070 and 2100. If global emissions decrease rapidly and there is a major scale up in protection (i.e. continued construction/raising of dikes) the annual affected population could be limited to less than 100 people. Adaptation alone will not offer sufficient protection, as sea level rise is a long-term process, with high emissions scenarios bringing increasing impacts well beyond the end of the century.

Source: Human dynamics of climate change, technical report, Met Office, HM Government, UK, 2014.

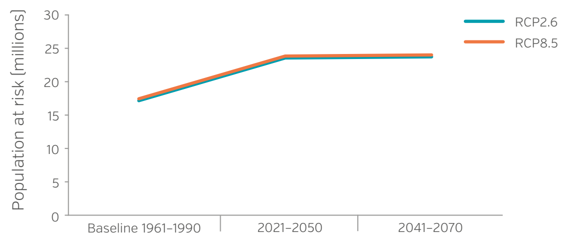
### KEY IMPLICATIONS FOR HEALTH

Sri Lanka also faces inland river flood risk. It is projected, that by 2030, an additional 25,700 people may be at risk of river floods annually as a result of climate change and 19,300 due to socio-economic change above the estimated 59,000 annually affected population in 2010.[a]

In addition to deaths from drowning, flooding causes extensive indirect health effects, including impacts on food production, water provision, ecosystem disruption, infectious disease outbreak and vector distribution. Longer term effects of flooding may include post-traumatic stress and population displacement.

## INFECTIOUS AND VECTOR-BORNE DISEASES

**Population at risk of malaria in Sri Lanka (in millions)**




Towards 2070, under both high and low emissions scenarios, the population at risk of malaria is projected to increase to about 24 million. Population growth can also cause increases in the population at-risk in areas where malaria presence is static in the future.

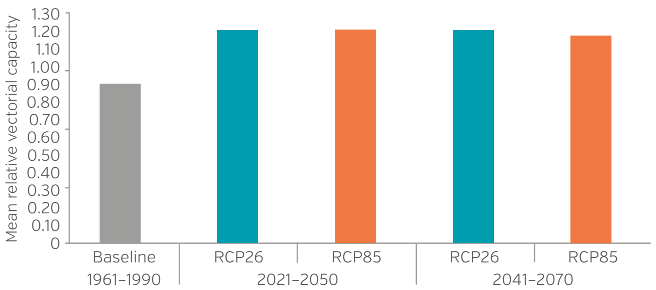
Source: Rocklöv, J., Quam, M. et al. 2015.[d]

### KEY IMPLICATIONS FOR HEALTH

Some of the worlds most virulent infections are also highly sensitive to climate: temperature , precipitation and humidity have a strong influence on the life-cycles of the vectors and the infectious agents they carry and influence the transmission of water and food-borne diseases.[b]

Socioeconomic development and health interventions are driving down burdens of several infectious diseases, and these projections assume that this will continue. However, climate conditions are projected to become significantly more favourable for transmission, slowing progress in reducing burdens, and increasing the populations at risk if control measures are not maintained or strengthened.[c]

**Mean relative vectorial capacity for dengue fever transmission in Sri Lanka**



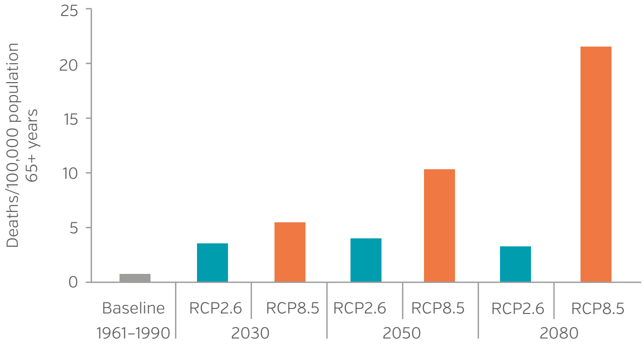

The mean relative vectorial capacity for dengue fever transmission is projected to increase towards 2070 under both a high and low emissions scenario.

Source: Rocklöv, J., Quam, M. et al., 2015.[d]

a World Resources Institute, http://www.wri.org. Aqueduct Global Flood Analyzer. Assumes continued current socioeconomic trends (SSP2) and a 25-year flood protection.
b Atlas of Health and Climate, World Health Organization and World Meteorological Organization, 2012.
c Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014.
d Country-level analysis, completed in 2015, was based on health models outlined in the Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014. The mean of impact estimates for three global climate models are presented. Models assume continued socioeconomic trends (SSP2 or comparable).

## HEAT-RELATED MORTALITY

**Heat-related mortality in population 65 years or over, Sri Lanka (deaths / 100,000 population 65+ yrs)**




Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to about 22 deaths per 100,000 by 2080 compared to the estimated baseline of under 1 death per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 3 deaths per 100,000 in 2080.

Source: Honda et al., 2015.[a]

## KEY IMPLICATIONS FOR HEALTH

Climate change is expected to increase mean annual temperature and the intensity and frequency of heat waves resulting in a greater number of people at risk of heat-related medical conditions.

The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions.

## UNDERNUTRITION

Climate change, through higher temperatures, land and water scarcity, flooding, drought and displacement, negatively impacts agricultural production and causes breakdown in food systems. These disproportionally affect those most vulnerable people at risk to hunger and can lead to food insecurity. Vulnerable groups risk further deterioration into food and nutrition crises if exposed to extreme climate events.[b]

Without considerable efforts made to improve climate resilience, it has been estimated that the global risk of hunger and malnutrition could increase by up to 20 percent by 2050.[b]

In Sri Lanka, the prevalence of stunting in children under age 5 was 14.7% in 2012, the prevalence of underweight children and wasting in children under 5 was 26.3% and 21.4%, respectively, in 2012.[c]

a Country-level analysis, completed in 2015, was based on health models outlined in the Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014. The mean of impact estimates for three global climate models are presented. Models assume continued socioeconomic trends (SSP2 or comparable).

b World Food Project 2015 https://www.wfp.org/content/two-minutes-climate-change-and-hunger

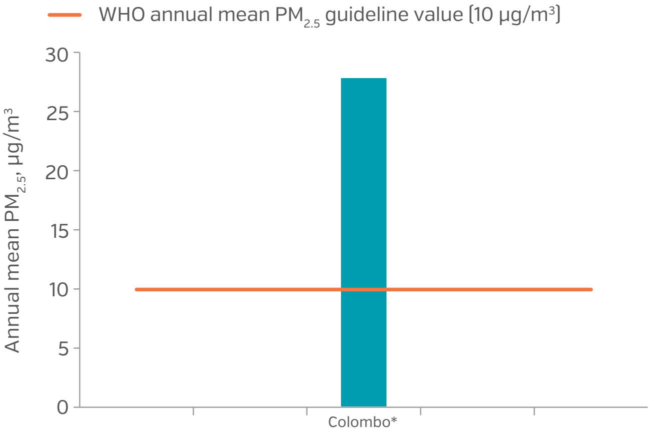
c World Health Organization, Global Database on Child Growth and Malnutrition (2015 edition). Please see source for defintions of child malutrition measures..

# 3 CURRENT EXPOSURES AND HEALTH RISKS DUE TO AIR POLLUTION

Many of the drivers of climate change, such as inefficient and polluting forms of energy and transport systems, also contribute to air pollution. Air pollution is now one of the largest global health risks, causing approximately seven million deaths every year. There is an important opportunity to promote policies that both protect the climate at a global level, and also have large and immediate health benefits at a local level.

## OUTDOOR AIR POLLUTION EXPOSURE

**Outdoor air pollution in Colombo, Sri Lanka annual mean $PM_{2.5}$ (μg/m³) 2010***




### KEY IMPLICATIONS FOR HEALTH

Outdoor air pollution can have direct and sometimes severe consequences for health.

Fine particles which penetrate deep into the respiratory tract subsequently increase mortality from respiratory infections, lung cancer and cardiovascular disease.

In Colombo, air pollution data indicate that annual mean $PM_{2.5}$ levels were above the WHO guideline value of 10 μg/m³.

Source: Ambient Air Pollution Database, WHO, May 2014.

* A standard conversion has been used, see source for further details.

## HOUSEHOLD AIR POLLUTION

### SRI LANKA

Percentage of population primarily using solid fuels for cooking (%), 2013

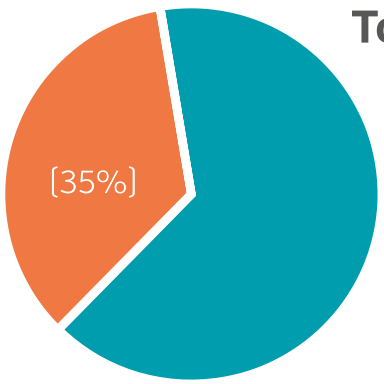
RURAL AREAS **83**

URBAN AREAS **34**

NATIONAL TOTAL **74**

Source: Global Health Observatory, data repository, World Health Organization, 2013.

Percent of total deaths from ischaemic heart disease, stroke, lung cancer, chronic obstructive pulmonary disease (18 years +) and acute lower respiratory infections (under 5 years) attributable to household air pollution, 2012.




**Total Deaths:** 55,300

Attributable to household air pollution

Source: Global Health Observatory, data repository, World Health Organization, 2012.

### KEY IMPLICATIONS FOR HEALTH

Air pollution in and around the home is largely a result of the burning of solid fuels (biomass or coal) for cooking.

Women and children are at a greater risk for disease from household air pollution. Consequently, household air pollution is responsible for a larger proportion of the of total number of deaths from ischaemic heart disease, stroke, lung cancer and COPD in women compared to men.[a]

In Sri Lanka, 56% percent of an estimated 230 child deaths due to acute lower respiratory infections is attributable to household air pollution (WHO, 2012).

a Annu. Rev. Public. Health. 2014.35:185-206. http://www.who.int/phe/health_topics/outdoorair/databases/HAP_BoD_results_March2014.pdf?ua=1

# 4 CO-BENEFITS TO HEALTH FROM CLIMATE CHANGE MITIGATION: A GLOBAL PERSPECTIVE

Health co-benefits are local, national and international measures with the potential to simultaneously yield large, immediate public health benefits and reduce the upward trajectory of greenhouse gas emissions. Lower carbon strategies can also be cost-effective investments for individuals and societies.

Presented here are examples, from a global perspective, of opportunities for health co-benefits that could be realised by action in important greenhouse gas emitting sectors.[a]

## Transport

Transport injuries lead to 1.2 million deaths every year, and land use and transport planning contribute to the 2–3 million deaths from physical inactivity. The transport sector is also responsible for some 14% (7.0 $GtCO_2e$) of global carbon emissions. The IPCC has noted significant opportunities to reduce energy demand in the sector, potentially resulting in a 15%–40% reduction in $CO_2$ emissions, and bringing substantial opportunities for health: A modal shift towards walking and cycling could see reductions in illnesses related to physical inactivity and reduced outdoor air pollution and noise exposure; increased use of public transport is likely to result in reduced GHG emissions; compact urban planning fosters walkable residential neighborhoods, improves accessibility to jobs, schools and services and can encourage physical activity and improve health equity by making urban services more accessible to the elderly and poor.

## Electricity Generation

Reliable electricity generation is essential for economic growth, with 1.4 billion people living without access to electricity. However, current patterns of electricity generation in many parts of the world, particularly the reliance on coal combustion in highly polluting power plants contributes heavily to poor local air quality, causing cancer, cardiovascular and respiratory disease. Outdoor air pollution is responsible for 3.7 million premature deaths annually, 88% of these deaths occur in low and middle income countries. The health benefits of transitioning from fuels such as coal to lower carbon sources, including ultimately to renewable energy, are clear: Reduced rates of cardiovascular and respiratory disease such as stroke, lung cancer, coronary artery disease, and COPD; cost-savings for health systems; improved economic productivity from a healthier and more productive workforce.

## Household Heating, Cooking and Lighting

Household air pollution causes over 4.3 million premature deaths annually, predominantly due to stroke, ischaemic heart disease, chronic respiratory disease, and childhood pneumonia. A range of interventions can both improve public health and reduce household emissions: a transition from the inefficient use of solid fuels like wood and charcoal, towards cleaner energy sources like liquefied petroleum gas (LPG), biogas, and electricity could save lives by reducing indoor levels of

## Healthcare Systems

Health care activities are an important source of greenhouse gas emissions. In the US and in EU countries, for example, health care activities account for between 3–8% of greenhouse gas ($CO_2$-eq) emissions. Major sources include procurement and inefficient energy consumption. Modern, on-site, low-carbon energy solutions (e.g. solar, wind, or hybrid solutions) and the development of combined heat and power generation capacity in larger facilities offer significant potential to lower the