

CLIMATE AND HEALTH COUNTRY PROFILE – 2015

MOROCCO



World Health
Organization



United Nations
Framework Convention on
Climate Change



OVERVIEW

Morocco's climate is very diverse, with a warm, Mediterranean climate in the northern coastal region, continental inland areas and semi-arid areas in the south. Morocco has ambitious renewable energy targets and is making political and strategic efforts to conserve biodiversity and to mitigate and adapt to climate change.

Despite positive action, Morocco remains vulnerable to the effects of climate change. The Mediterranean coast and low-lying Moulouya River delta, with their economic and ecological importance are threatened by sea-level rise and subsequent shoreline erosion and saline intrusion.^a Agriculture, which represents 16% of Morocco's GDP,^b is endangered by decreases in annual rainfall increasing the risk of crop failures and malnutrition. Morocco could also face aggravated water scarcity; rising temperatures; severe heat waves; and increased incidence of dengue fever, malaria and schistosomiasis.^c

SUMMARY OF KEY FINDINGS

- Under a high emissions scenario, mean annual temperature is projected to rise by about 5.5°C on average from 1990 to 2100. If emissions decrease rapidly, the temperature rise is limited to about 1.6°C.
- Under a high emissions scenario, and without large investments in adaptation, an annual average of 187,400 people are projected to be affected by flooding due to sea level rise between 2070 and 2100. If 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 about 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.

- Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to almost 50 deaths per 100,000 by 2080 compared to the estimated baseline of just under 5 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in emissions could limit heat-related deaths in the elderly to just over 14 deaths per 100,000 in 2080.

OPPORTUNITIES FOR ACTION

Morocco has an approved national health adaptation strategy and is currently implementing projects on health adaptation to climate change. Country reported data [see section 6] indicate there are further opportunities for action in the following areas:

1) Adaptation

- Conduct an updated assessment of climate change impacts, vulnerability and adaptation for health.
- Implement actions to build institutional and technical capacities to work on climate change and health.
- Develop an integrated disease surveillance and response system with climate information included.
- Estimate the costs to implement health resilience to climate change.

2) Mitigation

- Initiate actions for greening the health sector, such as promoting the use of renewable energy.
- Conduct valuation of the co-benefits of health implications of climate mitigation policies.

DEMOGRAPHIC ESTIMATES

Population [2014] ^d	33.8 million
Population growth rate [2014] ^d	1.25%
Population living in urban areas [2014] ^d	60.3%
Population under five [2014] ^d	10.2%
Population aged 65 or older [2014] ^d	6.1%

ECONOMIC AND DEVELOPMENT INDICATORS

GDP per capita [current US\$, 2013] ^e	3,056 USD
Total expenditure on health as % of GDP [2013] ^f	6%
Percentage share of income for lowest 20% of population [2012] ^g	NA
HDI [2013, +/- 0.01 change from 2005 is indicated with arrow] ^h	0.617 ▲

HEALTH ESTIMATES

Life expectancy at birth [2013] ^h	71 years
Under-5 mortality per 1000 live births [2013] ⁱ	30

a Tekken, V., et al. [2009] Assessing the regional Impacts of Climate Change on Economic Sectors in the Low-lying Coastal Zone of Mediterranean East Morocco. Journal of Coastal research p 272-276.

b World Bank Data. Agriculture as % of GDP. <http://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>

c EMRO 61st Session Regional Committee Meeting, Towards A Public Health Response To Climate Change And Air Pollution In The Eastern Mediterranean Region.

d Recensement Général de la Population et de l'Habitat [2014]

e World Development Indicators, World Bank [2015]

f Global Health Expenditure Database, WHO [2014]

g United Nations Development Programme, Human Development Reports [2014]

h Global Health Observatory, WHO; 2014

i Levels & Trends in Child Mortality Report 2015, The UN Inter-agency Group for Child Mortality Estimation [2015]

CURRENT AND FUTURE CLIMATE HAZARDS

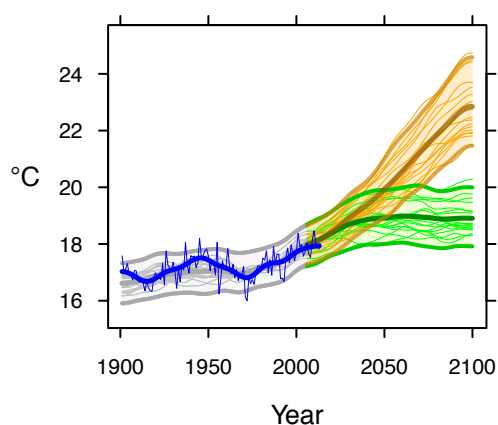
Due to climate change, many climate hazards and extreme weather events, such as heat waves, heavy rainfall and droughts, could become more frequent and more intense in many parts of the world.

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

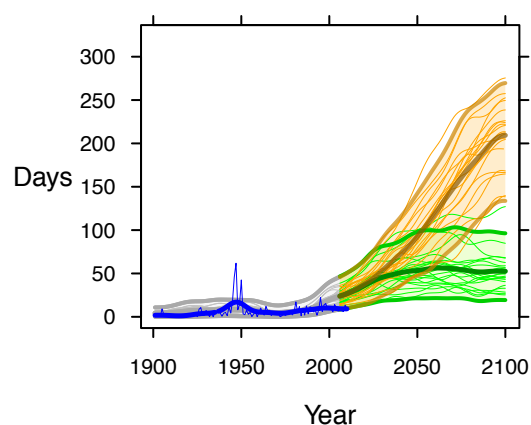
The model projections below present climate hazards under a high emissions scenario, Representative Concentration Pathway 8.5 [RCP8.5] (in orange) and a low emissions scenario, [RCP2.6] (in green).^a The text boxes describe the projected changes averaged across about 20 models (thick line). The figures 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



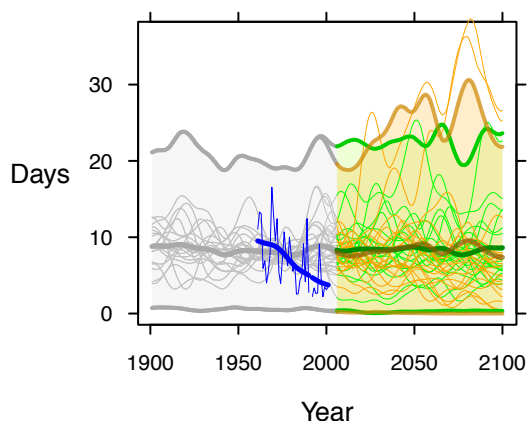
Under a high emissions scenario, mean annual temperature is projected to rise by about 5.5°C on average from 1990 to 2100. If emissions decrease rapidly, the temperature rise is limited to about 1.6°C.

DAYS OF WARM SPELL ('HEAT WAVES')



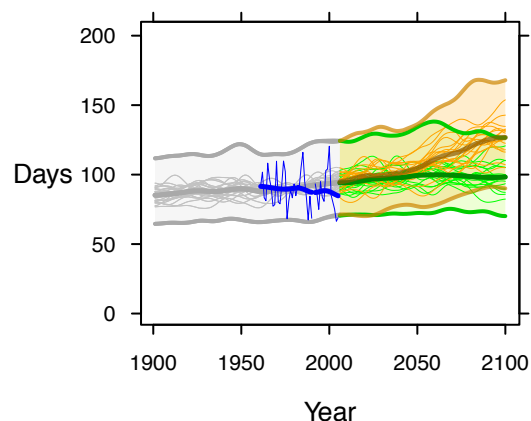
Under a high emissions scenario, the number of days of warm spell^d is projected to increase from about 10 days in 1990 to about 210 days on average in 2100. If emissions decrease rapidly, the days of warm spell are limited to about 50 on average.

DAYS WITH EXTREME RAINFALL ('FLOOD RISK')



Under both high and low emissions scenarios, the number of days with very heavy precipitation [20 mm or more] is not projected to change much on average, though year-to-year variability is large and a few models indicate increases outside the range of historical variability. This contrasts with the observed decrease in such days.

CONSECUTIVE DRY DAYS ('DROUGHT')



Under a high emissions scenario, the longest dry spell is indicated to increase from an average of about 90 days to just over 125 days, with continuing large year-to-year variability. If emissions decrease rapidly, the anticipated changes in the length of dry spells are somewhat less.

^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-TSv3.22; 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.

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	53,500	100
	RCP8.5	187,400	100

* Medium ice melting scenario

** Values rounded to nearest '00

Under a high emissions scenario, and without large investments in adaptation, an annual average of 187,400 people are projected to be affected by flooding due to sea level rise between 2070 and 2100. If 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 about 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.

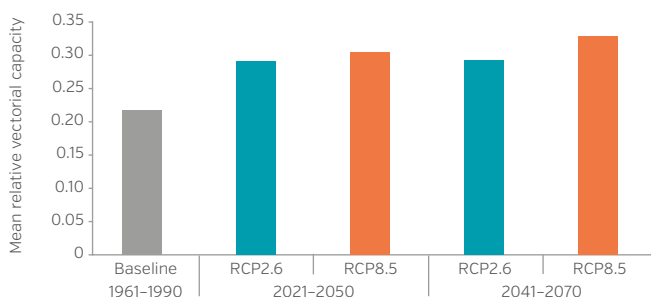


KEY IMPLICATIONS FOR HEALTH

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

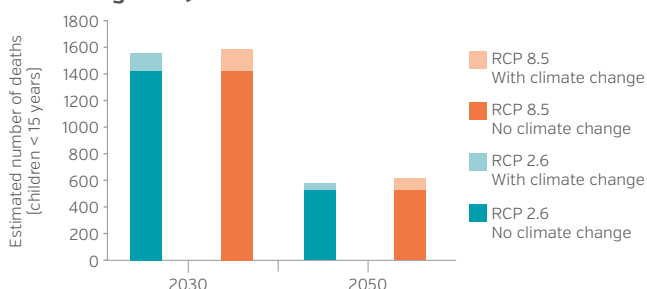
Mean relative vectorial capacity for dengue fever transmission in Morocco



Under a high emissions scenario, the mean relative vectorial capacity for dengue fever transmission is projected to increase to about 0.33 by 2070 compared to the estimated baseline value of 0.22. If emissions decrease rapidly, the mean relative vectorial capacity could be limited to about 0.29 by 2070.

Source: Rocklöv, J., Quam, M. et al., 2015.^c

Estimated number of deaths due to diarrhoeal disease in children under 15 years in Morocco (base case scenario for economic growth)



In the baseline year of 2008 there were an estimated 4,200 diarrhoeal deaths in children under 15 years old. Under a high emissions scenario, diarrhoeal deaths attributable to climate change in children under 15 years old are projected to be about 10.5% of approximately 1600 diarrhoeal deaths projected in 2030. Although diarrhoeal deaths are projected to decline to just over 600 by 2050 the proportion of deaths attributable to climate change could rise to approximately 14.7%.

Source: Lloyd, S., 2015.^c

a Atlas of Health and Climate, World Health Organization and World Meteorological Organization, 2012.

b Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014.

c 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, Morocco
(deaths / 100,000 population 65+ years)



Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to almost 50 deaths per 100,000 by 2080 compared to the estimated baseline of just under 5 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in emissions could limit heat-related deaths in the elderly to just over 14 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 disproportionately affect those most vulnerable to hunger and can lead to food insecurity. Vulnerable groups risk further deterioration into food and nutrition crises if exposed to extreme weather events.^b

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

In Morocco, the prevalence of stunting in children under age 5 was 14.9% in 2011; the prevalence of underweight children and wasting in children under 5 was 3.1% and 2.3%, respectively, in 2011.^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 definitions of child malnutrition measures.

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 AND SHORT LIVED CLIMATE POLLUTANTS



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.

Short-lived climate pollutants (SLCPs) such as black carbon, methane and tropospheric ozone are released through inefficient use and burning of biomass and fossil fuels for transport, housing, power production, industry, waste disposal (municipal and agricultural) and forest fires. SLCPs are responsible for a substantial fraction of global warming as well as air-pollution related deaths and diseases.

Since short lived climate pollutants persist in the atmosphere for weeks or months while CO₂ emissions persist for years, significant reductions of SLCP emissions could result in immediate health benefits and health cost savings,^a and generate very rapid climate benefits – helping to reduce near-term climate change by as much as 0.5°C before 2050.^a

In Morocco, it is projected that a reduction in SLCPs* could prevent almost 2,000 premature deaths per year from outdoor air pollution, from 2030 onwards [Source: Shindell, D., Science, 2012].

*Through implementation of 14 reduction measures: 7 targeting methane emissions and the rest, emissions from incomplete combustion. See source for further detail.

HOUSEHOLD AIR POLLUTION

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Percentage of population primarily using solid fuels for cooking [%], 2013



**RURAL
AREAS**
6



**URBAN
AREAS**
<5



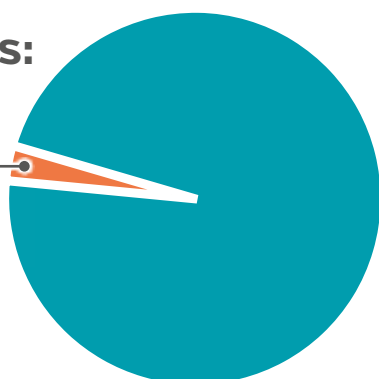
**NATIONAL
TOTAL**
<5

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:
58,500

Attributable
to household
air pollution
3%



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 total number of deaths from ischaemic heart disease, stroke, lung cancer and COPD in women compared to men.^b

In Morocco, 5% percent of an estimated 2,900 child deaths due to acute lower respiratory infections is attributable to household air pollution [WHO, 2012].

a United Nations Environment Programme. Reducing Climate-related Air Pollution and Improving Health: Countries can act now and reap immediate benefits. <http://www.unep.org/ccac/Media/PressReleases/ReducingClimate-relatedAirPollution/tabid/131802/language/en-US/Default.aspx>

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

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 GtCO₂e) 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 CO₂ 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 (CO₂-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 health sector's carbon footprint.



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https://www.yunbaogao.cn/report/index/report?reportId=5_26714

