CLIMATE AND HEALTH COUNTRY PROFILE – 2015
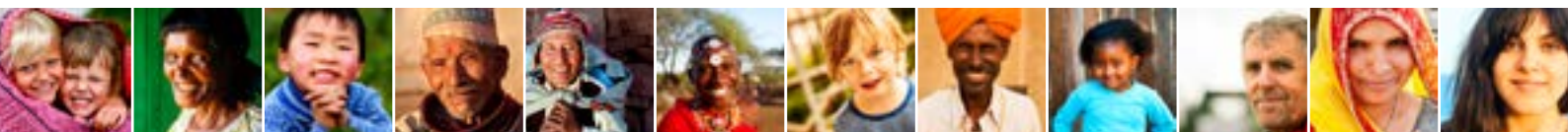## IRAN

World Health Organization

United Nations Framework Convention on Climate Change

OVERVIEW

The Islamic Republic of Iran has a diverse geography with vast coastlines, mountains, forested areas, plains and deserts. It is predominantly a dry climate with over 80% of the country being arid or semi-arid.[a] In past decades, environmental resources and ecosystems have been threatened due to lack of precipitation, persistent drought, heat-stress, air pollution, water pollution, soil erosion and loss of biodiversity.[a] Iran is highly vulnerable to the impacts of climate change, including rising temperatures, sea-level rise and increased frequency of natural disasters. Climate change could result in increased heat-related mortality, food insecurity, disruption of livelihoods, internal migration and changing distribution patterns of infectious and vector-borne diseases.

Iran is yet to develop an official national climate change action plan, which could prove beneficial for mitigation and adaptation strategies that target public health in the context of climate change. Iran has envisioned climate change within the broader objective of achieving sustainable development.

SUMMARY OF KEY FINDINGS

- In Iran, under a high emissions scenario, mean annual temperature is projected to rise by about 6.2°C on average from 1990 to 2100. If global emissions decrease rapidly, the temperature rise is limited to about 1.7°C (page 2).
- In Iran, under a high emissions scenario, the number of days of warm spell[b] is projected to increase from about 10 days in 1990 to about 215 days on average in 2100. If global emissions decrease rapidly, the days of warm spell are limited to about 50 on average (page 2).
- In Iran, under a high emissions scenario, and without large investments in adaptation, an annual average of about

184,700 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 about 200 people (page 3).
- in Iran, under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to almost 70 deaths per 100,000 by 2080 compared to the estimated baseline of under 6 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 16 deaths per 100,000 in 2080 (page 4).

OPPORTUNITIES FOR ACTION

Iran has conducted a national assessment of climate change impacts, vulnerability and adaptation for health. Additionally, Iran is currently implementing projects on health adaptation to climate change and is taking action to build institutional and technical capacities to work on climate change and health. Country reported data (see section 6) indicate there are further opportunities for action in the following areas:

1) **Adaptation**
   - Implement activities to increase climate resilience of health infrastructure.
   - Estimate the costs to implement health resilience to climate change and include these costs in planned allocations.

2) **Mitigation**
   - Conduct a valuation of co-benefits to health of climate change mitigation policies.

3) **National policy implementation**
   - Develop a national health adaptation strategy.

DEMOGRAPHIC ESTIMATES	
Population (2013)[c]	77.15 million
Population growth rate (2013)[c]	1.3 %
Population living in urban areas (2013)[d]	72.3 %
Population under five (2013)[c]	8.8 %
Population aged 65 or older (2013)[c]	4.9 %
ECONOMIC AND DEVELOPMENT INDICATORS	
GDP per capita (current US$, 2013)[e]	6,631 USD
Total expenditure on health as % of GDP (2013)[f]	6.7 %
Percentage share of income for lowest 20% of population (2012)[e]	NA
HDI (2013, +/- 0.01 change from 2005 is indicated with arrow)[g]	0.749 ▲
HEALTH ESTIMATES	
Life expectancy at birth (2013)[h]	74 years
Under-5 mortality per 1000 live births (2013)[i]	17

a Iran's 2nd national communication to UNFCCC http://unfccc.int/resource/docs/natc/iranc2.pdf
b 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.
c World Population Prospects: The 2015 Revision, UNDESA (2015)
d World Urbanization Prospects: The 2014 Revision, UNDESA (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
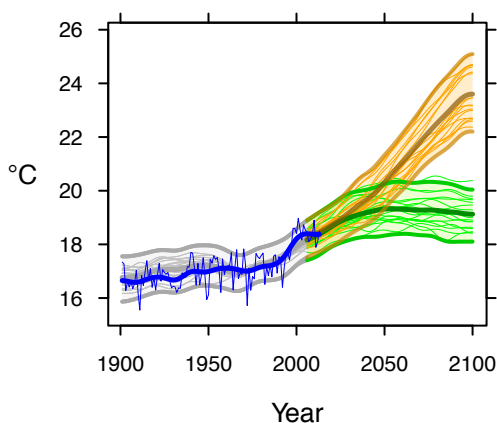
Under a high emissions scenario, mean annual temperature is projected to rise by about 6.2°C on average from 1990 to 2100. If emissions decrease rapidly, the temperature rise is limited to about 1.7°C.

### DAYS OF WARM SPELL ('HEAT WAVES')
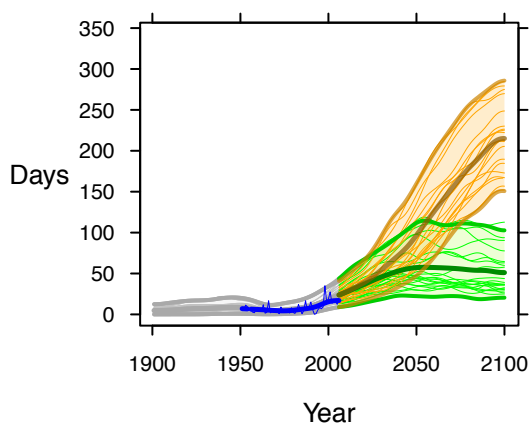
Under a high emissions scenario, the number of days of warm spell[d] is projected to increase from about 10 days in 1990 to about 215 days on average in 2100. If emissions decrease rapidly, the days of warm spell are limited to about 50 on average.

DAYS WITH EXTREME RAINFALL ('FLOOD RISK')
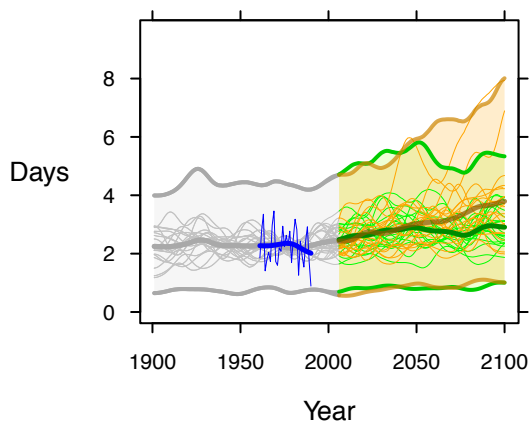
Under a high emissions scenario, the number of days with very heavy precipitation (20 mm or more) could increase by an average of about 2 days on average from 1990 to 2100. Some models indicate larger increases but the total number of such days remains low. If emissions decrease rapidly, the increase in risk is somewhat reduced.

CONSECUTIVE DRY DAYS ('DROUGHT')
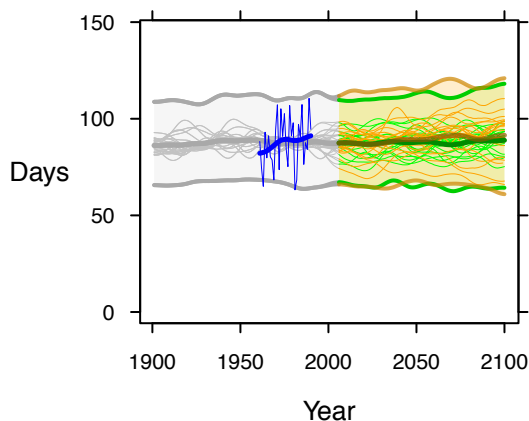
Under both high and low emissions scenarios, the longest dry spell is not indicated to change much from an average of about 90 days, with continuing large year-to-year variability.

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.
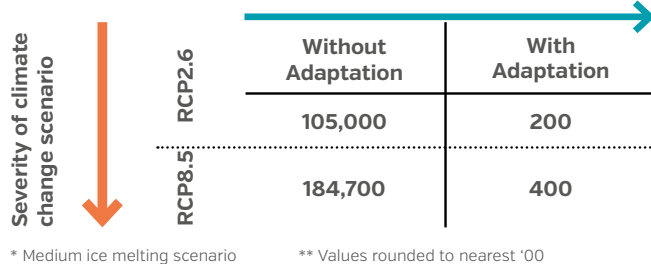c   Analysis by the Climatic Research Unit and Tyndall Centre for Climate Change Research, University of East Anglia, 2015.
d   A 'warm spell' day is a day when maximum temperature, together with that of at least the 6 consecutive previous days, exceeds the 90th percentile threshold for that time of 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.

ANNUAL EXPOSURE TO FLOODING DUE TO SEA LEVEL RISE (PERIOD 2070–2010)

Severity of climate change scenario

	Without Adaptation	With Adaptation
RCP2.6	105,000	200
RCP8.5	184,700	400

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

Under a high emissions scenario, and without large investments in adaptation, an annual average of about 184,700 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 about 200 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.

INFECTIOUS AND VECTOR-BORNE DISEASES

Estimated number of deaths due to diarrhoeal disease in children under 15 years in Iran (base case scenario for economic growth)
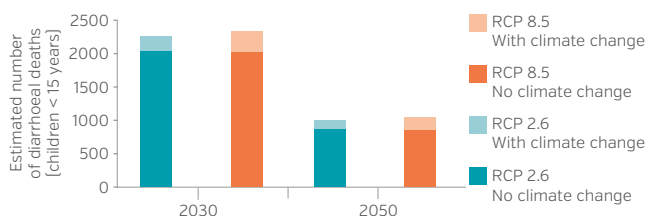
In the baseline year of 2008 there were an estimated 5,900 diarrhoeal deaths in children under 15 years old. Under a high emissions scenario, diarrhoeal deaths attributable to climate change in children under 15 years old are projected to be approximately 12.7% of about 2,300 diarrhoeal deaths projected in 2030. Although diarrhoeal deaths are projected to decline to approximately 1,100 by 2050, the proportion of deaths attributable to climate change will rise to about 17.5%.

Source: Lloyd, S., 2015.[c]

**Mean relative vectorial capacity for dengue fever transmission in Iran**

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.

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.[a]

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.[b]

Under both high and low emissions scenarios, mean relative vectorial capacity remains relatively constant (about 0.23–0.25) towards 2070. Co-factors such as urbanization, development and population movements may modify the disease burdens associated with dengue, and make the disease cross new subnational borders.

Source: Rocklöv, J., Quam, M. et al., 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 socio-economic trends (SSP2 or comparable).

HEAT-RELATED MORTALITY

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

Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to almost 70 deaths per 100,000 by 2080 compared to the estimated baseline of under 6 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 16 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 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 globally the risk of hunger and malnutrition could increase by up to 20 percent by 2050.[b]

In Iran, the prevalence of underweight children under age 5 was 4.1% 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 socio-economic trends (SSP2 or comparable].
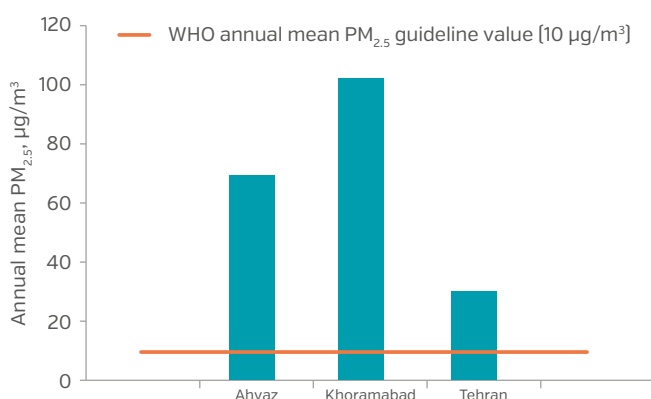b   World Food Project 2015 https://www.wfp.org/content/two-minutes-climate-change-and-hunger
c   World Health Organization, Global Database on Child Growth and Malnutrition (2015 edition]. Child malnutrition estimates are for % underweight, defined as: Percentage of children aged 0–59 months who are below minus two standard deviations from median weight-for-age of the World Health Organization (WHO] Child Growth Standards. Note, % underweight estimates for Iran for 2011 are pending re-analysis.

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 cities in Iran annual mean PM$_{2.5}$ (µg/m^3) 2010*

WHO annual mean PM$_{2.5}$ guideline value (10 µg/m^3)

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.

The cities for which there was air pollution data available in 2010 had annual mean PM$_{2.5}$ levels that were above the WHO guideline value of 10 µg/m^3.

Source: Ambient Air Pollution Database, WHO, May 2014. * A standard conversion has been used for the city of Tehran, see source for further details.

OUTDOOR AIR POLLUTION EXPOSURE AND SHORT-LIVED CLIMATE POLLUTANTS

Short-lived climate pollutants such as black carbon, methane and tropospheric ozone – 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 – 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 CO_2 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 Iran, it is estimated that a reduction in SLCPs* could prevent about 5,800 premature deaths attributed to outdoor air pollution per year, from 2030 onwards (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.

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

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

Current patterns of electricity generation in many parts of the world, particularly the reliance on coal combustion in highly polluting power plants, contribute heavily to poor local air quality, causing cancer, cardiovascular and respiratory disease. Outdoor air pollution is responsible for 3.7 million premature deaths annually. High-income countries still have work to do in transitioning to cleaner and healthier energy sources.

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.

Food and Agriculture

Agricultural emissions account for some 5.0–5.8 $GtCO_2eq$ annually, with food and nutrition constituting an important determinant of health. Many high-income countries are feeling the burden of poor diet and obesity-related diseases, with some 1.9 billion adults overweight globally.

A wide range of interventions designed to reduce

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