LEBANON

HEALTH AND CLIMATE CHANGE

COUNTRY PROFILE 2021

World Health Organization

United Nations
Framework Convention on
Climate Change

CONTENTS

ACKNOWLEDGEMENTS

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HOW TO USE THIS PROFILE

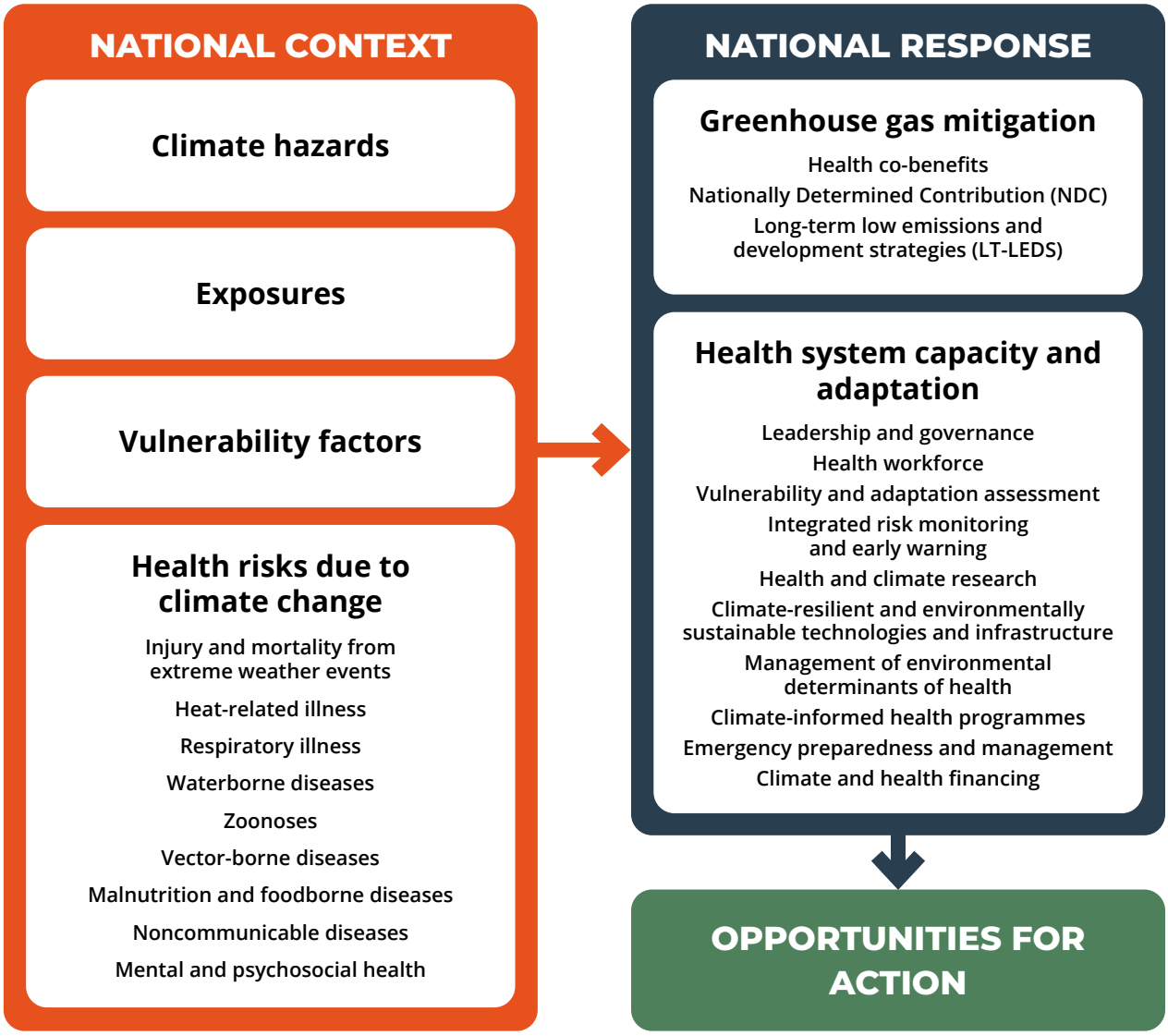
This health and climate change country profile presents a snapshot of country-specific climate hazards, climate-sensitive health risks and potential health benefits of climate change mitigation. The profile is also a key tool in monitoring national health sector response to the risk that climate variability and climate change pose to human health and health systems. By presenting this national evidence, the profile aims to:

- Raise awareness of the health threats of climate change within the health sector, other health-related sectors and among the general public;
- Monitor national health response;
- Support decision-makers to identify opportunities for action;
- Provide links to key WHO resources.

Tools to support the communication of the information presented in this country profile are available. For more information please contact: nevillet@who.int

The diagram below presents the linkages between climate change and health. This profile provides country-specific information following these pathways. **The profile does not necessarily include comprehensive information on all exposures, vulnerability factors or health risks** but rather provides examples based on available evidence and the highest priority climate-sensitive health risks for your country.

CLIMATE CHANGE AND HEALTH



COUNTRY BACKGROUND

Located on the eastern shore of the Mediterranean Sea, Lebanon's territory is mostly mountainous with a land area of 10 452 km^2 and a coastline of 225 km *(1)*. The economy is dependent upon the service sector, which contributes 45% of the national GDP *(2)*. While the agricultural sector accounts for only around 5% of GDP, agriculture has been impacted by higher world food prices and climate change, which could have significant implications for food security in Lebanon *(2,3)*. Around 90% of Lebanon's population lives in urban areas, especially in the big cities along the coast *(1)*.

Lebanon's climate is predominantly Mediterranean, with hot and dry summers from June to September and cool and rainy winters from December to March *(1)*. Due to arid and semi-arid conditions, water resources are scarce and vulnerable to the effects of climate change and consequential changes in precipitation patterns *(4)*. This threatens the agricultural sector, which is also pressured by population growth and urbanization *(5)*. Further, climate change is expected to result in less snow, increased droughts, sea level rise and forest fires. Higher temperatures and frequent extreme events, such as droughts and floods, could lead to health risks such as infectious diseases, increased morbidity and mortality from heat stress, waterborne and vector-borne diseases *(1)*. Encroaching seas are projected to expand seawater incursions into coastal freshwater aquifers and reduce the supply of freshwater for local use. Additionally, higher storm surges could increase damage to low-lying infrastructure and communities, and higher temperatures and reductions in annual precipitation could result in a hotter and drier climate, potentially diminishing future supplies of surface water.

Lebanon updated its Nationally Determined Contribution (NDC) in 2020, increasing its previous mitigation ambitions. The NDC commits unconditionally to reducing its greenhouse gas emissions by 20%, compared with the business-as-usual scenario, by 2030. Climate change is recognized as a threat multiplier in the NDC, which outlines numerous adaptation strategies, including implementing climate-resilient systems to ensure and protect public health, well-being and safety of all communities in Lebanon *(4)*.

CURRENT AND FUTURE CLIMATE HAZARDS

CLIMATE HAZARD PROJECTIONS FOR LEBANON

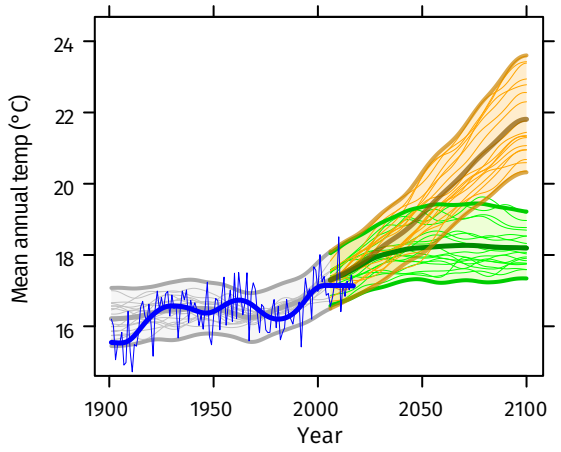
Country-specific projections are outlined up to the year 2100 for climate hazards under a 'business as usual' (BAU) high emissions scenario compared to projections under a 'two-degree' scenario with rapidly decreasing global emissions (see Figures 1–5).

The climate model projections given 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 describes the projected changes averaged across about 20 global climate models (thick line). The figures[b] also show each model individually as well as the 90% model range (shaded) as a measure of uncertainty and the annual and smoothed observed record (in blue).[c] In the following text the present-day baseline refers to the 30-year average for 1981–2010 and the end-of-century refers to the 30-year average for 2071–2100.

Modelling uncertainties associated with the relatively coarse spatial scale of the models compared with that of geographically small countries are not explicitly represented. There are also issues associated with the availability and representativeness of observed data for some locations.

Rising temperature

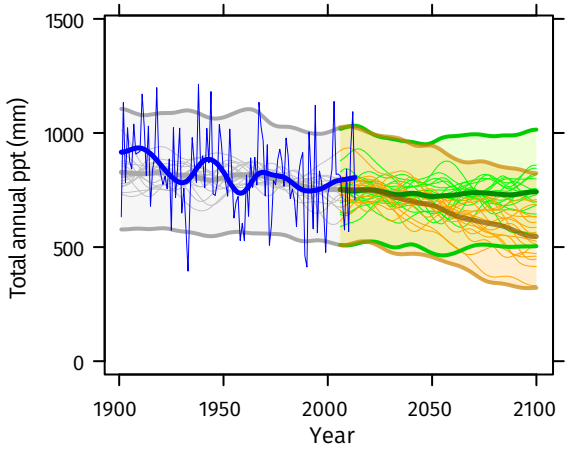
FIGURE 1: Mean annual temperature, 1900–2100



Under a high emissions scenario, the mean annual temperature is projected to rise by about 4.3°C on average by the end-of-century (i.e. 2071–2100 compared with 1981–2010). If emissions decrease rapidly, the temperature rise is limited to about 1.3°C.

Decrease in total precipitation

FIGURE 2: Total annual precipitation, 1900–2100



Total annual precipitation is projected to decrease by about 25% on average under a high emissions scenario, although the uncertainty range is large (-37% to -9%). If emissions decrease rapidly, there is little projected change on average: with a decrease of 3% and an uncertainty range of -17% to +4%.

NOTES

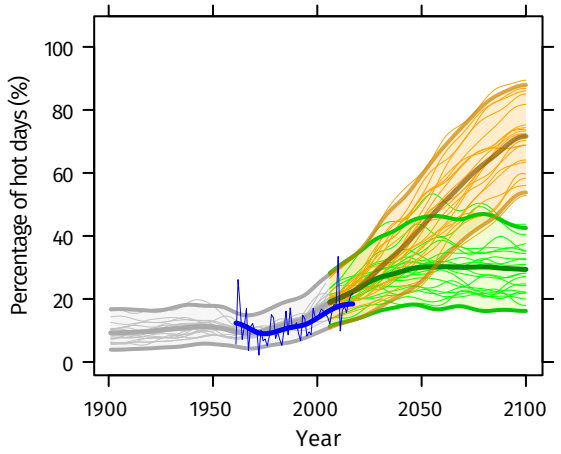
[a] Model projections are from CMIP5 for RCP8.5 (high emissions) and RCP2.6 (low emissions). Model anomalies are added to the historical mean and smoothed.

[b] Observed historical record of mean temperature and total precipitation is from CRU-TSv3.26. Observed historical records of extremes are from JRA55 for temperature and from GPCC-FDD for precipitation.

[c] Analysis by the Climatic Research Unit, University of East Anglia, 2018.

More high temperature extremes

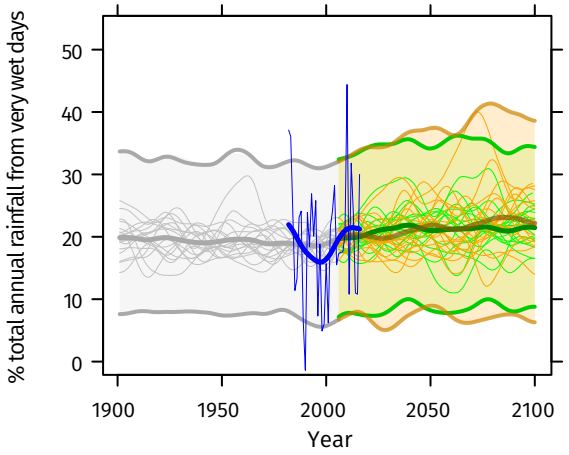
FIGURE 3: Percentage of hot days ('heat stress'), 1900–2100



The percentage of hot days[d] is projected to increase substantially from about 15% of all days on average in 1981–2010 (10% in 1961–1990). Under a high emissions scenario, about 65% of days on average are defined as 'hot' by the end-of-century. If emissions decrease rapidly, about 30% of days on average are 'hot'. Similar increases are seen in hot nights[d] (not shown).

Small increase in extreme rainfall

FIGURE 4: Contribution of very wet days ('extreme rainfall' and 'flood risk') to total annual rainfall, 1900–2100



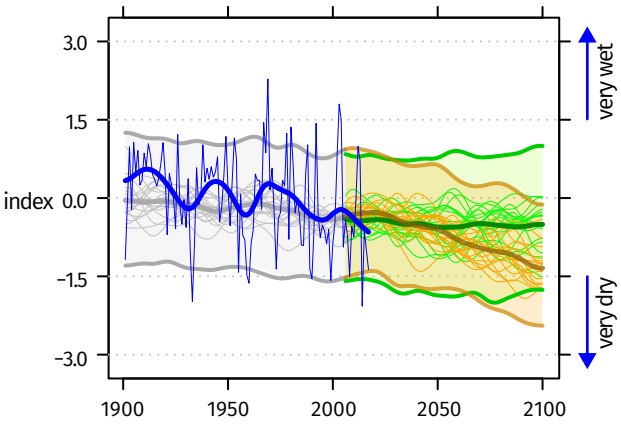
Under a high emissions scenario, the proportion of total annual rainfall from very wet days[e] (about 20% for 1981–2010) could increase slightly by the end-of-century (to about 23% on average with an uncertainty range of about 5% to 40%), with even less change if emissions decrease rapidly. These projected changes are accompanied by decreases in total annual rainfall (see Figure 2).

Drought frequency and intensity

FIGURE 5: Standardized Precipitation Index ('drought'), 1900–2100

The Standardized Precipitation Index (SPI) is a widely used drought index which expresses rainfall deficits/excesses over timescales ranging from 1 to 36 months (here 12 months, i.e. SPI12).[f] It shows how at the same time extremely dry and extremely wet conditions, relative to the average local conditions, change in frequency and/or intensity.

Under a high emissions scenario, SPI12 values are projected to decrease from about -0.3 to -1 on average by the end-of-century (2071–2100) indicating an increase in the frequency and/or intensity of dry episodes and drought events. If emissions decrease rapidly there is little change although year-to-year variability remains large.[f]



[d] A 'hot day' ('hot night') is a day when maximum (minimum) temperature exceeds the 90th percentile threshold for that time of the year.

[e] The proportion (%) of annual rainfall totals that falls during very wet days, defined as days that are at least as wet as the historically 5% wettest of all days.

[f] SPI is unitless but can be used to categorize different severities of drought (wet): above +2.0 extremely wet; +2.0 to +1.5 severely wet; +1.5 to +1.0 moderately wet; +1.0 to +0.5 slightly wet; +0.5 to -0.5 near normal conditions; -0.5 to -1.0 slight drought; -1.0 to -1.5 moderate drought; -1.5 to -2.0 severe drought; below -2.0 extreme drought.

HEALTH RISKS DUE TO CLIMATE CHANGE

HEAT STRESS

CLIMATE HAZARDS[a]

Up to 4.3°C mean annual temperature rise by the end-of-century.

About 65% of days could be 'hot days' by the end-of-century.

EXPOSURES

Population exposure to heat stress is likely to rise in the future as heat waves are projected to increase. Increased urbanization (and the associated urban heat island effect) is expected to further exacerbate this risk.

EXAMPLE VULNERABILITY FACTORS[b]

Age (e.g. the elderly and children)

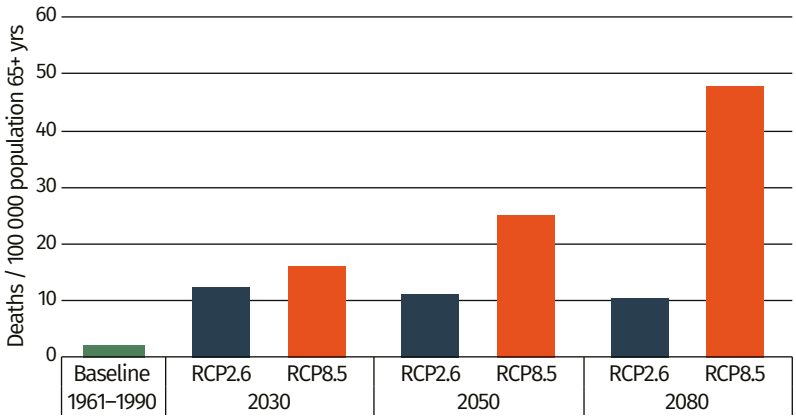
Biological factors and health status

Geographical factors (e.g. urbanization)

Socioeconomic factors (e.g. occupation and poverty)

HEALTH RISKS[c]

FIGURE 6: Heat-related mortality in population 65 years or above, Lebanon (deaths / 100 000 population 65+ yrs).[d] Source: Honda et al. (2015) *(6)*



The health risks of heat stress include heat-related illnesses such as dehydration, rash, cramps, heatstroke, heat exhaustion and death.

Current heat-related deaths among the elderly (65+ years) are approximately 2 per 100 000 population. Under a high emissions scenario (RCP8.5), heat-related deaths among the elderly (65+ years) are projected to rise to about 48 per 100 000. A rapid reduction in emissions (RCP2.6) could significantly reduce deaths to around 10 per 100 000 among the elderly in 2080 *(6)*.

[a] For details see "Current and future climate hazards".

[b] These vulnerability factors are not comprehensive but rather examples of relevant vulnerability factors. Please see the WHO Quality Criteria for Health National Adaptation Plans for more details: https://www.who.int/publications/i/item/quality-criteria-health-national-adaptation-plans.

[c] See "National health response: health system capacity and adaptation" for the national response to heat stress.

[d] Country-level analysis, completed by Honda et al. (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).

FOOD SAFETY AND SECURITY

CLIMATE HAZARDS[a]

Up to 4.3°C mean annual temperature rise by the end-of-century.

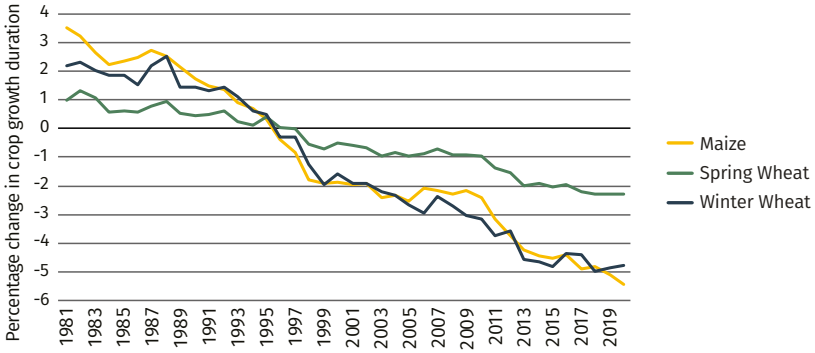
About 65% of days could be 'hot days' by the end-of-century.

Total annual precipitation could decrease by about 25% by the end-of-century.

Drought events projected to increase under a high emissions scenario.

EXPOSURES

FIGURE 7: Percentage change in crop growth duration in Lebanon in 1981–2020, relative to the 1981–2010 average, expressed as the running mean over 11 years (5 years before and 5 years after) *(7,8)*



Reliable food resources are essential to good health. Climate change significantly increases exposure to changes in the safety and sustainability of food systems, directly through its effects on agriculture and fisheries and indirectly by contributing to underlying risk factors such as water insecurity, dependency on imported foods, urbanization and migration, and health service disruption.

EXAMPLE VULNERABILITY FACTORS[b]

Age (e.g. the elderly and children)

Biological factors and health status (e.g. pregnant women)

Environmental factors (e.g. loss of biodiversity)

Gender and equity

Socioeconomic factors

HEALTH RISKS[c]

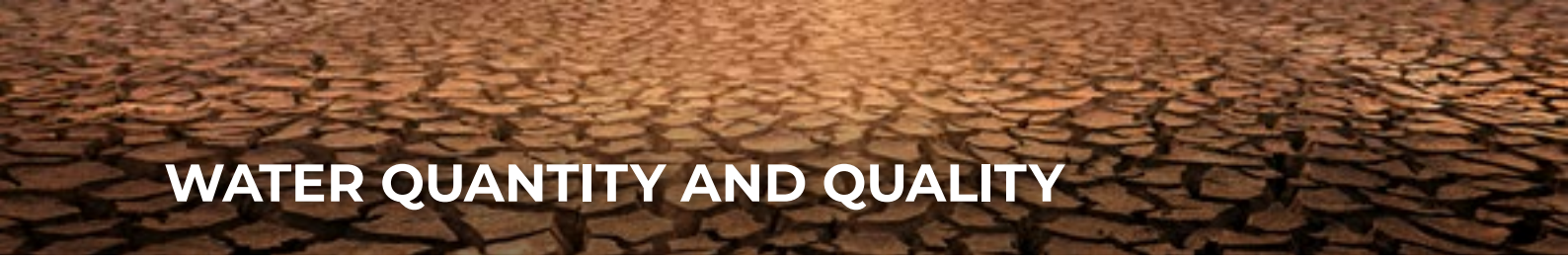
Food safety and security problems can lead to malnutrition, micronutrient deficiencies, other noncommunicable diseases (NCDs), foodborne diseases and mortality. Increasing temperatures can also lead to increases in foodborne illnesses through spoiled food from refrigeration failure in transport/storage or changes in patterns of salmonella growth.

It is estimated that 1.35 million people are in need of food in Lebanon *(9)*. A major challenge for the country has been the ongoing conflicts in surrounding countries increasing their refugee population. Whilst agriculture employs approximately 60% of the population, it contributes only around 5.5% to GDP and around 80% of the country's food needs are covered by imports *(9,10)*. Climate change will exacerbate these ongoing developmental challenges, raising the risk of food and nutrition insecurity in Lebanon further.

[a] For details see "Current and future climate hazards".

[b] These vulnerability factors are not comprehensive but rather examples of relevant vulnerability factors. Please see the WHO Quality Criteria for Health National Adaptation Plans for more details: https://www.who.int/publications/i/item/quality-criteria-health-national-adaptation-plans.

[c] See "National health response: health system capacity and adaptation" for the national response to food safety and security.



WATER QUANTITY AND QUALITY

CLIMATE HAZARDS[a]

Up to 4.3°C mean annual temperature rise by the end-of-century.

Total annual precipitation could decrease by about 25% by the end-of-century.

Drought events projected to increase under a high emissions scenario.

EXPOSURES

Like other Arab countries, Lebanon faces severe challenges in the face of water security, with urbanization, population growth, overexploitation, and climate change widening the gap between water supply and demand. Water security is a central pillar to all aspects of society and so water shortages in Lebanon demand urgent action *(11)*.

1.4 million

rural inhabitants living in rainfed areas with high drought frequency OR irrigated areas with high water stress *(12)*

657 000

urban inhabitants living in rainfed areas with high drought frequency OR irrigated areas with high water stress *(12)*

EXAMPLE VULNERABILITY FACTORS[b]

Access to clean and safe water and sanitation services

People living near flood and drought zones

Socioeconomic factors

Gender and equity

HEALTH RISKS[c]

3.7 million

people in need of water in Lebanon *(13)*

Water insecurity in Lebanon is associated with significant health risks. As such, the government of Lebanon has been investing in water infrastructure, which has helped 400 000 people gain improved access to safe water resources *(14)*. Additionally, the UN Refugee Agency (UNHCR) has been working in Lebanon and provided more than 192 000 Lebanese citizens and refugees with reliable access to safe water *(15)*. Climate change threatens to undo such progress, and so it is essential that impacts of climate change are accounted for and climatic variables and extremes embedded into these projects. In recognition of these threats, the Ministry of Environment has installed three rainwater-harvesting systems in agricultural greenhouses and aims to implement these practices more widely. Furthermore, an assessment on updating the National Adaptation Plan to Climate Change in the water sector was conducted and identified barriers to adaptation to climate change, measures to overcome these obstacles, and an action plan for the period 2021–2016 *(16)*. Lebanon has also joined the initiative "Paris Pact on Water and Climate Change Adaptation", which aims to make water systems more resilient to climate impacts *(17)*.

[a] For details see "Current and future climate hazards".

[b] These vulnerability factors are not comprehensive but rather examples of relevant vulnerability factors. Please see the WHO Quality Criteria for Health National Adaptation Plans for more details: https://www.who.int/publications/i/item/quality-criteria-health-national-adaptation-plans.

[c] See "National health response: health system capacity and adaptation" for the national response to water quantity and quality.

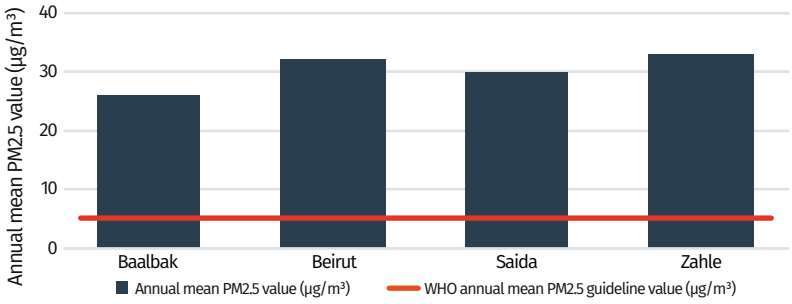
HEALTH RISKS DUE TO AIR POLLUTION

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.

EXPOSURES

Recent data indicate that in all four Lebanese cities, for which data have been reported, annual mean $PM_{2.5}$[a] levels were above the WHO guideline value of 5 µg/m^3 (see Figure 8) *(18)*.

FIGURE 8: Annual mean $PM_{2.5}$ in Lebanon cities, for which data were available, compared with the WHO guideline value of $PM_{2.5}$ of 5 µg/m^3. Source: Ambient Air Pollution Database, WHO, 2018. A standard conversion has been used, see source for further details *(18)*



EXAMPLE VULNERABILITY FACTORS[b]

- Age (e.g. the elderly and children)
- Biological factors and health status (e.g. pre-existing conditions)
- Gender and equity
- Geographical factors (e.g. rural/urban areas)
- Socioeconomic factors (e.g. poverty)

HEALTH RISKS[c]

3124

deaths from ambient air pollution in Lebanon in 2016 *(19)*

Ambient 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. Sand and dust storms have severe impacts on human health, by increasing particulate matter and carrying harmful substances and pathogens, all of which contribute to air pollution and associated respiratory problems. Furthermore, sand and dust storms increase desertification, drought and soil salinity, as well as decreasing water resources. This has severe implications for people's livelihoods as well as their health, with agricultural land being particularly badly affected. Indeed, farmland can be made unusable by sand and dust storms, with such events sometimes stripping away the fertile layer of soil on which agriculture is dependent. There has been an observed increase in the frequency and severity of sand and dust storms globally. This is expected to worsen with climate change and be further exacerbated by drought, land degradation, and unsustainable land and water management *(20)*.

[a] $PM_{2.5}$ is atmospheric particulate matter (PM) with a diameter of <2.5 µm.

[b] These vulnerability factors are not comprehensive but rather examples of relevant vulnerability factors. Please see the WHO Quality Criteria for Health National Adaptation Plans for more details: https://www.who.int/publications/i/item/quality-criteria-health-national-adaptation-plans.

[c] See "National health response: health system capacity and adaptation" for the national response to air pollution.

HEALTH CO-BENEFITS FROM CLIMATE CHANGE MITIGATION

Health co-benefits are local, national and international measures with the potential to simultaneously yield large, immediate public health benefits and reduce greenhouse gas emissions.

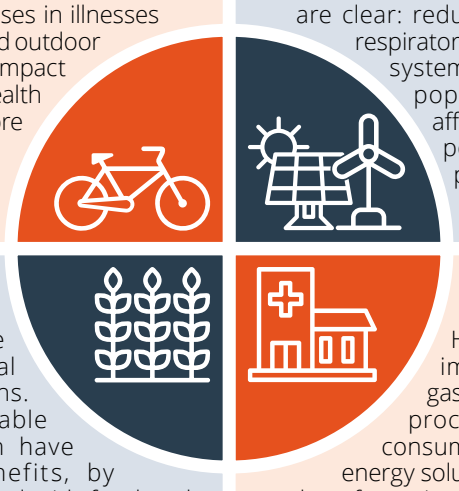
GLOBAL EXAMPLES

TRANSPORT

A shift towards active transportation and sustainable public transport systems could see reductions in greenhouse gas emissions; decreases in illnesses related to physical inactivity, reduced outdoor air pollution and noise exposure. Compact urban planning can also improve health equity by making urban services more accessible to the elderly and poor.

ENERGY

The health benefits of transitioning from polluting fuels, such as coal, to lower carbon sources and renewables are clear: reduced rates of cardiovascular and respiratory diseases; cost-savings for health systems; improved health equity where populations are disproportionately affected by household or ambient air pollution; and improved economic productivity from a healthier and more productive workforce.



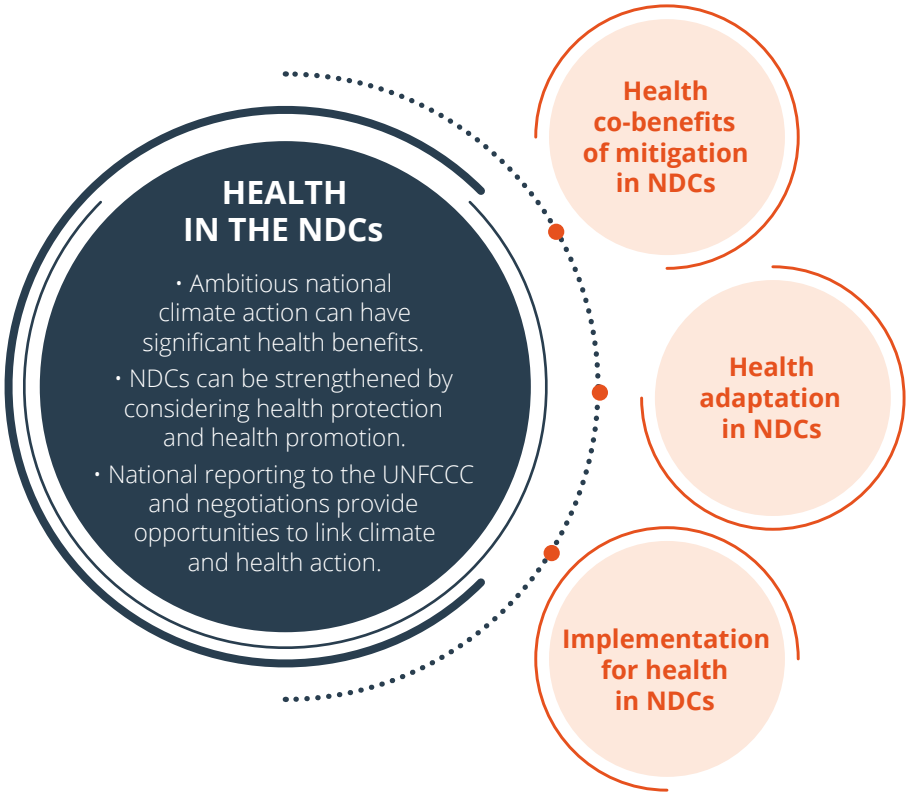
FOOD AND AGRICULTURE

Food systems emissions constitute a significant proportion of total global greenhouse gas emissions. Interventions to build sustainable and secure food systems can have significant public health benefits, by addressing malnutrition associated with food and nutrition insecurity while reducing diet-related noncommunicable diseases (NCDs).

HEALTH CARE SYSTEMS

Health care activities are an important source of greenhouse gas emissions. Major sources include procurement and inefficient energy consumption. Low-carbon and efficient energy solutions can lower the health sector's carbon footprint while improving the quality and reliability of energy services in many settings.

HEALTH IN THE NATIONALLY DETERMINED CONTRIBUTION (NDC)



Total 2013 emissions

26.13 Mt CO_2 equivalent *(21)*

NDC target

An unconditional target to reduce greenhouse gas emissions by 20% by 2030, compared with the projected BAU scenario, and a conditional target to increase this reduction to 31% *(4)*

Lebanon's NDC highlights the health impacts of climate change and identifies adaptation actions to protect human health. Indeed, the sixth adaptation priority is to "ensure overall public health and safety through climate-resilient health systems". This includes assessing the vulnerability of the health sector to climate change, establishing early warning systems, and incorporating climate data into national health information *(4)*.

NATIONAL HEALTH RESPONSE: HEALTH SYSTEM CAPACITY AND ADAPTATION

The following section measures progress in the health sector in responding to climate threats based on country reported data collected in the WHO Health and Climate Change Global Survey *(22)*.

GOVERNANCE AND LEADERSHIP

National planning for health and climate change

Has a national health and climate change strategy or plan been developed?[a] *Title:* N/A *Year:* N/A	●
Content	
Are health adaptation priorities identified in the strategy/plan?	○
Are the health co-benefits of mitigation action considered in the strategy/plan?	○
Have performance indicators been identified?	○
Level of implementation of the strategy/plan	○
Portion of estimated costs to implement the strategy/plan covered in the health budget	○

● yes ● no ○ unknown / not applicable

Intersectoral collaboration to address climate change

Is there an agreement in place between the ministry of health and this sector which defines specific roles and responsibilities in relation to links between health and climate change policy?

Sector[b]	**Agreement in place**
Transportation	●
Electricity generation	●
Household energy	●
Agriculture	●
Social services	●
Water, sanitation and waste-water management	●

● yes ● no ○ unknown / not applicable

[a] In this context, a national strategy or plan is a broad term that includes national health and climate strategies as well as the health component of national adaptation plans (HNAPs).

[b] Specific roles and responsibilities between the national health authority and the sector indicated are defined in the agreement.

EVIDENCE AND IMPLEMENTATION

Vulnerability and adaptation assessment for health

Has an assessment of health vulnerability and impacts of climate change been conducted at the national level?

Title: N/A

Year: N/A

Have the results of the assessment been used for policy prioritization or the allocation of human and financial resources to address the health risks of climate change?

● yes ● no ○ unknown / not applicable

Integrated risk monitoring and early warning

Climate-sensitive diseases and health outcomes	Health surveillance system exists[a]	Health surveillance system includes meteorological information[b]	Climate-informed health early warning system (EWS) in place
Thermal stress (e.g. heat waves)	●	●	●
Vector-borne diseases	●	●	●
Foodborne diseases	●	●	●
Waterborne diseases	●	●	●
Nutrition (e.g. malnutrition associated with extreme climatic events)	●	●	●
Injuries (e.g. physical injuries or drowning in extreme weather events)	●	●	●
Mental health and well-being	●	●	●
Airborne and respiratory diseases	●	●	●

● yes ● no ○ unknown / not applicable

[a] A positive response indicates that the surveillance system is in place, it will identify changing health risks or impacts AND it will trigger early action.

[b] Meteorological information refers to either short-term weather information, seasonal climate information or long-term climate information.

Emergency preparedness

Climate hazard	Early warning system in place	Health sector response plan in place	Health sector response plan includes meteorological information
Heat waves	●	○	○
Storms (e.g. hurricanes, monsoons, typhoons)	○	○	○
Flooding	●	○	○
Drought	●	○	○
Air quality (e.g. particulate matter, ozone levels)	●	○	○
Sand/dust storms	●	●	●

● yes ● no ○ unknown / not applicable

CAPACITY, INFRASTRUCTURE AND SUSTAINABILITY

Human resource capacity

International Health Regulations (IHR) Monitoring Framework Human Resources Core Capacity (2018) *(23)*	40%
Does your human resource capacity, as measured through the IHR, adequately consider the human resource requirements to respond to climate-related events?	●
Is there a national curriculum developed to train health personnel on the health impacts of climate change?	●

● yes ● no ○ unknown / not applicable

Health care facilities, infrastructure and technology

Has there been an assessment of the climate resilience of any public health care facilities?	●
Have measures been taken to increase the climate resilience of health infrastructure and technology?	○
Is there a national initiative/programme in place to promote the use of low-carbon, energy-efficient, sustainable technologies in the health sector?	●

● yes ● no ○ unknown / not applicable

OPPORTUNITIES FOR ACTION

1. COMPLETE AND IMPLEMENT THE HEALTH AND CLIMATE CHANGE STRATEGY/PLAN CURRENTLY UNDER DEVELOPMENT FOR LEBANON

Complete the development of the national health and climate change plan. Assess barriers to implementation of the plan/strategy (e.g. governance, evidence, monitoring and evaluation, finance). Implementation can be supported by exploring additional opportunities to access funds for health and climate change priorities (e.g. GCF readiness proposal). See "WHO resources for action" for further details.

2. STRENGTHEN INTEGRATED RISK SURVEILLANCE AND HEALTH EARLY WARNING SYSTEMS

Meteorological information is not currently used to inform risk surveillance of climate-sensitive diseases. The use of climate/weather information can be integrated into health surveillance systems and used to predict outbreaks of climate-sensitive diseases (i.e. climate-informed health early warning systems) to help ensure a preventive approach to specific climate-sensitive health programmes.

3. ASSESS THE HEALTH CO-BENEFITS OF NATIONAL CLIMATE MITIGATION POLICIES

Health co-benefits of mitigation are currently not included in Lebanon's Nationally Determined Contribution (NDC). Ensure that climate mitigation policies include the health risks posed from climate change, identify health adaptation priorities and measure and optimize the health co-benefits of climate mitigation action.

4. BUILD CLIMATE-RESILIENT AND ENVIRONMENTALLY SUSTAINABLE HEALTH CARE FACILITIES

Measures can be taken to prevent the potentially devastating impacts of climate change on health care facilities and health service provision while decreasing the climate and environmental footprint of health care facilities. A commitment towards climate-resilient, environmentally sustainable health care facilities can improve system stability, promote a healing environment and mitigate climate change impacts.

WHO RESOURCES FOR ACTION

- **Operational framework for building climate-resilient health systems**
  https://www.who.int/publications/i/item/operational-framework-for-building-climate-resilient-health-systems
- **WHO guidance to protect health from climate change through health adaptation planning**
  https://www.who.int/publications/i/item/who-guidance-to-protect-health-from-climate-change-through-health-adaptation-planning
- **Quality Criteria for Health National Adaptation Plans**
  https://www.who.int/publications/i/item/quality-criteria-health-national-adaptation-plans
- **Protecting health from climate change: vulnerability and adaptation assessment**
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- **Heat early warning systems guidance**
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- **Climate services for health fundamentals and case studies**
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