



Ministry Of Health

National Climate Change Health Adaptation Strategy of Jordan 2024-2033



The Ministry of Health gratefully thanks World Health Organization Country Office in Jordan, for supporting the development of “National Climate Change Health Adaptation Strategy of Jordan 2024-2033” in The Hashemite Kingdom of Jordan.

Contents

Summary.....	4
List of Abbreviations.....	5
List of tables	5
List of figures	6
1. Climate change variability projection in Jordan.....	6
2. Climate change and health.....	7
3. Development process	9
4. Climate Change and Airborne and Respiratory Diseases	13
4.1 Assessment of Current Vulnerability	13
4.2 Assessment of Vulnerable Regions	14
4.3 Current Policies and Programs	14
4.4 Adaptation Measures	14
5. Climate Change and Water- and Food- Borne Diseases.	15
5.1 Assessment of Current Vulnerability	15
5.2 Assessment of Vulnerable Regions	16
5.3 Current Policies and Programs	16
5.4 Adaptation Measures	17
6. Climate Change and Nutrition and Food Safety	17
6.1 Assessment of Current Vulnerability	18
6.2 Assessment of vulnerable regions.....	18
6.3 Current Policies and Programs	18
6.4 Adaptation Measures	19
7. Climate Change and Heatwaves.....	19
7.1 Assessment of Current Vulnerability	20
7.2 Assessment of vulnerable regions.....	21
7.3 Current Policies and Programs	21
7.4 Adaptation Measures	22
8. Climate Change and Occupational Health and Safety	22
8.1 Assessment of Current Vulnerability	22
8.2 Assessment of Vulnerable Regions	23
8.3 Current Policies and Programs	23
8.4 Adaptation Measures	23

9.	Climate change and Vector-Borne Diseases.....	24
9.1	Assessment of Current Vulnerability	24
9.2	Assessment of Vulnerable Regions	25
9.3	Current Policies and Programs	25
9.4	Adaptation Measures	26
10.	Mental Health and Climate Change.....	26
10.1	Assessment of Current Vulnerability	26
10.2	Assessment of Vulnerable Regions	26
10.3	Current Policies and Programs.....	27
10.4	Adaptation Measures	27
11.	Identification and prioritization of health policies and programs for adaptation	28
11.1	Recommended interventions for all identified climate sensitive outcomes	29
12.	Adoption of the one health approach in Jordan’s CC and HNAP	34
12.1	Interlinkages between the one health approach and CC	34
12.2	Situation analysis of one health threats in Jordan	34
12.3	Current one health initiatives in Jordan.....	35
12.4	Implementation of the one health approach in Jordan	35
12.5	Addressing the impact of climate change through the one health approach.....	36

Summary

Our climate is changing. These changes are affecting various areas of life, including our health and wellbeing. During the sixty-first session of the World Health Assembly (WHA) in May 2008, climate change was identified as a fundamental threat to public health. To reduce climate-related risks to health, WHA urged countries to take decisive actions to address the health impact of climate change. Moreover, the World Health Organization (WHO) Eastern Mediterranean Regional Committee issued a Regional Committee Resolution (EM/RC55/R.8) that aimed to protect health from the effects of climate change and encouraged member states to implement the Regional Framework for Health Sector Action to Protect Health from the Effects of Climate Change to build health systems capacity to assess climate change health vulnerability and proactively prepare for and address potential health impacts.

The Hashemite Kingdom of Jordan is among the first countries to develop National Climate Change Health Adaptation Strategy (HNAP) and Action Plan. In the 2012 plan, Jordan highlighted multiple expected health risks with plans to address the risk through comprehensive strategies and international cooperation to mitigate the adverse health impact of climate change and enhance health system resilience. This document is an update of the 2012 document that was developed based on assessment of the current health-related vulnerabilities and coping capacity, while considering vulnerable population and regions.

The 10-year adaptation plan tackled the impact of climate change on seven climate sensitive health issues- airborne and respiratory diseases, water and food-borne diseases, vector-borne diseases, nutrition, heatwaves, occupational health, and mental health. The development process started with Climate Change and Health Vulnerability and Adaptation (V&A) Assessment in Jordan is to provide a scientific basis for evidence-based policy decisions and adaptive actions to safeguard public health against climate change impacts. It aimed to evaluate vulnerable populations, identify system weaknesses, and help guide the interventions over the ten-year period of the strategy.

The Ministry of Health, supported by the World Health Organization, led the development of HNAP in consultation with various stakeholders following the WHO's Framework for Vulnerability, Impact and Adaptation Assessment. The vision for the HNAP is 'to protect the health and wellbeing of people and communities from the effects of climate change to achieve Health for All'. This includes:

- To strengthen the health system capacity to provide climate resilient health services
- To address the direct and indirect effects of climate change on the health of communities including effect from non-health sectors.
- To raise the profile of health consideration in multi-sectoral climate action

List of Abbreviations

AMR	Antimicrobial Resistance
CC	Climate Change
CL	Cutaneous Leishmaniasis
CMHCs	Community Mental Health Centers
COPD	Chronic Obstructive Pulmonary Disease
DHS	Demographic and Health Survey
DoS	Department of Statistics
FAO	Food and Agriculture Organization
FBDs	Food borne Disease
HNAP	National Climate Change Health Adaptation Strategy
IOHS	Institute for Occupational Health and Safety
IPCC	Intergovernmental Panel on Climate Change
JPFHS	Jordan Population and Family Health Survey
MD	Meteorology Department
MOL	Ministry of Labor
MOH	Ministry of Health
NTDs	Neglected Tropical Diseases
OHD	Occupational Health Directorate
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
RCP	Representative Concentration Pathway
SSC	Social Security Corporation
UNFCCC	United Nations Framework Convention on Climate Change
UNRWA	United Nations Relief and Works Agency
VBDs	Vector- Borne Diseases
WBGT	Wet Bulb Globe Temperature
WHO	World Health Organization
W & FBDs	Water- and Food- Borne Diseases

List of tables

Table 1	Projected Climate Change in Jordan by the End of the 21st. (RCP = Representative Concentration Pathways scenarios. The number represents a scenario where radiative forcing stabilizes at 4.5 or 8.5 Watts per square meter by the year 2100)
Table 2	Overall Vulnerability Classification
Table 3	Scores of the Health Sector's Vulnerability Components
Table 4	Socioeconomic Vulnerability Disaggregated by Governorate

Table 5	Priority Ranking of Climate-Sensitive Health Outcomes for Adaptation by Governorate
Table 6	Measures to Mitigate Vulnerability to Climate Change Impacts on Airborne and Respiratory Diseases
Table 7	Measures to Mitigate Vulnerability to Climate Change Impacts on Water- and Food-Borne Diseases
Table 8	Measures to Mitigate Vulnerability to Climate Change Impacts on Nutrition and Food Safety
Table 9	Measures to Mitigate Vulnerability to Climate Change Impacts on Heatwaves Diseases
Table 10	Measures to Mitigate Vulnerability to Climate Change Impacts on Occupational Health and Safety
Table 11	Measures to Mitigate Vulnerability to Climate Change Impacts on Vector-Borne Diseases
Table 12	Measures to Mitigate Vulnerability to Climate Change Impacts on Mental Health
Table 13	Adaptation Interventions, Activities and Timeframes for Climate-Related Health Outcomes

List of figures

Figure 1	Methodological approach used for assessing climate Change vulnerability for each health outcome
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1. Climate change variability projection in Jordan

Jordan, a Mediterranean country situated approximately 80 kilometers east of the Mediterranean Sea, boasts a unique geographic location between 29°10' and 33°45' North latitude and 34°55' and 39°20' East longitude. This strategic position, coupled with its Mediterranean climate characterized by hot, dry summers and cool, wet winters, has significantly shaped its topography. The country can be divided into five main physiographic regions, arranged in a north-south alignment:

- Tropical Desert: Located in the central Ghor or rift valley, this region is characterized by its arid climate and low-lying terrain.
- Escarpments and Mountain Highlands: Rising east of the Ghor, these regions offer a stark contrast to the desert, featuring mountainous landscapes and varying elevations.
- Arid Plains: Expansive, flat areas that often experience harsh desert conditions.
- Badia: A vast desert region known for its nomadic lifestyle and sparse vegetation.
- Azraq and Wadi Sirhan Depression: Depressions or lowlands that may contain oases or water bodies.

As of 2021, Jordan's population was estimated to be around 11.1 million, of which approximately 30% were non-Jordanians. This significant portion includes over 1.3 million Syrian refugees, with a substantial 89% residing in host communities, primarily in the capital Amman and the northern governorates. This influx has made Jordan one of the world's largest refugee-hosting countries relative to its native population size.

The strain on Jordan's resources, particularly its limited water supply, has been immense. Additionally, the country's public services, including health, education, energy, infrastructure, municipal services, and solid waste management, have faced severe challenges due to the increased demand from the refugee population. These circumstances have put significant pressure on Jordan's government and society, requiring innovative solutions and international support to address the needs of both its native citizens and the refugee community.

The Fourth National Communication (4NC) to the United Nations Framework Convention on Climate Change (UNFCCC) projects significant climate changes in Jordan by the end of the 21st century. The table below depicts a summary of these changes.

Parameter	RCP 4.5	RCP 8.5
Minimum Air Temperature Increase	1.2 °C [+0.6 °C to +2.9 °C]	2.7 °C [+2.1 °C to +4.5 °C]
Maximum Air Temperature Increase	1.1 °C [+0.7 °C to +1.7 °C]	3.1 °C [+2.6 °C to +3.7 °C]
Precipitation Decrease	15.8% [-7.1% to -31.3%]	47.0% [23.3% to -57.5%]
Potential Evapotranspiration Increase	5.8% [+4.7% to +6.9%]	11.1% [+8.1% to +15.3%]
Relative Humidity Decrease	3% [-2.5% to -3.3%]	7.2% [-6.0% to 7.8%]
Wind Speed	No significant changes	No significant changes

Table 1. Projected Climate Change in Jordan by the End of the 21st. (RCP = Representative Concentration Pathways scenarios. The number represents a scenario where radiative forcing stabilizes at 4.5 or 8.5 Watts per square meter by the year 2100)

Additionally, drought probability and duration will rise, particularly in the north, with maximum drought probability reaching 93% under RCP 8.5 and 50% under RCP 4.5., and heatwave events are projected to double under RCP 4.5 and triple under RCP 8.5.

2. Climate change and health

Climate change in Jordan is expected to negatively impact health through various pathways, including more frequent heatwaves, floods, and droughts, and shifts in vector-borne diseases. Water- and food-borne diseases are likely to increase due to rising temperatures, increasing the survival and abundance of microorganisms and the use of unsafe water due to reduced water availability as result of decreased precipitation. Water- and food-borne diseases epidemics can also be caused by flooding due to water contamination and crowding. Vector-Borne Disease (VBD) risk is also expected to increase with increasing temperature, particularly in Eastern Desert areas with water-harvesting projects which will impact on the intermediate hosts or vectors responsible for the transmission of malaria, schistosomiasis and leishmaniasis.

Access to nutritious food may decline; dietary quality and quantity impacted, and micronutrient malnutrition (or hidden hunger) increased as indirect impacts of climate change, leading to malnutrition. The expected increase in heatwaves will cause an increase in a spectrum of disorders, including heat exhaustion and heat stroke, which can be fatal. Outdoor workers will face increased risks from UV radiation, leading to conditions like cataracts and skin cancer, while both outdoor and indoor workers may suffer from heat stress and exposure to pollutants. Climate change is expected to negatively impact mental health in Jordan, causing anxiety, depression, and other disorders due to stress and displacement from extreme weather events.

The sixty first session of the World Health Assembly (WHA) in May 2008 identified climate change as a fundamental threat to public health, adopting a resolution urging Member States to take decisive action to address the health impacts of climate change. The World Health Organization (WHO) Eastern Mediterranean Regional Committee issued a Regional Committee Resolution (EM/RC55/R.8) at its fiftieth session aiming at protecting health from the effects of climate change and encouraging Member States to implement the endorsed Regional Framework for Health Sector Action to Protect Health from the Effects of Climate Change. This resolution focuses on building health sector capacity urging health systems to assess health vulnerability to climate change and proactively prepare for and address its health impacts. In 2021, WHO issued quality criteria for health national adaptation plans, to help guide the development of a long term iterative HNAP process. With 6 quality criteria, the report highlights the main climate sensitive health risk that included injury and mortality from extreme events, heat-related illnesses, respiratory illnesses, water-borne diseases and other water-related health impacts, zoonosis, vector-borne diseases, malnutrition and food-borne diseases, non-communicable diseases (NCDs), and mental and psychosocial health.

Jordan has been one of the first countries to recognize the importance of addressing the impacts of climate change on health and health sector. In 2012, the Ministry of Health through a multisectoral effort developed its National Climate Change Health Adaptation Strategy and Action Plan by which a comprehensive assessment of climate change impacts on health was conducted highlighting several prioritized climate sensitive health outcomes. The plan identified seven climate sensitive health issues: airborne and respiratory diseases, water- and food-borne diseases, vector-borne diseases, nutrition, heatwaves, occupational health and mental health. Building on the efforts surrounding climate change, Jordan's Ministry of Health has made a significant commitment to building a climate-resilient, environmentally sustainable, and low-carbon health sector. This commitment aligns with global efforts, such as the COP26 Health Program and the Global Alliance on Transformative Action on Climate Change and Health (ATACH). Jordan has further played an active role in several climate change and health related initiatives, participating in COP28's Health Day and Health Ministerial as well as endorsing the Health Declaration, which emphasizes the importance of climate-resilient and environmentally sustainable health systems.

3. Development process

The Ministry of Health led the development process to enhance the health sector preparedness and resilience to communities affected by climate change. The development process of the national adaptation strategy involved a thorough assessment of health vulnerability and adaptation to climate change along with key adaptation projects and plans of action. The whole process was carried out collaboratively with Ministry of Environment, Royal Medical Services, Jordan Physicians Association, Private Hospitals Association, Academic institutions, Jordan Center for Disease Control, the World Health Organization (WHO) and other relevant stakeholders. Engagement with key stakeholders in the HNAP occurred through face-to-face meetings and five multiple participatory workshops in 2024. The process started with a vulnerability and adaptation (V&A) assessment that aimed to evaluate the vulnerable population and geographies, identify system weaknesses, and specify response interventions. The V&A assessment was built surrounding multitude of data sources. This included the following:

- Peer-reviewed Literature: including the 2012 climate change and health strategy and scientific publications on potential changes in health risks associated with climate hazards
- Policies and programs related to climate-sensitive health outcomes
- Health Data from the Ministry of Health and subnational health authorities
- Meteorological and Hydrological Data
- Demographic and socioeconomic data
- Data from Other Ministries and Organizations: such as data on flood or drought zones

The selected climate vulnerable regions and communities were based on analysis of indicators for climate-sensitive health risks, capacity of health sector, and socioeconomic conditions. The weights assigned to the health sector vulnerability, the socio-economic vulnerability, and the vulnerability to the climate sensitive disease were 25%, 25%, and 50% respectively. Scores of socioeconomic vulnerabilities (25%), health sector’s vulnerability (25%), and the vulnerability of the health outcome will be summed to determine the overall vulnerability (100%) of the health outcome to climate change. The overall vulnerability will be used to determine the vulnerability classification as shown in Table 1.

Overall Vulnerability	Vulnerability Classification
More than 75%	High
50%-75%	Medium
25%-49%	Low
Below 25%	Not Vulnerable

Table 2. Overall Vulnerability Classification

The available data and classification were adopted at the governorate level, classifying each governorate into not vulnerable, vulnerable, or highly vulnerable. The vulnerability scores for both the health sector and the socioeconomic sector were adopted from Jordan’s Fourth National Communication on Climate Change.

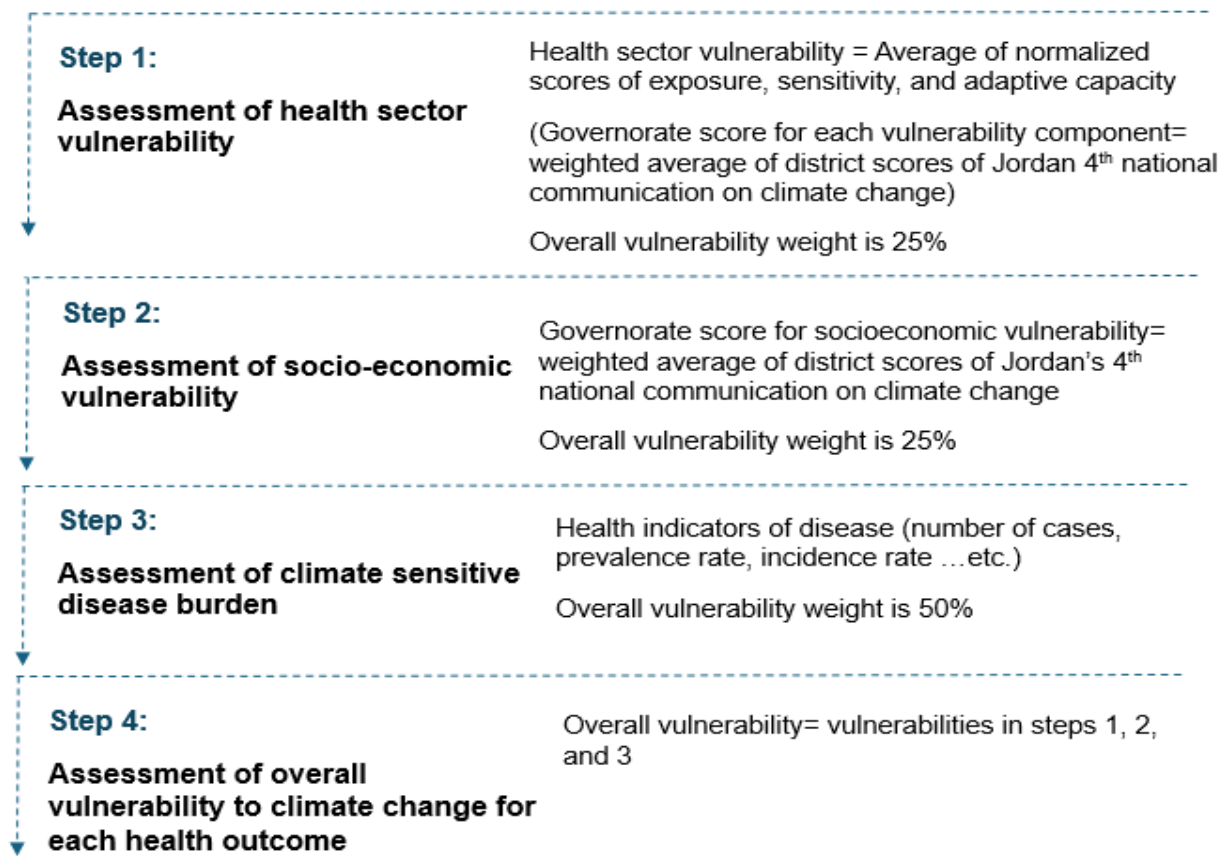


Figure 1. Methodological approach used for assessing climate Change vulnerability for each health outcome

Health sector vulnerability

The ability of the health sector to combat health risks associated with climate change must be determined. To identify vulnerable regions, a governorate-level spatial mapping of exposure, sensitivity and adaptive capacity of the health sector under the current climate was conducted. An aggregated vulnerability score was calculated based on sensitivity, exposure, and adaptive capacity for the health sector. To conduct capacity assessment of the health sector, the Ministry of Health infrastructure and human resources data were reviewed. Since MoH is not the sole healthcare provider, similar data was requested from Royal Medical Services and the private sector. However, raw data from these health service providers could not be obtained. The requested data included the following and was disaggregated at the governorate level:

- Number of hospitals
- Number of beds
- Number of medical staff
- Number of administrative staff

- Number of laboratories
- Number of health centers
- Average number of patients

Health sector’s exposure, sensitivity, and adaptive capacity at the district level were adopted from Jordan’s 4th National Communication on climate change to determine the health sector’s weighted average at the governorate level. For each component, a score of 25 was given to the most vulnerable governorate. The average of the vulnerability components was used to determine the health sector’s vulnerability in each governorate.

Governorate	Score of Exposure (25%)	Score of Sensitivity (25%)	Score of Adaptive Capacity (25%)	Average Score of Health Sector Vulnerability (25%)
Amman	18	16	2	12
Balqa	21	8	14	14
Zarqa	20	25	10	18
Madaba	21	11	15	16
Irbid	23	22	18	21
Mafraq	19	22	20	20
Jarash	20	24	20	22
Ajlun	25	23	25	24
Karak	20	12	20	17
Tafila	16	15	20	17
Ma’an	15	13	18	15
Aqaba	15	3	15	11

Table 3. Scores of the Health Sector’s Vulnerability Components

Socioeconomic vulnerability

The socioeconomic baseline data was obtained from the Department of Statistics and included the most recent estimates of population, average family income, unemployment percentage, and health-insured population for each governorate. The socioeconomic vulnerability was built on district level socioeconomic vulnerability reported in Jordan’s 4th National Communication on Climate Change. The data was then normalized and a score of 25 was given to the most vulnerable governorate enabling the determination of the vulnerable governorates based on relative vulnerability rather than absolute vulnerability. The most socioeconomically vulnerable governorates were Irbid followed by Jarash, Ajlun, and Mafraq. Meanwhile, the least vulnerable from a socioeconomic perspective were the governorates of Aqaba, Balqa, Madaba, and Amman.

Governorate	Socioeconomic Vulnerability [3]	Socioeconomic Vulnerability Average Score 25%
Amman	0.1467	6
Balqa	0.1062	5
Zarqa	0.3046	13
Madaba	0.1442	6
Irbid	0.583	25
Mafraq	0.4636	20
Jarash	0.4879	21
Ajlun	0.4997	21
Karak	0.302	13
Tafila	0.3712	16
Ma'an	0.2968	13
Aqaba	0.0598	3

Table 4. Socioeconomic Vulnerability Disaggregated by Governorate

Climate-sensitive health outcomes

The consultative meetings and workshops identified the main challenges, probable and priority health outcomes. The seven selected health outcomes were airborne and respiratory diseases, water and food-borne diseases, vector-borne diseases, nutrition, heatwaves, occupational health, and mental health.

The main components and activities of the action plan were further developed collaboratively adopting the one health approach. Based on the outcomes of the consultations, the V&A assessment components for each health outcome previously selected and the associated warning system were updated. This process included a review of the available evidence, policies, plans and ongoing programs and strategies concerned with each health outcome to complete the assessment steps of vulnerability, capacity, future risk and adaptation assessments. Finally, in consultation with the different departments at MOH and other stakeholders, the adaptation measures were developed and analyzed.

Below is a summary Priority Ranking of Climate Sensitive Outcomes for Adaptation for the seven health outcomes.

Rank	Health outcome	Most Vulnerable Governorates
1	Air-Borne and Respiratory Diseases	Ajlun, Irbid
2	Nutrition and Food Safety	Mafraq, Irbid
3	Vector-Borne Diseases	Ajlun, Irbid
4	Water and Food-Borne Diseases	Balqa, Ajloun
5	Heatwaves	Karak, Irbid
6	Occupational Health	Karak, Irbid
7	Mental Health	Jarash, Tafila, Irbid

Table 5. Priority Ranking of Climate-Sensitive Health Outcomes for Adaptation by Governorate

Finally, in consultation with the different departments at MOH and other stakeholders, the adaptation measures were developed and analyzed. The detailed analysis of each health outcome policies, plans and ongoing programs and strategies, V&A assessment, capacity, future risk and adaptation assessments are detailed below.

4. Climate Change and Airborne and Respiratory Diseases

Climate change exacerbates air pollution by intensifying the frequency and severity of extreme weather events such as heatwaves, wildfires, and dust storms. These events release large volumes of particulate matter, ozone, and other pollutants into the atmosphere, compromising air quality and triggering respiratory illness. However, establishing a clear evidence base for the correlation between climate events and respiratory diseases remains challenging due to data gaps and numerous confounding factors further complicate efforts to isolate the direct impacts of climate change on respiratory diseases.

4.1 Assessment of Current Vulnerability

Rising temperatures, altered rainfall patterns, and more frequent extreme weather events significantly affect the incidence and severity of these diseases. Warmer climates and increased precipitation expand habitats for disease vectors like mosquitoes, increasing the spread of influenza and tuberculosis. Higher temperatures also promote the growth of fungi and mold, worsening conditions like asthma and Chronic Obstructive Pulmonary Disease (COPD). Additionally, degraded air quality from climate change exacerbates respiratory diseases. Increased temperatures lead to higher ground-level ozone, while more frequent wildfires release harmful pollutants, triggering asthma attacks, reducing lung function, and increasing hospital admissions. Extreme weather events like heatwaves, and floods further impact respiratory health by worsening existing conditions and promoting mold growth in affected areas.

A comprehensive assessment of current vulnerabilities is crucial for developing effective public health strategies. The current strategy includes an extensive literature review and a vulnerability assessment to identify vulnerable populations and regions. The vulnerable populations are identified as follows:

1. People with chronic respiratory disease and asthma
2. People living in areas experiencing land-use changes such as deforestation, coastal development, or urbanization
3. Pregnant women, elderly individuals with chronic medical conditions
4. People with low socioeconomic status
5. People living in desert areas prone to dust storms or in regions with extensive olive tree cultivation, which increases pollen exposure

4.2 Assessment of Vulnerable Regions

The assessment incorporated three vulnerability indicators to identify the vulnerable regions. The indicators are vulnerability of health sector to climate change, socioeconomic vulnerability, and vulnerability to airborne and respiratory diseases (AB&RD). The results indicate that the top five governorates most vulnerable to AB&RD due to climate change are Zarqa, Irbid, Jarash, Ajloun, and Mafraq.

4.3 Current Policies and Programs

- The Ministry of Health's national tuberculosis program, overseen by the Directorate of Chest Diseases, Foreigners Health, and Occupational Health, is partially integrated into general health services and provides comprehensive care for tuberculosis patients throughout the country.
- Awareness campaigns on non-communicable disease risk factors have been ongoing since 2022 under the supervision of the non-communicable disease directory
- National surveys on non-communicable disease risk factors were conducted in 2018 and 2019, also under the non-communicable disease directory's supervision.

4.4 Adaptation Measures

Adaptation measures to reduce the potential negative impacts of climate change on AB&RDs involve a multi-faceted approach. The following table summarizes key adaptation measures to climate change impacts to reduce vulnerability to AB&RD

<p>Strengthen surveillance system where both environmental and climatic factors & disease indicators are incorporated</p>	<p>Establishing early warning systems to trigger prompt public health intervention which relies on health and climate data</p>	<p>Developing climate-informed respiratory disease control programs that includes meteorological data</p>	<p>Developing the capacity of health care professionals to monitor, diagnose, and treat cases of climate-sensitive diseases</p>	<p>Strengthening disaster management program to enhance health sector emergency preparedness and response</p>
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Table 6. Measures to Mitigate Vulnerability to Climate Change Impacts on Airborne and Respiratory Diseases

5. Climate Change and Water- and Food- Borne Diseases.

Climate change significantly impacts water- and food-borne diseases by altering environmental conditions that affect the proliferation and transmission of pathogens. Rising temperatures, increased rainfall, and extreme weather events can lead to the contamination of water supplies and food sources with harmful bacteria, viruses, and parasites. Flooding and heavy rain can overwhelm sanitation systems, leading to outbreaks of diseases like cholera and hepatitis A. Changes in temperature and precipitation also influence the growth and spread of foodborne pathogens, such as Salmonella and E. coli, posing increased risks to public health.

5.1 Assessment of Current Vulnerability

Climate change-induced temperature rise is likely to foster the survival and proliferation of microorganisms, consequently heightening the prevalence of water and food-borne diseases. The anticipated reduction in precipitation will diminish water availability, potentially prompting the consumption of unsafe, contaminated water for various purposes, leading to an upsurge in water and foodborne illnesses. Floods, a consequence of climate change, are expected to trigger epidemics of water and food-borne diseases, primarily stemming from water contamination due to disruptions in water purification and sewage disposal systems. In other words, chemical contamination of water might occur due to displacement of chemicals during a flood, with overloaded sewers, storm water floods and landfill sites identified as potential sources of chemical contamination. Moreover, secondary effects of flooding, such as overcrowding and the subsequent fecal-oral transmission of gastrointestinal pathogens, may also contribute to the dissemination of water- and food-borne diseases.

Water-borne diseases are manifested by various types of infections that are transmitted via water, and include different types of pathogens such as viruses, bacteria, protozoa, and helminths. These pathogens can cause an array of symptoms. Water-borne most important diseases are diarrheal diseases, cholera, shigella, typhoid, hepatitis A and E, and poliomyelitis.

Vulnerable groups (groups at increased risk of severe illness) of water- and food- borne diseases are:

- ❑ **Children:** Children under 5 years old; Malnourished children, and Children with immunity impairment
- ❑ **Adults:** Immunosuppressed persons such as those receiving chemotherapy, transplant recipients; People with chronic diseases such as renal disease, cancer, chronic lung disease, and diabetes; Individuals without ready access to rehydration therapy and health services.
- ❑ **Elderly people:** People above 60 years old; Immunosuppressed persons such as those receiving chemotherapy, transplant recipients; People with chronic diseases such as renal disease, cancer, chronic lung disease, and diabetes; Individuals without ready access to rehydration therapy and health services.
- ❑ **Low socio-economic groups:** With poor access to adequate water, sanitation, and hygiene services); Living in areas impacted by climate change, e.g. flood prone areas

5.2 Assessment of Vulnerable Regions

Regarding vulnerable regions, they were identified based on an assessment of vulnerabilities at the governorate level. Namely, vulnerability to climate change impacts, socioeconomic vulnerability, and the burden of water- and food- borne diseases. The burden of diseases was reflected by determining the spatial and temporal incidence rates. The assessment results showed that the top five vulnerable governorates to water- and food- borne diseases due to climate change are Balqa, Jarash, Ajlun, Karak, and Ma'an.

5.3 Current Policies and Programs

- Directorate of disease monitoring, Diarrhea control program where a form should be filled to declare the number of diarrhea cases in each clinic and hospital.
- The “Emergency Health Project” is a results-based project that aims to maintain and deliver health care services at the Ministry of Health primary and secondary health care facilities, in addition to improving the efficiency of health services through capacity-building.
- The Healthy Villages project, which aimed to enable disadvantaged communities from health, social and economic aspects in order to achieve sustainable development (MoH strategy 2023-2025).
- Water quality control program –in all its phases (start date: 1/1/1970-ongoing), Environment Health and health directorates across governorates, partners are Ministry of Water and Irrigation.
- Wastewater treatment, reuse and control program (start date: 1/1/1970-ongoing), Environment Health and health directorates across governorates, partners are Ministry of Water and Irrigation.
- Engaging the private sector in interactive reporting of communicable diseases (CD) (2018-2021). The program has been implemented in collaboration with WHO.
- Program for keeping the Kingdom free from reemerging diseases (CD) (2018-2022), Epidemiological Surveillance Dept. in collaboration with MoH.

5.4 Adaptation Measures

Proposed measures to mitigate vulnerability to water- and food- borne diseases resulting from climate change impacts are categorized into three key areas, as outlined in the table below.

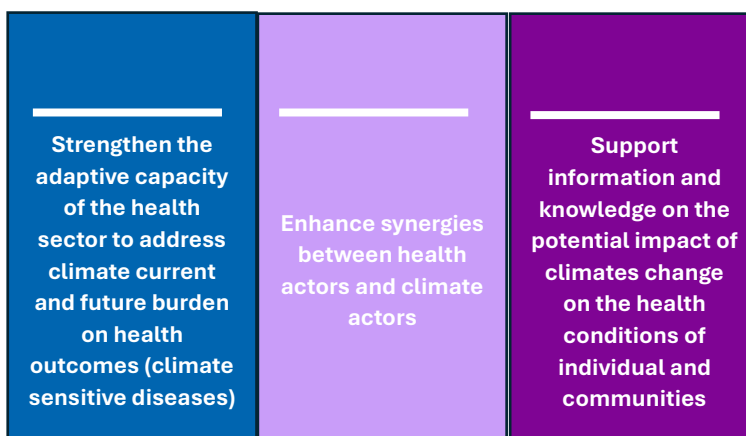


Table 7. Measures to Mitigate Vulnerability to Climate Change Impacts on Water- and Food-Borne Diseases

6. Climate Change and Nutrition and Food Safety

Climate change may affect health through a range of exposure pathways. Nutrition and food safety have been identified as climate sensitive health concerns. Overall, the effects of climate change on health are likely to be negative especially in low-income countries.

According to the WHO, almost 1 in 10 people in the world fall ill after eating contaminated food and 420 000 die every year. Economically, more than USD100 billion is lost each year in productivity and medical expenses resulting from unsafe food in low- and middle-income countries.

Climatic changes leading to long-term changes in weather parameters such as temperature and precipitation and increasing frequency of extreme events affect farming practices, crop production and the nutritional quality of food crops.

According to the National Climate Change Health Adaptation Strategy and Action Plan of Jordan developed by the MOH in 2012, access to nutritious food was expected to decrease leading to a decline in dietary quality and eventually quantity, and an increase in micronutrient malnutrition (or hidden hunger) as indirect impacts of climate change.

Malnutrition can lead to several health problems that can be a serious threat to human lives. These health conditions, which can be attributed to malnutrition, serve as key indicators of nutrition and food safety, and include:

- Stunting, underweight and wasting among children under 5 years of age

- Iron deficiency (ID) among women at childbearing age
- Vitamin A deficiency among children under five years old
- Iodine deficiency disorder

The Jordan National Micronutrients and Nutrients Survey (JNMNS) 2019, reported that the prevalence rates of iron and vitamin D deficiencies are high in both pre-school children and non-pregnant women of reproductive age and that vitamin A deficiency affected about one fifth of pre-school children.

6.1 Assessment of Current Vulnerability

Data provided by the MOH shows higher prevalence of anemia in the southern region. However, the 2023 Jordan Population and Family Health Survey (JPFHS) which is a more thorough survey did not show a similar trend. The 2023 survey is the eighth in a series of Population and Family Health Surveys conducted in Jordan by Department of Statistics (DoS) at the request of the MOH. Data collection took place from January 2023 to June 2023. The survey results for stunting, wasting, underweight, and anemia in children below 5 years of age in each governorate show that the highest prevalence of stunting was in Mafrq at 15.2%. The prevalence of anemia among children varies widely by governorate, from 18% in Ma'an to 45% in Mafrq. Approximately similar prevalence of anemia among women 15-49 years of age is noted except in Ma'an, where the prevalence of anemia in women is significantly higher than in children. The prevalence of wasting and underweight was generally low with no significant differences between governorates.

In general, there seem to be no significant change in these food safety and nutrition indicators in Jordan. However, this does not rule out potential impact of climate change. Interventions and increased public awareness may have helped prevent a potential rise in the food safety and nutrition indicators in Jordan.

6.2 Assessment of vulnerable regions

To determine the vulnerable governorates based on socioeconomic conditions, adaptive capacity of the health sector, and nutrition and food safety status, scores of socioeconomic vulnerability, scores of health sector's vulnerability, and scores of nutrition and food safety vulnerability are summed to determine the overall vulnerability. The overall assessment of the nutrition and food safety vulnerability to climate change revealed that governorates of Mafrq and Irbid are highly vulnerable. On the other hand, the governorates Balqa, Amman, and Madaba are classified as having low vulnerability.

6.3 Current Policies and Programs

Nutrition and food safety intersect with other challenges such as economic growth, water, agriculture, employment, social protection, climate change and others. Therefore, no specific policies on nutrition and food safety exist. There have been several nutrition strategies and decrees, such as:

- Salt iodization program, rendering the iodization of salt for human consumption mandatory

- Iodine Deficiency Disorders Control Program
- Flour fortification program in 2002, rendering the addition of iron and folic acid to the Mowahad wheat flour mandatory. The program was broadened by adding vitamins A, B1, B2, B3, B6 and B12 and zinc to the premix
- School-feeding program was initiated in the late 1990's targeted to pupils in underprivileged areas

It is worth noting that these programs are not linked to climate change. They do not provide additional precautions and actions to combat the negative effects of climate change on nutrition and food safety.

6.4 Adaptation Measures

Proposed measures to mitigate vulnerability to nutrition and food safety diseases resulting from climate change impacts are categorized into two key areas, as outlined in the table below.

<p>Establish an efficient, easy to conduct, and sustainable nutritional surveillance system, which enhances the availability of a reliable and sustainable database on the nutritional status of people at the national level</p>	<p>Establishing continuous supplementation programs to high-risk groups at high-risk areas e.g. supplements of iron, folic acid, and B12 to pregnant women attending health facilities; regular supplements of iron to all less than five years of age, especially for those under two years of age</p>
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Table 8. Measures to Mitigate Vulnerability to Climate Change Impacts on Nutrition and Food Safety

7. Climate Change and Heatwaves

There are several definitions for heatwaves based on how much and how long the temperature exceeds the normal temperature at the time and location where it occurs. The meteorological definition describes a heatwave as a period of at least three consecutive days with temperatures exceeding a certain threshold, which varies depending on the region and climate norms.

Heat and hot weather that can last for several days, can have a significant impact on human health which may lead to mortality. However, their death tolls and destruction may not always be immediately apparent. Between 1998 and 2017, more than 166 000 people died due to heatwaves, including more than 70 000 who died during the 2003 heatwave in Europe.

The health impacts of exposure to extreme heat can be classified into direct and indirect. The most vulnerable individuals and communities include elderly, infants and children, pregnant women, outdoor and manual workers, athletes, and the poor.

Due to climate change, the frequency and severity of heatwaves increased globally. Heatwaves have been identified as climate sensitive health concern. They can cause sunburn and fatigue, heat rash, heat cramps, heat syncope, heat exhaustion, and heat stroke. Heat exhaustion and heat stroke can lead to death. Exposure to hot weather may also increase the severity of existing chronic medical conditions.

Overall, the effects of heatwaves on health are likely to be negative especially in low-income countries. Other effects of heatwaves include: increased energy and water demand, increased stress on the infrastructure, and wildfires resulting from longer periods of drought.

In many countries, heatwaves have been recognized as one of the priority national risks. In Jordan, heatwaves were identified by the National Center for Security and Crises Management as the fourth priority national risk after earthquakes, flash floods, and landslides.

Climate change plays a significant role in increasing the frequency and severity of heatwaves, thus affecting human health, ecosystems, and socioeconomic systems. Many studies have shown clear trends of increasing heatwaves globally as a result of climate change which was also documented in the reports of the Intergovernmental Panel on Climate Change (IPCC).

In Jordan, linear trend analysis of the historical time period from 1990 up to 2020, shows that the number of heatwaves are significantly increasing with time at a rate of 0.15 events per year. The highest heatwave intensity existed in the highland regions of Madaba, Shoubak and Queen Alia International Airport. Temporal trends of historical heatwaves, from 1990 till 2020, show that most heatwaves occur during March, April and May.

7.1 Assessment of Current Vulnerability

Heatwaves characterized by excessive heat are more likely to have adverse effects on human health. The frequency of this type of heatwaves is increasing due to climate change. Heatwaves during the period from 2015 to 2020 show that Dair Alla in the Governorate of Balqa recorded the highest number of heatwaves, the longest and hottest was in September of 2020 which lasted for 8 days reaching a temperature as high as 50.1 °C.

Although the highest number of heatwaves occur in March and April, however most of the extreme temperature heatwaves occur in May and the longest ones occur in September

Direct impacts of heatwaves on human health include illnesses such as strokes, cramps, and dehydration. Heatwaves also contribute to the severity of other illnesses such as respiratory and cardiovascular diseases. Heat strokes were selected as an indicator of the effect of heatwaves on human health. Historic data of heat strokes and their geographical and temporal distributions available at the MOH were very limited. The number of heat strokes recorded in Jordan during the

period from 2020 to 2023 are increasing at a rate of 60 cases per year. About 84% of these heat strokes occurred in Ghor Elsafi in the Governorate of Karak.

7.2 Assessment of vulnerable regions

The most vulnerable regions to heat strokes caused by heatwaves are specific regions within the Governorates of Karak, Aqaba, and Irbid. Analysis shows that most of the extreme temperature heatwaves occurred in Dair Alla in the Governorate of Balqa. However, no records of heat strokes in that region were found at the MOH although such cases are likely to exist.

The vulnerability scores of heatwaves based on the number of extremely hot days and the number of heat strokes recorded in each governorate obtained were in the governorate of Karak and more specifically in Ghor El-Safi region.

The overall vulnerability of heatwaves to climate change for each governorate is computed. None of the Jordanian governorates can be classified as highly vulnerable to heatwaves impacts due to climate change. The overall vulnerability classification in the governorates of Karak and Irbid was of medium vulnerability.

Currently the MOH has health centers covering most communities. Medical staff in these centers provide treatment for patients suffering from common illnesses including heat strokes. In many cases patients suffering from health effects of heatwaves are treated without recognition of the causes of the patients' symptoms. Therefore, available records of heat strokes may not reflect their actual prevalence.

7.3 Current Policies and Programs

The MOH 2012 National Climate Change Health Adaptation Strategy and Action Plan of Jordan reported that there were no specific curative or preventive intervention programs for the management of heatwaves implemented by the ministry. The current situation is not very different. No progress was made in this regard due to the ministry's changing priorities to face arising problems caused by the Syrian refugee crises and Covid-19 pandemic. Hence, specific management of heatwaves is still considered a new issue for the MOH which has not been previously identified as a public health concern.

Some of the programs may indirectly contribute to the management of heatwaves. However, and as mentioned earlier, these programs are not linked to climate change. They do not provide additional precautions and actions to combat the negative health impacts of increasing heatwaves due to climate change.

7.4 Adaptation Measures

Proposed measures to mitigate vulnerability to heatwaves diseases resulting from climate change impacts are categorized into two key areas, as outlined in the table below.

<p>Development of Heat Health Warning System</p>	<p>Enhancement of preparedness of hospitals and health care services during heat waves</p>
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Table 9. Measures to Mitigate Vulnerability to Climate Change Impacts on Heatwaves Diseases

8. Climate Change and Occupational Health and Safety

Climate change significantly challenges global occupational health and safety (OHS) by increasing existing hazards and introducing new risks, such as heat stress, air pollution, and extreme weather events. Rising temperatures increase the risk of heat-related illnesses among outdoor workers, while changing air quality affects respiratory health. Extreme weather, including hurricanes and wildfires, poses safety hazards and disrupts operations. Climate change also influences the spread of vector-borne diseases, posing risks for outdoor workers. A conceptual framework by Schulte and Chun highlights how factors like urbanization and deforestation exacerbate these hazards, necessitating adaptive policies and preventive measures to protect worker health.

Assessment of occupational heat exposure commonly relies on the Wet Bulb Globe Temperature (WBGT), which incorporates factors such as temperature, humidity, wind speed, and heat radiation, notably from the sun. The threshold limit values for WBGT indicating health risks and reduced productivity are typically set at 28°C, although the International Standards Organization recommends a lower threshold of 26°C (ISO Standard 7243, Geneva: International Standards Organization, 1989). To safeguard workers from excessive heat, WBGT measurements are utilized to determine the proportion of a work hour during which a worker can sustain activity, balanced with the need for rest to cool down and maintain core body temperature below 38°C. This proportion enables the estimation of "work capacity" across various heat exposure levels and work intensities. Studies have demonstrated that work capacity declines rapidly as WBGT surpasses 26-30°C, providing insights into the potential impact of climate change-induced heat exposure, particularly in tropical regions.

8.1 Assessment of Current Vulnerability

In Jordan, occupational health and safety are increasingly vulnerable to climate change due to factors like temperature extremes, air quality, and vector-borne diseases. Outdoor workers, such as those in agriculture, construction, and maintenance, face high risks of heat fatigue and heatstroke due to prolonged exposure to heat and physical exertion. These workers often have limited shade and ventilation, exacerbating their risk. Inadequate access to water, insufficient breaks, and lack of

personal protective equipment (PPE) further increase the dangers. Socioeconomic pressures may also force workers to continue despite symptoms. To address these issues, comprehensive heat illness prevention programs, adequate hydration, and education are essential.

The analysis of occupational health focuses on data from the Social Security Corporation (SSC), which represents over 60% of Jordan's labor force. The dataset likely underrepresents the total number of work accidents, as many are unreported. Manufacturing industries have the highest accident rate at 32.3%, followed by construction at 13.9%. Symptoms of heat exhaustion often go unreported and, if untreated, can lead to heat stroke and severe health risks. Monthly data on accidents, which could link rates to hot weather, is currently unavailable.

8.2 Assessment of Vulnerable Regions

Karak, Aqaba, and Irbid are most susceptible to heat strokes from heatwaves. However, the extreme temperature heatwaves predominantly occur in Dair Alla in the Governorate of Balqa, where the Ministry of Health lacks recorded heat strokes, though they are presumed to exist. Karak, especially the Ghor El-Safi region, has the highest heatwaves score.

8.3 Current Policies and Programs

Several governmental bodies manage occupational health and safety through various preventive programs, while curative care is handled by healthcare facilities. Key initiatives include:

1. Occupational Health Directorate (OHD): Focuses on indoor workers in industrial plants, ensuring their health and safety.
2. Ministry of Labor (MOL): Regulates labor laws and health and safety standards through legislative measures under Labor Law No. 8 of 1998.
3. Institute for Occupational Health and Safety (IOHS): Provides training for occupational health supervisors, conducts specialized sessions, performs environmental assessments, and supports research.
4. Social Security Corporation (SSC): Offers insurance for work-related accidents and diseases, conducts firm inspections, and grants awards for safety excellence.

These programs, though effective, have limitations, such as inadequate coverage for some workers and a lack of focus on heat exposure. There is a need for a national strategy to adapt occupational health to climate change and address emerging risks.

8.4 Adaptation Measures

Climate is one of several factors affecting health outcomes, with non-climatic elements sometimes having a greater impact. Population growth and economic development can worsen environmental pressures. Jordan lacks specific programs for adapting occupational health to climate change, highlighting the need for policies that incorporate climate adaptation measures. Addressing the human impacts of climate change is crucial, and conducting adaptation assessments can help

prioritize policies, identify gaps, and enhance the effectiveness of occupational health management against climate risks.

Below are the recommended Measures and priorities to adapt to the impact of Climate change on OHS

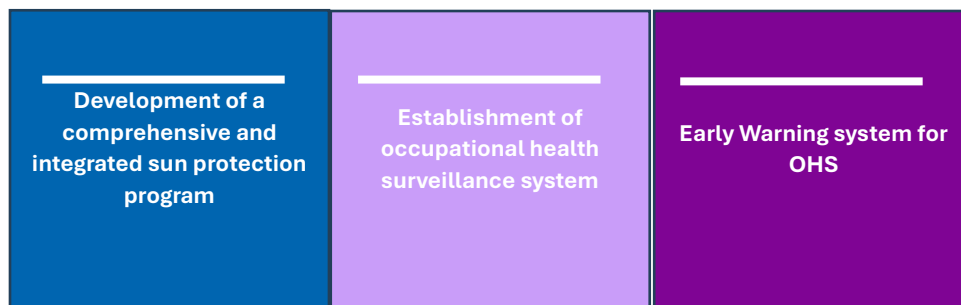


Table 10. Measures to Mitigate Vulnerability to Climate Change Impacts on Occupational Health and Safety

9. Climate change and Vector-Borne Diseases.

Vector-borne diseases (VBDs) are caused by pathogens transmitted to humans through the bite of a vector. Major shifts in vector-borne diseases and appearances are predicted as a result of climate change. Elevated temperatures, altered precipitation patterns, and climate variability are projected to modify the spatial distribution and timing of transmission for many vector-borne diseases. favorable rainfall patterns combined with warmer temperatures could extend the transmission season in certain areas. Climate-induced alterations in environmental conditions will also influence the distribution and prevalence of other vector-borne infections such as dengue, Leishmaniasis, Lyme disease, and tick-borne encephalitis, potentially pushing them beyond their current geographical boundaries. Climate change can impact vector-borne diseases through various mechanisms. Heavy rainfall may either increase or decrease mosquito abundance, depending on whether breeding sites are washed away. On the other hand, a lack of rainfall can lead to an increase in container-breeding mosquitoes as people are forced to store water. Flooding can alter mosquito populations due to the potential contamination of water sources. Drought conditions may affect vector abundance if soil moisture decreases, as some vectors breed in dried-up riverbeds. Additionally, rising temperatures can influence vector survival, with effects varying depending on the species. Lastly, increased humidity generally enhances vector survival, providing more favorable conditions for their reproduction.

Three diseases were selected as indicators of vector-borne diseases (VBD) in Jordan: Malaria, Cutaneous Leishmaniasis (CL), and Bilharzia.

9.1 Assessment of Current Vulnerability

The assessment of current vulnerability of vector-borne diseases to climate change involves a comprehensive evaluation of how changing environmental conditions affect the spread and severity of diseases transmitted by vectors such as mosquitoes, ticks, and flies.

The extensive literature review on vulnerable populations to Cutaneous Leishmaniasis (CL) in Jordan revealed that males are more susceptible to contracting CL than females. The highest infection rates were observed in the 25-34 age group, followed by children under 5. For malaria, young adult males are particularly more vulnerable.

Additionally, schistosomiasis (Bilharzia), which is prevalent in tropical and subtropical regions, primarily affects poor communities that lack access to safe drinking water and adequate sanitation. This indicates that individuals in these socioeconomically disadvantaged areas are highly vulnerable. Overall, the studies demonstrate that vector-borne diseases disproportionately affect males, young children, young adults, and socioeconomically disadvantaged populations

9.2 Assessment of Vulnerable Regions

Vulnerable areas were identified based on a comprehensive assessment at the governorate level, which encompasses vulnerability to climate change impacts, socioeconomic vulnerability, and the burden of vector-borne diseases. The vector borne disease indicators used in this analysis are the incidence rate of Malaria, Cut. Leishmaniasis, and Bilharzia over the period 2012-2022. The results show that the five most vulnerable governorates to vector-borne diseases taking into account the impact of climate change are Balqa, Irbid, Jarash, Ajlun, and Karak.

9.3 Current Policies and Programs

Based on the Ministry of Health's strategic plan (2023-2025), several programs have been implemented for the surveillance and management of vector-borne diseases.

- The Malaria Program, initiated on January 1, 2018, and renewed annually, is overseen by the Communicable Diseases Directorate's Parasitic and Common Diseases Department.
- The Bilharziasis Program, also started on January 1, 2018, and renewed annually, is managed by the same department. Additionally, the Leishmaniasis Program, which began on January 1, 2018, and is renewed annually, falls under the responsibility of the Communicable Diseases Directorate's Parasitic and Common Diseases Department.

These continuous and annually renewed programs demonstrate the ministry's commitment to controlling and managing vector-borne diseases.

9.4 Adaptation Measures

To effectively address the potential impact of climate change on vector proliferation and vector-borne diseases (VBDs) transmission, key strategies and measures are suggested in the Table below.

<p>Strengthen the adaptive capacity of the health sector to address climate current and future burden on health outcomes (climate sensitive diseases)</p> <p>(surveillance and early warning systems)</p>	<p>Enhance synergies between health actors and climate actors (multisectoral approach)</p>	<p>Support information and knowledge on the potential impact of climates change on vectors proliferation and VBD transmission pathways</p>
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Table 11. Measures to Mitigate Vulnerability to Climate Change Impacts on Vector-Borne Diseases

10. Mental Health and Climate Change

Climate change impacts mental health in Jordan through various environmental, social, and economic factors. Increased heat exacerbates stress and anxiety, especially among vulnerable groups. Water scarcity, worsened by climate change, can lead to psychosocial stress. Food insecurity due to decreased agricultural productivity can contribute to mental distress. Extreme weather events, though infrequent, can cause trauma and displacement. Jordan's refugee population faces compounded mental health challenges from conflict and environmental pressures. Despite these issues, resilience can be bolstered through strong social support and mental health services.

10.1 Assessment of Current Vulnerability

The vulnerability of climate change at the government level is usually calculated based on the number of cases per governorate per 100 000 of the population. However, due to the lack of such details, the vulnerability assessment has taken a different approximate approach. The approach was to consider the number of visits to the mental clinic in each governorate. It was also assumed that the visits trend is the same for all governorates.

10.2 Assessment of Vulnerable Regions

Based on the employed analysis in this action plan it was revealed that the most vulnerable region in Jordan is the governorate of Jarash, Irbid, Madaba, and Tafila while the least vulnerable are Zarqa and Mafrq. However, these numbers as mentioned earlier depend only on the number of visits to the mental health clinics and not the actual cases with different mental disorders.

10.3 Current Policies and Programs

Jordan's primary health policies, including the National Strategic Health Plan (2023-2025) and the National Mental Health and Substance Use Action Plan (2022-2026), emphasize mental health. The National Mental Health Policy of 2011, reviewed in 2016, underpins these initiatives, which aim to integrate mental health into primary care and enhance services across healthcare levels. Effective mental health care requires involvement from multiple sectors, including education and social development, with robust coordination among them.

The mental health services are organized across various levels:

1. **Primary Health Care:** The Ministry of Health (MOH) manages 383 PHC clinics, 111 comprehensive PHCs, and 181 secondary PHCs, with 93 integrating mental health services through mhGAP. However, only a few have pharmacies with essential medications. UNRWA and NGOs also offer mental health services.
2. **Secondary Healthcare:** Includes acute inpatient units in three hospitals, community mental health centers (CMHCs), and outpatient clinics. There are four MOH CMHCs and 48 psychiatric outpatient clinics, but there are shortages in resources and specialized services.
3. **Tertiary Healthcare:** Comprises three mental hospitals under MOH, a forensic facility awaiting staffing, and a private psychiatric hospital. The need for more CMHCs, interdisciplinary teams, and community rehabilitation services is emphasized.

10.4 Adaptation Measures

Adaptation measures for the psychosocial impacts of climate change include various interventions like policies, behavioral changes, and community-based initiatives. In Jordan, efforts to address mental health challenges involve several key strategies:

1. **Mental Health Policies:** Jordan has established laws, such as Mental Health Law No. 47 of 2008, to promote mental health and support individuals with mental disorders.
2. **Integration into Primary Healthcare:** There is a focus on incorporating mental health services into primary care, with training for providers to manage mental health conditions.
3. **Capacity Building:** Jordan invests in training healthcare professionals to improve mental health services.
4. **Community-Based Programs:** Programs provide support at the community level, often through collaborations with NGOs and government agencies.
5. **International Support:** Jordan collaborates with international organizations for resources and best practices in mental health care.
6. **Research:** Ongoing research aims to understand mental health issues, inform policy, and evaluate interventions.

Below are the recommended priority Measures and priorities to adapt to the impact of Climate change on Mental health

<p>Development and implementation of Training Program for physicians and Nurses in the hospitals and primary health care centers on the mental health illness related to CC, their identification, and how to deal with the patients.</p>	<p>Establishment of CC and Mental health clinics in the country</p>
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Table 12. Measures to Mitigate Vulnerability to Climate Change Impacts on Mental Health

11. Identification and prioritization of health policies and programs for adaptation

There are several actions and policies that will collectively help collectively build a climate resilient health system. A system that can prevent, prepare for, and respond to current and future health risks associated with climate change. However, such a climate-resilient health system needs allocation of resources to implement prioritized interventions that will effectively enhance the adaptive capacity and protect public health from negative impacts climate change. There are several actions to be prioritized by the MOH based on their urgency and potential impact to combat current and projected health risks. The action can include the following:

1. Strengthening primary health care services
2. Establishing early warning systems and disaster risk management
3. Integrated disease surveillance programs
4. Mainstreaming climate change into health policies
5. Improving infrastructure with climate considerations
6. Strengthening stakeholder dialogue
7. Conducting innovative research
8. Building capacity and training
9. Improving integration across sectors

11.1 Recommended interventions for all identified climate sensitive outcomes

INTERVENTIONS	ACTIVITIES	TIME FRAME
AIR-BORNE AND RESPIRATORY DISEASES		
<p>Improve the understanding of the potential risk of respiratory diseases due to climate change</p>	<ul style="list-style-type: none"> • Mobilizing relevant institutions and experts to undertake comprehensive studies and observations on the impact of climate change (specifically decreasing humidity and increasing air pollutants) on respiratory diseases especially COPD and Asthma. • To raise public awareness about the relationship between air pollution and respiratory diseases. • Produce posters, brochures, educational materials • Inter-ministerial and multi-sectoral coordination and communication for sharing correct and the most relevant information of climate change impact on health to the public 	<p>Short term</p>
<p>Enhance the adaptive capacity of the health sector to address climate induced respiratory diseases</p>	<ul style="list-style-type: none"> • Develop the capacity of health care professionals (through regular training workshops) to monitor, diagnose, and treat cases of climate-sensitive diseases, even when they alter their incidence, seasonality, and geographic range. • Build the needed capacity to conduct health vulnerability assessments to identify the most vulnerable regions and populations. • Adopt an efficient electronic exchange of surveillance data to facilitate prompt interventions. • Develop climate-informed respiratory disease control programs where new meteorological indicators (such as Air Quality Index) are introduced for protecting health. • Collaborate with the pertinent ministry(ies) to establish access to real-time air quality monitoring data which is crucial for establishing the connection between respiratory diseases, air pollution and climate change. 	<p>Long term</p>
<p>Strengthening disaster management program to enhance health sector emergency preparedness and response, including disaster related outbreak management.</p>	<ul style="list-style-type: none"> • Establish highly sensitive alert systems (Early warning systems) by developing a health forecast system for acute respiratory and climate-sensitive diseases (Asthma). 	<p>Long term</p>
NUTRITION AND FOOD SAFETY		

INTERVENTIONS	ACTIVITIES	TIME FRAME
<p>Establish an efficient, easy to conduct, and sustainable nutritional surveillance system, which enhances the availability of a reliable and sustainable database on the nutritional status of people at the national level</p>	<ul style="list-style-type: none"> • Assess nutrition status, especially among vulnerable population groups, to track trends in nutrition status over time. • Identify potentially at-risk areas, and advocacy / empowerment of decision-making for the type of interventions required • Target population groups through reliable available database by collecting: <ul style="list-style-type: none"> ○ Population-based information which includes census, Civil Registration ○ Population surveys, through: <ul style="list-style-type: none"> ▪ Large scale national surveys, such as DHS and MICS ▪ Repeated small scale surveys ▪ Rapid nutrition assessments ▪ Services-based information (routine collection of data) from health services records, records of school-based programs 	<p>Long term</p>
<p>Establishing continuous supplementation programs to high-risk groups at high-risk areas e.g. supplements of iron, folic acid, and B12 to pregnant women attending health facilities; regular supplements of iron to all less than five years of age, especially for those under two years of age</p>	<ul style="list-style-type: none"> • Capacity Building and capacity development to improve the quality of service, especially for staff at the Maternal and Child Health Clinics • Organize public awareness sessions at health centers to promote healthy food and nutritional diet • Develop and maintain operative national supplementation program 	<p>Short term</p>
VECTOR-BORNE DISEASES		
<p>Support information and knowledge on the potential impact of climate change on vectors proliferation and VBD transmission pathways</p>	<ul style="list-style-type: none"> • Promote the dissemination of information to raise awareness of climate-related risks of VBD among the public, healthcare professionals, and emergency responders. • Develop climate-based health information systems to facilitate a better understanding of the relationship between climate, disease outbreak, and response. 	<p>Short term</p>
<p>Strengthen the adaptive capacity of the health sector to address climate</p>	<ul style="list-style-type: none"> • Incorporate early warning systems in disease surveillance and response systems. • Enhance surveillance in specific geographic areas where infections are expected to expand and integrate vector and reservoir surveillance into epidemiological surveillance; to 	<p>Long term</p>

INTERVENTIONS	ACTIVITIES	TIME FRAME
current and future burden on VBD	<p>inform adaptation (modelling, remote sensing, vulnerability mapping), forecasting readiness, and early detection.</p> <ul style="list-style-type: none"> • Develop rapid diagnostic tests for vector-borne diseases. • Develop action plans for a mix of control measures, such as control and/or eradication (considering unintended consequences) of vectors, vaccine development and vaccination campaigns, based on the best available evidence. • Promote awareness among health professionals of likely changes in disease patterns as a result of climate change and provide training for rapid detection and treatment. • Strengthen environmental health capacity to predict, detect, and reduce the spread of vector-borne disease. • Invest in the development of weather forecasting tools, early warning systems, and localized climate impact scenarios to ensure timely dissemination of information to the most vulnerable populations. 	
Enhance synergies between health actors and climate actors (multisectoral approach)	<ul style="list-style-type: none"> • Developing in cooperation with climate relevant institutions meteorologically based disease control programs and surveillance systems which integrate environmental indicators. For example, integrating forecasts of meteorological conditions to detect epidemic precursors of vector-borne disease outbreaks and serve as early warning systems for risk reduction. • Establish in collaboration with relevant ministries and authorities an information sharing/exchange system to ensure real time accessibility to meteorological and environmental data pertinent to climate sensitive health outcomes. • Control of disease vectors and hosts by environmental management. 	Long Term
WATER AND FOOD-BORNE DISEASES		
Support information and knowledge on the impact of climate change in inducing water and food borne diseases	<ul style="list-style-type: none"> • Mobilization of related institutions and experts to conduct studies and observations of climate impacts on inducing water and food borne diseases. • Establishing education and information programs to raise public awareness of climate change adverse implications on health (water and food related diseases) 	Short term
Strengthen the adaptive capacity of the health sector to address climate current and future burden on W&H	<ul style="list-style-type: none"> • Revise, update, and scale up programs related to spreading of water borne disease and mapping of regions having chances of outbreaks due to climate change. • Enhance the skills and develop the capacity of healthcare professionals to effectively monitor, diagnose symptoms and early treatment of water and food-borne diseases particularly in vulnerable areas including circumstances where occurrence, seasonal patterns, and geographical spread may shift. 	Long term

INTERVENTIONS	ACTIVITIES	TIME FRAME
	<ul style="list-style-type: none"> • Improved and increased surveillance for infectious diseases. For example, Bacteria and parasites, which contaminate food and water and cause serious illnesses, are influenced by temperature and other climate variables. The incidence rates of these illnesses should be monitored to assess the health risks related to climate change and better prepare for disease outbreaks. • Establish a climate informed early warning system for identifying new health risks and increasing the resilience of health service provision. 	
Enhance synergies between health actors and climate actors	<ul style="list-style-type: none"> • Developing in cooperation with climate relevant institutions meteorologically based disease control programs and surveillance systems which integrate environmental indicators (water quality) and programs (water safety planning). • Establish in collaboration with relevant ministries and authorities an information sharing system to ensure real time accessibility to meteorological data pertinent to climate sensitive health outcomes. 	Long term
HEAT WAVES		
Development of Heat Health Warning System	<ul style="list-style-type: none"> • Identify weather indicators • Identify health indicators related to heat waves • Develop data collection, processing, and dissemination systems • Create close coordination with Metrology Department (MD) 	Long term
Enhancement of preparedness of hospitals and health care services during heat waves	<ul style="list-style-type: none"> • Ensure bed availability especially in emergency departments • Ensure availability of sufficient number of ambulances • Identify and actively monitor high risk patients to identify symptoms associated with heat • Adapt pharmacological treatments • Postpone non-emergency surgery • Increase medical care staff to ensure full coverage in case of an increase in admissions • Ensure high risk patients are placed in rooms with air conditioning • Increase patients' liquid intake and modify diet • Adjust patient bed and personal clothing • Train first aid and emergency room personnel • Enhance response to vulnerable groups/areas 	<ul style="list-style-type: none"> • Short term
OCCUPATIONAL HEALTH		
Development of a comprehensive and integrated sun protection program	<ul style="list-style-type: none"> • Prepare and print brochures about the health risks associated with working directly under the sun • Conduct workshops to raise the awareness of employers and employees on the impact of occupational exposure to UV, 	Short term

INTERVENTIONS	ACTIVITIES	TIME FRAME
	<p>and the policies and procedures to reduce sun exposure in the workplace</p> <ul style="list-style-type: none"> • Develop brochures about protective devices against the impact of UV • Conduct TV and radio awareness interviews, messages, talk shows about the health impact of exposure to UV • Introduce the health impacts of exposure to UV in the curricula of schools and universities • Investigate establishing a UVI reporting system with the MD 	
Establishment of occupational health surveillance system	<ul style="list-style-type: none"> • Establish units for occupational health in public and private hospitals • Develop a notification system on occupational diseases and injuries and accidents related to climate change • Develop guidelines for • identification and recognition of occupational diseases and injuries related to climate change • Design the surveillance system and provide all technical, logistics, and financial support to the surveillance system • Prepare and distribute awareness materials for workers and employers • Conduct a series of workshops for safety officers and public health inspectors about climate change and the health of workers • Carry out a series of workshops for the employers and employees on the impact of climate change and productivity • Monitor and evaluate progress 	Long term
MENTAL HEALTH		
Development and implementation of Training Program for physicians and Nurses in the hospitals and primary health care centers on the mental health illness related to CC, their identification, and how to deal with the patients.	<ul style="list-style-type: none"> • Development of Training Material for physicians in the hospitals and primary health care centers on the impact of Climate change on mental health. • Development of Training Material for Nurses in the hospitals and primary health care centers on the impact of Climate change on mental health. • Implementing a comprehensive training program 	Short term
Establishment of CC and Mental health clinics in the country	<ul style="list-style-type: none"> • Needs Assessment and Feasibility Study to understand the community's mental health needs related to climate change. • Identify and secure a suitable location for the clinic, ensuring accessibility for vulnerable populations. • Renovate and equip the facility with necessary medical, technological, and therapeutic tools. • Recruit the team including mental health professionals, social workers, and support staff. 	Long term

INTERVENTIONS	ACTIVITIES	TIME FRAME
	<ul style="list-style-type: none"> • Design evidence-based treatment programs addressing stress, anxiety, depression, and trauma related to climate change. • Develop a monitoring and evaluation framework to assess the effectiveness of the clinic’s services and programs. • Collect and analyze data to inform continuous improvement and report outcomes to stakeholders and funders. 	

Table 13. Adaptation Interventions, Activities and Timeframes for Climate-Related Health Outcomes

12. Adoption of the one health approach in Jordan’s CC and HNAP

The One Health approach is a multidisciplinary strategy focusing on the interconnectedness of human, animal, and environmental health. It involves:

1. Interdisciplinary Collaboration: Integrating efforts across medicine, veterinary science, public health, and environmental disciplines.
2. Disease Surveillance and Control: Monitoring diseases in animals to prevent zoonotic diseases like influenza and rabies.
3. Environmental Health: Addressing how environmental factors, such as pollution and climate change, impact health and disease distribution.
4. Food Safety and Security: Ensuring the safety of food supplies and addressing related health issues.
5. Antimicrobial Resistance (AMR): Promoting the responsible use of antibiotics to combat AMR and reduce the spread of resistant pathogens.

12.1 Interlinkages between the one health approach and CC

Climate change significantly impacts the One Health concept by affecting humans, animals, and environmental health. It alters habitats and behaviors of disease vectors, leading to shifts in the distribution of vector-borne diseases like malaria and dengue. Changes in climate also impact ecosystems, affecting biodiversity and increasing the emergence of zoonotic diseases. Additionally, climate change influences agricultural productivity and water availability, thereby impacting food and water security and increasing the risk of foodborne and waterborne diseases. Extreme weather events further contribute to health challenges by causing direct injuries, disrupting health services, and increasing disease outbreaks.

12.2 Situation analysis of one health threats in Jordan

Jordan faces various One Health threats, including zoonotic and vector-borne diseases, antimicrobial resistance (AMR), and foodborne illnesses. These threats are addressed through

global and regional initiatives like roadmaps for neglected tropical diseases (NTDs) and plans for vector control. Despite progress, challenges persist with diseases such as leishmaniasis, MERS-CoV, cholera, and E. coli. Effective management requires an integrated One Health approach that focuses on zoonoses, AMR, and food safety, guided by risk assessment. Zoonotic diseases, which constitute a significant portion of human infectious diseases, are exacerbated by human activities encroaching on natural habitats. NTDs like rabies and leishmaniasis, which are often vector-borne or zoonotic, pose major health and economic concerns. The One Health approach aims to provide a holistic framework for sustainable and locally adapted interventions.

12.3 Current one health initiatives in Jordan

Jordan is implementing the One Health approach through various interdisciplinary initiatives. Key efforts include the development of joint surveillance systems by the Ministry of Health and Ministry of Agriculture for early detection of zoonotic diseases like brucellosis and avian influenza. The National Antimicrobial Resistance Action Plan integrates One Health principles to manage antibiotic use across humans, animals, and agriculture, including guidelines and public awareness campaigns. Educational programs at universities train professionals in a holistic health perspective. Collaborative projects between public health and veterinary sectors, such as rabies vaccination campaigns, have successfully reduced incidence rates. Additionally, the Ministry of Environment supports the response to climate change impacts on health, focusing on water security, food safety, and vector-borne diseases through sustainable practices and environmental monitoring.

12.4 Implementation of the one health approach in Jordan

Implementing the One Health approach in Jordan involves several key strategies to integrate different sectors effectively. The following are the needed actions:

- 1) A national One Health committee should be established/ activated with representatives from health, agriculture, and environment ministries to coordinate efforts
- 2) Strengthening disease surveillance through integrated systems and real-time data sharing is crucial
- 3) Capacity building through interdisciplinary training and research funding will support holistic health solutions
- 4) Public awareness campaigns and community engagement will help in disease prevention
- 5) Policies and regulations should be developed to support One Health principles, including addressing antimicrobial resistance and food safety
- 6) Environmental health issues will be managed through monitoring and sustainable practices. Finally
- 7) International collaboration will be vital for sharing knowledge and resources.

This multi-faceted strategy aims to enhance health outcomes by bridging human, animal, and environmental health.

12.5 Addressing the impact of climate change through the one health approach

Addressing climate change through the One Health approach in Jordan involves several coordinated strategies. First, integrating climate data with health surveillance systems and monitoring environmental factors like water quality and air pollution is crucial. Strengthening health infrastructure includes training healthcare professionals and investing in facilities to manage climate-related health impacts. Promoting sustainable practices in agriculture and urban planning helps ensure food security and reduce environmental degradation. Establishing joint task forces for interdisciplinary collaboration and encouraging research on climate change impacts are vital. Public awareness campaigns and community engagement activities raise awareness and involve locals in adaptation efforts. Developing policies that support climate resilience and participating in international networks for knowledge exchange further enhance these efforts.

Implementing the One Health approach in Jordan involves collaboration among various stakeholders. In Jordan, the Ministry of Health leads health initiatives, including environmental health, incorporating One Health principles into national health policies and climate adaptation strategies. The Ministry of Agriculture focuses on animal health, veterinary services, and sustainable agriculture practices. The Ministry of Environment focuses on combating climate change by addressing its effects through adaptation, mitigation, provision of financing, and transfer of technology. Health-related climate monitoring and adaptation efforts are led by the Ministry of Health, in collaboration with Ministry of Environment and Royal Medical Services and other stakeholders, ensuring that health systems are resilient to environmental changes. Academic institutions conduct interdisciplinary research and training on One Health, while international organizations like WHO, FAO, UNEP, IOM and various NGOs support health, environment, and animal welfare initiatives.

