



Ministry of Foreign Affairs

Climate Change Profile

Yemen

| Climate Change Profile | Yemen | Climate Change Profile | Yemen | Climate Change Profile | Yemen | Climate Change Profile | Yemen | Climate Change Profile | Yemen |



Table of contents

Introduction	3
Summary	3
Overall ranking	3
Biophysical vulnerability	3
Socio-economic vulnerability	5
National government strategies and policies	6
Intended Nationally Determined Contributions (INDC)	7
Climate finance	8
Climate change projects	8
Climate contribution of the Netherlands	8
Maps	
Map 1 Yemen geography	10
Map 2 Yemen agro-ecological zones	10
Map set 3 Regional climate models for temperature and precipitation in the Gulf region	11
Map 4 Changes in agricultural production by governorate ('mid' scenario 2080)	12
Map 5 Main production items per zone	13
Annex	
International and multilateral climate projects	15

Introduction

This climate change profile is designed to help integrate climate actions into development activities. It complements the publication 'Climate-smart = Future-Proof! – Guidelines for Integrating climate-smart actions into development policies and activities' and provides answers to some of the questions that are raised in the step-by-step approach in these guidelines.

The current and expected effects of climate change differ locally, nationally and regionally. The impacts of climate change effects on livelihoods, food and water security, ecosystems, infrastructure etc. differ per country and region as well as community and individual, with gender a particularly important vulnerability factor. This profile aims to give insight in the climate change effects and impacts in Yemen, with particular attention for food security and water. It also sheds light on the policies, priorities and commitments of the government in responding to climate change and important climate-relevant activities that are being implemented, including activities being internationally financed.

Summary

Yemen faces serious risks from climate change that further threaten the already fragile state of the country¹. As climate change and rapid population growth put more and more pressure on critical resources, especially water, the Yemen shows what may happen in the region as a whole². Yemen is a predominantly arid country on the Arabian Peninsula with a history of food aid dependence. It experiences extreme water scarcity due to overexploitation of groundwater that leads to salt water intrusion in coastal areas. Climate change is expected to increase temperatures, variability of rainfall and heavy precipitation events. The increase in heavy rains in combination with rising temperatures, especially in the north, will probably lead to shortened growing seasons. Shorter growing seasons threaten food security, and competition for dwindling natural resources could further fuel conflict. On-going conflict, a lack of adequate natural resources management, weak governance as well as other factors seriously hinder Yemen's ability to address the current and future impact of climate change.

¹ USAID (2016) Climate Change Risk Profile: Yemen. Available at <https://www.climate-links.org/resources/climate-change-risk-profile-yemen>

² World Bank (2014) *Future Impact of Climate Change Visible Now in Yemen* <http://www.worldbank.org/en/news/feature/2014/11/24/future-impact-of-climate-change-visible-now-in-yemen>

Overall ranking

Yemen ranks 130 out of 188 countries in per capita GHG emissions³ and contributes only an estimated 0.08% of global emissions⁴. However, for climate vulnerability Yemen ranks 166 out of 181 countries in the ND-GAIN index⁵ (2016). It is the 30th most vulnerable and 17th least ready country – meaning that it is extremely vulnerable to, yet very unready to address climate change effects. *Vulnerability* measures the country's exposure, sensitivity, and ability to cope with the negative effects of climate change by considering vulnerability in six life-supporting sectors: food, water, ecosystem service, health, human habitat and infrastructure. *Readiness* measures a country's ability to leverage investments and convert them to adaptation actions by considering the country's economic, governance and social readiness.

Biophysical vulnerability

Current climate. Yemen has a semi-arid to arid tropical climate with significant variation due to topographical differences⁶. Yemen is characterized by five major ecological systems⁷ (see [Map 1](#) and [Map 2](#)): a Hot-humid Coastal Plain, Temperate Highlands, Yemen High Plateaus and Hadramout–Mahrah Uplands, the Desert Interior, and the Islands Archipelago.

Temperature in Yemen is generally high, with an annual average of 21 °C. Temperatures vary by location and season. The coastal regions are hot and dry. The southern coastal areas are characterized by limited rainfall (50 mm per year). **Rainfall** in the central highlands varies from 400 mm to 800 mm per year. Northern regions and Wadi Hadramawt are hot and dry throughout the year. In the highlands there is more seasonal variety: winter can be cold, with temperatures below 0°C, while the summers are temperate and rainy⁸.

Current trends. Over the last 30 years, temperatures have significantly increased, at a rate of 0.19 °C per decade. Also, an increase of 29% in total annual precipitation over the last 30 years was observed⁹. However, a decrease in the average

³ <https://en.actualitix.com/country/wld/co2-emissions-per-capita.php> based on an analysis of World Bank data of 2011.

⁴ WRI (2017) <http://cait2.wri.org/>

⁵ GAIN index summarizes a country's vulnerability to climate change and other global challenges in combination with readiness to improve resilience, <http://index.gain.org/country/yemen>

⁶ USAID (2016)

⁷ Global Climate Change Alliance (GCCA) (2012): Yemen Experience on Climate Change, <http://www.gcca.eu/sites/default/files/GCCA/Yemen-presentation.pdf>

⁸ Climate Service Center Germany (2015). Climate-fact-sheet. Yemen, updated version 2015. http://www.climate-service-center.de/products_and_publications/fact_sheets/climate_fact_sheets/index.php.en

⁹ Climate Service Center Germany (2015). Climate-fact-sheet. Yemen, updated version 2015.

rainfall at a rate of 12 mm per month per decade, generally affecting the drier season, with noted declines in the Highlands has also been suggested¹⁰.

Climate change. The United Nations Development Programme (UNDP) states that there is insufficient daily precipitation data available to determine trends in heavy rainfall events¹¹. Indeed, projections of future rainfall do not correspond, with some models projecting increases in rainfall while other models project decreases. These large uncertainties in future rainfall patterns are partly due to differences in modelled behaviour of the Inter-Tropical Convergence Zone over this region. The proportion of rainfall that falls in 'heavy' events shows an increase in most model projections¹². The projected rainfall increases for June - October is offset by a decrease in October - December across the country, except for the Upper Highlands where a decrease is projected for the whole year¹³. The majority of climate models tend to predict a tendency towards increased total annual precipitation (probable increase in the September-November rainfall)¹⁴. By 2100, a change in rainfall is expected ranging from -7% to +69%¹⁵.

The mean annual temperature is expected to increase by 1.2-3.3 °C by 2060 and by 1.6-5.1 °C for the end of this century. Models predict a strong increase in the duration of heat waves, as well as a strong reduction in duration of cold spells¹⁶. The rate of warming is more rapid in the interior regions than in areas close to the coast (see [Map set 3](#)). This is consistent with the higher rates of warming that are projected for the Arabian Peninsula and East Africa, according to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)¹⁷. The projected average temperature increase is 2.3 °C, with increases over 3 °C for specific months (2011)¹⁸.

The projected changes by 2025 per region are as follows:

- Sa'adah (north-west): precipitation +10%, temperature +1.8 °C;
- Sana'a (central-west): precipitation +2%, temperature +1 °C;
- Aden (south-west): precipitation +10%, temperature unknown¹⁹.

Yemen is a disaster-prone country that faces **natural hazards** every year with floods as the most important and recurring form of disaster. While *regular* flooding has historically been beneficial for agriculture in Yemen, *high-magnitude* flooding often leads to losses of cropland, uprooting of fruit trees, death of animals caught in high floodwater surges, and destruction of infrastructure, such as irrigation facilities and rural roads. The damages done by floods tend to be exacerbated by ongoing desertification processes and land degradation, partly caused by climate change. In addition, several models project higher rainfall levels for Yemen, thus potentially increasing the frequency and severity of **floods**²⁰. Rising sea levels are expected to accelerate coastal erosion, damage key infrastructure, force community relocations, and threaten marine ecosystems and low-lying coastal wetlands²¹. Greater variability in rainfall patterns will reduce food security because of the increasing severity of droughts and floods. In October 2008 alone, flood damage in the country inflicted costs equal to 6% of GDP²².

An analysis of regional climate change impacts on agriculture in Yemen shows a mixed pattern, with production increases in the highlands (from Sa'adah to Taiz) due to higher temperatures. Significant yield reductions are expected in some lower and hotter areas such as around Raymah in the west, Abyan in the south, and in the eastern half of the country (see [Map 4](#))²³. Annual desertification of cultivated land is 3-5%²⁴, which negatively affects food production and decreases overall availability of arable land. The countrywide food insecurity impact of floods is minor; however, there are substantial consequences at the local level where the consequences can be severe, especially in the areas that are directly affected by *floods*. The rural population and especially farmers in the Internal Plateau zone are hardest

¹⁰ USAID (2016)

¹¹ McSweeney, C.; New, M.; Lizcano, G., (2010): *UNDP Climate Change Country Profiles: Yemen*, http://www.geog.ox.ac.uk/research/climate/projects/undp-cp/UNDP_reports/Yemen/Yemen.Lowres.report.pdf

¹² World Bank (2011): *Vulnerability, Risk Reduction, and Adaptation to Climate Change - Yemen profile*, http://sdwebx.worldbank.org/climateportal/doc/GFDRRCountryProfiles/wb_gfdr climate_change_country_profile_for_YEM.pdf

¹³ Wiebelt, M.; Breisinger, C.; Ecker, O.; Al-Riffai, P.; Robertson, R.; Thiele, R., (2011): *Climate Change and Floods In Yemen: Impacts on Food Security and Options for Adaptation* (IFPRI Discussion Paper 01139) <http://www.ifpri.org/sites/default/files/publications/ifpridp01139.pdf>

¹⁴ USAID (2016)

¹⁵ Climate Service Center Germany (2015). Climate-fact-sheet. Yemen, updated version 2015.

¹⁶ Climate Service Center Germany (2015). Climate-fact-sheet. Yemen, updated version 2015.

¹⁷ Wiebelt et al. (2011)

¹⁸ Wiebelt et al. (2011)

¹⁹ Haidera, M.; Alhakimi, S.A.; Noaman, A.; Al Keksi, A.; Noaman, A.; Fencil, A.; Dougherty, B.; Swartz, C., (2011): Water scarcity and climate change adaptation for Yemen's vulnerable communities, Local Environment: The International Journal of Justice and Sustainability 16(5), <http://www.tandfonline.com/doi/abs/10.1080/13549839.2011.565465#>

²⁰ Wiebelt et al. (2011)

²¹ Climate Investment Funds (2012): *Pilot Programme for Climate Resilience*, http://www.climateinvestmentfunds.org/cif/sites/climateinvestment-funds.org/files/PPCR_Yemen.pdf

²² Climate Investment Funds (2012)

²³ World Bank (2010): *Yemen: Assessing the Impacts of Climate Change and Variability on the Water and Agricultural Sectors and the Policy Implications*, http://yncf.net/pdf/Climate_change_and_development/Yemen_Climate_Change_Study_April_8_2010.pdf

²⁴ Climate Investment Funds (2012)

hit and, to a lesser extent, the rural population in the neighbouring Arabian Sea and Desert zones²⁵. Within agricultural subsectors, fruits are the hardest hit by floods, followed by sesame and tomatoes²⁶.

The rise in the sea level and, as a result, deterioration of the coastal ecosystem, will lead to a diminished fisheries sector increasing the vulnerability of fishermen who are dependent on fish for their livelihoods.

Yemen's **water availability** per capita is the lowest in the world²⁷. Extraction of groundwater has exceeded the level of replenishment capacity, causing water depletion. Since Yemen over-extracts an estimated 0.9 billion cubic meter of water each year from its deep aquifers, groundwater aquifers are declining one to seven meters each year. Sana'a is the world's most water stressed city and draws water from the world's most water-stressed aquifer²⁸. It is anticipated that climate change combined with high population growth, inadequate agricultural development and policies, qat growth, and a lack of law enforcement to regulate water²⁹ will put continuing pressure on Yemen's water resources and contribute to its water crisis³⁰. Greater rainfall variability could increase drought periods and diminish water supplies more rapidly while increased temperatures could lead to higher evapotranspiration rates, further slowing the replenishment of water sources³¹. The overexploitation of groundwater resources and the rising sea level due to climate change will result in increased salt water intrusion, especially in coastal aquifers.

Projections suggest that aquifers such as Abyan, Tuban, and Sa'adah will be depleted by 2025. Depletion of the Tuban aquifer is the most rapid (2015, versus 2019 for Abyan) because of a greater reliance on groundwater relative to discharge in the Tuban sub-basin³². Moreover, Aden is one of the top 20 cities in the world where the most people will be at the greatest risk from sea level rise and storm surges in the developing world³³.

Socio-economic vulnerability

Key facts:

GDP (PPP) per capita (2016) ³⁴ :	USD 2508.1 (decline)
Population (July 2017) ³⁵ :	28,250,420
Projected population (2050) ³⁶ :	48 304,000
Population density per km ² (2016) ³⁷ :	52.25
Human Development Index (2016) ³⁸ :	168 out of 188 countries
Corruption Perceptions Index (2016) ³⁹ :	170 out of 176 countries
Gender Inequality Index (2016) ⁴⁰ :	159 out of 188 countries
Fragile States Index (2017) ⁴¹ :	4 out of 178 countries
Adult literacy (2015) ⁴² :	70.1 (male 85.1%; female 55%)

In March 2015, Yemen descended into widespread armed conflict, further exacerbating an already severe humanitarian situation⁴³. It currently ranks as 4th most Fragile State in the world⁴⁴. Prior to the current conflict Yemen was the poorest country in the Middle East. It was estimated that up to 43% of its people were living in chronic poverty with 32% of the population being food insecure⁴⁵. Notwithstanding the current conflict, given the country's historically high levels of food import dependency, food insecurity, and poverty, both global and local climate change impacts are likely to significantly influence its prospects. As of March 2017, an estimated 17 million Yemenis (about 60 percent of the total population) are estimated food insecure and a further 7 million severely food insecure. Over 21.1 million Yemenis (80 percent of the population) are in need of humanitarian assistance and 2.8 million Yemenis have been forcibly internally displaced⁴⁶.

²⁵ Wiebelt et al. (2011)

²⁶ Wiebelt et al. (2011)

²⁷ Glass, N. (2010): *The Water Crisis in Yemen: Causes, Consequences and Solutions*, *Global Majority E-Journal* 1(1), https://www.american.edu/cas/economics/ejournal/upload/global_majority_e_journal_1-1_glass.pdf

²⁸ USAID (2016)

²⁹ Glass (2010)

³⁰ E.g. Al Omari (2008) and Wardam (2009) in Glass (2010)

³¹ USAID (2016)

³² Haidera et al. (2011)

³³ Dasgupta, et al. (2009) Center for Global Development, in GCCA (2012)

³⁴ World Bank Data – GDP per capita, PPP. <http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD>

³⁵ World Population Review – Yemen, <http://worldpopulationreview.com/countries/yemen-population/>

³⁶ UNDESA (2017): *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables*. Working Paper No. ESA/P/WP/248. https://esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf

³⁷ World Bank Data – Population density, <http://data.worldbank.org/indicator/EN.POP.DNST>

³⁸ UNDP (2016) Human Development Report 2016. Human Development for Everyone. Table. 1. <http://hdr.undp.org/en/content/human-development-index-hdi>

³⁹ Transparency International (2017.) Corruption Perceptions Index. https://www.transparency.org/whatwedo/publication/corruption_perceptions_index_2016

⁴⁰ UNDP (2016) Human Development Report. Table 5. <http://hdr.undp.org/en/content/human-development-index-hdi>

⁴¹ Fragile States Index (2017) Available at <http://fundforpeace.org/fsi/data/>

⁴² CIA (2015). The World Factbook – Yemen. Available via <https://www.cia.gov/library/publications/the-world-factbook/geos/ym.html>

⁴³ European Commission (2015): *Yemen ECHO Factsheet*, http://ec.europa.eu/echo/files/aid/countries/factsheets/yemen_en.pdf

⁴⁴ Fragile States Index (2017) Available at <http://fundforpeace.org/fsi/data/>

⁴⁵ Wiebelt et al. (2011)

⁴⁶ World Bank (2017) <http://www.worldbank.org/en/country/yemen>

Climate change risks are projected to not only impede the national capacity to achieve sustainable development but also to reverse the economic development that occurred prior to the conflict. The Impact of climate change on the most vulnerable groups (rural poor, women) include increased exposure to extreme weather events in combination with decreased financial resources available for reconstruction and preparedness due to lower (agricultural) incomes. Vulnerable groups are also more exposed to terrorist recruitment since they lack adequate alternatives for providing sufficiently in their livelihood, especially if these alternatives are less attractive in terms of risks (extreme weather influencing the agricultural production, insecure food prices, inaccessible markets due to extreme weather conditions etc.). Yemen's population growth is projected at 3.1%, increasing the vulnerable position of the country by raising the demand for food, water, and other natural resources. Rural households are harder hit than urban households, and among the rural households the non-farm households suffer most from declining (access) to natural resources.

Prior to the current conflict, over 90% of water consumption was used for irrigation. The government of Yemen is concerned that climate change will decrease the frequency and amount of rainfall, thereby destroying the country's agricultural production. This would not only result in a water crisis, but also in food and economic crises. The severity of the crisis is expressed in the projection that Sana'a is the only capital city in the world that may run out of fresh water within the next decade⁴⁷.

Historically, Yemen was heavily dependent on imported food. Prior to the conflict, it imported 70-90% of its cereals and was a net importer of many other food items as well⁴⁸. Maize, millet, sorghum, and wheat are cultivated in Yemen, yet mainly for household or village level consumption (see [Map 5](#) for production details per zone). There is concern that the ancient terraces designed to be flood-irrigated will become high risk with changes in climate as seed can germinate and then die due to lack of water⁴⁹. As can be seen in the table below, wheat is considered the most vulnerable crop, followed by maize. Losses are mainly incurred in the Desert zone, where grain production is limited to wheat. Red Sea/Tihama is expected to benefit from climate change. This is because sorghum and millet experience high yield increase and at the same time account for a larger share of agricultural value-addition than in any

other zone, whereas the grains with declining yields (maize and wheat) are hardly produced⁵⁰.

	Maize	Millet	Sorghum	Wheat
Yemen (total)	+0.1 - 1.4%	+0.1 - 4.0%	+0.3 - 2.7%	-0.1 - +0.1%
Upper Highlands	+0.3 - 1.3%	+1.0 - 3.6%	+0.8 - 2.4%	-0.1 - +0.1%
Lower Highlands	-0.1 - +1.7%	+0.0 - 3.3%	+0.1 - 2.4%	-0.3 - +0.3%
Red Sea/Tihama	-0.5 - -0.4%	+0.1 - 4.0%	+0.2 - 4.0%	-1.0 - -0.5%
Arabian Sea	-0.3 - +0.2%	+0.2 - 4.0%	+0.3 - 4.0%	-0.3%
Internal Plateau	-0.7 - +0.7%	+0.8 - 4.0%	+0.2 - 4.0%	-0.4 - +1.6%
Desert	-0.5 - -0.4%	-0.9 - +4.0%	-0.8 - 4.0%	-0.8 - -0.6%

Main expected rain fed crop yield changes 2000-2050 for six regions in Yemen⁵¹

The on-going conflict overrides the climate concerns, however, climate change will exacerbate its consequences, and will impact disproportionately on vulnerable populations, such as women and youth. As water access declines, women and young girls, already travelling long distance for water, will experience further challenges to their health, safety, and ability to receive education. The absence of adequate natural resources management in combination with ongoing conflicts is likely to diminish Yemen's climate readiness in terms of governance and economic prosperity.

| 6 |

National government strategies and policies

Prior to the current conflict, climate change adaptation and mitigation did not dominate Yemen's policymaking and political activity. According to the Climate Investment Fund (CIF), Yemen's development planning was dictated largely by the immediate survival needs of its population, which constrained the government's ability to invest in longer-term strategies for sustainable resource use and climate risk reduction⁵².

Yemen ratified the UN Convention on Biological Diversity (CBD) for which it elaborated a Biological Diversity National Strategy and Plan of Action in 2005⁵³, the Convention to Combat Desertification (CCD)⁵⁴ for which it did not elaborate a National Plan of Action, the Framework

⁴⁷ Glass (2010)

⁴⁸ Glass (2010) and Wiebelt et al. (2011)

⁴⁹ World Bank; UN; EU; Islamic Development Bank (IDB), 2012: Joint Social and Economic Assessment for the Republic of Yemen, <https://openknowledge.worldbank.org/bitstream/handle/10986/11920/693880ESW0P13005mentopubo8031012web.pdf?sequence=1>

⁵⁰ Wiebelt et al. (2011)

⁵¹ Wiebelt et al. (2011)

⁵² Climate Investment Funds (2015): *Yemen*, <https://www.climateinvestmentfunds.org/cifnet/?q=country/yemen>

⁵³ Yemen Ministry of Water and Environment, Environment Protection Authority (EPA) (2002): *National Biodiversity Strategy and Action Plan* <http://www.cbd.int/doc/world/ye/ye-nbsap-01-en.pdf>

⁵⁴ United Nations Convention to Combat Desertification, (2014): <http://www.unccd.int/Lists/SiteDocumentLibrary/convention/Ratification%20list%20May2014.pdf>

Convention on Climate Change (UNFCCC), and the Kyoto Protocol. Yemen signed the Paris Agreement on climate change in September 2016 but has not ratified the agreement (see Intended Nationally Determined Contributions below).

Yemen drafted its Initial National Communication in 2001 and submitted its Second National Communication (SNC), which included its Greenhouse Gas (GHG) inventory, to the UNFCCC in 2013. The latter specifies projects to be implemented in the field of water resources and coastal zone management, and agricultural assessments (adaptation), as well as renewable energy assessments (mitigation)⁵⁵. Climate change was mainstreamed into key development and sector policies including agricultural as well as fishery sector development strategies.

In Yemen's National Adaptation Programme of Action (NAPA), major vulnerabilities are listed for seven economic sectors. These include water, agriculture/food security, coastal areas, and coastal infrastructure. The NAPA was developed in 2009 and its primary goal was to identify priority measures to adapt to climate change and climate variability, and translate them into project-based activities that can address Yemen's urgent needs for adapting to the adverse impacts of climate change. As a follow-up to its NAPA, Yemen submitted 12 NAPA projects to the UNFCCC in 2013⁵⁶. The projects promote traditional land and coastal management approaches that are resilient in the context of current challenges, including climate change impacts⁵⁷. However, due to a lack of valid data, low awareness of climate change, and political instability little action has been taken.

Through the development of its NAPA, Yemen also identified a number of barriers to taking action to assess and adapt to climate change. These barriers include: weak institutional structures and environmental legislation, lack of appropriate data and inadequate institutional, technical and financial capacity to develop, modify or interpret existing models and methodologies. Entrenched poverty conditions worsen local conditions and constrain efforts to build resilience⁵⁸.

With support from UNDP, Yemen began the preparation of a Low-Emission Development Strategy (LEDS) in 2013 with the

development of a roadmap⁵⁹. In this LEDS Roadmap⁶⁰ it was noted that Yemen had not yet designated a dedicated national institution for administering climate change policies and strategies.

Intended Nationally Determined Contributions (INDC) ⁶¹

Despite the conflict, Yemen submitted its Intended Nationally Determined Contribution (INDC) in November 2015 but has not submitted its First NDC to the UNFCCC. In its INDC Yemen commits to a 14% GHG-emission reduction by 2030 compared to a Business-as-Usual (BAU) scenario, of which 13% is contingent on international support and 1% will be covered by national sources.

Mitigation. Mitigation measures focus on energy, agriculture and waste. Unconditional measures are scheduled or already in-progress and include a wind farm project, a rural energy access project and expansion of solar power technology. Conditional (international funding) mitigation measures are concentrated on energy (power generation) and include for example installation of combined-cycle gas turbines (CCGT) and combined heat and power systems (CHP); increasing use of renewable energy sources for electricity. Other sectors include transport (improving efficiency), industry, agriculture (introducing solar water pumping for irrigation and land management to reduce methane from soils), water (methane captures from wastewater treatment plants, desalination through renewable energy based techniques) and waste (landfill gas capture). Estimated costs for these conditional measures are still to be prepared and are not provided in the INDC.

Adaptation. Apart from the continuing implementation of several national policies, the following adaptation measures are foreseen:

- upscaling of rainwater harvesting;
- promoting drought management in agriculture;
- planning and implementing land resources management programs;
- livelihood approaches for integration natural resources management and preservation of ecosystems;
- disaster risk management (floods and droughts);
- capacity building and awareness raising (in general, for integrated coastal zones and marine resources management and institutional capacity for climate resilience).

⁵⁵ Republic of Yemen (2013): *Second National Communication under the UNFCCC* <http://unfccc.int/resource/docs/natc/yemnc2.pdf>

⁵⁶ UNFCCC (2013): *Index of NAPA Projects by Country*. http://unfccc.int/files/cooperation_support/least_developed_countries_portal/napa_project_database/application/pdf/napa_index_by_country.pdf

⁵⁷ Zubrycki, K.; Crawford, A.; Hove, H.; Parry, J-O., (2011): *Review of Current and Planned Adaptation Action: North Africa*, Adaptation Partnership. <http://www.adaptationpartnership.org/resource/north-africa-current-and-planned-adaptation-action>

⁵⁸ YEPA (2009), in Zubrycki et al (2011)

⁵⁹ UNDP (2013), *Development of National Low-Emission Development Strategy (LEDS) in Yemen*. [http://www.undp.org/content/dam/yemen/E&E/Docs/UNDP-YEM-Development%20of%20National%20Low-Emission%20Development%20Strategy%20\(LEDS\)%20in%20Yemen.pdf](http://www.undp.org/content/dam/yemen/E&E/Docs/UNDP-YEM-Development%20of%20National%20Low-Emission%20Development%20Strategy%20(LEDS)%20in%20Yemen.pdf)

⁶⁰ UNDP (2013)

⁶¹ Republic of Yemen (2015). *Intended Nationally Determined Contribution (INDC) under the UNFCCC*. Available via <http://www4.unfccc.int/submissions/INDC/Published%20Documents/Yemen/1/Yemen%20INDC%202015%20Nov.%202015.pdf>

Climate finance

Yemen joined the Global Environment Facility (GEF) in 1994 and completed GEF enabling activities (to qualify for funding), including a National Biodiversity Strategy and Action Plan (NBSAP)⁶² and a country self-assessment. Since it has joined the GEF, Yemen received GEF grants totalling USD 45 million - that leveraged USD129 million in co-financing resources - for 24 national projects. These include eight projects in biodiversity, three multi-focal area projects, eleven projects in climate change, and one in persistent organic pollutants⁶³. Yemen, considered prior to the conflict as a lower-middle income country, received USD 41.27 million in climate funds between 2004 and 2014 – placing the country at number 31 of the climate finance approved ranking list, which is composed of 135 countries. Also, due to its vulnerability, it ranked 10th in the top ten recipients of adaptation finance⁶⁴.

Prior to the conflict Yemen was a pilot country for CIF's Pilot Project for Climate Resilience (PPCR), the purpose of which is to help developing countries to integrate climate resilience into development planning⁶⁵. As the poorest country in the Middle East, the Yemen CIF/PPCR strategic program is designed to reduce the vulnerability of coastal populations and integrate climate resilience and adaptation planning and capacity into the water and agricultural sectors⁶⁶ with investments in three focus areas: Integrated Coastal Zone Management (USD 20 million k), Natural Resource Management and Rural Livelihoods (USD 11 million), and Climate Services (USD 19 million)⁶⁷.

Yemen has not submitted Nationally Appropriate Mitigation Actions (NAMAs) to the UNFCCC⁶⁸, nor has it designated institutional structures for NAMA.

Climate change projects

The conflict has put on hold the implementation of climate relevant projects as well as other initiatives that are not humanitarian aid. The climate projects in the [Annex](#) have not been officially closed, but there is limited activity.

Climate contribution of the Netherlands

Prior to the conflict the Netherlands supported a number of climate-relevant projects in Yemen in the field of integrated water resources management. However, since the conflict erupted, these projects came to a halt and the Netherlands now focuses on meeting humanitarian WASH needs. Climate-relevant WASH activities in the Sana'a basin, managed by FAO Yemen and a UNICEF program Water & Conflict receive support until the end of 2017 and mid-2018 respectively.

⁶² Yemen Ministry of Water and Environment, Environment Protection Authority (EPA) (2002)

⁶³ GEF (2013): *Country profile Yemen*, <https://www.thegef.org/gef/sites/thegef.org/files/publication/Yemen%20-%20Fact%20Sheet%20-%20Nov2013.pdf>

⁶⁴ Nakhooda, S.; Norman, M. (2014): *Climate Finance: Is it making a difference? A review of the effectiveness of Multilateral Climate Funds*. ODI. <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9359.pdf>

⁶⁵ Climate Investment Funds (2015)

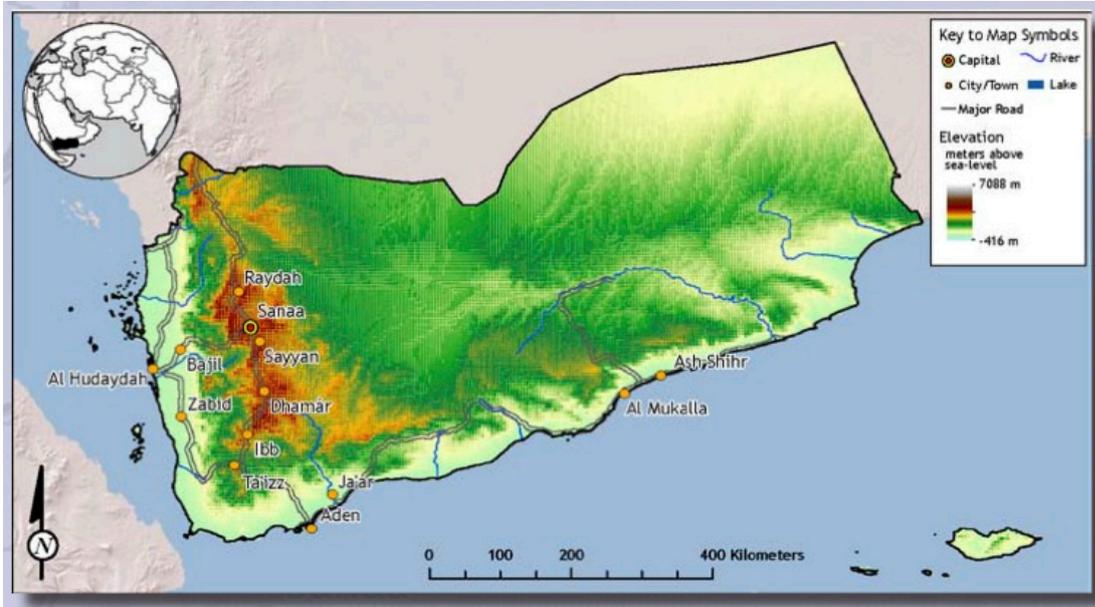
⁶⁶ Climate Investment Funds (2012b): *PPCR Yemen factsheet*. http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/PPCR_Yemen.pdf

⁶⁷ Climate Investment Funds (2012b)

⁶⁸ UNFCCC (2015) NAMA Registry <http://www4.unfccc.int>

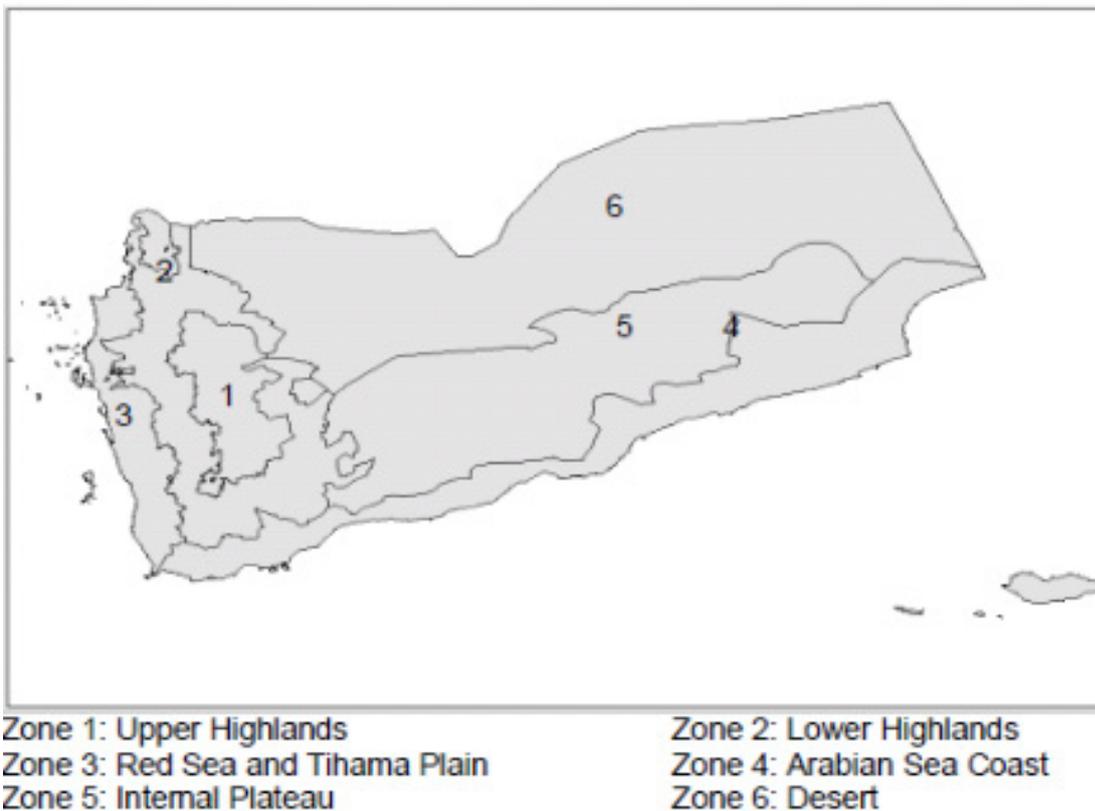
Maps

Map 1 Yemen geography



Source: World Bank (2011)

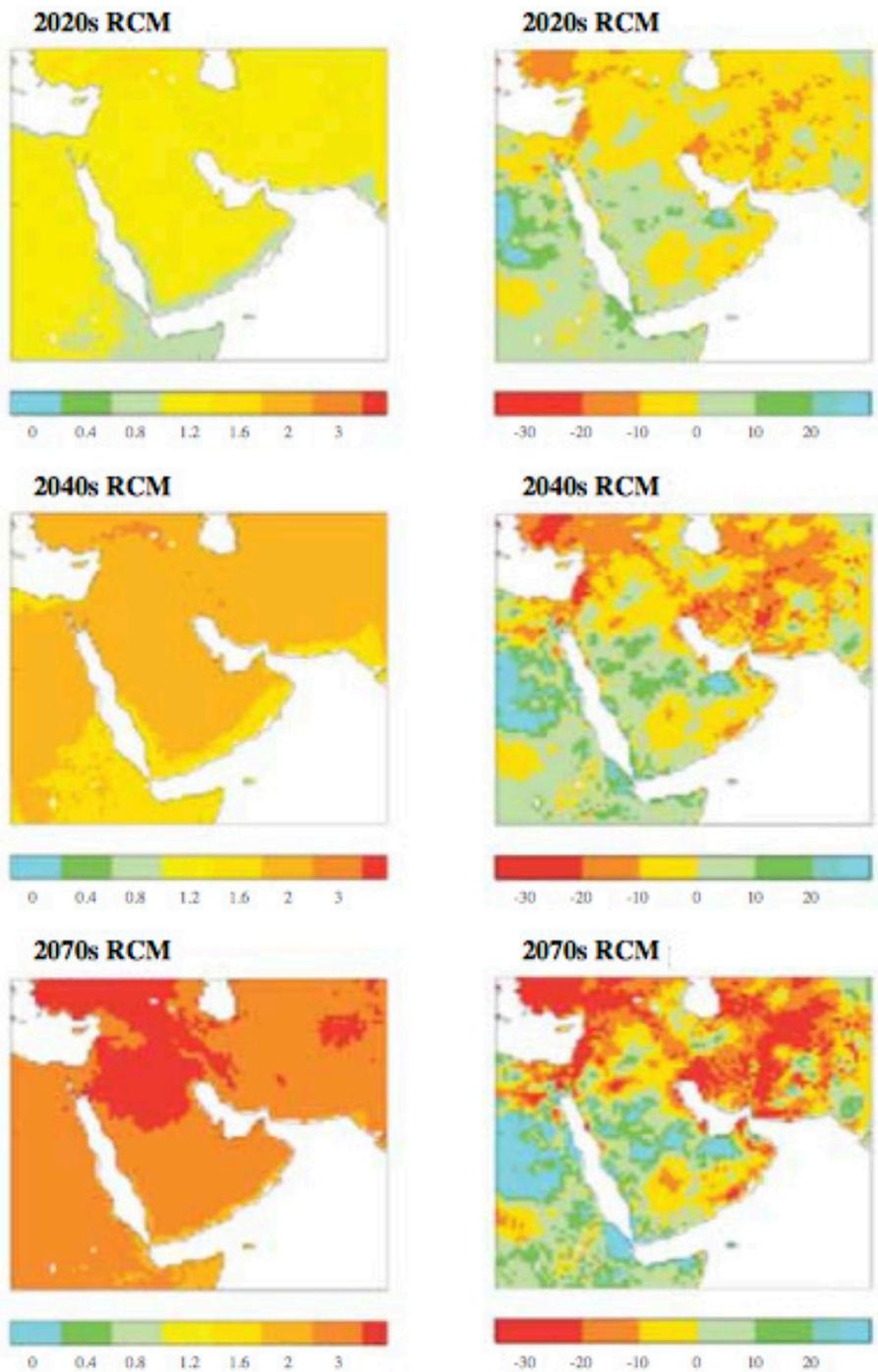
Map 2 Yemen agro-ecological zones



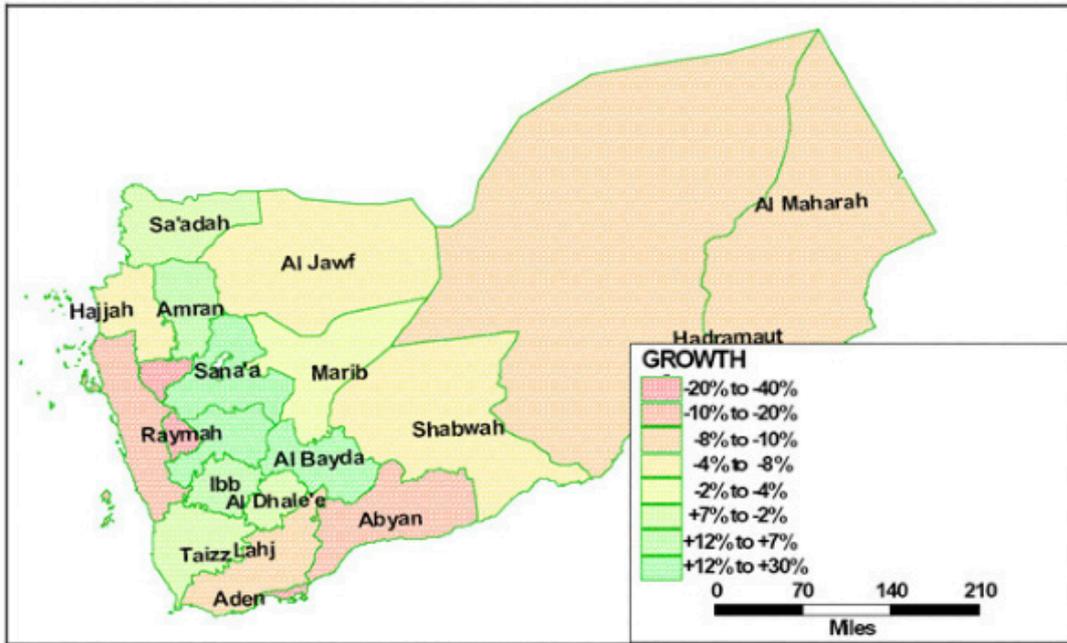
Source: Wiebelt et al. (2011)

Map set 3 Regional climate models for temperature and precipitation in the Gulf region

Left: projections of average temperature changes (in degrees Celsius) for the 2020s, 2040s and 2070s, relative to the 1990s.
Right: projections of precipitation changes (in percentage) for the 2020s, 2040s and 2070s, relative to the 1990s.



Map 4 Changes in agricultural production by governorate ('mid' scenario 2080)

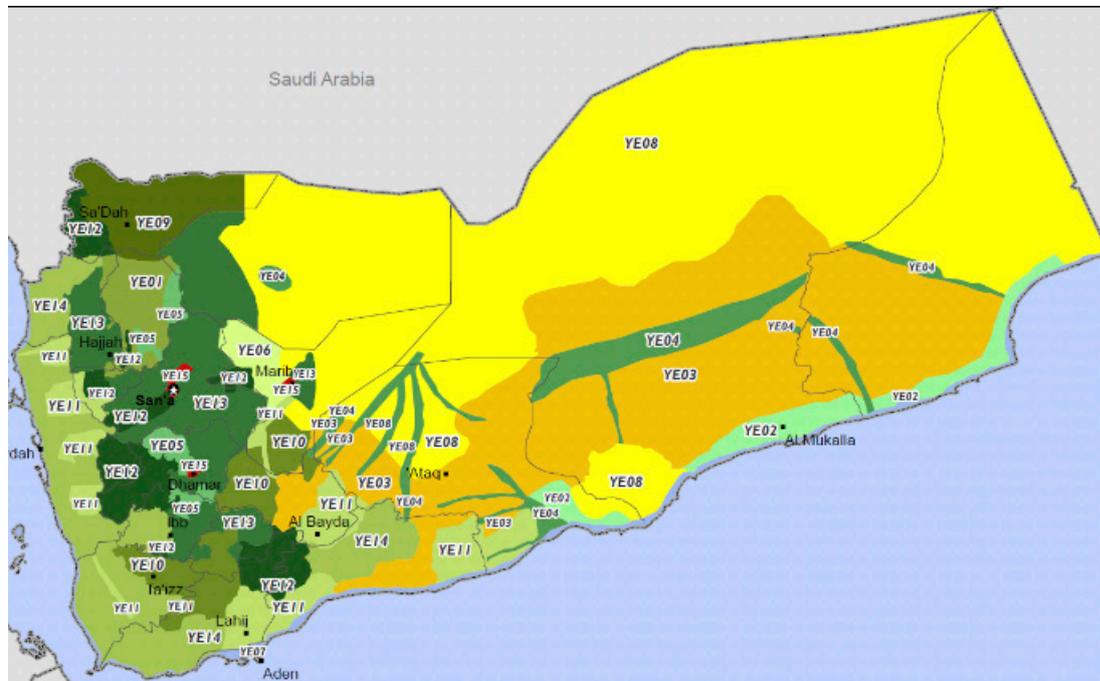


Assumed temperature increase of 3.1% and rainfall decrease of 3%.

Source: World Bank (2010): Yemen: Assessing the Impacts of Climate Change and Variability on the Water and Agricultural Sectors and the Policy Implications.

http://ynccf.net/pdf/Climate_change_and_development/Yemen_Climate_Change_Study_April_8_2010.pdf

Map 5 Main production items per zone



- YE01 - Amran Rainfed Sorghum, Barley, Qat, and Livestock Zone
- YE02 - Arabian Sea Coastal Irrigated Tropical Fruit, Fodder and Livestock Zone
- YE03 - Central and Eastern Plateau Agro-Pastoral Zone
- YE04 - Central and Eastern Wadi Palm, Wheat, Vegetable and Livestock Zone
- YE05 - Central Highland Potato, Vegetable and Livestock Zone
- YE06 - Eastern Plateau Sorghum, Millet and Livestock Zone
- YE07 - Greater Yemen Coastal and Island Fishing Zone
- YE08 - Northern and Eastern Desert Pastoral Zone
- YE09 - Sa'adah Irrigated Wheat, Fruit, Vegetable, Qat, and Livestock Zone
- YE10 - Western and Central Highland Qat, Grain, Fodder and Livestock Zone
- YE11 - Western and Central Wadi Sorghum, Millet, Vegetable, Fruit and Livestock Zone
- YE12 - Western Central Highland Coffee, Qat, Sorghum and Livestock Zone
- YE13 - Western Central Highland Wheat, Sorghum, Qat, and Livestock Zone
- YE14 - Western Coastal Plain Sorghum, Millet, and Livestock Zone
- YE15 - Urban

Regional vulnerabilities

Overall: crop failure, crop and livestock disease

YE02–03–04: rain failure, floods

YE05: rain failure, frost

YE08–09: rain failure

YE14: lack of groundwater, water salinity

Source: FEWS NET (2011): Livelihoods Zoning "Plus" Activity in Yemen, http://www.fews.net/sites/default/files/ye_zonedescriptions_en.pdf

Annex

International and multilateral climate projects (since 2012)^{69 70}

Source Climate Funds Update (2016) <http://www.climatefundsupdate.org/data>

Name of Project	Fund	Amount of Funding Approved (USD millions)	Disbursed (USD millions)	Dates
Integrated Water Harvesting Technologies to Adapt to Climate Change Induced Water Shortage	Least Developed Countries Fund (LDCF)	5		2013
Rural Adaptation in Yemen	Least Developed Countries Fund (LDCF)	10		2013
Rural Growth Programme	Adaptation for Smallholder Agriculture Programme (ASAP)	10		2013
Pilot Programme for Climate and Resilience (PPCR): <ul style="list-style-type: none"> • Climate Information System and PPCR Program Coordination (IBRD) • Integrated Coastal Zone Management • Natural Resource Management and Rural Livelihoods 	CIF/PPCR	50 For 3 focal areas	1.6	2013
Third National Communication and First Biennial Update Report to the UNFCCC	Global Environment Facility (GEF5)	0.9	0.9	2013

⁶⁹ World bank suspended all projects except those related to emergency/humanitarian assistance.

⁷⁰ While these projects are still officially open, progress is delayed or halted because of the conflict. This is reflected in the lack of disbursement of the funds

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