

WEATHERING RISK

Undercurrents

How conflict, climate
change and the
environment intersect
in Yemen

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WEATHERING RISK

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Executive Summary

Climate change, overexploitation and 10 years of civil war are leading to the degradation of natural resources in Yemen. Impacts on social cohesion and conflict are widespread at the local level, but are poorly reflected in conflict analysis, programming and high-level peace efforts. This assessment outlines the relationship between conflict, climate change, and the environment in Yemen, spotlighting dynamics around water and arable land. Key findings include:

Water



- **Climate change is likely to exacerbate long-standing water scarcity problems, while the civil war is reducing water access. Women and girls are bearing the brunt of impacts.**
- **Civil war actors on both sides are weaponizing water resources, aggravating insecurity and conflict dynamics.**
- **Conflicts over available water resources lead to thousands of deaths each year.**

Land



- **Climate-induced desertification and flooding are reducing arable land, leading to competition and conflict between farmers.**
- **Insufficient management of the interconnected issues of extreme weather events, war and displacement is causing these issues to grow.**
- **War and land seizures exacerbate the scarcity of arable land, which in turn fuels conflict.**

Faced with some of the most hostile environmental and security conditions on the planet, Yemenis and supporting international organisations are undertaking a variety of efforts to address these challenges. However, their efforts face significant challenges, including:

- **Tribal and community structures lack the reach to address the root causes of environmental problems and have been weakened by the civil war, even though they remain the most effective and accepted means of conflict resolution.**
- **Yemeni administrations face a lack of authority, capacity shortfalls and critically low funding, which limits their ability to develop and implement policy.**
- **The judicial system, already weak, has been further undermined by the civil war and is overwhelmed by water and land dispute cases.**
- **International organisations and donors are increasingly integrating climate change and peace programming, but a holistic approach is missing, risking long-term adverse impacts on Yemenis.**

The challenges associated with climate change, natural resources and conflict in Yemen are set to exponentially increase as the climate crisis advances. To mitigate these critical threats and support sustainable peace, the following actions are recommended:

International organisations and donors should:

- Incorporate climate considerations into Yemen's national peace process.
- Support climate- and environmentally resilient livelihoods.
- Remove barriers to accessing climate finance.

Yemeni authorities should:

- End the weaponisation of natural resources.
- Integrate climate adaptation into recovery and reconstruction plans.
- Increase capacity to respond to climate change, environmental degradation and related conflicts.

Civil society organisations should:

- Prioritise measures to prevent conflict over natural resources.
- Support research on climate change, the environment and conflict.
- Raise awareness of climate change and its impacts at the local level.

List of Abbreviations

CSO	Civil Society Organisation	STC	Southern Transitional Council
CVE	Countering Violent Extremism	TNC	Third National Communication
DAC	Donor Assistance Committee	US	United States of America
EPA	Environment Protection Authority	UAE	United Arab Emirates
FAO	Food and Agriculture Organisation	UK	United Kingdom
GCF	Green Climate Fund	UN	United Nations
GDP	Gross Domestic Product	UNESCO	United Nations Educational, Social and Cultural Organisation
GEF	Global Environment Facility	UNFCCC	United Nations Framework Convention on Climate Change
GHG	Greenhouse Gas	WUA	Water Users' Association
IDP	Internally Displaced Person		
IFAD	International Fund for Agricultural Development		
INDC	Intended Nationally Determined Contribution		
INGO	International Non-Governmental Organisation		
IRGY	Internationally Recognised Government of Yemen		
MENA	Middle East and North Africa		
NAPA	National Adaptation Programme of Action		
NDC	Nationally Determined Contribution		
NGO	Non-Governmental Organisation		
NSAG	Non-State Armed Group		
ODA	Overseas Development Assistance		
OECD	Organisation for Economic Cooperation and Development		
OSEGY	Office of the Special Envoy of the Secretary-General for Yemen		

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Introduction

Why this study?

In 2024, Yemen entered its tenth year of civil war. Fought primarily between the Yemeni government, Houthi forces and international proxies, the war has caused one of the largest global humanitarian disasters since 1945 (UNSC 2017).

In addition to the violent power struggles of national and regional actors, an array of local conflicts contributes to significant casualties and destruction each year. Many of Yemen's local conflicts revolve around access to dwindling natural resources, particularly water and land – a problem that has plagued Yemenis for decades. Now, climate change and the environmental impacts of the war are critically reducing the availability of natural resources, undermining social cohesion and fuelling conflict. Despite their importance in Yemen's social fragmentation and violence, these dynamics are often excluded from peace and security strategies, particularly at the national and international levels.

This assessment aims to highlight the deep environmental and climate crises that are unfolding amidst

of Yemen's civil war. These crises are perpetuating conflict among Yemenis today and undermining long-term peace efforts. Integrating climate and environmental action, including climate adaptation and sustainable environmental management, into conflict mitigation and peacebuilding processes is therefore essential to ensure sustainable peace. The findings of this assessment underscore the importance of such integrated action.

The assessment begins by outlining Yemen's humanitarian, economic, social and political context. Key current and projected climate trends are presented, followed by an overview of the key drivers and dynamics of Yemen's water crisis. The assessment then outlines climate-related security pathways in Yemen, analysing how climate change and civil war are driving conflict at the local level and undermining peacebuilding efforts. Finally, the assessment discusses the current state of climate finance in Yemen, before proposing some recommendations for international actors, Yemeni authorities and civil society to improve the prospects for peace and security in the country.



Methodology

This assessment is the result of a collaboration between adelphi and the European Institute of Peace and was conducted in line with the Weathering Risk Peace Pillar in Yemen.¹ Data was collected through a combination of surveys (2,283 respondents), focus group discussions (69 participants), and interviews (58). Respondents were reached in the governorates of Ma'rib, Mahra, Aden, Hodeida, Taiz, Sana'a, Al-Dhale'e, Hajjah, and Shabwah. The climate security analysis was conducted using the Weathering Risk methodology, which combines climate impact analysis with an in-depth contextual analysis of climate-related security risks. Climate-related security risks are defined as those driven by one or more climate stressors that have specific direct and/

or indirect impacts on human security, challenging the peace and stability of states and societies (Rüttinger et al. 2023). These are systemic risks that arise from complex interactions between climate change and various social, economic, environmental, demographic and political factors.² This approach seeks to identify not only risks, but also the resilience of different groups and communities.

This assessment was subject to several limitations, including the rapidly changing security situation in Yemen, which inhibited access to parts of the country and delayed the research process. A lack of comprehensive climate data, particularly of climate projections, also impeded the study.

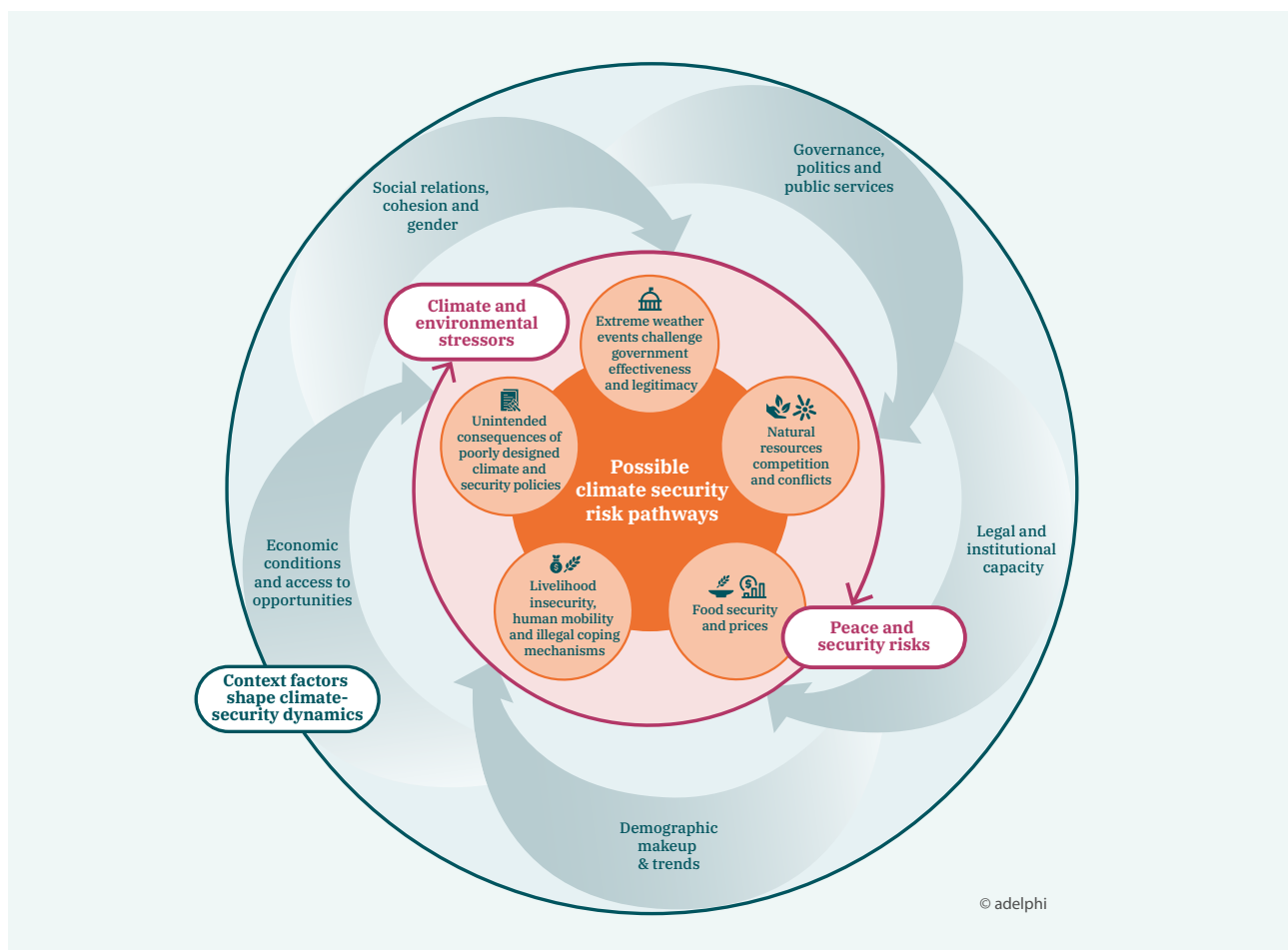


Figure 1: Elements of the Weathering Risk climate security assessment approach (© adelphi)

¹ The Weathering Risk Peace Pillar is a flagship initiative that integrates climate security into peace programming in regions affected by climate impacts and conflict. See: weatheringrisk.org.

² For analysis of broader climate-related security risks and entry points for environmental peacemaking in Yemen and elsewhere, see previous [Weathering Risk](#) and [EIP](#) publications.

Governorates included in field research

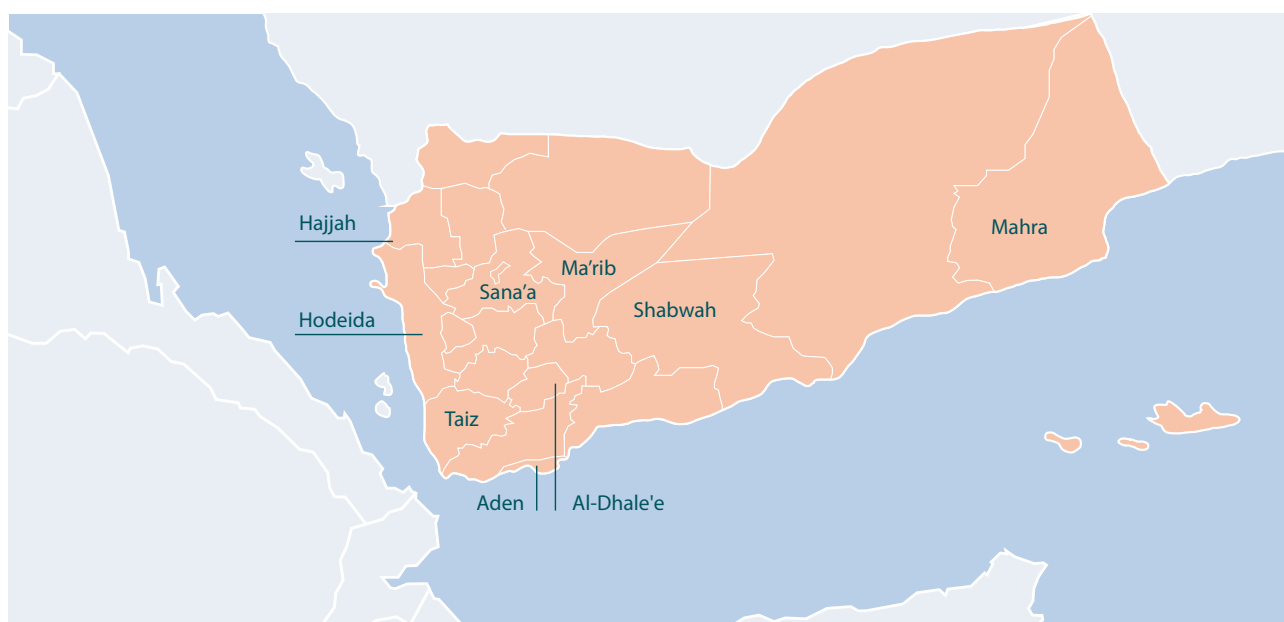


Figure 2: Governorates of Yemen included in data collection (© adelphi)

NOTE ON THE USE OF TERMS

1. Although this assessment sees 2014 as the start of the civil war, it is important to acknowledge that political conflict has been ongoing in Yemen for decades.
2. Civil war refers to Yemen's political conflict, primarily between the IRGY and the Houthis rebel group. Other national, regional and international actors include the STC, Al Qaeda, Saudi Arabia, Iran, UAE, US, UK and others. Major tribal confederations are also considered important actors in the civil war, to the extent that they are involved in political conflict.
3. Unless otherwise noted, in this assessment, conflict refers to violent conflict between two or more individuals or groups (HIIK 2022). This assessment distinguishes local conflicts from civil war, given that they are not typically linked to any particular political end or positional difference.
4. Social cohesion is defined in this assessment as the “ongoing process of developing well-being, sense of belonging, and voluntary social participation of the members of society while developing communities that tolerate and promote a multiplicity of values and cultures, and while granting at the same time equal rights and opportunities in society” (Fonseca et al. 2019).
5. Disasters are defined as hazardous environmental events that emerge quickly or unexpectedly, for example, earthquakes, flash floods, volcanic eruptions, etc (UNDRR 2024).

Context

YEMEN’S HUMANITARIAN CRISIS

In 2023, Yemen ranked as the second lowest country on the Global Peace Index (GPI 2023). By late 2021, its civil war had already led to the death of 377,000 people, and the death toll has continued to rise since.³ If the war goes on, the United Nations predicts that approximately 1.3 million people will have lost their lives by 2030 (UNDP 2021).

Some 60 per cent of deaths related to the conflict are due to indirect causes, including water insecurity, hunger and disease. This figure is expected to grow the longer the conflict lasts (UNDP 2021). Two-thirds of the population need humanitarian assistance and protection services, and 17 million people require emergency assistance to combat malnutrition and food insecurity as of 2024 (UNHCR 2023; World Bank 2024). Meanwhile, an estimated 18 million Yemenis live without access to safe water and sanitation. As a result, Yemen has been grappling with recurring outbreaks of preventable diseases such as cholera, diphtheria, measles and dengue fever (World Bank 2023a).

A STRUGGLING ECONOMY

Prior to the 2014 outbreak of war, Yemen was one of the poorest countries in the Middle East and North Africa. Between 2015 and 2023, Yemen experienced a 54 per cent decline in real GDP per capita, leaving the majority of Yemenis in poverty (Keyes 2024). Yemen also has the second lowest GDP per capita (US \$677) in the region, following Syria (World Bank 2023a).

A YOUNG, PRIMARILY RURAL POPULATION

As of early 2024, Yemen had a population of 35 million (WPR 2023). The number is rising by approximately 2.24 per cent each year, and by 2050, Yemen’s population is set to surpass 55 million. Due to this rapid growth, Yemen’s population is very young, with a median age of 19. Currently, the majority of Yemenis (63 per cent) reside in rural areas (World Bank 2023b). However, rural-to-urban migration is widespread, primarily due to civil war-related displacement. Approximately 4.5 million Yemenis, or 13 per cent of the population, are internally displaced and particularly vulnerable to the humanitarian crisis (UNHCR 2022). In addition, groups frequently excluded from civic and political participation, including women, lowest-income groups and Muhamasheen⁴ face even more humanitarian risks (Al-Warraq 2019).

TRIBAL SYSTEMS ARE SIGNIFICANT IN SOCIAL AND POLITICAL LIFE

Yemen is often described as one of the most tribal countries globally, with the majority of the population (70-80 per cent) identifying with a particular tribe (ACAPS 2020). Five major confederations broadly make up Yemen’s tribal structure, although hundreds of groups and subgroups exist.

Key demographic indicators	Most recent value	Global Rank
Population Density (people per sq. km, 2020)	61.15	140 (out of 215)
Life Expectancy (for total population in years, 2021)	63.75	170 (out of 209)
Fertility Rate (total births per woman, 2021)	3.80	40 (out of 210)
Dependency Ratio (dependents per 100 working-age people, 2022)	72.89	41 (out of 217)

Figure 3: Demographic indicators for Yemen. (© World Bank 2023a)

3 Most recently available figures as of mid-2024.
4 Muhamasheen are a social group outside of Yemen’s traditional tribal structures that has faced historic marginalisation.

A HISTORY OF TURBULENT LAND GOVERNANCE ECHOES TODAY

Land ownership has been at the centre of recent tensions in Yemen. After unification in 1990, complicated processes began to return southern land that had been nationalised to its former owners. Yet, many complained that their land was not returned (LANDac 2019; Hill 2009). Efforts to reform land governance in the following years also failed. Matters only worsened in the aftermath of the 1994 war, when northern elites confiscated huge portions of southern land. These losses especially troubled Yemen's south, later fuelling calls for secession (Hales 2010). These tensions were not confined to the south, as unequal distribution and land grabs occurred across the entire country for decades.

The Hashid and Bakil confederations are the two largest tribes, and they are both based north of Sana'a, covering Sana'a, Amran, Sa'ada, Al-Jawf and some of Ma'rib. The Madhaj, Himyar and Kinda confederations span the rest of the country. The overlap of tribes between regions is common. Some (typically urban) areas such as Aden do not strongly identify with the tribal system (Mugahed 2022).

Tribes are heavily armed, and they have been important actors in every conflict and war in Yemen's modern history. Since the civil war's outbreak in 2014, Yemen's tribal system has been shaken. Different groups have allied with either the IRGY or the Houthis; some have operated as independent actors instead (Mugahed 2022). While some tribal structures have been undermined by the civil war, others (particularly in rural areas) have become stronger, as government authority has weakened (ACAPS 2020).

Due to their influential power and ability to secure local legitimacy, tribes have been very important not only to the civil war, but also to peacebuilding efforts. At the local level, tribal leaders frequently mediate disagreements between individuals or issue decrees to stop conflicts, particularly when disputes revolve around environmental issues and access to natural resources. At the national level, many Yemenis believe tribes have an important role in future reconciliation efforts (Mugahed 2022).

A LONG HISTORY OF POLITICAL CONFLICT AND VIOLENCE

The 2014 uprising is often considered the onset of Yemen's civil war. However, political instability, conflict and war have a much longer history in the country. Yemen experienced a violent colonial regime, followed by years of political upheaval, institutional collapse and humanitarian crises. In fact, Yemen has faced a coup, insurrection or violent political conflict every decade since the 1960s (Feierstein 2019). Some of the root causes of instability in Yemen include economic disenfranchisement, political marginalisation, international strategic interests and the effects of an extractive, corrupt and rentier state (Al-Akhali 2014).



Until 1990, Yemen was divided into two states, which merged following the collapse of the Soviet Union: the People's Democratic Republic of Yemen (South Yemen) and the Yemen Arab Republic (North Yemen). The decade after unification saw the expansion of a political and economic system based on elite control (Feierstein 2019). The Houthi movement emerged and began to gain power in the 1990s partly in response to this concentration of wealth in the hands of the elite (Wilson Center 2022).

Tensions escalated into civil war in 1994 and rose again between 2004 and 2010. In 2011, the Arab Spring protests brought groups from the North and South together to rally against the elite's exploitation of resources and corruption, among other issues (Feierstein 2019). In 2012, amid unrest and violence, 30-year-ruling President Ali Abdullah Saleh was ousted, and a new president, Abed Rabbo Mansur Hadi, rose to power. Between 2013 and 2014, the National Dialogue Conference (NDC) took place and aimed to facilitate a peaceful political transition (Alley 2022).

Shortly after the NDC reached an agreement, a rise in fuel prices, together with ongoing instabilities, triggered a popular uprising. The Houthi movement escalated its campaign, capturing Sana'a – Yemen's capital – in September 2014 and overthrowing President Hadi in 2015. Violence escalated throughout 2015, when a coalition of states led by Saudi Arabia and supported by the United States began a military campaign against Houthi insurgents. Since then, the country has been fighting in a war between the West- and Saudi-backed IRGY, the Iran-supported Houthis and (to a lesser extent) the secessionist, UAE-backed Southern Transitional Council (CFR 2023). Now, Yemen is geographically divided between these groups. Approximately 70-80 per cent of Yemen's population live in areas controlled by the Houthis, including Sana'a (US Department of State 2021).

In 2022, a UN-brokered truce between the warring parties resulted in a reduction of violence and an improvement of the humanitarian situation. While the truce failed to be renewed in October 2022, the

war has not returned to its pre-ceasefire intensity. Since then, talks between Saudi Arabia and Iran rekindled some hope in the peace process. The Special Envoy of the Secretary-General for Yemen, Yemeni leaders across both sides and other regional powers are currently drafting a UN Roadmap to End the War in Yemen. However, at the time of writing (i.e. late-2024), it is unclear whether these efforts are likely to meet their objectives in the near future, given escalations to the civil war that have been taking place since December 2023.⁵

Natural resources and Yemen's civil war

Prior to the country's unification, Yemen's wealthy landowners – particularly the elite tribes of the northern highlands – enjoyed a monopoly over natural resources like oil (Dingl 2016; MEI 2019; Mugahed 2022). The vast majority of Yemenis remained very poor. In fact, Zaydi Shia groups, which formed a majority in the northwest, complained of economic disenfranchisement for decades (Minority Rights Group 2018; UN Foundation 2018; Lackner et al. 2020). Resentment of the rentier system only grew during Saleh's oppressive authoritarian regime, which culminated in the Arab Spring revolts and brought together diverse groups that had been excluded from power to demand change (Dingl 2016). In the years that followed, natural-resource politics continued to destabilise peace efforts in Yemen. During the NDC, a plan was devised to divide Yemen into a federation of six wilayat (provinces) with limited autonomy from the central government (Al-Madhaji 2016).⁶ Under this plan, the federal government reserved the right to retain control of revenues from natural resources such as oil and gas (Day 2019). Large portions of the population, particularly in Zaydi Shia-majority areas, felt that the provisions disadvantaged them, which drove tensions and weakened peace prospects (Jalal 2022). While just one of the many complicating forces behind the 2014 outbreak of war, these problems formed a base upon which armed groups, including the Houthis, could build support, framing their uprising against a corrupt elite that had guarded the nation's natural riches for itself (UNDP 2013; Lackner et al. 2020).

⁵ In response to the war in Gaza, Houthi forces launched a series of attacks on international cargo ships in the Red Sea in December 2023, which are still occurring at the time of writing. The US and UK responded with airstrikes on the Houthi-held capital of Sana'a in January 2024 and have continued to respond to Houthi attacks on ships with drone strikes.

⁶ The NDC was a dialogue process held between 2013 and 2014. It attempted to tackle political challenges and transition to democratic governance (Schmitz, 2014).

Environment and Climate Change

GEOGRAPHY AND TOPOGRAPHY

Yemen is located on the south-western edge of the Arabian Peninsula. It is administratively subdivided into 21 governorates (muhafazat) and one municipal capital (Amanah). It consists of five major geographic regions (World Bank 2023a):



1. Along the western shores, the Tihama region (or coastal plain) is characterised by a hot and humid climate that receives little precipitation. It extends 2,200 kilometres and is 30–60 kilometres wide. The important port cities of Aden on the Gulf of Aden and Al Hodeida on the Red Sea are both located in this zone.



2. The Sarawat Mountains comprise the western and central highlands, which rise abruptly from the coast along Yemen's entire western perimeter and continue northward into Saudi Arabia. The western highlands range from 1,000 to over 3,600 metres in altitude and receive the most precipitation on the entire Arabian Peninsula. The central highlands, where the capital Sana'a resides, are lower in altitude and drier compared to the western highlands.



3. The sparsely populated eastern highlands, stretching across Hadramawt and Al Mahra, have lower elevations (approximately 1,000 metres) and experience a climate similar to the southern coast.



4. The Rub al-Khali Desert is often referred to as the "Empty Quarter" and occupies the north and north-eastern interior. It is characterised by an extremely dry, arid climate and is sparsely populated.



- 5 Yemen also has over 100 islands located in the Red Sea and the Arabian Sea. The islands are a rich source of mangroves, coral reefs and fisheries. Socotra, a UNE-SCO-protected and ecologically distinct four-island archipelago in the Arabian Sea, became a separate governorate in 2013 and has been de facto governed by the UAE since the outbreak of the civil war (Coombs 2020).



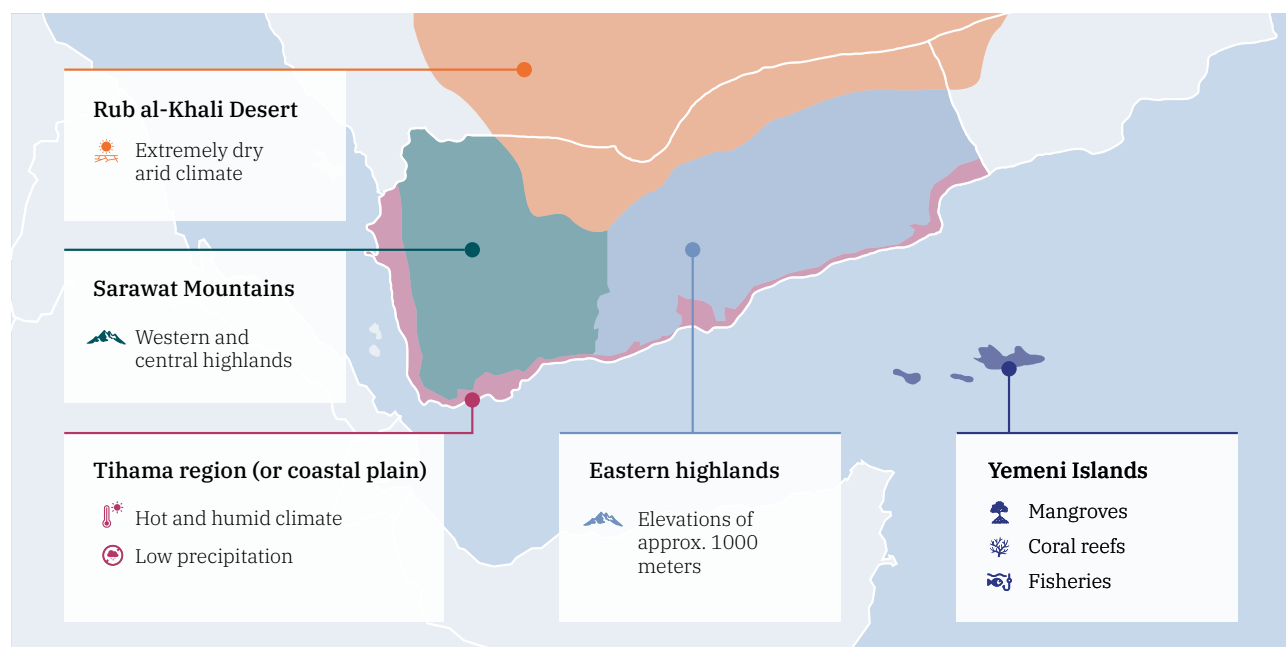


Figure 4: Yemen's geographic regions (© adelphi)

CURRENT CLIMATE

Yemen has a tropical, semi-arid climate along its coast and inland desert, and a subtropical and temperate climate in its highlands. The mean temperature is 25.54°C, but average temperatures can range widely depending on the region. From 1991 to 2020, mean annual precipitation totalled 189.81 millimetres at the national level. However, there are a variety of regionally and seasonally distinct precipitation regimes (World Bank 2023a). The country has two monsoonal rainy and dry seasons per year. Winter monsoons take place between December and March, and summer ones between June and September (USAID 2017). Three climate zones can be distinguished:



1. Coastal plain: The coastal plain experiences warm winters and hot, humid summers. Summer temperatures frequently surpass 50°C, and this figure is on the rise. Rainfall varies between 10-100 millimetres each year (USAID 2017).



2. Western Sarawat mountains: The Sarawat mountains have lower humidity and temperatures, and higher rates of rainfall, than the other two regions (USAID 2017).



3. Eastern highlands: Yemen's east is made up of Hadhramaut's inhospitable scrubland and desert, part of the Arabian Peninsula's "Empty Quarter." The region is sparsely populated, with a continuously growing desert. Very low rainfall and hot summers occur in the east (USAID 2017).

CLIMATE CHANGE AND PROJECTIONS

Between 1971 and 2020, Yemen's mean annual temperature increased by an estimated 0.42°C per decade – approximately twice the rate of the global average⁷ (World Bank 2023a; NOAA 2024). The most rapid increase in temperature is occurring during the summer months (June through August), with an increasing number of hot and humid days and nights (World Bank 2023a).

Over the same period, Yemen experienced a decrease in annual precipitation (–6.25 millimetres) per decade, though precipitation trends varied regionally and between years. This generally affects the drier seasons, with declines particularly noted in the highlands (USAID 2017). Western and southwestern coastal regions also observed significant decreases in precipitation over this time period, mostly during summer and fall months (World Bank 2023a).

CLIMATE-RELATED HAZARDS

Extreme weather events have plagued Yemen throughout its history, and they are rising in both frequency and intensity due to climate change (World Bank 2022). In addition, civil war, a lack of adaptation, population growth, and poorly managed urbanisation is increasing Yemenis' exposure to disasters, seeing more people physically at risk of being affected by disasters and fewer protections against them (ESCWA 2017; Interview 6 2023). The most frequently occurring weather-related disasters in Yemen are flash floods (51 per cent of cases), landslides (12 per cent) and floods (10 per cent) (ESCWA 2017).

⁷ Global average surface temperature increase measured since 1982.

CLIMATE CHANGE VULNERABILITY

Yemen is widely considered among the most vulnerable countries in the world to climate change. According to the ND-GAIN index, Yemen ranks 174th out of the 185 evaluated countries globally.⁸ This makes it the lowest-scoring country in the entire MENA region. Particularly in terms of readiness, Yemen is scoring extremely low (182nd out of the 192 evaluated countries) (ND-GAIN 2023). Similarly, the INFORM risk index identifies countries at risk of humanitarian crises and disasters that could overwhelm their national response capacity. In regard to hazards, vulnerability and lack of coping capacity, Yemen ranks among the 10 lowest-scoring countries overall, although it is not among the most exposed to hazards (DRMKC 2023).

CLIMATE AND ENVIRONMENTAL POLICIES

Despite its oil production, Yemen's contribution to the climate crisis has been very minor (Ritchie 2019). Nonetheless, Yemen has undertaken efforts to join the international community in its attempts to reduce emissions. It joined the UNFCCC in 1996 and the Kyoto Protocol in 2008 as an unaffiliated party. In 2009, the Yemeni government developed a draft National Adaptation Programme of Action (NAPA), which identified several critical adaptation areas, including water management, agriculture and food security, biodiversity, coastal communities' protection, ecological-infrastructure consolidation in coastal areas, healthcare and tourism (World Bank 2023a; Al-Sarari 2023). Yemen submitted its INDC to the UNFCCC in 2015, as well as the First Biennial Update Report in 2017 and the TNC in 2018. The INDC established a target to reduce 14 per cent of greenhouse gas emissions by 2030, and it also recommended adaptation measures under sector-specific national frameworks. In addition, Yemen has signed, but not ratified, the Paris Agreement.

The Public Authority for the Environment, affiliated with the Ministry of Water and Environment, is the primary government institution in charge of climate action and environmental policies.⁹ Yet, climate action and environmental protection in the IRGY came to a near-complete stop since the outbreak of the civil war. A recent policy that has been designed to combat Yemen's environmental crisis is the National Biodiversity and Action plan.¹⁰

(Republic of Yemen 2016). In 2021, the Ministry of Water and Environment reactivated the Climate Change Unit, tasking it with drafting an action plan for an updated national adaptation programme of action (Al-Sarari 2023). In Houthi-controlled territories, information on both climate and environmental policies is lacking. The administration is known to be highly suspicious of any activities regarding climate and the environment, as well as CSO activities more broadly (Interview 4 2023).

YEMEN'S WATER CRISIS

At only 74 m³ per capita, water availability in Yemen is among the lowest in the world (FAO 2021). The country has no major lakes or rivers, or any permanent surface water. It relies on groundwater aquifers and rainfall, which is frequently inaccessible during long droughts (Zeitoun 2012; Al-Qubateen 2022; World Bank 2023a). Since the 1970s, deep-well drilling has rapidly diminished Yemen's groundwater reserves. Over the following 30 years, the portion of irrigated land in Yemen increased tenfold, and many indigenous practices to harvest rainwater and conserve resources fell to the wayside (Lichtenthäler 2010; Interview 6 2023).¹¹ Extraction has been exacerbated by government plans to increase the production of crops such as qat, a mild narcotic that is important for Yemeni livelihoods but also extremely water-intensive (Zeitoun 2012). To fuel the qat industry, authorities subsidised diesel for water extraction and funded expansive irrigation schemes (Suter 2018; Norton, 2022; UNDP 2013).

Since the outbreak of civil war, Yemeni authorities have had no meaningful oversight of extraction from groundwater aquifers, and they lack the ability to enforce regulations (Interview 1 2023). In the absence of a functioning state, wealthy landowners, tribes and civil war parties have been able to drill for water ad hoc, significantly reducing its availability. The quality of remaining resources has also been compromised, as over-extraction leads to saline encroachment in aquifers (FGD 6 2023). As a result, Yemen is facing an abject water crisis. In as little as 20 to 30 years, aquifers are likely to be depleted, even without considering climate change (Suter 2018; World Bank 2023c).

⁸ The ND-GAIN index summarises a country's vulnerability to climate change and other global challenges, along with its readiness to improve its resilience.

⁹ An extended analysis of climate and environmental governance in Yemen is available in "Integrating climate security into policy: Roadmap for Yemen."

¹⁰ In-depth analysis of the implementation of the National Biodiversity Action plan is beyond the scope of this assessment.

¹¹ Previously, the agricultural sector relied on terracing to protect soils and fields, and to help water infiltration into shallow aquifers. Now, terraces have deteriorated, and less water can be captured in aquifers (Pouran et al. 2019).



Pollution in Taiz, Yemen. Source: © EIP

Climate Security Pathways

Climate impacts, along with the effects of civil war, population growth and environmental degradation, are exerting pressure on Yemen's dwindling natural resources (FGD 5 2023). In a consultation conducted across Yemen in 2023 as part of the Weathering Risk Peace Pillar, an overwhelming majority of respondents noted that the reduced availability of natural

resources is contributing to competition, tensions and reduced social cohesion among the population. Many disputes are escalating into violent conflict, with more than 52 per cent of Yemenis experiencing or hearing of a conflict driven by environmental factors in their district (EIP 2024).

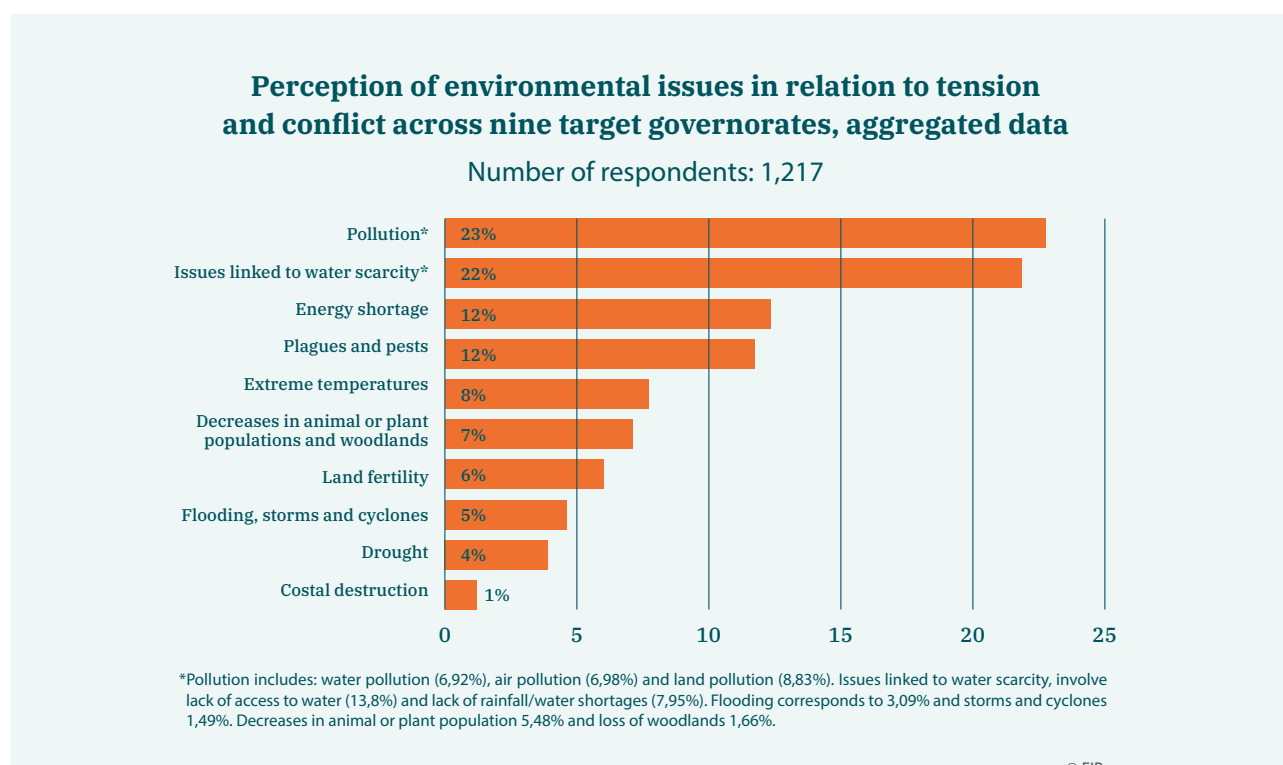


Figure 5: Environmental drivers Yemenis see as sources of tension. (© EIP)

Tensions arising from climate and environmental hazards are largely rooted in Yemenis' dependence on water and fertile land for their livelihoods. The agricultural sector accounts for approximately 44 per cent of total employment and 66 per cent of women's employment (ESCWA 2021). Indirectly, natural resources are important for an even larger share of the workforce (Figure 6).

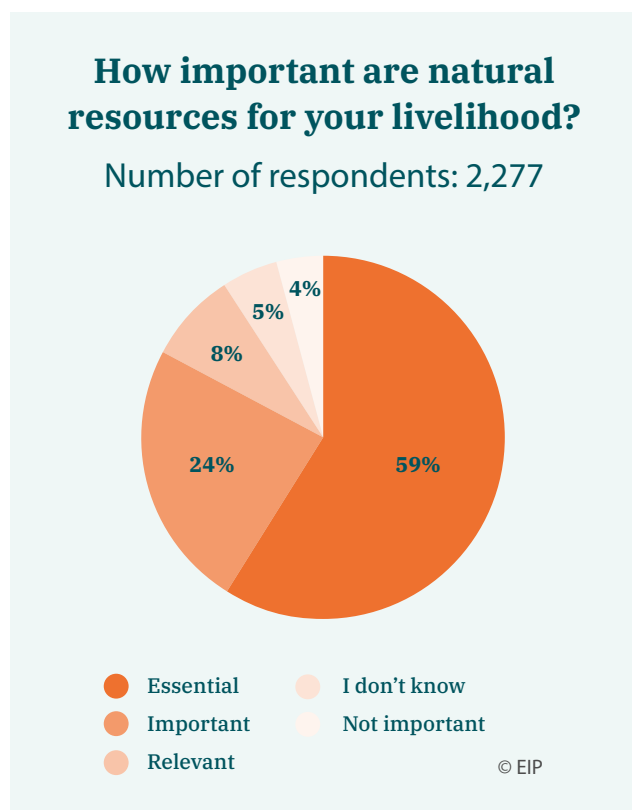


Figure 6: How relevant Yemenis see natural resources for their livelihoods. (© EIP)

“The rains used to fall during two periods (April and June), which was suitable for rain-fed agriculture, but in recent years, the rainfall seasons began to vary, and rains became inconsistent... This hinders farmers, who are dependent on rain-fed agriculture to benefit from these rains, not to mention the damage that heavy rains can cause, leading to soil erosion and inability to control the volume and timing of irrigation.”

Meteorological expert in Sana'a

As the impacts of climate change have reduced the availability of natural resources and the civil war has restricted access to them, water and land have become lynchpins of conflict (UNDP 2023). The key factors linking water and land challenges to insecurity and conflict are presented below.

Water

WATER SCARCITY IS COMPOUNDED BY CLIMATE CHANGE AND INACCESSIBILITY.



Climate change is likely to exacerbate long-standing water scarcity problems, while the civil war is reducing water access. Women and girls are bearing the brunt of impacts.

Yemen's water crisis is largely driven by over-exploitation, but climate change could make it worse. Climate change-induced droughts, rising temperatures and changing precipitation patterns are likely to reduce the potential for rainwater harvesting. They could also contribute to aquifer depletion, critically reducing the available water for domestic use and farming (Taylor et al. 2023; Green 2016). If aquifer depletion continues at the current rate, the loss of reserves will see agricultural output reduced by up to 40 per cent over the next 20 to 30 years (World Bank 2010).

Meanwhile, available water resources are largely inaccessible to many Yemenis (Aklan et al. 2019; ESCWA 2021). In rural areas, approximately 70 per cent of Yemeni farmers rely on private wells for irrigation, but few can afford to independently manage water extraction (Aklan et al. 2019). The machinery necessary to extract water is expensive and requires a significant, consistent supply of energy, which most Yemenis cannot access (IRENA 2023; FEWS NET 2022). As a result, wells are managed by a range of different actors: sometimes by a community leader, but often by armed groups and wealthy landowners, who drill without regard for sustainable extraction or equitable distribution (UNDP 2023; FGD 6 2023). Local authorities have also contributed to the problem, building new wells in dwindling aquifers and sequestering water from communities that rely on these basins for farming and domestic use (FGD 6 2023).

In the absence of land irrigation, fewer crops are being produced, driving recruitment into armed groups. Some farmers noted that their crop yields in 2022 were half of what they expected (Ali 2023). As armed groups provide salaries and food that may not be otherwise attainable, many members of farming households – especially young boys – have joined them (FGD 5 2023). For example, many unemployed young men from Sa'ada – formerly one of Yemen's richest agricultural areas – have been recruited into the insurgency, as fields that once grew grapes,

pomegranates and oranges turned barren due to water scarcity (Herald Tribune 2013; al-Mowafak 2021).

“ Prices and lack of job opportunities may push some to earn money in illegal ways to meet their household needs of water and food. Some may resort to fraud, theft and looting due to environmental changes.”

Teacher in Shabwah

These challenges are also severely impacting water accessibility for drinking and domestic use, especially for women and girls. Due to their traditional responsibility to collect water, women are disproportionately affected by water access issues (Jagannathan et al. 2009; Aklan et al. 2021). Journeys to collect water are very long, often across mountains and valleys in rural areas, and lengthened during drought periods. Routes can be hazardous, and women have been subject to gender-based and sexual violence, killed or injured by stepping on unexploded landmines, or shot by snipers on journeys to collect water (Aklan et al. 2019; Interview 3 2023; FGD 6 2023; UNDP 2023; FGD 5 2023; Partners Global 2023). Even in urban areas, women face increased risks due to their water-collection responsibilities. For example, women and girls in cities have been more exposed to water-borne illnesses like cholera and malaria (FGD 5 2023).

CIVIL WAR ACTORS ARE EXPLOITING THE WATER CRISIS.



Civil war actors on both sides are weaponizing water resources, aggravating insecurity and conflict dynamics.

Both the Houthis and the IRGY have instrumentalised water resources to advance their war objectives. Scarcity has rendered water a highly lucrative commodity for civil-war parties, enabling opposing groups to win local legitimacy by securing the water supply or by blocking access to specific groups. In addition, controlled water basins generate war revenues for the IRGY and the Houthis, e.g. by extracting water for qat growth (Aklan et al. 2023; Interview 10 2023; Jafarnia 2023; Siyech 2023). Both the IRGY and the Houthis have restricted water supply to opponents' territories, bombing essential sanitation and freshwater infrastructure like dams, reservoirs, desalination plants and pipelines (Jafarnia 2023; Caye 2020; CIVIC 2019).

In turn, the war is damaging water quality. Conflict debris fills many of Yemen's wadis and canals, and Yemeni authorities have not cleared them (UNDP 2023).¹² Water pollution is also a major problem, with the IRGY and Houthi administrations lacking the finances to clear water resources. Yemen's biggest cities, including Sana'a, Aden and Taiz, are particularly affected by water pollution (EIP 2024).

“ Depending on your support or opposition to the people who control resources, you will be affected in your home, in your community, in your resources and in your movements.”

Public administration employee in Ma'rib

CASE STUDY 1: WATER WEAPONISATION AND MEDIATION IN TAIZ

Taiz's water supply is sourced from five basins via 88 wells, just 21 of which are operational (Jafarnia 2023). Two of the five basins are on the frontlines of the civil war and cannot be reached by the local IRGY water and sanitation administration. Two other basins are in Houthi territories, where the rebel administration is exploiting resources to fuel the war economy. Rather than distributing water to its population, Houthi forces sell water to qat farmers at expensive rates across Taiz, including in IRGY areas (Interview 10 2024). Just one basin remains in IRGY territories, where the majority of Taiz's population lives (Jafarnia 2023; Interview 10 2024).

In 2023, two women leaders of local NGOs began a mediation process between Houthi and government forces, speaking with the Houthi administration to negotiate the rehabilitation of supply. Sometimes, the local Houthi administration would agree to reinstate supply, but the decision would be repealed by the central administration in Sana'a. After months of negotiations and large meetings between the authorities and the community, the bloc successfully reinstalled water to one area in Taiz. However, water supply has not been rehabilitated in the majority of the governorate (Interview 10 2024).

12 Wadis are valleys common in the Middle East and Africa that have rivers following periods of rain (Cambridge 2024).



Pollution in Yemen. (© EIP)

THE WATER CRISIS IS LEADING TO COMPETITION AND VIOLENT CONFLICT.



Conflicts over available water resources lead to thousands of deaths each year.

Water shortages have increased competition over wells, water basins and access to aquifers between and within communities; climate change is exacerbating these dynamics (FGD 6 2023; EIP 2024; Case study 2). While competition does not always or even usually escalate into violent conflict, the number of disputes that do result in violence is very high, causing up to 4,000 deaths annually (UNDP 2023).¹³ These conflicts have occurred in Yemen for decades; however, the aggravated risks posed by the current water crisis have increased the risk of violence (World Bank 2009; UNESCO 2012; Haidera et al. 2011). Conflicts have been reported in every governorate. As many as 70 per cent of respondents reached by this research team reported tensions and conflicts over water resources in their community (EIP 2024; Interview 10 2023). Such conflicts can last for years and are highly localised.¹⁴ In cities, violent conflict has occurred at a micro-scale between individuals at water-collection points (FGD 4 2023). For example, clashes have erupted in city centres in Sana'a and Aden when some women fill more cannisters than permitted (Zabara et al. 2022; FGD 4 2023). Densely populated urban areas, including Sana'a, Taiz and Aden, have emerged as hotspots.

“For one year there has been a problem between my cousin and a neighbouring family over a water well. They have been in court for the year but there has been no action. One day when my cousin and his close friend were getting into their car, the other family shot at them. My cousin was injured and his friend was killed. His friend was not part of the conflict.”

Interviewee from village in Ibb

In rural areas that are reliant on irrigation to sustain residents' livelihoods, water conflicts are even more severe, often involving entire communities, villages or tribes that fight one another by damaging opponents' water infrastructure, for example by blowing up wells and pumps. Individuals may also physically injure or murder a competitor to gain access to water directly, to punish the community for conserving water sources for itself or to enact revenge after a member of their own community was killed in a water-related conflict. For example, in the Saber area of Taiz, the Qurabah and Marzoh villages have been engaged in violent conflict since 2019 over the ownership of a well. As of January 2024, at least 200 people had been injured and 20 had been killed (Interview 10 2024). Violent conflict is amplified by the prevalence of gun ownership in Yemen, which is among the highest per capita in the world (WPR 2024; IWM 2024).

¹³ Given data-collection challenges and low rates of official crime reporting, actual figures are likely higher.

¹⁴ While tensions and competition emerge from the exclusion of the population's most vulnerable from water, this group is usually not engaged in intensive armed conflict, which requires resources to buy arms, etc. (Interview 10 2024).

“ [A] water path firstly goes through our lands, then reaches them.¹⁵ But, because they are influential, powerful and have authority, they attack us, and they change the path of rainfall runoff water to their far villages and don't let the water go through our lands. [...] We couldn't deal with them or handle them because they only know how to use force. Then we resorted by going to the government, but until now they still haven't finished making the report on the issue.”

Farmer in Zabid district, Al-Hodeida

CASE STUDY 2: PRECIPITATION CHANGES AND COMBAT CREATE TENSIONS OVER WATER RESOURCES IN KHANFAR, ABYAN

Khanfar, a district in the Abyan governorate, depends on Wadi Bana for water. However, new climate change-induced rainfall patterns are reducing supply and preventing irrigation across the district's farmlands.¹⁶ Long periods of little to no water flow in the wadi occur, and dangerous bouts of torrential rain cause periodic flash floods between March and October. In addition, many of the wadi's sub-canal are blocked by sedimentation, waste and vegetation, further reducing supply.

Meanwhile, the area is a combat hotspot, with the IRGY, STC, Al Qaeda and other NSAGs all fighting for control. Attacks have damaged water infrastructure directly and are preventing repair and basic maintenance (Sanaa Center 2022; Nasser 2023; Reuters 2022). As of late 2023, 85 per cent of Khanfar's irrigation infrastructure was damaged or destroyed by the conflict.

To secure their water supply, some farmers have built alternative irrigation structures that bypass damaged canals, channelling water to their fields and away from downstream users. Local residents complain that one family removes irrigation infrastructure every flood season to capture the water before it flows downstream, expressing fears that violence will soon erupt in their community as a result (UNDP 2023).

Land

CLIMATE AND ENVIRONMENTAL IMPACTS ARE DAMAGING ARABLE LAND.



Climate-induced desertification and flooding are reducing arable land, leading to competition and conflict between farmers.

Prolonged droughts, exacerbated by climate change, have led to critical levels of desertification in Yemen. Between 3-5 per cent of arable land is destroyed every year, and nature reserves and forests have been drastically reduced (YCFA 2023; USAID 2017; UN News 2023). Desertification is predicted to increase significantly in the future. The IRGY predicts that up to 86 per cent of Yemen could soon be consumed by desert (Al Awsat 2022), although precise forecasting is lacking, and estimations vary widely. Soil erosion is also likely to occur as a result of droughts, accelerating the loss of arable land (Environment Protection Authority 2023). This is preventing farmers from earning an income through agriculture, leading to increased poverty and migration. Indeed, many farmers have abandoned their land, moving to cities in search of work.

In addition, extreme weather events are damaging and destroying arable land, increasing conflict over land ownership. Yemen's Environmental Protection Authority documented 36 weather-related hazards between 2000 and 2020, leading to significant impacts on Yemeni life and property.¹⁷ Among these incidents were five major cyclones that occurred since 2008 (2008, 2011, two in 2015, 2018), devastating Yemen's agricultural lands. Southern governorates including Abyan, Shabwah, Hadramawt and Al Mahra, as well as the Socotra islands, were most affected. Floods have been the most frequent and dangerous threat, filling agricultural fields with damaging saltwater that hampers crop production (Interview 9 2023; Environment Protection Authority 2023). In addition, floods frequently wash away property boundaries, leading to confusing situations in rural areas with unclear delineations between farms. Conflict over property rights has ensued, at times escalating into violence (Lackner 2021).

¹⁵ Referring to a neighbouring village. Villages are not named to protect the security of research participants.

¹⁶ Wadis are valleys common in the Middle East and Africa that have rivers following periods of rain (Cambridge 2024).

¹⁷ Compared to 15 reported between 1981 and 2000 (Environmental Protection Authority 2023).

WEAK RESPONSES TO EXTREME WEATHER EVENTS AND DISPLACEMENT CREATE NEW SECURITY RISKS.



Insufficient management of the interconnected issues of extreme weather events, war and displacement is causing these issues to grow.

Strategic and comprehensive disaster risk reduction measures are lacking in Yemen, exacerbating the impact of extreme weather events (especially floods) and leading to the loss of more agricultural and domestic land. Combined with slow-onset events like desertification, the loss of arable land and the destruction of homes have driven displacement and migration. The IRGY faces significant challenges in preparing for and responding to extreme weather events. It lacks authority even within the territories it controls, has minimal financial resources and confronts institutional problems, such as a lack of specific government agencies specialised in disaster prevention, response and recovery (Interview 9 2023). Even prior to the civil war, Yemen ranked extremely low on a scale of disaster preparedness (Notre Dame 2021; HFA Monitor 2009).¹⁸ In the current context, this has been exacerbated as finances and state capacity have been eroded by the war, and authorities are unable to anticipate and respond to threats. For example, flood canals have not been cleared, and deforestation is removing flood-control trees, leading to worse and more floods (Aklan 2024).

High levels of displacement from the civil war increase flood-management challenges. Of the 13 per cent of Yemenis who have been displaced by the civil war, many have relocated to cities, where authorities struggle to manage the surge of arrivals. Often, displaced people do not have any alternative than to relocate into climate-vulnerable areas. In Aden, for example, settlements were constructed for IDPs in low-lying areas that previously acted as natural flood draining systems. As climate change has intensified typhoon periods, torrential rain and flash floods, overcrowding and settlements have damaged these natural draining systems, leading to more floods. In some cases, families displaced by the civil war were displaced two more times, due to floods (Interview 6 2023).

In turn, displacement and internal migration have put pressure on land use in Yemen, with IDPs, landowners and host communities competing to use land for commercial and residential purposes (FGD 6 2023). With nowhere to go, IDPs have settled in large informal camps or occupied abandoned land, leading to disputes with landowners (UNHCR 2016). This was particularly apparent during the 2022 ceasefire period, in which intratribal violence, predominantly rooted in land disputes, increased by 59 per cent compared to the previous six months (Khelifi et al. 2022).

“Displacement is temporary by nature, but in Yemen it became a prolonged phenomenon... This led to imbalances and conflicts over residential and agricultural land, water and other natural resources.”

Meteorological expert in Sana'a

CASE STUDY 3: TENSIONS ARISE BETWEEN IDPS AND LANDOWNERS IN MOKHA, TAIZ

In Mokha, a severely conflict-affected area in Taiz, a dispute is ongoing between a tribal leader and the head of the IDP committee about a large settlement on the tribal leader's private property. When the civil war broke out, the leader permitted IDPs to reside on the land, though he claims that the land was only intended to be used for two to three years. Since then, IDP populations have grown substantially. As of early 2024, approximately 800 families remain living on the land, leading to tension between the landowner and the IDP committee (Interview 10 2024).

“There is no longer any conflict because both the host and the displaced communities are living under the same dire conditions now. There is nothing left for them to fight over.”

Veterinarian in Hajjah

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“About 90 per cent of the tribes in Marib rely on livestock, and 70 per cent of the livestock pastures come from nature. When it rains, acidic rain falls, causing harm to the plants. This led to desertification, and most of the plants have become extinct... The people who used to own herds of camels now have only five.”

Public administration employee in Ma'rib

Strong tribal structures, which mediate disputes and oppose Houthi influence, as well have oil income have enabled Ma'rib to remain somewhat

peripheral to the frontlines of the civil war, leading many displaced families to settle in the governorate (ACAPS 2021; Message Heard 2023). According to the latest available figures (2020), Ma'rib's population has grown tenfold since the beginning of Yemen's war, with IDPs comprising approximately 83 per cent of the population.

“The conflict has a significant impact on the environment, as it has led to the displacement of over 2 million people to the city of Marib... There is significant pressure on resources in the governorate due to displacement, leading to an impact on the distribution of resources such as water and services.”

Public environmental administration employee in Ma'rib

This influx has driven tensions in the Harib district over access to and ownership of dwindling land, often focusing on issues of land abandonment, new settlements and changes in land accessibility. Host communities and IDPs often clash over agricultural land. In addition, host communities may perceive IDPs to be disproportionately advantaged with humanitarian and development support from INGOs, leading to tensions between the two groups (Interview 6 2023). Meanwhile, as new IDPs are still arriving to Harib and Ma'rib at large, local resentment towards new arrivals could grow, as fertile, healthy land becomes scarcer (EIP 2024).

Ma'rib - observed annual mean temperature (°C) 1901-2021

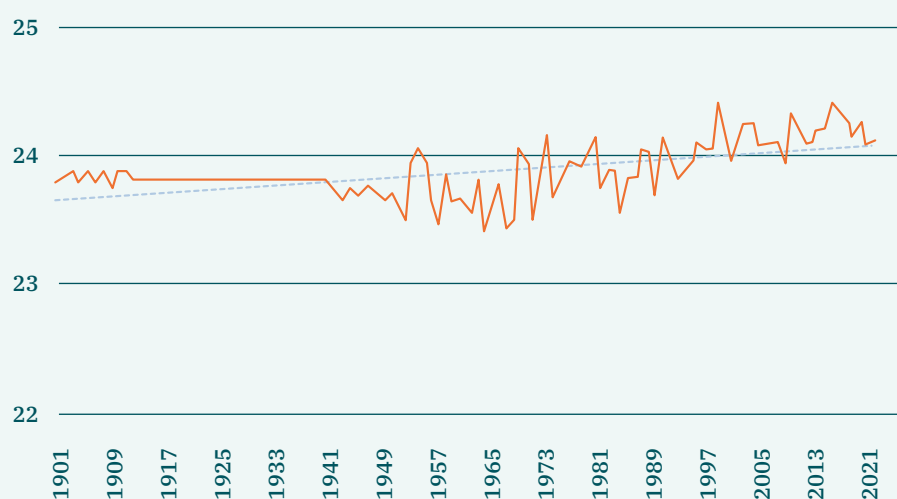


Figure 7: Annual mean temperature in Ma'rib, Yemen. (© EIP)

CIVIL WAR DAMAGES LAND AND ITS RESOURCES, INCREASING CONFLICT RISKS.



War and land seizures exacerbate the scarcity of arable land, which in turn fuels conflict.

The availability of productive land is shrinking due to unlawful land seizures and illegal occupations of nature reserves and forests, particularly in mountainous areas (al-Mowafak 2021). The exploitation of Yemen's land, including through unlawful seizures by the elite, such as Yemeni authorities, the private sector and armed groups, is a long-standing grievance of the Yemeni population. Since 2014, as the rule of law has been further undermined by the civil war and impunity thriving, authorities, local militias and armed groups have exploited land resources with greater ease. Combat has damaged soil fertility, with conflict debris scattered across Yemen's agricultural fields and pastures, rendering large swathes unusable (Al-Mowafak 2021). Land mines in particular are a significant problem. Fearing an explosion, farmers have stopped cultivating land in many areas, sometimes abandoning it altogether (FGD 5 2023).

“ There is a terrifying impact of war on environmental issues, such as land grabbing, which has killed large numbers of people.”

University employee in Sana'a

Meanwhile, the lack of available fertile and habitable land, combined with rapid population growth, is driving local conflicts over arable. These dynamics are closely tied with water competition, as access to wells and aquifers is tied to land rights in Yemen (USAID 2010). Conflicts have been reported in every governorate in Yemen, typically occurring between individuals or small communities independently of the civil war (FGD 1 2023; FGD 5 2023). Intertribal fighting over land has also been reported, with tribes fighting over the distribution of private grazing land, water access and communal land (ACAPS 2023; Aklan 2024).

LAND TRANSACTIONS IN YEMEN

An estimated 80 to 90 per cent of land transactions in Yemen take place outside of statutory structures (Alshuwaiter 2021). Sheikhs or local elders often issue documents called basira, or parties may prepare informal documents as proofs of transaction (Alaghbari 2022). Frequently, land titles and rights are not systematically documented, leading to confusion and conflict when overlapping claims to land arise (ACAPS 2023). Corruption is also an issue. Sheikhs, for example, sometimes have a direct economic interest in creating overlapping claims to land (NRC 2019). Some sheikhs have transferred land rights for their personal use or sold communal land (LANDac 2019).

Responses to Tensions and Conflict Around Water and Land

“Some individuals do raise these issues to the state, but due to the absence of effective governance and law enforcement, most people resort to resolving them informally. However, the problem persists because there are no comprehensive solutions to address these issues at their root.”

Development worker in Taiz

TRIBAL AND COMMUNITY STRUCTURES



Tribal and community structures lack the reach to address the root causes of environmental problems and have been weakened by the civil war, even though they remain the most effective and accepted means of conflict resolution.

Typically, tribal and other community structures have been the first point of call to address local conflicts in Yemen, but they have limited reach.

These systems command an enormous amount of local legitimacy in Yemen, which is crucial for ensuring that final decisions are respected by all parties. However, community measures are limited in scope and can rarely address the root causes of climate risks or local conflict. At times, attempts to prevent conflict can even exacerbate the conditions that incite conflict in the first place, e.g. insufficient access to and availability of water. Following violent conflict over a water basin or well, sheikhs may forbid all parties from using the resource (FAO 2018; Interview 10 2024). For example, after violence occurred between community members over water access, a basin in Al-Khokhah in Al-Hodeida governorate was closed in 2021, reducing water availability for the whole community and pushing people into illicit means of securing water (Interview 10 2024).

In addition, a decade of civil war has significantly impacted community peacebuilding structures (Interview 1 2023). Many mechanisms that previously resolved conflicts have dissolved. For example, as communities have become fractured by war and displacement, sheikhs have been killed or displaced or are no longer able to sustain traditional practices (Interview 1 2023). In addition, local stakeholders are sometimes unwilling to engage with climate

and environmental issues amidst the ongoing war, seeing them as less important ones than those posed by the escalating security situation between political factions (Interview 10 2024). However, it is important to note that this view is not shared by the majority of the population and most often, it is tribal leaders, community water managers, WUAs, CSOs, etc. at the forefront to address climatic and environmental challenges and resolve conflicts (EIP 2024).

“They don’t believe that the war and blockade will come to an end, and during intensive air and missile strikes, many thought there was no point in cleaning the water or the environment. I believe this pessimistic view undermines any solutions that any party seeks to do to address environmental problems.”

Meteorological expert in Sana’a

CASE STUDY 5: WOMEN LEAD CONFLICT RESOLUTION IN AL-MALAKHA, SANA’A

In Al-Malakha, Sana’a, a dam fit to supply 350 farmers with water was a flashpoint of conflict for years. Disputes often escalated into violence between tribes, leading to a tribal decree prohibiting all farmers from using the dam (FAO 2018). Meanwhile, extreme weather events continued to affect Sana’a, reducing rainwater availability and rendering farming more difficult (Abulohoom 2014). Many farmers continued to extract water in secret, leading to police intervention and more violent conflict. In 2018, the women’s unit of the Al-Malakha WUA led a conflict resolution process, working with the administrative board of the WUA, the FAO and local tribal leaders. A compromise able to uphold the tribal decree was reached: shallow wells were permitted to be dug around the village, and a pipeline was built from the dam, replenishing wells without interference from the community. The project was replicated in 14 other villages where armed conflict was occurring (FAO 2018).

ADMINISTRATIVE STRUCTURES



Yemeni administrations face a lack of authority, capacity shortfalls and critically low funding, which limits their ability to develop and implement policy.

There is a general understanding of climate-related security challenges in the country, but limited resources exist to address them. The IRGY is aware of the critical threat of climate change and of the role it plays in exacerbating conflict drivers (Interview 9 2023). However, this fails to translate into comprehensive and feasible strategies to mitigate these issues. Many policymakers are eager to address these threats to peace but say that they lack the necessary capacities to act (Interview 9 2023). Yemen was already a low-income country before the civil war, and the IRGY now has even fewer resources to invest in internal capacity-building, climate adaptation, environmental restoration and peacebuilding projects. It also faces security constraints and a lack of authority, even within its own territory. As a result, policy implementation in all sectors, including climate and environment, has effectively ground to a halt (Interview 1 2022).

In the Houthi administration, a significant data gap compromises the extent to which responses to climate security challenges can be assessed.

Houthi civil servants have demonstrated a high degree of suspicion around data collection, particularly regarding climate change. At times, members of the administration have even claimed that efforts to raise awareness of climate-related threats are a pretence for foreign espionage (Interview 4 2023). Yemeni civil-society members and activists attempting to advocate for action risk their lives and safety in Houthi territories; indeed, abductions and disappearances of UN and civil-society workers are a regular occurrence (HRW 2024).

COURTS



The judicial system, already weak, has been further undermined by the civil war and is overwhelmed by water and land dispute cases.

Yemen's courts are subject to capacity shortfalls and corruption, reducing their potential to resolve disputes. Yemen's judicial system has never been strong, and in some areas, particularly in the north, it has always been much weaker than tribal and other community structures (IWM 2021).

The civil war has significantly delayed processing times in Yemen's courts, meaning that resolutions to disputes over land and water are rarely resolved before they escalate into violence (Interview 10 2024). In some areas, such as Hadhramaut, the majority of land dispute cases were filed prior to the civil war but have remained in courts due to war-induced delays in processing times (Alshuwaiter 2021). This is not atypical, as many ongoing cases have been in Yemen's legal system for decades (LANDac 2019). Cases have continued to increase as land grabbing by militias and internal displacement have led to more disputes (Alshuwaiter 2021). Water-related disputes are also overwhelming courts, with an estimated one-third of criminal court cases involving water-related conflict deaths (UNDP 2023).

INTERNATIONAL ORGANISATIONS AND DONORS



International organisations and donors are increasingly integrating climate change and peace programming, but a holistic approach is missing, risking long-term adverse impacts on Yemenis.

International organisations and donors are increasingly tackling climate security challenges. UN agencies, the WB and various INGOs have designed programmes and conducted research on Yemen's climate and environmental challenges, as well as associated conflict dynamics. More and more, international actors are undertaking more integrated efforts, such as funding peacebuilding projects focused on water-sharing, conducting in-depth research on water-related conflicts and consulting Yemeni communities on environmental and climate issues, which are then streamlined into high-level peace processes (UNDP 2024; Interview 11 2024; FAO 2018).

However, efforts to address the impacts of climate change and localised conflict over natural resources have not yet been integrated into a comprehensive strategy with a clear objective. Programmes and projects are typically not united under one coherent objective across a given region, and funding often ends before challenges are solved. In Yemen, problems arise when international projects fail to integrate a sufficiently structural approach, focusing on short-term objectives that could compromise long-term environmental resilience or even risk conflict (Aklan et al. 2019).

CASE STUDY 6: COMPLEX IMPACTS OF SOLAR PANEL USE ON YEMENI FARMS

Heavy machinery is required to pump water from basins and aquifers, and this amounts to more energy than most Yemeni farmers have access to (IRENA 2023). To enable farmers to extract water for irrigation, international institutions, including the World Bank, designed a wide-reaching programme to provide solar panels to small farmers in rural Yemen to power pumps (World Bank 2022; IFC 2021).

Although localised solar pumping slows the rate of groundwater depletion in comparison- Although localised solar pumping slows the rate of groundwater depletion in comparison to other fuel-based pumping, its introduction drastically increased the number of people utilising aquifers (Lackner 2022; Interview 6 2023). No comprehensive monitoring of the additional pressure on aquifers due to solar panels has been conducted (CEOBS 2024). In the absence of this oversight and a solid regulatory framework to manage farmers' extraction, the use of solar energy has exacerbated aquifer depletion (Aklan et al. 2019). In the long term, there is a risk that the introduction of solar panels could worsen the water crisis for small farmers and increase conflict risks.



Socotra, Yemen. Source: © andrew_svk/unsplash.com

Climate Finance in Yemen

Adaptation and mitigation efforts are essential for Yemen, where the impacts of climate change are closely intertwined with the ongoing conflict, but funding for those efforts remains disproportionately small compared to other sources of aid. Even though nearly US \$2 billion of ODA was dispersed by OECD Development Cooperation Assistance (DAC) donors to Yemen, the majority of the funds went to humanitarian assistance (OECD 2024A; Figure 8),¹⁹ and only US \$279,000 went to climate change- and environment-related activities.²⁰ Outside of DAC ODA, figures are similarly low. A full-scale review of all projects was outside of this assessment's purview, but even with a small sampling, it is clear that Yemen is significantly under-resourced (see Annex 1). This includes both adaptation and mitigation activities, not to mention the lack of finance geared towards activities with peace co-benefits.

Moreover, the funding Yemen receives for climate and the environment skews towards mitigation, even though contributions to overall GHG and

climate change are very small (Figure 10). Since 2006, the GEF “small grants programme” has supported 104 projects in Yemen, though only 35 per cent have been on adaptation (Gaston et al. 2023). The funds that are allocated towards adaptation tend to focus on water projects and technology, rather than on resource management or human security issues, such as livelihood support (Gaston et al. 2023).

Further, climate finance rarely targets the climate, peace and security nexus. While projects may support access to water through better irrigation systems or the adoption of climate-resilient crops to improve agricultural output, few achieve and sustain peace or prevent conflict as a direct goal or output. Of the projects reviewed for this assessment, only one identified conflict resolution around water management as a core goal (World Bank 2017). As a result, co-benefits that could come from climate finance, especially between adaptation and peace, are missed.

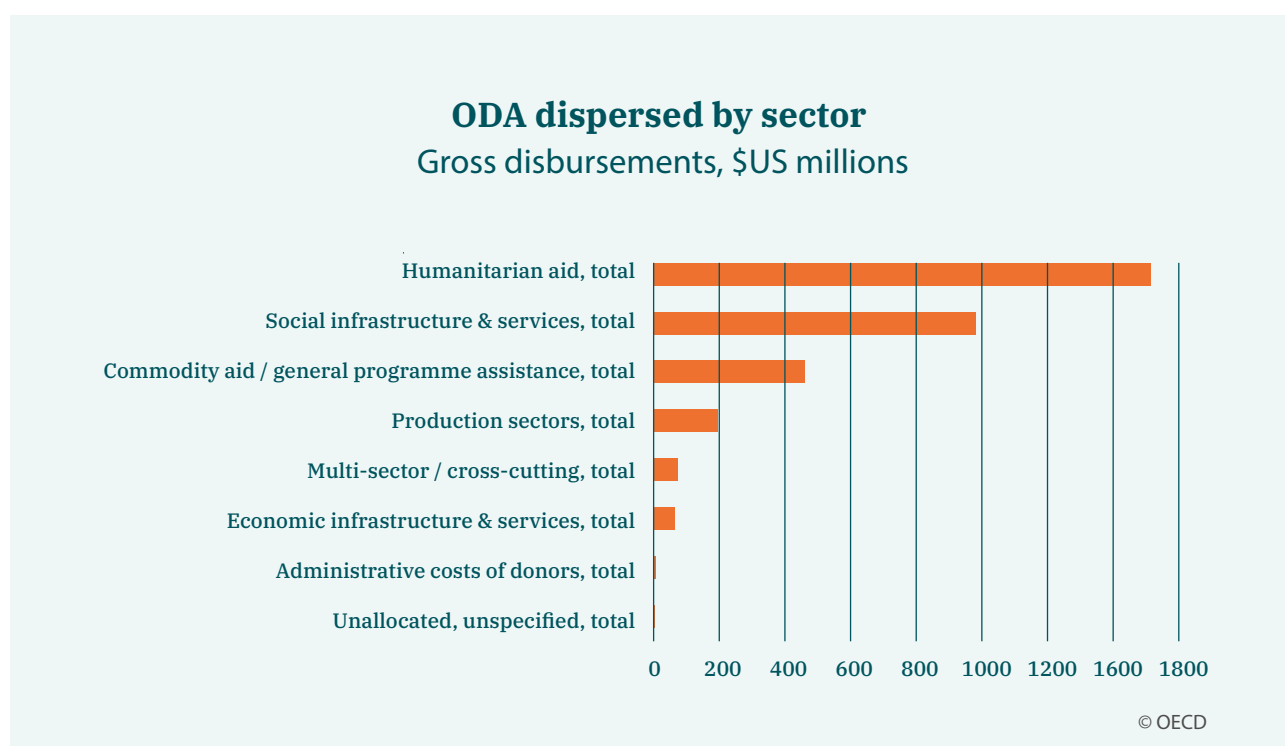


Figure 8: Total ODA by sector. (© OECD 2024a)

19 That does not mean Yemen is not a big recipient of aid. According to the OECD, through to 2022, Yemen received almost US \$4 billion in total ODA (OECD 2024). This includes US \$1.87 billion from OECD DAC countries bilaterally, US \$934 million from non-DAC countries and US \$929 million from multilateral institutions, like the World Bank and the EU (OECD 2024a).

20 This includes climate adaptation and mitigation, the environment, biodiversity and desertification. See: <https://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/48785310.pdf>.

ODA targeting climate and environment Bilateral allocable (DAC only), commitments, USD millions

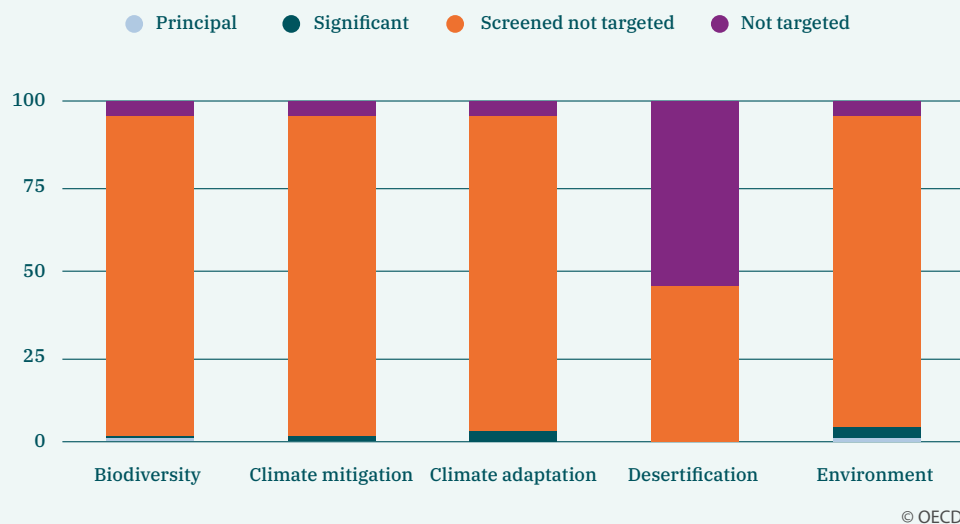


Figure 9: Focus of ODA to Yemen dedicated to climate and the environment. (© OECD 2024b)

Adaptation-related multilateral flows to developing countries by multilateral banks (A) and multilateral climate funds (B)

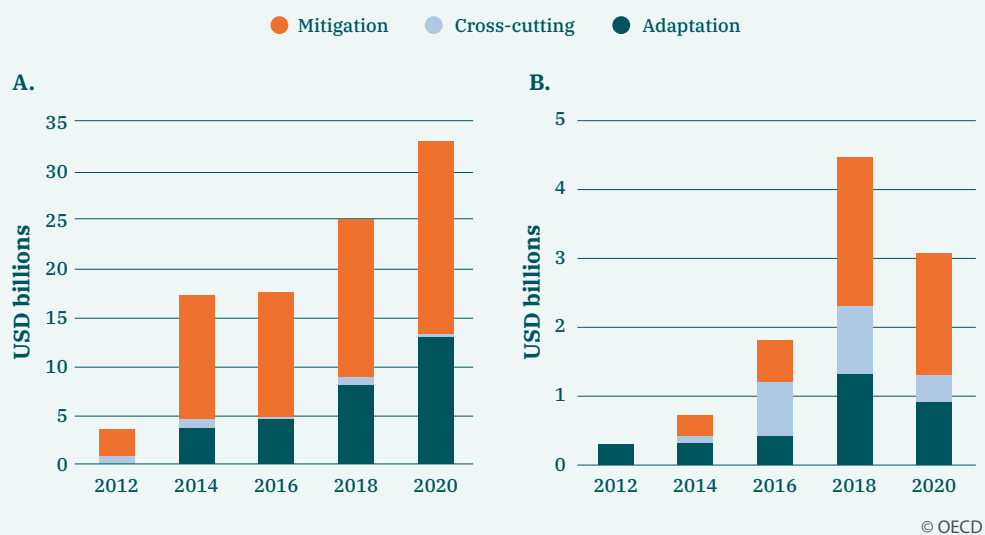


Figure 10: Adaptation-related multilateral flows to developing countries between 2012 and 2020 by multilateral banks (A) and multilateral climate funds (B). (© UNEP 2022)

Despite the effectiveness of small-scale adaptation projects, local actors often struggle to access funding. For example, Food4Humanity, a women-led Yemeni CSO, facilitated local ceasefires to distribute water during the 2015 crisis but has faced challenges in securing UN funding due to strict turnover requirements (ICRC/NRC 2023). This issue reflects a broader problem in which large international institutions hold and disperse funds, limiting the control Yemenis have over their own development.

The security environment also exacerbates these challenges, frequently halting projects or forcing them to relocate to less risky areas, thereby neglecting the most vulnerable populations. In 2015, for example, a significant adaptation project on rural growth, co-funded by the Adaptation for Smallholder Agriculture Programme, was suspended due to conflict escalation, highlighting how security concerns directly impact project continuity (Interview 12 2024). Additionally, the risk of unintentionally empowering specific actors over others, especially in contentious areas involving land and water, makes funders cautious (GEF 2020). Lastly, organisations that may be keen to operate, but require evidence or research to inform policies and programmes, have trouble acquiring that knowledge due to the volatile security situation (Interview 12 2024).

Finally, weak institutions and limited capacity driven by the civil war have significantly hindered Yemen's ability to secure and effectively utilise climate finance, including in critical areas such as basic services and infrastructure investments for climate change adaptation (Interview 5 2023). The civil war has led to a mass exodus of skilled labour, leaving IRGY institutions critically understaffed, including those that would typically act as nationally designated authorities for climate funds like the GEF and GCF (Interview 2 2023). As a result, these institutions lack the financial and technical resources needed to effectively absorb and manage available funding. This deficiency impacts their capacity to apply for and receive funding, meet complex reporting requirements, maintain oversight and fulfil fiduciary duties for large investment projects, build evidence and data to inform climate policies and projects, enforce regulations in hard-to-reach areas, and implement projects effectively.

Conclusion and Recommendations

“ The conflict is a fight over land and water between the members of one community, or between IDPs and the host community. Therefore, it is necessary to include the issues of environment and climate change [in peace-building] as causes of conflict.”

INGO worker in Sana'a

Under every projected climate scenario, the climate crisis is expected to severely impact Yemen's natural resources and, as a result, the livelihoods of those who depend on them. Yemen has not undertaken sufficient climate adaptation or sustainable resource management efforts, and years of civil war have depleted resources and capacities. As the impacts of the climate crisis continue to grow, conflict over water and land will increase, threatening Yemen's long-term peace and stability.

However, conflict outcomes, both current and future, are not pre-determined. After 10 years of brutal civil war, the Yemeni population has shown extreme resilience, and many continue to combat the effects of climate change, civil war and conflict amid extremely challenging circumstances. To support their efforts and leverage international momentum to build sustainable peace in Yemen, international organisations and donors, as well as Yemeni authorities and civil society, are recommended to consider the following actions:

INTERNATIONAL ORGANISATIONS AND DONORS



Incorporate climate considerations into Yemen's national peace process.

International organisations, in particular the OSEGY, should incorporate climate considerations into Yemen's high-level peace process, including the UN Roadmap to End the War in Yemen. Important dimensions to consider are 1) local conflict dynamics that may be independent of the civil war, 2) natural resource and infrastructure distribution, e.g. water, land and fisheries and 3) climate-sensitive recovery and reconstruction.

Support climate- and environmentally resilient livelihoods.

International organisations and donors should design programmes to support livelihoods across Yemen, with a particular focus on conflict-prone, rural, farming regions. Livelihood support should be viewed as a strategy to prevent and overcome conflict and should be prioritised over hard security approaches to conflict resolution and CVE. This could include climate-smart agriculture, shared water management systems, flood protection equipment and livelihood support for returning combatants.

Remove barriers to accessing climate finance.

International organisations and donors should improve accessibility of climate finance in Yemen through investments in communication, trainings and technical assistance. International organisations should provide the necessary support to ensure that authorities are aware of available international climate and peacebuilding funds and have the necessary expertise to develop strong applications and implement effective programmes. In addition, donors are recommended to remove prohibitive barriers to receiving and using international funds in Yemen, and to provide core funding for research and CSOs working on integrated climate and peace programmes.

YEMENI AUTHORITIES



End the weaponisation of natural resources.

Yemeni authorities should put an immediate end to the weaponisation of natural resources, particularly water, when advancing their security objectives. Yemeni authorities must fulfil their obligations under international law and ensure that their security strategies do not compromise the availability of or access to water and other essential natural resources. In addition, they should take proactive steps to minimise the impacts of the civil war on the environment and the people who rely on it, by undertaking all possible efforts to clear conflict debris, explosives and other pollutants from agricultural fields, nature reserves, forests and water resources across the country.

Integrate climate adaptation into recovery and reconstruction plans.

Yemeni authorities should improve planning and investments in DRR as a way to build the country's adaptive capacity and resilience to the impacts of climate change. Recovery and reconstruction plans for Yemen's cities should consider long-term climate impacts, including sea-level rise, higher temperatures and more frequent storms, rebuilding for the likely climate scenarios of the future. Societal impacts, particularly around rural-urban migration, should also be considered. In addition, Yemeni authorities should enact the required policies and regulations for DRR, including designing and implementing action-linked EWS to predict and respond to extreme weather events and their potential conflict risks.

Increase capacity to respond to climate change, environmental degradation and related conflicts.

Yemeni authorities should increase institutional capacities to respond to critical climate security threats. Yemeni administrations are recommended to request the support of national governments and/or international organisations to provide capacity-building trainings or share learnings on issues such as disaster response, IDP management, conflict-sensitive adaptation strategies, etc. To achieve these aims, applying for and efficiently using climate finance should be prioritised, as well as overcoming potential personnel deficiencies, e.g. by ensuring potential gender quotas required for climate finance are fulfilled.

CIVIL SOCIETY ORGANISATIONS



Prioritise measures to prevent conflict over natural resources.

CSOs in Yemen should strengthen their peacebuilding focus and action, e.g. by focusing their efforts on conflict prevention and resolution. This could entail, for example, developing and implementing resource-sharing agreements, hosting dialogues on environmental and climatic challenges and/or carrying out environmental protection activities, e.g. waste management. CSOs should be able to access international funds and/or technical support where needed, e.g. for scaling up projects beyond the community level.

Support research on climate change, the environment and conflict.

CSOs are recommended to support efforts to conduct more research on the impacts of climate and environmental changes and conflict in Yemeni districts, working together with academic and research institutions in the country and internationally. Research should be conducted on an ongoing basis to reflect new developments, particularly in dynamic conflict landscapes. Some recommended areas for future research on climate- and environment-related conflict include violence around fisheries, scarcity and armed group recruitment, environmental challenges in IDP settlements and social cohesion challenges pertaining to waste, pollution and rural-urban migration. Insofar as possible, CSOs should aim to ensure that research particularly focuses on the sub-national level, consulting a diverse range of stakeholders, including women, IDPs, surrounding communities in IDP settlements, Muhamasheen, and others, including by hiring local researchers from under-represented groups.

Raise awareness of climate change and its impacts at the local level.

CSOs should work together with local authorities to promote awareness of climate change, environmental hazards and their local impacts, including changing weather patterns, land degradation, declining water availability, fish depletion, etc. Outreach efforts should be context-specific, using local media that is already popular and communicating in the relevant local dialects. In all these efforts, they should ensure that careful risk assessments are conducted to ensure the safety of CSO staff and participants.

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ANNEX 1: INTERVIEWS AND FOCUS GROUP DISCUSSIONS

Key Informant Interviews

NUMBER	POSITION/AFFILIATION	DATE
1	International organisation	January 2023
2	Yemeni environmental policymaker	January 2023
3	Civil society actor	January 2023
4	Senior analyst, NGO	August 2023
5	Yemeni environmental policymaker, second interview	September 2023
6	Environmental researcher	September 2023
7	Civil society actor	September 2023
8	International organisation	November 2023
9	Yemeni policymaker	December 2023
10	Local researcher	January 2024
11	International organisation	April 2024
12	Yemeni environmental policymaker, third interview	April 2024

Forty-six additional interviews were conducted by the European Institute of Peace during 2022-2023 with key stakeholders including farmers, teachers, IDPs, environmental experts, Yemeni authorities, civil society and INGOs.

Focus Group Discussions (conducted by EIP)

NUMBER	GROUP	YEAR
1	Activists and civil society	2023
2	Fishermen, farmers and IDPs	2023
3	Persons with disabilities	2023
4	Politicians and decisionmakers	2023
5	Women	2023
6	Youth	2023

ANNEX 2:
CLIMATE-FINANCE PROJECTS REVIEWED

FUNDING ORGANISATION	PROJECT NAME	PROJECT TIMELINE
<u>Green Climate Fund</u>	Supporting Yemen's Low Emissions Development through the preparation of the Nationally Determined Contribution, while enhancing required capacities and project pipeline in support of reducing emission	2023 - 2025
<u>Green Climate Fund</u>	Strengthen the capacities of sub-national authorities and key actors in the water sector to adapt to climate change in the Tuban delta	2021 - 2022
<u>Green Climate Fund</u>	Strengthening of the National Designated Authority in Yemen and enabling strategic frameworks for engagement with the Green Climate Fund	2020 - 2022
<u>Green Climate Fund</u>	NDA Strengthening and Country Programming support for Yemen through Sultan Qaboos University	2019 - 2020
<u>Global Environment Facility</u>	Resilient and sustainable livelihood for rural Yemen	2021 - 2023
<u>Global Environment Facility</u>	GET National	2022 - NA
<u>Global Environment Facility</u>	GET Regional/Global	NA
<u>Global Environment Facility</u>	STAR GEF-8 Allocation and Utilization	2022 - 2026
<u>Global Environment Facility</u>	STAR GEF-7 Allocation and Utilization	2018 - 2022
<u>Global Environment Facility</u>	STAR GEF-6 Allocation and Utilization	2014 - 2018
<u>Global Environment Facility</u>	STAR GEF-5 Allocation and Utilization	2010 - 2014
<u>Global Environment Facility</u>	STAR GEF-4 Allocation and Utilization	2006 - 2010
<u>Global Environment Facility</u>	Least Developed Country Fund (LDCF)	2022 - 2026
<u>Global Environment Facility</u>	Special Climate Change Fund (SCCF)	2022 - 2026
<u>FAO & World Bank project under Global Agriculture & Food Security Program</u>	Strengthening agriculture productivity and resilience project plus (SAPREP+)	2021 - 2023
<u>UN Peacebuilding Fund</u>	Water for peace in Yemen: Strengthening the role of women in water conflict resolution and climate change mitigation	2018 - 2021

<u>UN Peacebuilding Fund (PBF/IRF-202)</u>	Strengthening the role of women in peace building through natural resources management at the community level in the rural areas of the governorates of Sana'a and Lahj in Yemen	2017 - 2019
<u>United Nations Development Programme (co-funded by the EU and Sweden)</u>	Supporting resilient livelihoods, food security and climate adaptation in Yemen (ERRY III)	2022 - 2025
<u>United Nations</u>	Food4Humanity	NA
<u>World Bank</u>	Climate information system and PPCR coordination	2014 - 2017
<u>World Bank</u>	AY Yemen food security response and resilience	2023 - NA
<u>World Bank</u>	Yemen smallholder agricultural productivity restoration and enhancement project	2017 - 2020
<u>World Bank</u>	Increase the climate change resilience to water scarcity and sea level rise-related challenges in the Tuban delta	2022 - 2025
<u>World Bank</u>	Integrated urban services emergency project II	2023 - 2025
<u>World Bank</u>	Yemen food security response and resilience project	2021 - NA
<u>IFAD</u>	Rural growth programme	2000 - 2020
<u>Climate Investment Fund</u>	Strategic program for climate resilience for Yemen	2013 - NA
<u>IFAD</u>	Yemen Rural Livelihood Programme	2021 - 2025
FAO (23-UF-FAO-001)	Emergency livelihood assistance through the distribution of emergency agriculture and livestock kits in Hajjah and Taizz Governorates	2023 - 2024
United Nations CERF (22-RR-FAO-019)	Emergency livelihood assistance to address the negative impact of rising food prices in Yemen	2022 - 2022
<u>United Nations CERF (23-UF-CEF-003)</u>	Providing multisectoral lifesaving assistance to the most vulnerable in Yemen	2023 - 2024
<u>United Nations CERF (22-RR-FPA-022)</u>	Reducing the risks from, and responding to, GBV driven by food insecurity	2022 - 2022
<u>United Nations CERF (23-UF-WFP-002)</u>	Deliver assistance for the prevention and treatment of malnutrition in children and pregnant and lactating women and girls (PLWGs)	2023 - 2024

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