

### III. Climate, peace and security in Yemen

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The ongoing climate crisis has consequences for peace and security, especially in conflict-affected and fragile countries.<sup>1</sup> Although the causal relationship between climate change and conflict is not linear or predetermined, the effects of climate change interact through multiple pathways with political, social and environmental stresses to compound existing vulnerabilities and tensions.<sup>2</sup> The heightened frequency and intensity of extreme weather events, alterations in long-term climate patterns, and accelerated environmental degradation have the potential to cause significant disruptions and insecurity at the local, national and regional levels.<sup>3</sup>

During 2023 Yemen faced one of the worst humanitarian challenges in the world: a convergence of protracted armed conflict, economic crisis and climate change-related natural events. The latter included temperature increases and changing patterns in rainfall, which worsened floods, droughts and soil deterioration—all of these exacerbated vulnerabilities, threatened livelihoods and influenced existing conflicts in Yemen. Nearly two decades of civil war have heightened the vulnerability of its populations to climate change and hampered efforts to build climate resilience.<sup>4</sup>

In 2023 armed clashes in Yemen significantly declined following a truce brokered by the United Nations—the first respite since the outbreak of civil war in 2004—that ran from April to October 2022. Despite the truce's expiry and the absence of a formal extension, hostilities did not escalate to pre-truce levels, leading to a significant decrease in civilian casualties (table 4.1). However, intermittent skirmishes and exchanges of fire persisted on certain frontlines. The main two conflict parties are the Houthi movement backed by Iran, and the government of Yemen backed by a Saudi-led military coalition. Non-aligned local armed groups also remain active.<sup>5</sup>

Despite the decline in armed clashes, Yemen's humanitarian crises persisted in 2023 with an estimated 21.6 million people requiring humanitarian assistance.<sup>6</sup> The majority of humanitarian needs stem from the prolonged

<sup>1</sup> Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2022: Impacts, Adaptation and Vulnerability*, Working Group II Contribution to the IPCC Sixth Assessment Report (Cambridge University Press: Cambridge, 2022).

<sup>2</sup> Kim, K. and García, T. F., 'Climate change and violent conflict in the Middle East and North Africa', *International Studies Review*, vol. 25, no. 4 (18 Sep. 2023).

<sup>3</sup> von Uexkull, N. and Buhaug, H., 'Security implications of climate change: A decade of scientific progress', *Journal of Peace Research*, vol. 58, no. 1 (Jan. 2021); and Busby, J., 'Taking stock: The field of climate and security', *Current Climate Change Reports*, vol. 4, no. 4 (Dec. 2018).

<sup>4</sup> Samud, T. A. et al., *Country Risk Analysis: Yemen*, United Nations Economic and Social Commission for Western Asia (ESCWA), E/ESCWA/CL6.GCP/2023/CP.2 (ESCWA: Beirut, July 2023).

<sup>5</sup> ACLED, 'Little-known military brigades and armed groups in Yemen: A series', [n.d.].

<sup>6</sup> UNHCR, 'Yemen: January–October 2023', Fact sheet, 6 Dec. 2023, p. 1.

**Table 4.1.** Estimated conflict-related fatalities in Yemen, by event type, 2015–23

	Battles	Explosions/ Remote violence	Protests, riots and strategic developments	Violence against civilians	<b>Total</b>
2015	9 167	8 025	76	228	<b>17 496</b>
2016	8 505	6 900	14	242	<b>15 661</b>
2017	10 889	6 530	17	169	<b>17 605</b>
2018	21 811	12 001	40	419	<b>34 271</b>
2019	16 615	10 896	168	338	<b>28 017</b>
2020	14 794	4 295	85	626	<b>19 800</b>
2021	12 426	5 627	75	278	<b>18 406</b>
2022	3 576	3 265	28	291	<b>7 160</b>
2023	2 091	788	56	279	<b>3 214</b>

*Notes:* For definitions of event types, see Armed Conflict Location & Event Data Project (ACLED), ‘ACLED definitions of political violence and protest’, 11 Apr. 2019. The first available year for data on Yemen in the ACLED database is 2015.

*Source:* ACLED Dashboard, accessed 20 Jan. 2024.

armed conflict. For example, for the 4.5 million internally displaced persons (IDPs) in Yemen at the end of 2022, the conflict was the primary cause of displacement; only 693,000 of these displacements are associated with natural disasters.<sup>7</sup> However, climate-related disasters, such as floods, droughts and cyclones, have become more frequent and intense in recent years, displacing people from their homes and disrupting food production. In 2023 floods affected various locations where different authorities exercised control, and Cyclone Tej affected some 18 000 households in the east of the country.<sup>8</sup> Conflicts and tensions between the warring parties have continued to complicate humanitarian aid delivery.

This section outlines climate-related peace and security risks in Yemen with a focus on key developments during 2023. First, it briefly outlines the analytical framework of climate insecurity pathways and introduces the main categories of analysis: deteriorating livelihood conditions, changing migration and mobility patterns, and armed group tactics.<sup>9</sup> Then it reviews some of the socio-economic vulnerabilities in Yemen and impacts of the protracted civil war. Finally, it focuses on how climate change in Yemen can be linked to three analytical categories, discussing each in turn.

<sup>7</sup> See Internal Displacement Monitoring Centre, ‘Country profile: Yemen’, 24 May 2023.

<sup>8</sup> Relief Web, ‘Yemen: Situation update—Cyclone Tej, 5 November 2023’, Situation report, 6 Nov. 2023; and UN Office for the Coordination of Human Affairs, ‘Yemen situation update: Cyclone Tej’, 5 Nov. 2023, p. 1.

<sup>9</sup> See the analytical framework developed by SIPRI in Mobjörk, M., Krampe, F. and Tarif, K., ‘Pathways of climate insecurity: Guidance for policymakers’, SIPRI Policy Brief, Nov. 2020; and Kim, K. et al., ‘Yemen’, SIPRI and Norwegian Institute of International Affairs (NUPI) Climate, Peace and Security Fact Sheet, June 2023.

### **The links between climate change, conflict and insecurity: Three categories for analysis**

The impacts of climate change on conflict, peace and security are mostly indirect and varied.<sup>10</sup> National and local socio-political systems, economic conditions and the environment all shape individuals' and society's vulnerability to climate change, and these contexts also set the limits on coping and adaptive capacity. Governance systems, social and cultural norms, and structural discrimination, among other policies, can further affect specific groups' ability to adapt to the changing climate and avoid adverse impacts.<sup>11</sup>

When climate impacts contribute to adverse social outcomes such as deteriorating livelihood conditions, migration, escalation of armed groups' tactics, and elite capture, risks of violent conflict can increase.<sup>12</sup> In conflict-affected and fragile countries, climate change can further exacerbate these risks and hinder conflict resolution. Violent conflict can in turn worsen the adverse social outcomes arising from climate impacts, leading to a vicious cycle among violent conflict, vulnerability and climate change.<sup>13</sup> Analysis of these linkages tend to focus on three categories: deterioration of livelihood conditions, migration and mobility patterns, and armed actors. The following discussion applies a climate and insecurity focus to these categories.

The 'deterioration of livelihood conditions' category is fundamental to the contribution of climate change to insecurity. Agriculture, forestry, fishery, energy and tourism sectors are particularly climate-exposed and likely to experience adverse impacts if adaptation efforts fail to boost the resilience of these sectors.<sup>14</sup> Consequently, people whose livelihoods and food security depend on the natural environment are disproportionately affected by climate change. Marginalized groups and people with limited access to resources for coping and adapting are more vulnerable to short-term shocks and long-term changes caused by climate change.<sup>15</sup> Sea-level rise has negative impacts on deltas, coastal plains and human settlements, while heatwaves and worsening water shortages are expected to bring about declines in tourism and

<sup>10</sup> Hendrix, C. S. et al., 'Climate change and conflict', *Nature Reviews Earth & Environment*, 4 Jan. 2023; Kim and Garcia (note 2); Tarif, K., 'Climate change and violent conflict in West Africa: Assessing the evidence', SIPRI Insights on Peace and Security no. 2022/3, Feb. 2022; and Nordqvist, P. and Krampe, F., *Climate Change and Violent Conflict: Sparse Evidence from South Asia and South East Asia* (SIPRI: Stockholm, Sep. 2018).

<sup>11</sup> Thomas, K. et al., 'Explaining differential vulnerability to climate change: A social science review', *WIREs Climate Change*, vol. 10, no. 2 (2019).

<sup>12</sup> Tarif, K. et al., 'Insights on climate, peace and security', SIPRI Climate, Peace and Security Research Paper, Dec. 2023.

<sup>13</sup> Buhaug, H. and von Uexkull, N., 'Vicious circles: Violence, vulnerability, and climate change', *Annual Review of Environment and Resources*, vol. 46, no. 1 (Oct. 2021).

<sup>14</sup> IPCC (note 1), p. 11.

<sup>15</sup> Pande, R., 'The climate crisis is a crisis of inequality', *Science*, vol. 381, no. 6661 (31 Aug. 2023); and Cappelli, F., Costantini, V. and Consoli, D., 'The trap of climate change-induced "natural" disasters and inequality', *Global Environmental Change*, vol. 70 (Sep. 2021).

industrial activities.<sup>16</sup> Deteriorating livelihood conditions can also influence people's decision to migrate, and some may turn to illicit activities including joining non-state armed groups.<sup>17</sup>

Other climate and insecurity analysis focuses on changes in migration and mobility patterns. Some analysts consider migration a climate adaptation strategy, although others question the impact of migration on migrants' wellbeing.<sup>18</sup> Some analysis has linked subsequent socio-economic and political impacts of migration to conflict, although in some places such a link is contested.<sup>19</sup> Deteriorating livelihood conditions can trigger both short- and long-term migration from affected regions and accelerate rural-to-urban migration, although migrants' well-being and living conditions are not always improved or even maintained after relocation.<sup>20</sup> Increased migration to urban areas has contributed to growing instability in hosting cities with inadequate infrastructure for public services.<sup>21</sup> Climate change is a factor in shaping the mobility patterns of livelihood groups such as pastoralists and agropastoral groups; changes in these patterns, influenced by the availability of grazing land and water, can lead to intercommunal clashes.<sup>22</sup> Violent communal clashes and livestock raiding, which have become increasingly lethal, may intensify without adequate governance systems for reducing intergroup competition over these resources.<sup>23</sup>

Changing environmental conditions may influence the tactics employed by armed groups (the third category), further complicating conflict resolution and perpetuating insecurity. For example, research suggests that droughts and severe climate disasters in Mali boosted support for non-state armed

<sup>16</sup> Brown, S. et al., 'Quantifying land and people exposed to sea-level rise with no mitigation and 1.5°C and 2.0°C rise in global temperatures to year 2300', *Earth's Future*, vol. 6, no 3 (Mar. 2018).

<sup>17</sup> Seter, H., 'Connecting climate variability and conflict: Implications for empirical testing', *Political Geography*, vol. 53 (July 2016).

<sup>18</sup> Schwerdtle, P. N. et al., 'Health and migration in the context of a changing climate: A systematic literature assessment', *Environmental Research Letters*, vol. 15, no. 10 (Oct. 2020); and Rahaman, M. A. et al., 'Health disorder of climate migrants in Khulna City: An urban slum perspective', *International Migration*, vol. 56, no. 5 (Sep. 2018).

<sup>19</sup> In Syria e.g. the link between migration impacts and conflict is debated. See Ash, K. and Obradovich, N., 'Climatic stress, internal migration, and Syrian civil war onset', *Journal of Conflict Resolution*, vol. 64, no. 1 (2020); and Brzoska, M. and Fröhlich, C., 'Climate change, migration and violent conflict: Vulnerabilities, pathways and adaptation strategies', *Migration and Development*, vol. 5, no. 2 (2016).

<sup>20</sup> Vinke, K., *Unsettling Settlements—Cities, Migrants, Climate Change: Rural–Urban Climate Migration as Effective Adaption?*, Studien zur internationalen Umweltpolitik no. 18 (LIT: Münster, 2019).

<sup>21</sup> Balsari, S., Dresser, C. and Leaning, J., 'Climate change, migration, and civil strife', *Current Environmental Health Reports*, vol. 7, no 4 (2020).

<sup>22</sup> Mohammed Ali, I. M., 'The ecological, socio-economic and political constraints on pastoralists' access to water, Blue Nile State (Sudan)', *Nomadic Peoples*, vol. 23, no. 2 (2019); and Abroulaye, S. et al., 'Climate change: A driver of crop farmers-agro pastoralists conflicts in Burkina Faso', *International Journal of Applied Science and Technology*, vol. 5, no. 3 (June 2015).

<sup>23</sup> Detges, A., 'Close-up on renewable resources and armed conflict: The spatial logic of pastoralist violence in northern Kenya', *Political Geography*, vol. 42 (Sep. 2014).

groups.<sup>24</sup> Changing rain patterns and changing vegetation cover may also alter the way wars are fought.<sup>25</sup> In some conflicts, both states and non-state armed groups have weaponized water as a military tactic against civilian populations and other armed groups.<sup>26</sup> Water can be weaponized in three principal ways: reducing the quality of water (contamination), supplying too much water (flooding) or restricting water access (constriction)—all of which were used in recent wars in Syria and Iraq.<sup>27</sup> In addition, since 2011 there have been at least 180 instances of intentional targeting of water infrastructure in armed conflicts in Gaza, Libya, Syria and Yemen.<sup>28</sup> The reduced and unreliable availability of water due to climate change may provide additional incentives for armed groups to consider weaponizing water and targeting critical water infrastructure.

### **Socio-economic vulnerabilities in Yemen**

Yemen belongs to the group of least developed countries (LDCs)—a grouping of low-income countries that face severe structural impediments to sustainable development. LDCs are highly vulnerable to economic and environmental shocks and face severe structural impediments to sustainable development. Yemen's high level of dependency on agriculture and imported food has been a major source of vulnerability. The agricultural sector employs 28 per cent of the total population, and nearly 50 per cent of all women workers.<sup>29</sup> The country's agriculture is characterized by primarily smallholder farming reliant on rainwater, which is vulnerable to fluctuating precipitation levels. Conservative gender norms inhibit women and girls from accessing basic services and resources, undermining their human

<sup>24</sup> Benjaminsen, T. A. and Ba, B., 'Why do pastoralists in Mali join jihadist groups? A political ecological explanation', *Journal of Peasant Studies*, vol. 46, no. 1 (2019).

<sup>25</sup> Kishi, R., 'The rainy season and conflict in South Sudan', ACLED, 13 Nov. 2014; and Salkida, A., 'How rainy season aids Boko Haram fighters', HumAngle, 20 Apr. 2020.

<sup>26</sup> Shumilova, O. et al., 'Impact of the Russia-Ukraine armed conflict on water resources and water infrastructure', *Nature Sustainability*, vol. 6, no. 5 (2023); and King, M. D., 'The weaponization of water in Syria and Iraq', *Washington Quarterly*, vol. 38, no. 4 (2015).

<sup>27</sup> Lossow, T. von, 'The rebirth of water as a weapon: IS in Syria and Iraq', *International Spectator*, vol. 51, no. 3 (2 July 2016); and Yedur, M. and Carpentier, E., 'The weaponization of water: Water politics in the Middle East', *Oxford Political Review*, 24 June 2023.

<sup>28</sup> Borgomeo, E. et al., *Ebb and Flow: Volume 2. Water in the Shadow of Conflict in the Middle East and North Africa* (World Bank, Washington, DC, 2021), p. 10; and Sowers, J. L., Weinthal, E. and Zawahri, N., 'Targeting environmental infrastructures, international law, and civilians in the new Middle Eastern wars', *Security Dialogue*, vol. 48, no. 5 (Oct. 2017).

<sup>29</sup> 'Employment in agriculture (% of total employment) (modeled ILO estimate)—Yemen, Rep.', World Bank Open Data, 2021.

security.<sup>30</sup> Youth unemployment has been high, leading educated young people to emigrate to other countries.<sup>31</sup>

Irrigated agriculture using groundwater has expanded with the widespread use of diesel pumps and subsidised cheap fuel since the 1970s. This has enabled Yemeni farmers to cultivate water-intensive crops such as fruits, vegetables and qat (a legal narcotic that is widely consumed in Yemen).<sup>32</sup> Farmers have increasingly cultivated qat because it has remained profitable during the civil war.<sup>33</sup> Qat's short growing period means it can be harvested several times per year, making it more advantageous to vulnerable farmers than other cash crops.<sup>34</sup> Qat distribution networks are widespread, with one in seven Yemenis employed in the qat value chain.<sup>35</sup> Decades of overextraction of groundwater have led to the decline of groundwater resources, worsening the drought vulnerability of the agricultural sector. Saltwater intrusion into aquifers has further reduced water access in coastal areas, including the important food-producing region of Wadi Zabid and Wadi Rima.<sup>36</sup>

Over the years Yemen has become increasingly dependent on food imports, with imported food meeting nearly 90 per cent of the country's food requirement in 2015.<sup>37</sup> However, the blockade of major ports has led to a significant decrease in the volume of food imports since the civil war escalated in 2014. Factors contributing to the decrease include the declining value of the local currency and destruction of port infrastructure, such that offloading cargo demands more time. All shipments are subjected to rigorous mandatory inspections at Houthi-controlled ports, further delaying the process. The high cost and risks have led many commercial operators to cancel routes, leaving a handful of humanitarian and commercial suppliers to service the route.<sup>38</sup> While the warring parties resort to antagonistic economic measures

<sup>30</sup> Rohwerder, B., 'Conflict and gender dynamics in Yemen', Institute of Development Studies K4D Helpdesk Report, 30 Mar. 2017.

<sup>31</sup> 'Unemployment, youth total (% of total labor force ages 15–24) (national estimate)—Yemen, Rep.', World Bank Open Data, 2023; and Muthanna, A. and Guoyuan, S., 'Brain drain in higher education: Critical voices on teacher education in Yemen', *London Review of Education*, vol. 16, no. 2 (2018).

<sup>32</sup> Weiss, M. I., 'A perfect storm: The causes and consequences of severe water scarcity, institutional breakdown and conflict in Yemen', *Water International*, vol. 40, no. 2 (2015).

<sup>33</sup> Coppi, G., 'The humanitarian crisis in Yemen: Beyond the man-made disaster', International Peace Institute, 30 Jan. 2018.

<sup>34</sup> Abdullah, K. and Al-Khadher, A., 'In Yemen, farmers choose narcotic over other crops, exacerbating climate woes', Reuters, 10 Nov. 2022.

<sup>35</sup> Murugani, V. et al., *Food Systems in Conflict and Peacebuilding Settings: Case Studies of Venezuela and Yemen* (SIPRI: Stockholm, Dec. 2021), p. 20.

<sup>36</sup> Conflict and Environment Observatory, 'Yemen's agriculture in distress: A case study of wadis Zabid and Rima, the Tihamah', Oct. 2020.

<sup>37</sup> Baig, M. B. et al., 'Realizing food security through sustainable agriculture in the Republic of Yemen: Implications for rural extension', eds M. Behnassi, O. Pollman and H. Gupta, *Climate Change, Food Security and Natural Resource Management: Regional Case Studies from Three Continents* (Springer: Cham 2019), p. 33.

<sup>38</sup> Murugani et al. (note 35), p. 20.

to weaken the other side, intra-Yemeni trade remains curtailed by restrictions and the imposition of exorbitant fees and taxes.<sup>39</sup>

### **Yemen's protracted civil war as a driver of vulnerability**

The civil war in Yemen has heightened the vulnerability of its population by directly threatening their human security, prompting displacement, disrupting livelihoods and destroying crucial infrastructure. The roots of the conflict are complex and contested.<sup>40</sup> The Houthi insurgency began in 2004 when Hussein Badreddin al-Houthi, a leader of the Zaidi Shia, launched an uprising against the Yemeni government. Al-Houthi was killed in that uprising, with the insurgents going on to become known as the Houthis (their official name is Ansar Allah). There were six rounds of conflicts between the Houthi movement and the government of Yemen from 2004 to 2010, commonly referred to as the Saada War or Saada Conflict.

Mass demonstrations during the Arab Spring swept across Yemen in 2011, ignited by a variety of factors including poor socio-economic conditions and perceptions of corruption. These protests led to the collapse of the Yemeni government, which had been led by President Ali Abdullah Saleh since the unification of the country in 1990.

In 2014, after several years of growing violence, the country descended into a new phase of civil war between the government of Yemen under new president Abdrabbuh Mansur Hadi and an uneasy alliance of Iran-backed Houthis and forces loyal to former president Ali Abdallah Saleh that controlled the capital, Sanaa, and large parts of the country. Another major force at that time was al-Qaeda in the Arabian Peninsula (AQAP), which controlled vast swaths of territory in 2014–15 and continued to be a threat in 2023.<sup>41</sup>

Since March 2015 a coalition led by Saudi Arabia has been intervening militarily, either supplying ground troops or carrying out air strikes, on the side of President Hadi. The coalition, itself divided by conflicts and rivalries, includes, in addition to Saudi Arabia, Bahrain, Egypt, Jordan, Kuwait, Morocco, Qatar (until 2017), Senegal, Sudan and the United Arab Emirates (UAE). The coalition has also received substantial international support (including arms transfers) from Canada, France, the United Kingdom and the

<sup>39</sup> Grundberg, H., Special envoy of the secretary-general for Yemen, Briefing to the UN Security Council, 16 Aug. 2023.

<sup>40</sup> See Davis, I., 'Armed conflict in the Middle East and North Africa', *SIPRI Yearbook 2018*, pp. 80–82. See also e.g. Orkaby, A., 'Yemen's humanitarian nightmare: The real roots of the conflict', *Foreign Affairs*, Nov./Dec. 2017; and al-Hamdani, R. and Lackner, H., 'Talking to the Houthis: How Europeans can promote peace in Yemen', European Council on Foreign Relations, Policy Brief, Oct. 2020.

<sup>41</sup> Dass, R., 'Al-Qaeda in the Arabian Peninsula's drone attacks indicate a strategic shift', *Lawfare*, 20 Aug. 2023.



**Figure 4.1.** Areas of control and conflict in Yemen, April 2023

Source: Sameai, M., 'After 9 years of war, control of Yemen remains divided among 3 sides', Anadolu Agency, 14 Apr. 2023.

United States.<sup>42</sup> A UN arms embargo on Yemen, which prohibits transfers to non-state actors in the country, has been continuously violated since it was imposed in 2015.<sup>43</sup>

<sup>42</sup> On arms transfers to Saudi Arabia see chapter 6, sections II and III, in this volume. See also Palik, J., Obermeier, A. M. and Rustad, S. A., *Conflict Trends in the Middle East, 1989–2021*, PRIO Paper (PRIO: Oslo, 2022). For a list of the main conflict actors and armed groups see United Nations, Human Rights Council, 'Situation of human rights in Yemen, including violations and abuses since September 2014', Report of the group of eminent international and regional experts on Yemen, A/HRC/48/20, 10 Sep. 2021, annex IV.

<sup>43</sup> United Nations, Security Council, 'Final report of the Panel of Experts on Yemen established pursuant to Security Council resolution 2140 (2014)', S/2023/833, 2 Nov. 2023, pp. 22–27. On the UN arms embargo on Yemen see chapter 12, section II, in this volume.

The Saudi-led coalition has carried out thousands of air strikes which have killed tens of thousands of people, and has also conducted sea, air and land blockades to economically isolate the Houthis forces. The Houthis have attacked targets in Saudi Arabia and the UAE with ballistic missiles and drones, targeting strategic sites such as oil installations but also injuring civilians. Both sides in the civil war are alleged to have committed war crimes.<sup>44</sup>

In recent years there have been at least three main conflict zones to this major internationalized civil war in Yemen (figure 4.1): (a) in the north, between the coalition-backed Yemeni government and Houthi forces, including a Saudi Arabia–Yemen border conflict; (b) on the Red Sea coast, between Houthis and UAE-backed joint forces (which are only loosely affiliated with the Yemeni government); and (c) in the south between the Yemeni government and the Southern Movement, a fragile coalition of separatist groups operating in Aden, Hadramaut and Shabwa, and represented politically by the UAE-backed Southern Transitional Council. Another dimension to the armed conflict is the US-led counterterrorism campaign against radical armed groups—mainly AQAP and the local affiliate of the rival Islamic State—that operate mainly in the south. The USA has been carrying out regular air strikes against AQAP, or its antecedents, in Yemen since at least 2009, but their frequency has declined in recent years.<sup>45</sup>

Despite UN-mediated attempts to end the civil war—including the 2018 Stockholm Agreement and the 2019 Riyadh Agreement—the armed conflict continued until the April 2022 truce.<sup>46</sup> Since then the conflict has been conducted at a lower level of intensity. Peace talks have continued although major differences still separate the sides.<sup>47</sup> This generally positive shift can be attributed to the warming relationship between Iran and Saudi Arabia.<sup>48</sup> However, the outbreak of renewed conflict between Israel and Hamas in October 2023 has complicated the normalization of Iran–Saudi relations.<sup>49</sup> On the one hand, Hamas operations in Israel and the actions of Iran-backed groups like Hezbollah and Iraqi Shia militias have increased Saudi Arabia’s worries about Iran’s intentions and activities in the region. On the other hand, both Iran and Saudi Arabia called for a ceasefire and condemned Israel’s military actions in Gaza, showing a sense of pan-Islamic solidarity and a shared

<sup>44</sup> See e.g. United Nations, Security Council (note 43), pp. 28–35; and United Nations, Human Rights Council (note 42).

<sup>45</sup> Airwars, ‘US Forces in Yemen’, [n.d.].

<sup>46</sup> On the Stockholm Agreement see *SIPRI Yearbook 2019*, pp. 113–14, 177; and United Nations Mission to support the Hodeidah Agreement (UNMHA), ‘Stockholm Agreement’, [n.d.]. On the Riyadh Agreement see *SIPRI Yearbook 2020*, p. 170.

<sup>47</sup> Nagi, A., ‘Catching up on the back-channel peace talks in Yemen’, International Crisis Group, 10 Oct. 2023. See also chapter 2, section II, in this volume.

<sup>48</sup> Orr, B. and Yaakoubi, A. E., ‘Top Iranian, Saudi envoys meet in China in restoration of diplomatic ties’, Reuters, 6 Apr. 2023.

<sup>49</sup> On the Israel–Hamas war see chapter 1, chapter 2, section I, and chapter 10, section II, in this volume.

goal of maintaining peace in the Persian Gulf.<sup>50</sup> Further, the Houthi attacks on ships in the Red Sea and the response of the USA and other Western states to protect the vessels raised the spectre of a wider conflict in the region.<sup>51</sup>

The tenuous truce brought a reduction in violence in Yemen, but various armed groups continue to exert control in different regions. The predominance of local authority and governance by non-state actors is particularly pronounced in the southern region, where the governor's office holds substantial decision-making power.<sup>52</sup> The Houthis have gradually established control over local institutions during the course of the civil war, rolling out centralized legal and administrative structures.<sup>53</sup> Tribal militias continue to clash over disputes concerning land, water and road access, and they also engage in conflict with the Houthi and Yemeni government forces when these intrude into their communities.<sup>54</sup>

The dynamics of armed conflict shape people's vulnerability to climate change and their adaptive capacities. The subsequent section discusses climate-related risks to peace and security in Yemen.

### **Climate-related security risks in Yemen**

Climate change has aggravated the risk of droughts and floods disrupting critical agricultural production. These climate-induced disasters are major drivers of displacement and worsen the risk of local conflicts over critical land and water resources. Local conflicts over natural resources are closely tied to broader conflict dynamics. The following discussion first outlines trends in and projections for Yemen's exposure to climate risk. It then examines the impact of climate change on the three analytical categories: deterioration of livelihood conditions, migration and mobility patterns, and armed group tactics.

#### *Climate risk exposure: Trends and projections*

Yemen has an arid subtropical climate. Due to large topographical differences within the country, regional temperatures and levels of rainfall vary widely. The annual mean temperature is slightly above 25°C, with the warmest period occurring between June and August. In the western highlands, temperatures are on average significantly lower than in the coastal lowlands. Since 1971, temperatures have increased at an average rate of 0.42°C per decade. Under

<sup>50</sup> Cafiero, G., 'Is carnage in Gaza bringing Iran and Saudi Arabia closer?', *New Arab*, 27 Dec. 2023.

<sup>51</sup> Cornwell, A. and Magid, P., 'Riyadh reluctant to derail Iran detente over US Red Sea taskforce', *Reuters*, 20 Dec. 2023; and Clarkson, A., 'The Houthis mean business in the Red Sea', *World Politics Review*, 3 Jan. 2024.

<sup>52</sup> Morsy, A., 'Towards a renewed local social and political covenant in Libya, Syria and Yemen', *SIPRI Insights on Peace and Security* no. 2022/10, Dec. 2022, p. 16.

<sup>53</sup> Morsy (note 52), p. 17.

<sup>54</sup> ACLED (note 5).

the International Panel of Climate Change's 2021 high emission scenario, Yemen's temperatures are projected to increase by 1.64°C (1.00°C, 2.42°C) to 27.02°C (26.16°C, 28.00°C) for the period 2040–59.<sup>55</sup> Extreme heatwaves or days surpassing a heat index of 35°C are expected to increase by between 4.62 and 26.89 days by 2050.<sup>56</sup>

Rainfall in Yemen is often seasonally intense and consists of short-lived heavy storms, followed by lengthy dry periods. Over the 50-year period 1971–2020, Yemen experienced a decrease of 6.25 mm in annual precipitation every decade. The mean annual precipitation was 190.01 mm during the decade 1991–2020. Although the national decrease may not have been substantial, inter-regional and inter-year rainfall patterns have been drastic in some locations, such as the western and southwestern coastal regions. The central area of the country receives very little rainfall, while the coastal areas receive the most. The Yemeni highlands are therefore most likely to experience significant change, as rainfall is projected to increase overall, but with greater variability. The El Niño Southern Oscillation additionally contributes to climate variability by shifting precipitation patterns during wetter El Niño years and drier La Niña years.<sup>57</sup>

#### *Deterioration of livelihood conditions*

Yemen's agricultural sector, including fisheries and livestock farming, provides a vital source of livelihood in the country. Climate change increases the vulnerability of the agricultural sector and food insecurity of the conflict-affected populations. Insufficient agricultural outputs have worsened food insecurity in the country since the beginning of the civil war. An estimated 17 million people, or over 53 per cent of the population, suffered from acute food insecurity in 2023.<sup>58</sup>

As discussed above, climate change is bringing increased volatility in precipitation and prolonged dry periods in Yemen, both of which negatively impact the agricultural sector. Heavy rainfall often leads to flash floods, with negative impacts on soil erosion, which particularly threatens the food supply of smallholder subsistence farmers. By mid century, extreme precipitation and increased rainfall in parts of the country are more likely to occur due to climate change, posing risks to flood management.<sup>59</sup>

<sup>55</sup> The projection is based on the high emission scenario under the framework of Shared Socioeconomic Pathway (SSP) 3 to SSP 7, estimating the global temperature to increase by 1.5°C by 2040, 2.1°C by 2060, and 3.6°C by 2100. For SSP categorization see International Panel of Climate Change (IPCC), *Climate Change 2021: The Physical Science Basis*, Working Group I Contribution to the IPCC Sixth Assessment Report (Cambridge University Press: Cambridge, 2021), p. 232. See also World Bank, *Climate Risk Country Profile: Yemen* (World Bank: Washington, DC, 2023), p. 18.

<sup>56</sup> World Bank (note 55), p. 2.

<sup>57</sup> World Bank (note 55), p. 11.

<sup>58</sup> World Food Programme, 'Emergency Dashboard—Yemen', Nov. 2023.

<sup>59</sup> World Bank (note 55), p. 3.

Yemen has already experienced a series of devastating floods during 2021–23 in various parts of the country controlled by both Houthi and Yemeni government forces, displacing the population and disrupting agricultural production. The 2022 floods were particularly destructive and had a nationwide impact on already conflict-affected populations.<sup>60</sup> In 2023 Cyclone Tej caused substantial loss of farmland and crucial irrigation facilities, as well as infrastructure damage, in the eastern part of the country.<sup>61</sup>

The expected increase in frequency and intensity of dry periods is likely to lead to more frequent and widespread droughts, contributing to the higher risk of desertification and further land degradation in Yemen. Decreased rainfall during the last decades has affected important agricultural zones in western and southwestern coastal regions.<sup>62</sup> June to August 2023 was much drier, as much as 200 per cent drier in July, than the same period in 2022.<sup>63</sup> Some areas still received substantial rainfall, but the rest of the country had little to no rain and frequent dry spells. The dry conditions led to vegetation stress, especially across western coasts under the control of Houthi forces.<sup>64</sup> These conditions may further reduce agricultural production if no climate adaptation measures are taken.

Sea level rise further threatens coastal regions and agricultural communities in river deltas. For the agricultural sector, saltwater intrusion into groundwater is degrading once productive agricultural land, as discussed above. In addition, widespread qat cultivation has affected food security by overtaking production of food crops, and worsened water scarcity because the crop is highly water intensive.<sup>65</sup> The lucrative qat supply chain also contributes to the conflict economy because armed actors levy a fee in return for providing protection for the distribution networks.<sup>66</sup> Options to replace qat with other cash crops and drought-resilient grains have been explored but have not proven effective so far.<sup>67</sup>

Women in Yemen bear a disproportionate burden of socio-economic hardships exacerbated by climate exposure because they do not have the same access to resources, protection and basic services.<sup>68</sup> In 2021 Yemen was

<sup>60</sup> International Committee of the Red Cross (ICRC) and Yemen Red Cross Society, 'Yemen: People taking stock of lives and livelihoods lost after weeks of record floods', ICRC press release, 24 Aug. 2022.

<sup>61</sup> Human Rights Watch, 'Yemen: Warring parties deepen water crisis', Press release, 11 Dec. 2023.

<sup>62</sup> Weiss (note 32).

<sup>63</sup> Food and Agriculture Organization of the United Nations (FAO), 'Yemen: Agrometeorological update', 23 Aug. 2023, p. 1.

<sup>64</sup> FAO (note 63).

<sup>65</sup> Murugani et al. (note 35).

<sup>66</sup> Murugani et al. (note 35).

<sup>67</sup> Gadain, H., 'Being the change in Yemen: Improving integrated water resources management for food security', FAO News, 22 Mar. 2023.

<sup>68</sup> Geneva Centre for Security Sector Governance (DCAF), 'Yemen: Women taking forward the climate/security/gender nexus agenda', *Women Speak: The Lived Nexus between Climate, Gender and Security* (DCAF: Geneva, 2022), p. 37.

ranked as one of the least gender equal countries: ranked 155 out of 156 countries by the World Economic Forum, and ranked bottom (170th) in the UN Development Programme's Gender Inequality Index.<sup>69</sup> Gender disparity adversely impacts women's ability to cope with climate stress and adapt their livelihoods to climate change.

### *Migration and mobility patterns*

Climate change can cause displacement and affect migration decisions and thus change mobility patterns.<sup>70</sup> Approximately 4.5 million people in Yemen have been internally displaced, predominantly due to conflict-related violence.<sup>71</sup> The majority of these displaced people live in some 250 IDP camps and informal settlements, making them particularly vulnerable to extreme weather and natural disasters.<sup>72</sup> Following the 2022 floods, an additional 171 000 people were displaced, requiring shelter and access to food assistance.<sup>73</sup> Assisting those displaced by such climate-related events would probably be manageable were it not for the wider humanitarian, displacement and governance crises caused by the civil war.

IDP hosting sites are highly exposed to climate- and environment-related hazards such as heavy rain, windstorm, flooding, environmental pollution and extreme heat.<sup>74</sup> Water scarcity is severe in the IDP hosting sites. According to one account, water can be unavailable for longer than a week, causing disputes among IDPs.<sup>75</sup> At the same time, IDP camps are prone to flooding, such as during Cyclone Tej in 2023 when a dozen IDP sites were severely damaged.<sup>76</sup>

As climate change adversely affects livelihood conditions in Yemen, people are seeking alternative livelihood options by migrating out of climate-stressed regions, adding pressure on Yemen's already stressed urban infrastructure.<sup>77</sup> Sana'a, Aden and Taizz, as well as other urban centres, have been expanding quickly during recent years, but suffer from crumbling infrastructure as

<sup>69</sup> World Economic Forum, *Global Gender Gap Report 2021*, Insight Report (World Economic Forum: Geneva, Mar. 2021), p. 10; and United Nations Development Programme, 'Gender Inequality Index (GII)', [n.d.].

<sup>70</sup> Mobjörk et al. (note 9).

<sup>71</sup> UNHCR (note 6), p. 1.

<sup>72</sup> REACH, 'CCCM Cluster, IDP hosting site monitoring dashboard', Nov. 2023; and Murugani et al. (note 35).

<sup>73</sup> Figures for Yemen in 2023 obtained from Internal Displacement Monitoring Center (IDMC), Global Internal Displacement Database, IDMC Data Portal.

<sup>74</sup> Camp Coordination and Camp Management (CCCM) Cluster and REACH, 'Yemen: Site Monitoring Tool (SMT): Quarterly Trends Analysis Report—Q1 2023 (Round 1–Round 3)', May 2023, p. 5.

<sup>75</sup> Human Rights Watch, 'Yemen: Warring parties deepen water crisis' (note 61).

<sup>76</sup> UN OCHA, 'Yemen: Situation Update—Cyclone Tej' (OCHA: Aden, Nov 2023).

<sup>77</sup> World Bank, *Turn Down the Heat: Confronting the New Climate Normal*, Report no. 3 (World Bank: Washington, DC, Nov. 2014), p. 143.

a result of economic blockades and war-related destruction.<sup>78</sup> For example, Aden residents enjoyed a reliable and affordable supply of electricity and water before the civil war. Today, however, water and electricity access are often reduced to once every two or three days, or not at all.<sup>79</sup> In Taizz, a city with a population of more than 2.6 million, groundwater production from wells has decreased from 23 070 to 4760 cubic metres since the escalation of the conflict in 2015. Residents have relied on costly private water trucks, spending a quarter of their scarce income on obtaining water.<sup>80</sup> Some of these cities were the centre of unrest and democratic uprising during the Arab Spring.<sup>81</sup> The increased flow of rural-to-urban migrants may contribute to further instability in the cities.<sup>82</sup>

Land- and water-related conflict has been a major source of inter-communal violence involving tribal militias.<sup>83</sup> Land and water disputes between migrants and host communities often feed into the larger conflict dynamics. Heightened tension between migrants and host communities can escalate the risk of inter-communal conflict, especially where social, political and economic challenges are sources of conflict between different social groups.<sup>84</sup>

Climate-related migration in Yemen is not only internal. Yemen serves as a transit country for migrants from the Horn of Africa to the Arabian Peninsula. Droughts in the Horn of Africa, for example, are one of the drivers of migration from Ethiopia and Somalia.<sup>85</sup>

### *Military and armed actors*

When climate change affects the availability of natural resources, armed groups often adapt their tactics accordingly. Increasing resource scarcity can be an incentivizing factor for both state and non-state armed actors to target environmental infrastructure, to increase the leverage and effect that potential control over infrastructure may entail.<sup>86</sup> During Yemen's civil war

<sup>78</sup> International Crisis Group (ICG), *Brokering a Ceasefire in Yemen's Economic Conflict*, Middle East Report no. 31 (ICG: Brussels, 20 Jan. 2022).

<sup>79</sup> Human Rights Watch, 'Yemen: Aden electricity, water cuts threaten rights', Press release, 16 Nov. 2023.

<sup>80</sup> Jafarnia, N., 'Death is more merciful than this life', Human Rights Watch, 11 Dec. 2023.

<sup>81</sup> Hall, B., 'Yemen's failed transition: From peaceful protestors to war of "all against all"', D. della Porta et al., *Social Movements and Civil War: When Protests for Democratization Fail* (Routledge: Abingdon, 2018).

<sup>82</sup> Human Rights Watch (note 79).

<sup>83</sup> Weiss (note 32); and Heffez, A., 'How Yemen chewed itself dry', *Foreign Affairs*, 23 July 2013.

<sup>84</sup> Ide, T., Kristensen, A. and Bartusevičius, H., 'First comes the river, then comes the conflict? A qualitative comparative analysis of flood-related political unrest', *Journal of Peace Research*, vol. 58, no. 1 (2021).

<sup>85</sup> Ali, A. et al., 'Ethiopia', SIPRI and NUPI Climate, Peace and Security Fact Sheet, June 2022.

<sup>86</sup> Sowers, J. L., Weinthal, E. and Zawahri, N., 'Targeting environmental infrastructures, international law, and civilians in the new Middle Eastern wars', *Security Dialogue*, vol. 48, no. 5 (Oct. 2017); and Kim and Garcia (note 2).

there have been frequent attacks on water pipes, sanitation and desalination plants, water treatment, pumping and distribution facilities and dams. The Saudi-led military air campaigns have targeted water-bottling plants in Houthi-controlled areas.<sup>87</sup>

Armed actors may also seek control over farmland, fishing sites and pasture, in order to control local populations in contested territories. In Yemen, inter-communal disputes involving tribal militias are predominantly over land and water resources, including highly profitable groundwater-fed irrigation projects.<sup>88</sup> These community militias have also clashed with both Houthi and Yemeni government forces over access to crucial infrastructure, such as roads and irrigation facilities. The Houthi forces have invested substantially in gaining support and legitimacy from tribal and local leaders.<sup>89</sup> As local resistance grows within Houthi territory, managing tribal grievances and land disputes will be a key governance challenge.<sup>90</sup>

## Conclusions

The UN-led April 2022 truce and ongoing mediation efforts yielded positive results in continuing to reduce casualties from armed conflict in Yemen in 2023. However, the armed conflict remains a major impediment to peace and security in Yemen. Addressing long-term rehabilitation and climate change adaptation in Yemen requires a nationwide ceasefire and for conflicting parties to engage in a political process to stabilize the country and rehabilitate the state to have territorial control and agency.

At the same time, extreme weather events, such as floods, droughts and cyclones, have not only resulted in the loss of agricultural livelihoods and the destruction of irrigation facilities in Yemen, but have also intensified food and livelihood insecurity. The socio-economic challenges exacerbated by climate change disproportionately affect women in Yemen. The rising displacement and evolving patterns of migration and mobility pose potential threats to social cohesion. Although the prolonged conflict is the main reason for this, climate-related disasters and acute water shortages have continued to aggravate these trends in 2023. In the absence of robust governance systems, it is anticipated that climate-related events will likely fuel already lethal disputes over land and water in Yemen.

Humanitarian and peacebuilding efforts can contribute towards building climate resilience if they are carefully designed and executed with solutions that account for future climate impacts and the population's vulnerability to

<sup>87</sup> Sowers et al. (note 86).

<sup>88</sup> Weiss (note 32); and Heffez (note 83).

<sup>89</sup> Morsy (note 52), pp. 16–17.

<sup>90</sup> Fuller, B., *Increasing Tribal Resistance to Houthi Rule* (ACLED: 2019).

climate change. In August 2023 the UN Economic and Social Commission for Western Asia (ECSWA) published a number of policy recommendations for Arab states, including Yemen, to address climate-related security risks.<sup>91</sup> Many of these recommendations focus on actions that, with the support of the ECSWA's international partners, could be applied to climate-resilient peacebuilding and humanitarian assistance in Yemen. But as at December 2023, the prospect of a ceasefire and the political stabilization needed to implement these recommendations remains very unlikely.

<sup>91</sup> See UN Economic and Social Commission for Western Asia (ESCWA), *Climate, Peace and Security in the Arab Region*, Trends and Impacts in Conflict Settings no. 7 (ESCWA: Beirut, Aug. 2023), pp. 39–44. See also ESCWA, 'Addressing climate, peace and security in the Arab region', Policy brief, E/ESCWA/CL6.GCP/2023/Policy brief.2, Nov. 2023, pp. 6–8.