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The Disaster of Yemen's Flash Floods

Impact of and Local Responses to the Torrential Rains and Flooding in 2020

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Introduction¹

Yemen, which remains locked in an ongoing civil war and resultant humanitarian crisis, is also facing an ecological crisis. Between March and September 2020, as well as May through July 2021, the country experienced disastrous flash floods. Resulting from devastating downpours, flash flooding is a vivid

¹ Special thanks are dedicated to Howida al-Qubaty and Manal al-Mahdali, master students at the Gender-Development and Research Studies Center (GDRSC) at Sana'a University, for the data collection and processing.

Executive Summary

Yemen is facing an ecological crisis. Between March and September 2020, and again in May through July 2021, the country experienced periods of torrential rain that resulted in flash flooding. Flash floods are and will continue to be a recurrent natural phenomenon with destructive consequences in Yemen, which has not yet received broader attention. This Brief thus provides an overall understanding of the social and economic impact and current management of Yemen's flash floods in order to improve disaster prevention and mitigation. It shows that international organizations mainly provided the necessary support for rapid emergency help, pointing to the Yemeni governments' current inability to respond to climate-related threats. The paper further demonstrates that there is an evident lack of coordination, of appropriate institutional structures and of capacity to take proper actions to mitigate the medium- and long-term risks. Against this background, this Brief stresses the urgency of creating an independent environmental advisory body, comprised of a range of stakeholders and experts, to coordinate environmental reconstruction work and enhance tangible climate action into future strategies and interventions of national governance management and international humanitarian assistance.

example of the growing threat of natural disasters in an already vulnerable and unstable context. Although flash floods have become a regular event in Yemen – at least since 2008 – their impact and management have rarely been studied.²

The objectives of this Brief are twofold: Firstly, it intends to shed light on the impact of an aggregating environmental crisis taking place in Yemen that, amid the ongoing war, continues to be largely ignored by Yemeni stakeholders and the international community.³ Secondly, it scrutinizes the responses of local authorities and the humanitarian interventions by international organizations (IOs) in dealing with the impact of natural disasters. How are changing weather patterns affecting the political and socio-economic status quo in Yemen, and how are local authorities and international actors managing the subsequent challenges? The Brief examines the economic and social implications, with a focus on the most vulnerable populations. Lastly, it evaluates the capacity of local authorities to address environmental challenges and ends with concluding remarks and recommendations. The paper argues that further explorations into the above-mentioned issues could provide

useful insights and entry points to address future climate challenges.

This Brief focuses on seven governorates in Yemen: Sana'a, Hajja, Marib, al-Hudayda, Hadhramawt, Aden and Lahij. The case selection was based on several criteria, including: the impact of the flash floods on all areas in Yemen;⁴ the high variance of diverse climatic features and topography; and the varying involvement of IOs and local powers affiliated with different authorities – particularly the Huthis (also referred to as Ansar Allah) and the internationally recognized government of President 'Abd Rabbuh Mansur Hadi. The case selection followed the research approach of Most Dissimilar System Design (MDSD), i.e. a strategy to compare different units with each other. Methodologically, we combined different qualitative approaches: a media content analysis of various Arabic newspapers (coded with the software tool Nvivo); a document analysis of scholarly literature and formal situation reports by in-charge authorities and major international organizations; as well as five semi-structured expert interviews with employees of IOs and local stakeholders. The Brief combines inductive (i.e. deriving categories from data)

² See: Al-Eryani, Yasmine (July 2020): *Yemen Environment Bulletin: How Weak Urban Planning, Climate Change and War are Magnifying Floods and Natural Disasters*, Sana'a Center for Strategic Studies. Available at <https://sanaacenter.org/publications/analysis/10346> (13.11.2021). In contrast to occasional hazards such as flash floods, the 'endemic' water scarcity of Yemen has received much greater attention. See, for instance: Ward, Christopher (2015): *Water Crisis in Yemen: Managing Extreme Water Scarcity in the Middle East*, New York; Matthew I. Weiss (2015): 'A perfect storm: The causes and consequences of severe water scarcity, institutional breakdown and conflict in Yemen', in: *Water International* 40/2, pp. 251–72; Lackner, Helen (2020): 'Community-based water practices in Yemen', in: Marcus Dubois King (ed.): *Water and Conflict in the Middle East*, London, pp. 121–50.

³ See further: Lackner, Helen and Abdulrahman al-Eryani (December 2020): *Yemen's Environmental Crisis Is the Biggest Risk for Its Future*, The Century Foundation. Available at <https://tcf.org/content/report/yemens-environmental-crisis-biggest-risk-future/> (13.11.2021).

⁴ See, for instance: OCHA (October 2020): *Yemen Flood Snapshot (As of 28 September 2020)*, New York. Available at <https://reliefweb.int/report/yemen/yemen-flood-snapshot-28-september-2020-enar> (11.11.2021).

and deductive approaches (i.e. predetermined categories) to analyze the content.

Contextualization: Climate Risks and Socio-Economic Situation

Yemen's topography can be broadly divided into coastal regions, mountainous heights, and eastern plains. The climate varies within the three main regions: hot and humid conditions, particularly along its long coastal line (over 2,250 km); moderate highlands with some rainfall, particularly in the southwest plateau; highlands with widespread cloudiness and low annual rainfall; hot and tropical desert upland and eastern interior; and a general subtropical climate on most islands. The country's climate is arid. There are no perennial rivers and the minimal seasonal rainfall, which is rapidly lost to evapotranspiration, does not meet the growing demand of the population. Throughout the country, rain-fed and irrigated agricultural and animal farming use around 90 percent of remaining water resources. Around 70 percent of Yemenis live in rural areas, of which 55 percent work in the agricultural sector.⁵ As well, many other contextual factors need to be taken into account when analyzing both the impact and the response to Yemen's flash floods. These include long-term economic mismanagement of water resources, growing climate risks and prolonged political instability.

Firstly, water scarcity is a very serious problem in Yemen, with recurrent water shortages and overexploitation of groundwater resources. Since the 1970s, investments of lift-pumps and other extraction technologies (such as deep-drilling) to exploit underground aquifers have increased, making obsolete the traditional irrigation systems, such as spate-flow irrigated wadis in lower lying areas or underground aqueducts (*qanat*) irrigation in the highlands.⁶ Use of this modern technology has profoundly changed Yemeni topography through soil erosion and the abandonment of the traditional terrace farming. Studies have even suggested that a continuation of these trends may result in the accessible groundwater running out, or at least becoming inaccessible for those most in need. Additionally, the expansion of agricultural programs has eliminated trees and shrubs that act as natural barriers to flooding.

Secondly, Yemen already faces a deepening of its adverse humanitarian, institutional, social, and economic conditions, with climate change posing an additional threat to the expanding environmental vulnerability caused by above-named hardships. Increasing occurrence of droughts and flash floods put additional strain on an already weak infrastructure and limited budgets.⁷ The gradual change from regular rainy seasons to erratic rainfall, noted since the early 2000s, significantly strains environmental infrastructure

⁵ Lackner, Helen (2019): *Yemen in Crisis: Road to War*. London.

⁶ See, for instance, Salami, Habibollah, Toktam Mohtashami and Mohamed S. N. Naeini (2014): 'Neither security nor sovereignty: The political economy of food in Yemen', in: Zahra Babar and Suzi Mirgani (eds.): *Food Security in the Middle East*, London, pp. 115–34; Al-Saidi, Mohammed (2020): 'Contribution of water scarcity and sustainability failures to disintegration and conflict in the Arab region. The case of Syria and Yemen', in: Philipp O. Amour (ed.): *The Regional Order in The Gulf Region and the Middle East*, London, pp. 407–34.

⁷ Lackner, Helen (2019): 'Extreme environmental challenges in the context of lasting political crisis. The case of Yemen', in: Hamid Pouran and Hassan Hakimian (eds.): *Environmental Challenges in the MENA Region. The Long Road from Conflict to Cooperation*, London, pp. 108–26.

such as water, waste and energy; and thus challenges future development. For instance, in the largest governorate, Hadhramawt, heavy rainfall and floodwater transported oil refinery waste and byproducts, such as large quantities of salinity produced water and other chemicals, over long distances. The contaminated water flowed into wadis and polluted the soil and groundwater resources, damaging farmland and vegetation.⁸ Statistical evidence from the International Disaster Database (EM-DAT) highlights that natural disasters in Yemen, such as flash floods, have steadily increased over the past decades – culminating in the floods of 2020 – and predicts that this trend will continue in the future.⁹ Ultimately, environmental change has made the country more vulnerable to the effects of environmental risks, above all flash floods.

Thirdly, these growing challenges are further heightened by the ongoing political turmoil and the incapacity of political decision-makers to adequately address above-mentioned issues. The civil war, which started in 2014/15 and has resulted in the world's worst humanitarian crisis, has politically fragmented the country. Various political groups, with conflicting agendas, control different areas of Yemen. Power dynamics on the national level are divided between the Huthis; the internationally recognized government; the Southern Transitional Council (STC); forces formerly affiliated with the deceased president Salih; and various other small local groups, such as tribal

alliances and terrorist entities. This national patchwork of power is further complicated by the affiliation and type of relations internal forces have with external powers, including regional players such as Saudi Arabia, the United Arab Emirates, Iran, Qatar, and Oman. Additionally, the influence that other external powers – such as United States, Russia and United Kingdom – exert on local and regional powers alike adds another layer of complexity.

Social and Economic Implications: Flood-related State Fragility

Yemen was heavily affected by seasonal rains and flooding in the year 2020 (and again in 2021). Torrential rains and the resultant flooding have had a severe impact on social and economic conditions in the country, leading to injuries and deaths, and causing wide-scale damage by destroying homes and shelters, devastating the already fragile infrastructure, fuelling the spread of diseases, ruining agricultural yields and killing livestock. International reports covering the issue in September 2020 indicated that the lives of tens of thousands of people, many of whom were already in shelters for displaced people because of the war, were further disrupted. It is estimated that nearly half a million people were directly affected by heavy rains and flooding throughout 2020, and that 44 people died¹⁰ in 189 districts in 19 governorates.¹¹ As mentioned above, this analysis includes some of the most affected flooded

⁸ See further: Al-Eryani, Yasmine (December 2020): *Yemen Environmental Bulletin. Oil Extraction Industries' Impacts on Health, Livelihoods and the Environment in Hadhramawt*, Sana'a Center for Strategic Studies. Available at <https://sanaacenter.org/publications/analysis/12203> (11.11.2021).

⁹ See further: International Disaster Database (EM-DAT). Available at <https://www.emdat.be/> (11.11.2021).

¹⁰ Many more fatalities according to local media.

¹¹ OCHA (October 2020).

areas, such as Sana'a city and Sana'a governorate, Aden, Lahij, Marib, Hajja, al-Hudayda and Hadhramawt.

Sana'a City and Governorate

Sana'a city and most districts in Sana'a governorate were severely affected by consecutive waves of rainfall and subsequent flooding. For instance, early reports in April 2020 indicated that around 650 households were affected in the capital alone, leading to the evacuation of around 3,900 people.¹² By the end of August, the flash floods were already affecting more than 16,984 families in Sana'a City and Sana'a governorate.¹³ Media reports suggested that many houses in the Old City of Sana'a, a World Heritage Site, had been affected by heavy rains; with at least seven

houses collapsing, 17 with roofs caving in, and other damages to a total of 256 affected houses.¹⁴ Local news reported that the Historic Cities Authority, based in Sana'a, called upon UNESCO and other donors to rescue the city's historic walls and buildings. Even more disastrous, the news also reported the loss of many lives, including women and children, severe injuries, loss of sources of income, and evacuation of many families from their homes. Many residents were trapped for hours, sometimes for days, after torrential rains surrounded their areas, cutting off roads and blocking transportation. A major challenge was the disruption of food distribution efforts and provision of water and protection services provided by several IOs to vulnerable and affected families in targeted areas.

Table 1: Overview of flash flood impacts in Sana'a City and governorate¹⁵

Governorate	Reported affected areas	No. of people affected ¹⁶	Implications
Sana'a City	Old City, al-Qalfan, al-Barada, al-Qadisiya, Shumayla, Hamra 'Alba, Khawlan Street, al-Sadd neighborhood in Azal district, al-Wahda district, Shu'ub, Dar Salim, al-Huthili, al-Tahrir neighborhood	15,738	<ul style="list-style-type: none"> • Loss of lives • Injuries • Damage or destruction of buildings • Loss of sources of income • Displacement • Damages and loss of belongings
Sana'a governorate	Hamdan-Wadi Dhahr, Wadi Dhahr, Bani Dhabyan, Sanhan	86,166	

¹² IFRC (April 2020): *Emergency Plan of Action (EPoA), Yemen: Floods*, Geneva. Available at <https://reliefweb.int/report/yemen/yemen-floods-emergency-plan-action-epoa-dref-n-mdrye009> (10.11.2021).

¹³ OCHA (October 2020).

¹⁴ Saba.net (23.08.2020): "Udhw al-siyasiyya al-a'la al-Sami'i yatala' 'ala adhrar al-amtar bi-Sana'a al-Qadima [Senior political member al-Sami'i briefs on rain damage in Old Sana'a]", in: *Saba.net*. Available at <https://www.saba.ye/ar/news3106655.htm> (10.11.2021).

¹⁵ Based on situation and news reports.

¹⁶ All statistics in the following tables are adapted from OCHA (October 2020).

Aden and Lahij Governorates

The sudden rains and floods also affected Aden and Lahij badly. Early in April 2020 the internationally recognized government of President Hadi declared Aden a disaster zone, calling on all relief agencies to support the government in responding to the emergency. The absence of effective drainage and storm-water management added to the severity of the situation. Torrential rain flooded roads and bridges, destroyed houses and buildings, damaged the electricity grid and impaired the provision of basic services to thousands of people in the city. Crater and al-Mu'alla, some of the most populated districts, were among of the worst affected areas. According to media reports, around 20 people, including children, lost their lives during the first wave of heavy rains in April, as well as 27 injured and others reported missing. Local authorities reported widespread damage to private and public properties, including 66 houses that were either partially damaged or completely destroyed, in addition to a total power outage in Aden City. Considering the excessive

rainfall with high temperatures and humidity that characterize normal weather in Aden, the spread of infectious diseases such as malaria and cholera is a constant concern. Since January 2020, a total of more than 110,000 cases of suspected cholera have been recorded across all Yemeni districts.¹⁷

In Lahij, heavy rains caused multiple casualties and large-scale damage. The flow of torrents in many of Lahij's districts was responsible for the loss of dozens of lives, alongside the destruction of many properties, vehicles and personal belongings. The media also reported that severe floods were responsible for cutting main transportation roads between governorates, such as the road between Aden and al-Dhali'. Many of the internally displaced people (IDPs) taking refuge from the war in southern parts of the country were particularly hit hard with significant loss of their shelters and food stocks. As of 30 April 2020, an estimated 1,812 households were reported to be victims of heavy rains and flooding in IDP sites in Aden alone, and around 770 in Lahij governorate.¹⁸

Table 2: Overview of flash flood impacts in Aden and Lahij governorates¹⁹

Governorate	Reported affected areas	No. of people affected	Implications
Aden	Crater, Khur Maksar, al-Mu'alla, Sira, al-Tawahi	16,224	<ul style="list-style-type: none"> • Loss of lives • Injuries • Displacement
Lahij	al-'Askariyya (Yafi' district), al-Habilayn, al-Hawta	20,268	<ul style="list-style-type: none"> • Damage or destruction of buildings • Damages and loss of belongings • Loss of sources of income • Damaged infrastructure

¹⁷ IFRC (April 2020).

¹⁸ OCHA (April 2020): *Yemen: Flash Floods: Flash Update No. 2 as of April 2020*, New York. Available at <https://reliefweb.int/report/yemen/yemen-flash-floods-flash-update-no-2-23-april-2020-enar> (11.11.2021).

¹⁹ Based on situation reports and news reports.

Al-Hudayda and Hajja Governorates

The most affected governorates nationwide were al-Hudayda and Hajja. According to international reports, heavy rains resulted in the destruction of roads and shelters and damage to land, with households losing properties and

connecting the capital Sana'a and al-Hudayda. Local news also reported that heavy rains flooded large agricultural lands in al-Zuhra, al-Qanawis and al-Luhaiya districts and swept away more than 40 houses – some made of straw – and led to the collapse of more than 50 houses in al-Marawi'a district.

Table 3: Overview of flash flood impacts in al-Hudayda and Hajja governorates²³

Governorate	Reported affected areas	No. of people affected	Implications
al-Hudayda	al-Tuhayta, al-Hayma, al-Marawi'a, Hays, al-Qanawis, al-Luhaiya; villages al-Gharza, al-Sabkh, and Kadma Jabara in al-Zuhra district	65,400	<ul style="list-style-type: none"> • Injuries and loss of lives • Destruction of roads • Rock slides • Halting of commodity transport • Destruction of IDP and shelters • Land damage
Hajja	'Abs district (Midi, Hayran, Bani Hassan), Haradh district	109,170	<ul style="list-style-type: none"> • Loss of personal possessions • Destruction of water networks • Loss of livestock and crop damage • Blocked drainage and water swamps

livestock. An estimated 54,000²⁰ people were directly affected by flash flooding across the two governorates by the beginning of August 2020, with more than 16 people reported dead in the previous month of July. The first wave of torrential rains and flooding in mid-April affected the lives of more than 5,130 households in Hajja governorate – over 2,466 households in Abs district alone – with severe damage to IDP shelters.²¹ In al-Hudayda, as highlighted by the media and reports of IOs working in Yemen, nearly 5,000 people were displaced from their homes,²² and many roads were blocked by mud and water, including the main road

Marib Governorate

Heavy rains and floods struck several areas in Marib governorate. The first wave of heavy rains in April 2020 disrupted the lives of more than 37,716 people, causing the death of at least seven and injuries of another 250. Displaced persons, already living in IDP sites, were among the most affected victims of the floods.²⁴ Heavy rains and floods led to the collapse of many houses and damaged basic infrastructure, including vital road transport. The last wave of heavy rains and flooding was the largest in terms of scale and impact

²⁰ OCHA (August 2020): *Yemen: Flash Floods: Flash Update No. 4 as of August 2020*, New York. Available at <https://reliefweb.int/report/yemen/yemen-flash-floods-flash-update-no-4-11-august-2020-enar> (11.11.2021).

²¹ IFRC (April 2020).

²² USAID (September 2020): *Yemen – Complex Emergency. Fact Sheet 11*, Washington D.C. Available at https://www.usaid.gov/sites/default/files/documents/09.04.2020_-_USG_Yemen_Complex_Emergency_Fact_Sheet_11.pdf (13.11.2021).

²³ Based on situation reports and news reports.

²⁴ OCHA (April 2020).

in the governorate. In early August, after continuous heavy rainfall over past weeks, the media reported the overflow of the Marib Dam, leading to what they described as an unprecedented increase of flooding that covered large areas of land, including Sirwah district and al-Wadi directorate. This was the first flood of the dam since its reconstruction in the 1980s. Reports suggest that the dam

area, with over 4,000 households in need of shelter, non-food items (NFIs), food and water, sanitation and hygiene (WASH) support, as well access to health and protection services.²⁵ The latest assessment reports of September 2020 suggested that there were at least 100,000 people affected by heavy rains and subsequent events in the governorate of Marib.²⁶

Table 4: Overview of flash flood impacts in Marib governorate²⁷

Governorate	Reported affected areas	No. of people affected	Implications
Marib	Sirwah, al-Wadi, Midghal, al-Sawabin in Wadi Dhanna, al-Masil region in Wadi 'Ubayda, al-Madina, Raghwan, Rahaba, Harib, Majzar, Bidbada, al-Juba, Jabal Murad	101,526	<ul style="list-style-type: none"> • Injuries and loss of lives • Destruction of paved and unpaved roads • Halting of travel and transport of people and commodities • Destruction of IDP shelters • Land and propriety damages • Loss of personal possessions • Electricity and internet cuts • Severe damages to sewage system and water network

overflow, reaching more than a 30km spread, caused damage to surrounding areas, endangering the lives and livelihood of thousands of people. A government official announced that Marib's death toll had risen to 30, including 19 children under the age of 13. Similar to other areas, IDPs were among the most affected in Marib governorate, which had become a major destination for thousands of people fleeing conflict in their areas of origin. According to the International Organization for Migration (IOM), there were at least 19 IDP hosting sites in the flooded

Hadhramawt Governorate

In Hadhramawt, the largest governorate in Yemen, an early assessment in July 2020 found that torrential rains had resulted in more than nine fatalities, including children; dozens of injuries; blocked travel and transport ways; destroyed houses and essential household items, including tents for displaced families; and dead livestock.²⁸ Heavy rains also flooded roads and bridges, wrecked water networks, led to stagnant water, and destroyed crops in many of the districts. Many IDP shelters

²⁵ IOM Yemen (2020): *Marib Response. 29 July to 15 August*. Available at https://reliefweb.int/sites/reliefweb.int/files/resources/%5BEN%5D%20IOM%20Yemen_Marib%20Response_29%20July-15%20August%202020.pdf (11.11.2021).

²⁶ OCHA (October 2020).

²⁷ Based on situation and news reports.

²⁸ OCHA (August 2020).

Table 5: Overview of flash flood impacts in the Hadhramawt governorate²⁹

Governorate	Reported affected areas	No. of people affected	Implications
Hadhramawt	al-Sawm, Hajr, Brum Mayfa', Wadi Sar in al-Qatn district, Bawa'ish, Sam'un, Ibn Sina, Harshiyat, al-Shihr, al-Mukalla, Marima and Maduda in Say'un, Rabat Ba'Ashn in Daw'an, Thamud, Shibam, Ghayl BaWazir district	24,108	<ul style="list-style-type: none"> • Injuries and loss of lives • Road damages • Halting of travel and transport of people and commodities • Destruction of IDP shelters • Land and propriety damages • Loss of personal possessions • Electricity and internet cuts • Stagnant water • Destroyed crops

and local properties were destroyed, forcing families to move to safer areas. The media also reported that heavy rainfall affected the historical city of Shibam, damaging the roofs of many of the ancient mud houses. Citizens called on the local authorities and UNESCO to rehabilitate the damaged historical houses of Shibam as soon as possible.

Local Responses: Limited Rapid Emergency Measures and Absence of Medium and Long-term Strategies

While the information presented above demonstrates that Yemen is highly vulnerable to flash floods specifically and to climate change more generally, there is minimal substantial information regarding the country's environmental policymaking and natural

hazard management. For instance, the recent Environmental Performance Index (EPI) from the University of Yale did not include Yemen because the country's environmental management is hard to measure due to its broader challenges, such as civil unrest and divided governments.³⁰ In contrast, the Sustainable Development Report³¹ gave Yemen a rather positive rating for its urgent actions to combat climate change and its impacts. In fact, it is the only category (SDG 13: Climate Action) where Yemen manages to be on track in achieving a sustainable development goal (SDG). The fact that Yemen has considerably reduced its CO₂ emissions over the last few years perhaps explains this positive index ranking. The decrease of carbon emissions is mainly due to what has been described as Yemen's 'solar revolution,' which is a consequence of the destruction of the national electricity grid due to the ongoing war

²⁹ Based on situation reports and news reports.

³⁰ Wendling, Zach et al. (2020): *2020 Environmental Performance Index*, Yale Center for Environmental Law & Policy. Available at <https://epi.yale.edu/> (13.11.2021).

³¹ See: Sachs et al. (2020): *The Sustainable Development Goals and Covid-19. Sustainable Development Report 2020*. Cambridge. Also available at <https://dashboards.sdgindex.org/map> (13.11.2021).

and internal conflict rather than any strategic planning.³² Another issue to note is that, despite above average rainfalls across Yemen in recent years, groundwater depletion clouds the solar energy revolution: There is concern that the excessive spread of solar-powered irrigation systems has increased groundwater extraction levels dramatically, as suggested by recent reports.³³ Considering these limited and contradictory findings on Yemen's climate policies, the following section aims to provide deeper insight into the opportunities and obstacles of flood-related responses by local authorities.

Before looking at actual responses to the flash floods, however, some general remarks about the current situation in Yemen need to be made. Structural difficulties have accompanied and influenced the mode, scale and scope of local responses to the flash floods. Above all, the impact of the war and political fragmentation have limited adequate and sustainable disaster management. For instance, periods of escalating conflicts in certain areas, ongoing disputes about public management (e.g. over port revenues that impede fuel imports) and inadequate institutional capacities hamper reconstruction efforts. The limited functional capacity

of centralized government and authorities has empowered local councils. Yet, animosity between different authorities, such as the internationally recognized government, the Huthis and the STC have led to growing interference in and weakening of the work of these local bodies.³⁴

The political divisions and ongoing cleavages are also apparent in national media reports, as different camps use the natural disasters to blame others or highlight their own political agenda. For instance, Prime Minister Ma'in 'Abd al-Malik Sa'id of the internationally recognized government stated in April 2020, regarding the flash floods: "The paralysis of institutions in Aden has exacerbated this suffering," and there is "no solution except by the rapid implementation of the Riyadh Agreement in all of its provisions."³⁵ Here, the Prime Minister thus used a natural disaster to lay blame on the Southern secessionists of the STC for hampering the implementation of the Riyadh Agreement and thus the functionality of the government as such. Other public officials from the de facto authorities in Sana'a blamed the "Saudi-American aggression" that "destroyed basic infrastructure in the country" for the disasters caused by the rain; whereas others praised the external

32 For more on this topic, see: Almohamadi, Akram M. (May 2021): *Priorities for the Recovery and Reform of the Electricity Sector in Yemen*, RYE White Paper 08, DeepRoot Consulting/Sana'a Center for Strategic Studies/CARPO. Available at https://carpo-bonn.org/wp-content/uploads/2021/05/Rethinking_Yemens_Economy_No8_En.pdf (02.12.2021).

33 See: Aklan, Musaeed M. and Helen Lackner (April 2021): *Solar-powered Irrigation in Yemen. Opportunities, Challenges and Policies*, RYE Policy Brief 22, Sana'a Center for Strategic Studies/DeepRoot Consulting/CARPO. Available at <https://carpo-bonn.org/en/solar-powered-irrigation-in-yemen-opportunities-challenges-and-policies/> (13.11.2021).

34 See further: al-Awlaqi, Wadhah and Maged al-Madhaji (July 2018): *Local Governance in Yemen Amid Conflict and Instability*, RYE Policy Brief 06, Sana'a Center for Strategic Studies/DeepRoot Consulting/CARPO. Available at <https://carpo-bonn.org/en/rye-white-paper-02-local-governance-in-yemen-amid-conflict-and-instability/> (13.11.2021). *Reconstruction and Recovery in Yemen: Recommendations from the Development Champions*. RYE Policy Brief 12 (April 2019), DeepRoot Consulting/Sana'a Center for Strategic Studies/CARPO. Available at <https://carpo-bonn.org/en/rye-brief-12-reconstruction-and-recovery-in-yemen/> (13.11.2021).

35 Ra'i al-Yaman (22.04.2020): "Adan... Wafa 8 ashkhas wa-'isaba 4 'akharin jarra' suyl al-amtar [Aden... 8 people died and 4 others were injured due to torrential rains]", in: *Ra'i al-Yaman*. Available at <https://raialyemen.com/news10683.html> (23.11.2021).

help of involved actors such as Saudi Arabia and the UAE.³⁶

Capacity to adequately address the damage of the floods has further been hindered by additional natural disasters. For instance, contingency measures in Marib were disturbed by continuing torrential rain, storms and strong winds. After the governorate was initially hard hit in April 2020, periods of additional rainfall in the following months up to August caused the flooding of the historic Marib Dam and destroyed nearby villages and refugee camps, leading to a high number of civilian casualties. In Sana'a, recurring downpours caused a blockage of sewage channels and sewage drainage.

The outbreak and spread of the COVID-19 pandemic have also shaped local response management. The imposed curfews hindered rescue teams in reaching flood victims and distributing relief material. In April 2020, the STC announced a 48-hour lifting of the curfew in Aden in order to facilitate the movement of stranded people, provide humanitarian aid and remove waste.³⁷ Due to the COVID-19 health crisis, medical services across the country were already fully stretched and thus not always able to provide medical treatment to flash flood victims. Fears in Marib of potential outbreaks of malaria and dengue fever due to the flooding

further exacerbated the situation. The flash floods and resultant destruction of local infrastructure also impeded the containment of the pandemic, as facilities were not able to test suspected cases or send samples to test centers.

Lastly, there has been a range of both operational difficulties and risks associated with the relief work of several IOs and local NGOs. Since local councils have only a limited ability to provide short-term services on the ground and carry out long-term work, local and international NGOs frequently "bypass the local councils as an implementation mechanism."³⁸ In light of the ongoing and unpredictable conflict, humanitarian organizations face difficulties to visit certain areas and deliver aid due to security concerns or travel restrictions. The shortfall in humanitarian funding, with its potential devastating effects on emergency relief operations, is also an ongoing challenge.

Direct Emergency Response

Across the affected governorates, the responses of local authorities and international organizations varied considerably in terms of scale, scope and speed. For instance, when the region of Marib was hit by torrential rains, Governor Major General Sultan al-'Arada instructed that all IDPs whose housing had been damaged or destroyed by the floods to

³⁶ Saba.net (22.04.2020): 'Muhafiz 'Adan yaujuhu nida' istighatha wa yahdhur min khutura al-wadh' al-natij 'ayn al-amtar [The governor of Aden sends a distress call and warns of the seriousness of the situation resulting from the rains]', in: *Saba Net*. Available at <https://www.saba.ye/ar/news3094908.htm> (13.11.2021).

³⁷ Akhbar al-yaman al-yawm (22.04.2020): 'Al-huzn yakhim 'ala 'Adan ba'd yawm 'asif min al-amtar wa al-suyul alati 'awdat bi-hayat 8 ashkhas [Sadness hangs over Aden after a stormy day of rain and torrential rains that killed 8 people]', in: *Akhbar al-yaman al-yawm*. Available at <https://yemennownews.com/article/800798> (23.11.2021).

³⁸ Al-Awlaqi and al-Madhaji (July 2018), p. 4.

be accommodated in hotels at the expense of the local authority.³⁹ A rescue and emergency committee was also formed under the supervision of the Minister of Local Administration, while the Civil Defense of the Marib Governorate Police called on citizens living near the waterways and floods to take extra caution and to remain indoors.

Marib constitutes an exception, however, with its relatively organized and profound response of local authorities including the creation of a special taskforce: Local authorities in other governorates were hesitant or unable to take immediate action in the same manner. Most governorates called for external emergency help. Accordingly, international donors, often in collaboration with national NGOs, remained the main or even only source of much needed disaster assistance, by delivering and distributing relief materials. Some IOs – particularly UN agencies, the International Federation of Red Cross and Red Crescent Societies/Yemen Red Crescent Society or Western INGOs such as USAID – were present in several governorates, but other IOs limited their assistance to a specific area.

For instance, the governorates of Hajja and Aden relied heavily on help from Saudi Arabia channeled through the King Salman

Humanitarian Aid and Relief Center (KSRelief). Relief teams from the UAE, in turn, were particularly active in al-Hudayda governorate providing emergency help such as food, tents, rugs, blankets, and bags. Local media reported that the governor of al-Hudayda, Dr. al-Hassan 'Ali Tahir, directed the distribution of 20 million riyals for IDPs affected by the floods, particularly in the Aden and Lahij camps. The money, whose origin remained unnamed, was earmarked to treat patients and pay for surgical operations.⁴⁰ Urgent relief projects were also initiated in al-Jawf and Marib through the Society for the Revival of Islamic Heritage and the Arab World Committee as part of the 'Kuwait at Your Side' campaign.

Unsurprisingly, no similar Gulf-sponsored relief measures occurred in the Huthi-controlled Sana'a governorate. Local news noted that their appointed Secretary of the Capital, Hamud 'Ubad, directed the Public Works Office to provide equipment to rescue and evacuate citizens, as well as further efforts to save private properties and deliver relief materials to families.⁴¹ The Supreme Council for Management and Coordination of Humanitarian Affairs and International Cooperation (SCMCHA), created in October 2019, mainly coordinated the emergency help in the Huthi-controlled areas. For instance, the SCMCHA organized the distribution of food

³⁹ Alyompress.com (15.04.2020): 'Irtifa' dhahaya al-suyul fi Marib...wa al-'Arada yasdur tawjih li-l-fanadiq bi-l-madina [Flood victims rise in Marib...and al-'Arada issues directives to hotels in the city]', in: *Alyompress.com*. Available at <http://sahafaa.net/show6830501.html> (13.11.2021).

⁴⁰ Sahafa.net (22.04.2020): 'Al-muhafiz Tahir yujih bi-sirf 20 milyun riyal li-naziha al-Hudayda mutadharririn min al-suyul fi 'Adan wa-Lahij [Governor Tahir directs YR 20 million for the IDPs of Hudayda affected by the floods in Aden and Lahij]', in: *Sahafah.net*. Available at <https://sahafaa.net/show6843127.html> (13.11.2021).

⁴¹ Yemenipress.net (14.04.2020): 'Shahid suyul 'arima tahasir 'adadan bi-l-'asimat San'a' wa-tatasabab bi-inhiyar wa-ghariq 'asharat al-manazil wa al-sulutat tasdur taujihat 'ajila [Witnessing massive torrents besieging a number of neighborhoods in the capital Sana'a, causing the collapse and sinking of dozens of homes, the authorities issue urgent directives]', in: *Yemenipress.net*. Available at <https://www.yemenipress.net/archives/186717> (13.11.2021).

baskets for those affected by the floods in Sanhan district on the night of Eid al-Adha. As well, the Office of the General Authority of Zakat in Sana'a governorate distributed cash and in-kind aids among affected families in certain districts. This aid, part of the total emergency response project, targeted 16 families whose homes were severely damaged by the torrential rains. As a preventive emergency response and safety measure, the Yemeni National Meteorological Center warned citizens of further upcoming torrents and thunderstorms, while the Civil Defense Authority in Sana'a organized the evacuation of several residential areas.⁴²

Reconstruction and Development Efforts

While noting the above-mentioned varying and inconsistent emergency responses, medium and long-term strategies to mitigate the destructiveness of the flash floods have been relatively absent. Following the flooding and first response measures, governorates carried out campaigns to remove debris and stones from the streets. In Sana'a governorate, the local authorities called on citizens to implement self-initiatives to repair the damages. In al-Hudayda, KSRelief, in cooperation with the local Tayyiba Foundation for Development, conducted initiatives of rainwater suction and relocation in the flooded camps of al-Khawkhah city. These reconstruction efforts were also part of a broader sanitation project in the district to reduce disease outbreaks

and epidemics. In Marib and Hadhramawt, local authorities repaired internet services that were destroyed by the torrential rain. The governor of Marib also instructed the local authorities to allocate 100 million riyals for each district from the development account to deal with the damages from the rain and subsequent flooding of the Marib Dam. While priorities included the provision of relief assistance to the affected families and communities, the financial support package was also used to repair damaged roads and maintain bridges, dams and water barriers.

Apart from infrastructure reconstruction, further systematic, climate-resilient initiatives were largely absent. The destruction of fertile agricultural lands in particular depict a long-term problem, as the example of Lahij reveals. Hundreds of agricultural acres were flooded and water channels destroyed, and to date many small farmers remain unable to restore their agricultural lands due to the high cost of repairs and lack of financial assistance. According to one farmer quoted in the *Aden Times*, the responsible Lahij Agriculture Office was unable to provide help; neither with maintenance measures for agricultural land and water canals, nor with subsidies for basic requirements to till a field including seeds, electricity tariffs or diesel fuel.⁴³ In the governorate of Sana'a, local media wrote of the keenness of the governor to rehabilitate destroyed agricultural lands and to support farmers with machines and equipment.⁴⁴

⁴² Sahafah.net (01.05.2020): 'Tahdhirat 'ajila tadaffuq al-suyul al-jarifa ithar al-amtar al-ghazira fi San'a' [Urgent warning of extreme flash floods due to torrential rain in Sana'a], in: *Sahafa.net*. Available at: <https://sahafaa.net/show6858683.html> (13.11.2021).

⁴³ Al-Lahiji, Saddam (11.08.2020): 'Muzari'un -bi-Lahij li-'Adan Taym: "Dawr maktab al-zira'a gha'ib fi mu'alaja mashakilna jara' al-suyul" [Formers of Lahij to Aden Time: "The role of the Agriculture Office is absent in dealing with our problems due to the floods"], in: *Aden Time*. Available at <https://www.aden-tm.net/NDetails.aspx?contid=138864> (24.11.2021).

⁴⁴ Saba.net (03.08.2020): 'Muhafiz Sana'a yatafaqaq adhrar al-suyul fi Khawlan wa al-Tiyyal [The governor of Sana'a inspects the damages of the torrential rains in Khawlan and al-Tiyyal], in: *Saba.net*. Available at <https://www.saba.ye/ar/news3104624.htm> (24.11.2020).

However, due to lack of access to official financial records on government spending in areas controlled by the Huthis, verification of concrete steps remains difficult.

Conclusion and Policy Recommendations

In addition to the ongoing war that has evolved into the biggest humanitarian crisis worldwide⁴⁵, this Brief outlines how climate change is yet another serious challenge confronting the Yemeni people. The torrential rains and flooding that hit Yemen between March and September 2020 caused significant destruction of economic and social infrastructure and exacerbated the suffering of rural communities, leading to displacement and destruction of livelihoods of thousands of people, loss of assets, destruction of infrastructure, food insecurity, outbreaks of disease, and collapse of basic and essential services. It demonstrates that poor people, particularly IDPs, are hardest hit by these increasing natural hazards, as refugee camps have been built on inferior land that is highly exposed to flooding.⁴⁶ Also especially vulnerable are farmers who lack the financial and material resources to adequately safeguard themselves, their animal husbandry and their agricultural lands against weather extremes.

In terms of responses, this Brief stresses that Yemen is not well equipped to deal with these occasional, but ever more frequent, environmental threats such as flooding. In particular, both the national political cleavages and

the larger urban-rural conflict highlight the limited capacity in knowledge and financial resources of regional authorities to mitigate the subsequent impacts. In many cases, local authorities have been entirely dependent on external emergency help.

The lack of coherent response and Yemen's political disunity, combined with poor urban and development planning that have magnified climate change impacts, are key explanations for Yemen's growing environmental vulnerability. The ongoing COVID-19 pandemic and shrinking aid funding from international donors are further stressors. Acknowledging the fact that many of these issues will not be resolved in the short term, this Brief provides below recommendations to policymakers at the national, regional, and international levels on possible actions to support Yemen's climate resilience. The recommendations are structured along two different dimensions, starting with the national level, followed by the regional/international level.

National-level Recommendations

- 1) Overcoming the siloed approach: Factionalism and fragmentation are key obstacles in any reconstruction efforts in Yemen. This Brief therefore stresses the urgency to set up an independent environmental advisory body that facilitates coordination and empowers state and local authority capacities. Such a coordinative body must aim to ensure transparency to foster trust among opposing political camps and involved external actors by providing

⁴⁵ See, for instance: OCHA (February 2021): *Yemen Humanitarian Needs Overview 2021 (February 2021)*. Available at <https://reliefweb.int/report/yemen/yemen-humanitarian-needs-overview-2021-february-2021-enar> (13.11.2021).

⁴⁶ Interview with a representative of an international humanitarian organization, December 2020.

technical advice on environmental governance. The body should include experts of already existing environmental institutions such as Yemen's Ministries of Water and Environment or the Environmental Protection Agency (EPA), but also other technical experts from across the country.

- 2) **Creating governorate-level environmental agencies:** The most affected governorates should (be supported to) set up local disaster-risk offices to consistently report to the national level. The inclusion and integration of further stakeholders from the private sector, civil society sector, academia and local communities is of utmost importance. They can provide funding (e.g. environmental projects through public-private partnership schemes); specific knowledge (e.g. needs and concerns of affected people and unique characteristics of geographical areas); and professional knowledge (e.g. modelling long-term environmental risks). These offices would also help to fill the lack of relevant, valid and up-to-date information on natural risks in Yemen, as well as overcoming the knowledge gap among local policymakers on environmental threats and climate effects in Yemen.⁴⁷
- 3) **Advancing climate adaptation measures:** As the introductory section on Yemen's political economy indicates, the implementation of tangible climate-resilient strategies is closely linked to a reevaluation of the current threats and relevant needs in the country. For the past several decades, the primacy of water scarcity, which remains Yemen's greatest challenge, has dominated

polycymaking and obscured other aspects of the country's environmental vulnerability. Yet, the rapid implementation of new irrigation and other water systems have tended to accelerate harmful climate change impacts, such as flash floods. As the deep impact of technological changes over half a century makes a simple return to traditional water management mechanism impossible, a combination of technological innovation and revitalization of century-old water harvesting is needed.⁴⁸ For example, traditional rainwater drainage systems (*manahil*) and retention basins (such as cisterns or *qanat*) should be reactivated or expanded with modern channels. National climate policies must be implemented in consideration of mitigating the increasing weather extremes such as changing rainfall patterns. Instead of a 'one-size-fits-all' approach, appropriate strategies for different topographical areas need to be considered.

Regional/International-level Recommendations

- 1) **Overcoming the siloed approach on the international level:** Here, help has also been highly selective in some instances. This Brief argues that IOs should assist *all* affected governorates in setting up coordinated emergency and flood disaster relief plans for all governorates.
- 2) **Strengthening regional collaboration and policy learning:** Climate change constitutes a transboundary threat and its implications are often regional challenges. Despite their negative repercussions, natural

⁴⁷ Ibid.

⁴⁸ Lackner (2020), p. 122.

hazards and growing environmental vulnerability offer a window of opportunity to strengthen Yemen's cooperation with neighboring states. For instance, knowledge exchange should be facilitated with Oman, which has experienced similar weather extremes. The government in Muscat has already identified and outlined a range of measures in the country's long-term development plans and could share respective knowledge and experiences with its Yemeni counterparts. Moreover, as this Brief has shown, resource management is closely linked to natural disasters (e.g., food insecurity through destroyed farmland and water insecurity through increasing periods of erratic rainfall). International organizations and supranational bodies could assist to create a regional resource management system. Even Yemen's wealthier neighbors occasionally face shortcomings in providing basic services such as water and energy. The establishment of a regional water-energy-food network could provide a fruitful platform to exchange ideas and develop common strategies. It could also lower intra-state tensions and potential conflicts, as well as improve the public perception of countries such as Saudi Arabia and the UAE among Yemenis.

3) Refocusing on long-term climate protection and adaptation strategies by the donor community: While IOs were active during the 1990s and 2000s in setting up development and climate change

projects, these projects have been sidelined and replaced by the growing priority of short-termed emergency and rapid response help necessitated by the war since 2014/15.⁴⁹ In addition to the much-needed direct emergency help, a key objective of international donors must be to revitalize their focus on climate action and promote medium- and long-term capacity building towards disaster risk reduction.⁵⁰ According to one IO interview partner, "the mentality of global donors in Yemen is limited to emergency response and not development."⁵¹ In close relation, any climate action assistance must orientate to and address Yemen's specific topography and climate-related threats and challenges. Long-term development plans should not be simply transferred 'copy/paste' from other contexts to Yemen, as another IO interviewee claimed has often been the practice.⁵²

4) Enhancing environmental awareness: There is a dire lack of environmental and climate change-related awareness of Yemeni policymakers, as well as Yemeni society. There is also an additional need to improve the exchange of knowledge throughout Yemen regarding climate change, its associated risks, and the experiences of different localities in handling such risks. Research and exchange on these matters on all levels as well as respective awareness raising should be supported with international funding to advance local, national and international policymaking on these issues.

⁴⁹ See also: Al-Eryani (July 2020).

⁵⁰ Research interview with a representative of an international humanitarian organization and a local environmental politician, December 2020.

⁵¹ Research interview with two representatives of international organizations, December 2020.

⁵² Ibid.

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