

DNA

Yemen Dynamic Needs Assessment: Phase 3

2020 Update



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1818 H Street NW
Washington DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org

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The Yemen Dynamic Needs Assessment (DNA) is an in-conflict assessment that relies primarily on remote data sources, including satellite imagery and social media analytics. Every effort has been made to triangulate such remote data with data and assessments available from the Government of Yemen and ground partners. Despite these efforts, this assessment may contain residual inaccuracies and is not a substitute for a ground-based evaluation. Instead, it provides an indicative picture of the effect of the conflict on physical infrastructure and quality of services, offering preliminary estimates of recovery and reconstruction needs.

A first phase of the DNA, conducted in fall 2015, had a limited geographic and sectoral scope. The second phase, finalized in June 2017, updated the first-phase results and extended the geographic and sectoral range. This third phase represents a further expansion. However, it does not cover all cities and regions in Yemen, and therefore is not indicative of the entire country. The figures presented here provide only a partial estimate of the impact of the crisis and the country's recovery needs.

It is also important to note that the COVID-19 health crisis and its impact on human life, service delivery, institutions, and economic livelihoods are not covered in this report, as this third phase of the DNA covers data and information collected as of January 2020.

Contents

Abbreviations and Acronyms	viii
Acknowledgments	xi
Executive Summary	xiii
Overview	1
Context	1
Macroeconomic Overview	2
Objectives of the DNA	4
Scope	4
Methodology	5
Limitations	6
Findings	7
Summaries of Sector Reports	15
Toward Recovery and Resilience	23
1. Education	25
Pre-crisis Sector Conditions	25
Sectoral Damage Assessment	25
Sectoral Needs Assessment	30
Priorities Going Forward	32
2. Food Security	33
Pre-crisis Food Security Situation	33
Impact of Crisis on Food Security	34
Sectoral Needs Assessment	42
Priorities Going Forward	42
3. Governance and Institution Building	45
Approach	45
Limitations	47

Revenue Mobilization and Management	47
Strategic Planning and Public Expenditure Management.....	50
Budget Execution and Oversight	52
Core Capacities and Resources for Service Delivery	55
Public Accountability.....	57
Listening to the Voices of Yemeni People: 2019 Online Survey on Challenges and Trust.....	60
4. Health	65
Disclaimer	65
Pre-crisis Sector Conditions.....	65
Sectoral Damage Assessment.....	67
Sectoral Needs Assessment	73
Priorities Going Forward	75
5. Housing	76
Pre-crisis Sector Conditions.....	76
Sectoral Damage Assessment.....	77
Sectoral Needs Assessment	83
Priorities Going Forward	84
6. Information and Communications Technology	86
Pre-crisis Sector Conditions	86
Sectoral Damage Assessment.....	87
Sectoral Needs Assessment	93
Priorities Going Forward	94
7. Power	96
Pre-crisis Sector Conditions	96
Sectoral Damage Assessment.....	97
Sectoral Needs Assessment.....	106
Priorities Going Forward	107
8. Social Protection and Jobs	109
Pre-crisis Condition of Social Protection and Jobs	109
Sectoral Damage Assessment	112
Sectoral Needs Assessment	115
Priorities Going Forward.....	117

9. Social Resilience	118
Methodology	119
City Profiles	119
Conclusion	126
Recommendations for Future Programming	127
10. Solid Waste Management	128
Pre-crisis Sector Conditions	128
Sectoral Damage Assessment	128
Sectoral Needs Assessment	132
Priorities Going Forward	133
11. Transport	135
Pre-crisis Sector Conditions	135
Sectoral Damage Assessment	136
Sectoral Needs Assessment	141
Priorities Going Forward	141
12. Water, Sanitation, and Hygiene (WASH)	145
Pre-crisis Sector Conditions	145
Sectoral Damage Assessment	145
Sectoral Needs Assessment	151
Priorities Going Forward	153
Annex 1. Methodology	154
Data Sources	154
Damage Assessment	154
Needs Assessment	156
Qualitative Assessments	157
2020 Update	157

List of Boxes

Box 3.1 Categories of Future Governance and Institutional Needs	46
Box 3.2 Informal Payments and Citizen Complaint/Redress Mechanisms	59
Box 8.1 Impact of COVID-19 Pandemic on the Yemeni Population	113

List of Figures

Figure ES.1 Damage Cost by City for the 16 DNA Cities (in US\$ million and % of total).....	xv
Figure O.1 Roadmap of Yemen DNA	2
Figure O.2 The 16 DNA Cities of the Yemen DNA Phase 3.....	5
Figure O.3 Physical Damage Levels by Sector (in %).....	7
Figure O.4 Physical Damage Levels by City (in %)	8
Figure O.5 Operational Status by Sector	8
Figure O.6 Functionality of Services by City (in %)	9
Figure O.7 Damage Cost by Sector for the 16 DNA Cities	10
Figure O.8 Damage Cost by City for the 16 DNA Cities (in US\$ million and % of total)	10
Figure O.9 City-Level Recovery and Reconstruction Needs by Sector	13
Figure O.10 City-Level Recovery and Reconstruction Needs by City.....	13
Figure O.11 Governorate-Level Recovery and Reconstruction Needs.....	15
Figure 1.1 Physical Status of Educational Facilities in 16 Cities (2018)	26
Figure 1.2 Operational Status of Education Sector by Asset Type	26
Figure 1.3 Damage Cost Distribution by City (in %)	30
Figure 1.4 Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)	31
Figure 2.1 Percentage of Food-Insecure People in Yemen, 2014	34
Figure 2.2 Prevalence of Food Insecurity in Yemen, 2015 and 2017	35
Figure 2.3 Average Food Consumption Scores, 2016–2019	36
Figure 2.4 Percentage Increase in Commodity Prices (March 2015–December 2019)	36
Figure 2.5 Percentage Change in Diesel Prices (2015–2019)	37
Figure 2.6 Access to Basic Services by Food Security Status	38
Figure 2.7 Governorate-Level Prevalence of Food Insecurity before and during Conflict (2014–2017)	39
Figure 2.8 Percentage Change in Agricultural Production and Cultivated Area (2014–2017).....	41
Figure 3.1 Revenue and Expenditure Trends, 2010–2018.....	48
Figure 3.2 Who Do You Trust the Most to Successfully Improve Your (or your family’s) Economic Situation? ...	61
Figure 3.3 Cross-Answers to the Questions “Do You Feel Part of Your Local Community” and “Do You Feel Safe in Your Local Community”	62
Figure 3.4 Belief in the Government to Deliver Change for All of Yemen and for the Respondents’ Community across Financial Situations	62
Figure 3.5 Most Significant Loss since the Beginning of the Conflict.....	63
Figure 3.6 Priorities for Peacebuilding	63
Figure 3.7 Factors Standing in the Way of Achieving Sustainable Peace	64

Figure 4.1	Leading Causes of Disability-Adjusted Life Years (DALYs), Yemen, 1990–2010	66
Figure 4.2	Health Resources by Province, Yemen, 2011	67
Figure 4.3	Physical Status of Health Facilities in 16 Yemeni Cities	68
Figure 4.4	Physical Damage by Health Facility Type	68
Figure 4.5	Operational Status of the Health Facilities in 16 Yemeni Cities	69
Figure 4.6	Operational Status of Health Sector by Asset Type	69
Figure 5.1	Damage to the Housing Stock by Type	77
Figure 5.2	Damage to the Housing Stock in 16 Assessed Cities	78
Figure 5.3	Damage Levels and Distribution in Sana’a	79
Figure 5.4	Damage Levels and Distribution in Hodeidah	80
Figure 5.5	Damage Levels and Distribution in Taiz	81
Figure 5.6	Housing Damage Levels and Distribution in Ma’rib City (2020)	82
Figure 6.1	Submarine Cables Landing in Yemen	87
Figure 6.2	Physical Damage to ICT Sector Assets by Facility Type	88
Figure 6.3	Damage to National Backbone Facilities	88
Figure 6.4	Received Signal Strength Indicator (RSSI) in the City of Hodeidah	90
Figure 6.5	Internet Café Listed for Sale in Sana’a, 2017	91
Figure 6.6	Destroyed Mobile Network Tower	91
Figure 6.7	Stolen Copper Cables	92
Figure 7.1	Nighttime Satellite Images from 2012 and March 2018	98
Figure 7.2	Physical and Operational Status of Power System Assets in 15 Cities	98
Figure 7.3	Physical and Operational Status of the Power Sector by City (excluding towers)	99
Figure 11.1	Intra-urban Road Damage by City	137
Figure 11.2	Damage Cost Distribution by City (in %)	140
Figure 11.3	Damage Cost Distribution by Governorate (%)	140
Figure 11.4	Transport Map—Yemen	144
Figure 12.1	Physical Status of the WASH Sector by Asset Type	147
Figure 12.2	Physical Status of the WASH Sector by City	147
Figure 12.3	Operational Status of the WASH Sector by Asset Type	148
Figure 12.4	Damage Cost Distribution by City, in %	151

List of Tables

Table ES.1	Needs by Sector at City, Governorate, and National Levels (in US\$ million)	xvi
Table O.1	Key Macroeconomic Indicators for Yemen, 2016–2019	3

Table O.2	Damage Cost by Sector at City and Governorate Levels (in US\$ million)	11
Table O.3	Needs by Sector at City, Governorate, and National Levels (in US\$ million)	12
Table O.4	City-Level Recovery Needs by Needs Category and by Sector (in US\$ million)	14
Table 1.1	City-Level Damage Costs (in US\$ million)	29
Table 1.2	Damage Inventory: School Facilities in 16 Cities	30
Table 1.3	Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)	31
Table 2.1	Conflict Has Increased the Cost of Living	40
Table 2.2	Governorate-Level Losses due to Higher Cost of Food (in YRI million and US\$ million)	42
Table 2.3	Governorate-Level Needs to Ensure Food Security (in YRI million and US\$ million)	43
Table 4.1	Damage Inventory: Health Facilities in 16 Cities	72
Table 4.2	City-Level Damage Costs (in US\$ million)	73
Table 4.3	Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)	74
Table 5.1	Damage Inventory: Housing Stock in 16 Cities	77
Table 5.2	City-Level Damage Costs (in US\$ million)	83
Table 5.3	Recovery and Reconstruction Needs over Five Years (in US\$ million)	84
Table 6.1	Mobile Phone Market Structure (as of January 2020)	87
Table 6.2	Damage Inventory Table	92
Table 6.3	City-Level Damage Costs (in US\$ million)	93
Table 6.4	Recovery and Reconstruction Needs over Five Years (in US\$ million)	94
Table 7.1	Current Status of Public Electricity Supply in 11 Assessed Cities	101
Table 7.2	Damage Inventory by Type of Asset (sum of all 15 assessed cities)	105
Table 7.3	City-Level Damage Costs (in US\$ million)	105
Table 7.4	Recovery and Reconstruction Needs over Five Years (in US\$ million)	106
Table 8.1	Recovery and Reconstruction Needs over Five Years	116
Table 10.1	City-Level Damage Costs (in US\$ million)	132
Table 10.2	Sequenced Recovery and Reconstruction Needs in SWM Sector, by City (in US\$ million)	133
Table 11.1	Damage Inventory: Ports and Airports Assessed in This DNA	138
Table 11.2	City-Level Damage Costs (in US\$ million)	139
Table 11.3	Governorate-Level Damage Costs (in US\$ million)	141
Table 11.4a	Recovery and Reconstruction Needs over Five Years, City Level (in US\$ million)	142
Table 11.4b	Recovery and Reconstruction Needs Over Five Years, Governorate Level (in US\$ million)	143
Table 12.1	Total Damage Inventory Table by Asset Type	146
Table 12.2	City-Level Damage Costs (in US\$ million)	151
Table 12.3	Recovery and Reconstruction Needs over Five Years (in US\$ million)	152

Abbreviations and Acronyms

ADSL	asymmetric digital subscriber line	FAO	Food and Agriculture Organization
AFMIS	Automated Financial Management Information System	FGDs	focus group discussions
AUs	autonomous utilities	GAIP	General Authority for Insurance and Pensions
BTI	Bertelsmann Stiftung Transformation Index	GARWSP	General Authority for Rural Water Supply Projects
CBY	Central Bank of Yemen	GBD	Global Burden of Disease
CCIFs	City Cleaning and Improvement Funds	GCC	Gulf Cooperation Council
CDMA	code-division multiple access	GCSI	General Cooperation for Social Insurance
CE	citizen engagement	GDP	gross domestic product
CFSS	Comprehensive Food Security Survey	GoY	Government of Yemen
CFW	cash-for-work	GSM	Global System for Mobile Communications
COCA	Central Organization for Control and Audit	GTI	Governance Transformation Index
CPIAs	Country Policy and Institutional Assessments	HATC	High Authority for Tender Control
CSO	Central Statistical Organization	HBS	Household Budget Survey
CSOs	civil society organizations	HFO	heavy fuel oil
CT	conditional transfer	HFs	health facilities
DALYs	disability-adjusted life years	HR	human resources
dB	decibel	HTB	High Tender Board
DFA	<i>de facto</i> authorities	ICRC	International Committee of the Red Cross
DNA	Dynamic Needs Assessment	ICT	information and communications technology
DPs	development partners	IDP	internally displaced person
DSL	digital subscriber line	ILO	International Labour Organization
EFSNA	Emergency Food Security and Nutrition Assessment	IMF	International Monetary Fund
EITI	Extractive Industries Transparency Initiative	IOM	International Organization for Migration
EPA	Environmental Protection Agency	IPC	Integrated Food Security Phased Classification
ERC	Emirati Red Crescent	IRC	International Rescue Committee
ERWs	explosive remnants of war	IRG	internationally recognized government
ETC	Emergency Telecommunications Cluster		

IT	information technology	OOP	out of pocket
kg	kilogram	PAPFAM	Pan Arab Program for Family Health
KIIs	key informant interviews	PEC	Public Electricity Corporation
km	kilometer	PHC	primary health care
KSA	Kingdom of Saudi Arabia	PIP	public investment program
kV	kilovolt	PMIS	Procurement Management Information System
kVA	kilovolt-ampere	PMU	project management unit
kWh	kilowatt-hour	PPP	public-private partnership
LDAs	local development associations	PTC	Public Telecommunications Company
LPG	liquefied petroleum gas	PV	photovoltaic
LWSCs	local water and sanitation corporations	PWP	Public Works Project
m²	square meters	RAP	Rural Access Program
m³	cubic meters	RMF	Road Maintenance Fund
MAI	Ministry of Agriculture and Irrigation	RPBA	Recovery and Peacebuilding Assessment
Mbps	megabits per second	RSSI	received signal strength indicator
MDGs	Millennium Development Goals	SBDs	standard bidding documents
MENA	Middle East and North Africa	SFD	Social Fund for Development
MFIs	microfinance institutions	SME	small and medium enterprise
MHz	megahertz	SMEPS	Small and Micro Enterprise Promotion Services Program
MoCSI	Ministry of Civil Service and Insurance	SMS	short message service
MoE	Ministry of Education	SNACC	Supreme National Authority for Combating Corruption
MoF	Ministry of Finance	SP	social protection
MoPHP	Ministry of Public Health and Population	SSN	social safety net
MoPIC	Ministry of Planning and International Cooperation	SWF	Social Welfare Fund
MoPWH	Ministry of Public Works and Highways	SWM	solid waste management
MoT	Ministry of Transport	T&D	transmission and distribution
MoTIT	Ministry of Telecommunication and Information Technology	TFFPM	Task Force on Population Movement
MSMEs	micro and small and medium enterprises	TFR	total fertility rate
MTEF	Medium-Term Expenditure Framework	TIN	tax identification number
MW	megawatt	UAE	United Arab Emirates
MWE	Ministry of Water and Environment	UCT	unconditional cash transfer
NACS	National Anti-Corruption Strategy	UN	United Nations
NGOs	nongovernmental organizations	UNDP	United Nations Development Programme
NRC	Norwegian Refugee Council	UNESCO	United Nations Educational, Scientific and Cultural Organization
NWRA	National Water Resources Authority	UNHCR	United Nations High Commissioner for Refugees
OBI	Open Budget Index		
OCDS	Open Contracting Data Standard		

UNICEF	United Nations Children’s Fund	WBG	World Bank Group
UNOPS	United Nations Office for Project Services	WFP	World Food Program
UNVIM	United Nations Verification and Inspection Mechanism for Yemen	WGI s	World Governance Indicators
UXOs	unexploded ordnances	WHO	World Health Organization
VSAT	very small aperture terminal	WSS	water supply and sanitation
WASH	water, sanitation, and hygiene	WTO	World Trade Organization
		YRI	Yemeni riyal

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Individual sector chapters were drafted by the following specialists:

- Education: Nathalie Lahire (Senior Economist), Samira Halabi (Senior Education Specialist), and Almedina Music (Economist)
- Food Security: Rufiz Vakhid Chirag-Zade (Senior Agribusiness Specialist), Sharad Alan Tandon (Senior Economist), Faiza Hesham Hael Ahmed (Agricultural Specialist), and Mekbib Haile (Agricultural Economist)
- Governance: Francesca Recanatini (Lead Public Sector Specialist), Moad Alrubaidi (Senior Financial Management Specialist), Jamal Abdulaziz (Senior Procurement Specialist), Michael Jelenic (Public Sector Specialist), and Ashraf Al-Wazzan (Procurement Analyst)
- Health: Moustafa Abdalla (Senior Health Specialist), Mennatallah El-Beheiry (Consultant), and Mirna Mehrez (Consultant)
- Housing: Ellen Hamilton (Lead Urban Specialist) and Waad Tammaa (E T Consultant)
- Information and Communications Technology: Naomi J. Halewood (Senior ICT Policy Specialist) and Italo Mazzei (Consultant)
- Power: Ashok Sarkar (Senior Energy Specialist), Joern Huenteler (Energy Specialist), Abdulaziz Al-Shalabi (Energy Specialist), and Ghassan Al-Akwa (Young Professional)
- Social Protection and Jobs: Afrah Alawi Al-Ahmadi (Senior Social Protection Specialist) and Yashodhan Ghorpade (Economist)
- Social Resilience: Bernard Harborne (Lead Social Development Specialist), Ana Paula Fialho Lopes (Senior Social Development Specialist), Tobias Lechtenfeld (Social Development Specialist), and Kanishka Balasuriya (Consultant)

- Solid Waste Management: Guido Licciardi (Senior Urban Development Specialist), Philipp Petermann (DRM Specialist), and Ghadeer Ashram (Operations Analyst)
- Transport: Abdulhakim Al-Aghbari (Senior Highway Engineer)
- Water, Sanitation, and Hygiene: Naif Abu-Lohom (Senior Water Resources Management Specialist) and Dambudzo Josephine Muzenda (Water Supply and Sanitation Specialist).

The 2020 update was led by Philipp Petermann (DRM Specialist) under the guidance of Jaafar Friaa (Practice Manager) and with support from Ebrahim Al-Harazi (External Affairs Associate), Victoria Bruce-Goga (Program Assistant), Mohamed Almenfi (Research Analyst), and Ghizlane Aqariden (Consultant). Raja Rehan Arshad (Lead DRM Specialist) and Federica Ranghieri (Senior Urban Development Specialist) provided strategic guidance and quality reviews. The following specialists contributed to the revision of the individual sector chapters: Samira Halabi and Almedina Music (education), Faiza Hesham Hael Ahmed and Sharad Alan Tandon (food security), Francesca Recanatini and Mahi Elattar (governance), Moustafa Abdalla and Mennatallah El-Beheiry (health), Ellen Hamilton, Federica Ranghieri, and Philipp Petermann (housing), Naomi Halewood (ICT), Joern Huenteler and Matteo Malacarne (power), Yashodhan Ghorpade (social protection and jobs), Ana Paula Fialho Lopes (social resilience), Philipp Petermann (solid waste management), Abdulhakim Al-Aghbari (transport), and Naif Abu-Lohom (water, sanitation, and hygiene). Naoko Kojo updated the macroeconomic overview.

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Executive Summary

Context

In June 2014, armed conflict between the government and armed groups began to spread across much of the Republic of Yemen. The conflict, which escalated in March 2015, has caused major loss of life, internal displacement, and damage to infrastructure and service delivery throughout the economy and society. To understand the effect of the evolving conflict on the Yemeni people and estimate preliminary recovery and reconstruction needs, the World Bank Group (WBG), in close cooperation with the Government of Yemen (GoY), initiated the multi-phased Yemen Dynamic Needs Assessment (DNA) in September 2015. This assessment is the third phase in the series of DNAs that the WBG has conducted since 2015. It was conducted in 2018, and updated in 2020.

Objectives

The key objective of the third phase of the Yemen DNA is to provide the WBG, the GoY, and the international community with an update on the impact of the crisis on the population, physical assets, infrastructure, service delivery, and institutions of the Republic of Yemen. It also provides a preliminary estimate of the need for reconstruction of physical infrastructure and restoration of service delivery that may be useful in planning recovery.

Scope

Temporal scope: Damage and needs were calculated according to a March 2015 baseline situation, compared to data and information collected as of January 2020.

Sectoral scope: The assessment is conducted for the following 12 sectors: education, food security, governance, health, housing, information and communications technology (ICT), power, social protection, social resilience, solid waste management, transport, and water and sanitation (WASH).

Geographic scope: The third phase of the Yemen DNA is primarily a city-level assessment for the following 16 cities: Ad-Dhale, Aden, Al Hazm, Amran, Bayhan, Dhamar, Hodeidah, Khoka, Lahj, Lodar, Ma'rib City, Mocha, Rada'a, Sa'da, Sana'a, and Taiz. Whenever sufficient and accurate information was available, the assessment was extended to cover the governorates in which the target cities are located. Certain sectors were assessed at the governorate level or at the national level.

Methodology

Given the ongoing nature of the conflict and the WBG's lack of access on the ground, this assessment is primarily remote-based but validated through ground-based information in selected areas.¹ Remote data sources include 50 cm-resolution satellite imagery, (social) media analytics, data mining, and publicly available information. Remote data has been validated through ground information for Taiz (provided by the GoY), Sana'a and Hodeidah (provided by UNOPS). These three cities served as sample to ensure the reliability of the remote assessment. The analysis also utilized data from existing field surveys as well as reports from donor partners (e.g., the United Nations) and local agencies (e.g., local water and sanitation corporations).

The DNA is a broad-brush assessment that can provide an indicative picture of the damage to infrastructure, the interruptions in service delivery, the impact on institutions, and the resulting recovery and reconstruction needs.

Findings

Physical Damage

Sector-specific damage was worst in the housing sector, where 40 percent of units have been either partially damaged (39 percent) or completely destroyed (1 percent). The education, health, transport, and WASH sectors have also been severely affected, with overall damage ranging from 29 percent (transport) to 39 percent (health). The power sector has been somewhat less affected, with damage levels of 10 percent. The city with the highest proportion of damaged physical assets is Sa'da, with 67 percent of its facilities affected. In particular Sa'da's housing and health sectors have been severely impacted.

Functionality of Services

Reduced functionality in many sectors reflects not just physical damage but also factors such as institutional capacity, staffing and payment of salaries, and access to electricity.² Regarding operational status, the power sector appears to be the most seriously affected, with just 14 percent of facilities at least partially functioning despite relatively limited physical damage. More than 85 percent of power facilities are not functioning at all, largely for the lack of fuel. The city with the most seriously compromised functionality is Sa'da, where just 31 percent of assessed facilities are functioning. Sa'da is closely followed by Taiz, with a functionality rate of only 39 percent.

Damage Cost (city-level)

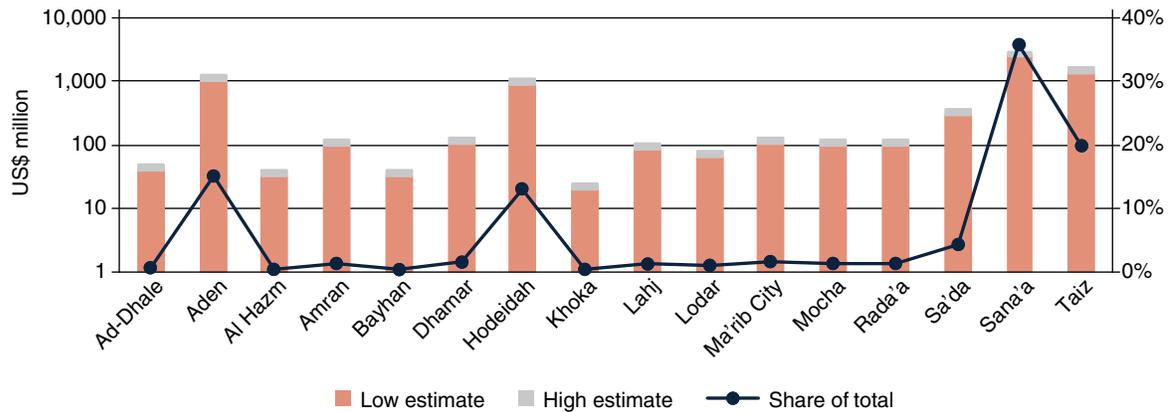
As of January 2020, damage in the 16 cities is estimated to total between US\$6.8 (low estimate) and US\$8.3 billion.³ Housing is by far the most-affected sector, with damage costs ranging between US\$5.1 and US\$6.2 billion, representing more than 74 percent of the total damage. Housing is followed by health (US\$605–740 million) and power (US\$422–516 million). Estimated damages in the WASH, transport, and education sectors are also in the hundreds of millions. Sana'a has suffered the greatest damage amongst the 16 DNA cities, with damage costs estimated at US\$2.4–3.0 billion. Sana'a is followed by Taiz, with US\$1.4–1.7 billion. Besides Sana'a and Taiz, Aden and Hodeidah have experienced the bulk of damage costs.

1 More information on the methodology can be found in the annex.

2 The operational status for the housing sector was not assessed since their operational status largely depends on the physical status.

3 Throughout the report, the low and high damage estimates were calculated with a 10 percent margin of the average damage value.

FIGURE ES.1 Damage Cost by City for the 16 DNA Cities (in US\$ million and % of total)



Recovery and Reconstruction Needs

Overall, the recovery and reconstruction needs assessed in this third phase of the DNA are estimated to range between US\$20 and US\$25 billion over five years. Depending on the sector, needs have been calculated at city, governorate or national level. Needs are detailed in in table ES.1.

There are three geographical levels—city, governorate, and national for this assessment. Facility or percentage-based direct data collection was done at the city level for eight infrastructure sectors out of which transport and WASH sectors also present governorate estimates as data was available. The governorate-level estimates of these two sectors are inclusive of city estimates. Some sectors are not appropriate to estimate at the city level considering the wider connectivity across the region in nature as well as data availability. Food security thus is measured at the governorate level and social protection at the national level, accordingly.

Table ES.1 Needs by Sector at City, Governorate, and National Levels (in US\$ million)

City level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Education	82	100	329	402	411	502
Health	254	311	1,017	1,243	1,271	1,554
Housing	1,525	1,864	6,099	7,455	7,624	9,319
ICT	4	4	3	3	6.1	7.5
Power	408	499	1,634	1,997	2,042	2,496
Transport	109	133	254	310	363	443
SWM	2	3	10	12	12	15
WASH	153	186	610	746	763	932
Total	2,537	3,101	9,956	12,168	12,493	15,269
Governorate level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Food security	965	1,180	1,556	1,901	2,521	3,081
Transport	354	432	825	1,008	1,179	1,440
WASH	224	274	896	1,095	1,120	1,369
Total	1,543	1,885	3,277	4,005	4,819	5,890
National level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Social protection	788	963	3,152	3,853	3,940	4,816
Total	788	963	3,152	3,853	3,940	4,816
Grand Total^a	4,606	5,630	15,520	18,969	20,127	24,599

a. The grand total uses the governorate level (not the city-level) estimates for the transport and WASH sectors.

Overview

Recovery and reconstruction needs assessed in selected sectors and geographical areas in this third phase of the Yemen Dynamic Needs Assessment (DNA) are estimated to range between US\$20 and US\$25 billion over five years. An estimated US\$4.6–5.6 billion will be needed in year 1, and US\$15.5–19.0 billion in years 2–5.

Context

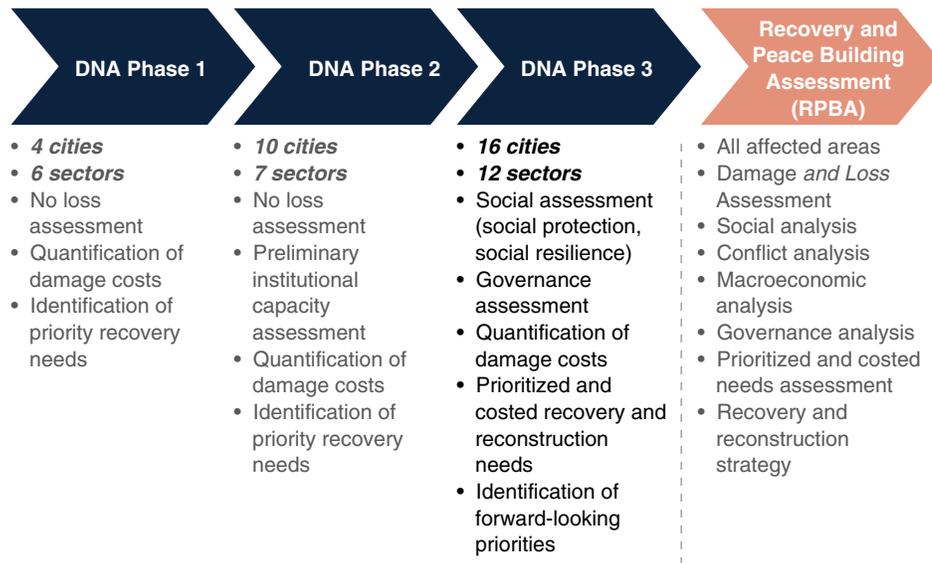
In June 2014, armed conflict between the government and armed groups began to spread across much of the Republic of Yemen. The conflict, which escalated in March 2015, has caused major loss of life, internal displacement, and damage to infrastructure and service delivery throughout the economy and society. Major roads and bridges across the country have been destroyed, power lines have been severely damaged, and oil and gas production is totally disrupted. According to the October 2020 *Situation Report* from the United Nations Office for the Coordination of Humanitarian Affairs, an estimated 24.1 million people—equivalent to more than 80 percent of the population of the Republic of Yemen—are in need of some kind of humanitarian or protection assistance, including 14.3 million in acute need. An estimated 3.65 million people have been displaced from their homes.⁴ More than 20 million people are food insecure.⁵

Drawing on similar assessments conducted in a number of countries, the World Bank Group (WBG) initiated the multiphased Yemen Dynamic Needs Assessment (DNA) in September 2015 to assess the impacts of the ongoing crisis in the country and to provide a preliminary estimate of recovery and reconstruction needs. The DNA is being conducted in close cooperation with the Government of Yemen (GoY). The first phase, covering four cities (Sana'a, Aden, Taiz, and Zinjibar) and six sectors (education, energy, health, housing, transport, and water and sanitation), was completed in early 2016. The second phase, finalized in June 2017, updated the first phase results and had an expanded geographic and sectoral scope (10 cities and 7 sectors). The third phase, reported here, further expands the number of cities and sectors assessed (figure O.1). It was conducted in 2018, and its findings were updated in early 2020 to reflect recent conflict dynamics. Analysis conducted under the Yemen DNA umbrella can ultimately feed into a comprehensive and country-wide Recovery and Peacebuilding Assessment (RPBA).

4 United Nations Office for the Coordination of Humanitarian Affairs, *Yemen Situation Report*, 7 October 2020 (<https://reports.unocha.org/en/country/yemen>).

5 World Food Program, *Yemen Situation Report*, August 2020 (<https://www.wfp.org/publications/yemen-0>).

FIGURE O.1 Roadmap of Yemen DNA



Macroeconomic Overview⁶

Violent conflict has entered its sixth year, and Yemen continues to face an unprecedented humanitarian, social, and economic crisis. Socioeconomic conditions deteriorated further in 2020, affected by low global oil prices, the economic fallout of COVID-19, and weak public infrastructure and coping capacity to deal with extreme climate events/natural disasters. Distortions created by the fragmentation of institutional capacity (especially of the Central Bank of Yemen, CBY) and the divergent policy decisions between the areas of control have further compounded the economic and humanitarian crisis, from protracted conflict, interruption of basic services, and acute shortages of basic inputs, including fuel.

Anecdotal evidence indicates a likely contraction of the economy from an already low base in the first half of 2020. The oil sector—the only large export earner—was hard hit by low global oil prices. Non-oil economic activity suffered significantly from COVID-19-related trade slowdown and exceptionally heavy rainfalls, which caused intense flooding, infrastructure damage, and human casualties. Foreign exchange shortages deepened further with the near depletion of Saudi Arabia’s basic import finance facility, reduced oil exports, and downsizing of humanitarian assistance. In April, some breathing space was provided through the IMF Catastrophe Containment and Relief Trust (CCRT). Trends in remittances are not clear, but were already troubling before COVID-19 due to the impact of weak oil prices on the GCC economies and the increased emphasis on employment nationalization programs in these economies.

The macroeconomic policy environment differs spatially due to the bifurcation of administration between areas of control. In the areas controlled by the internationally recognized government (IRG), significant revenue underperformance and continued monetization of the fiscal deficit have undermined macroeconomic stability. Oil prices remain low, eroding government hydrocarbon revenue, the main revenue source. Collection of non-hydrocarbon revenue has been compromised by contested control of key institutions in Aden, due to the associated fragmentation of revenue administration functions. The severe revenue shortfall has led to expenditure compression.

⁶ World Bank. October 2020. Yemen Macro-Poverty Outlook.

Table O.1 Key Macroeconomic Indicators for Yemen, 2016–2019

	2016	2017	2018	2019
Production and prices	<i>(annual percentage change)</i>			
Real GDP growth at market prices	-9.4	-5.1	0.8	2.1
Consumer price inflation (annual average)	21.3	30.4	27.6	10.0
Government finances	<i>(in percent of GDP)</i>			
Total revenue and grants	7.6	3.5	6.4	8.5
Total expenditure (cash basis)	16.5	8.2	14.3	13.8
Overall fiscal balance (cash basis)	-8.9	-4.7	-7.9	-5.3
External sector	<i>(in millions of U.S. dollars unless otherwise indicated)</i>			
Exports of goods and services	1,146	1,016	1,274	1,474
of which hydrocarbon	248	599	915	1,101
Imports of goods and services	7,433	7,826	8,844	10,700
of which hydrocarbon	1,706	1,979	2,427	3,115
Basic food	1,400	1,519	2,139	3,250
Current account (in percent of GDP)	-2.1	0.1	-2.2	-4.4

Source: Yemeni authorities, IMF, and World Bank staff estimates.

Since early 2020, salary payments to public sector workers have seen frequent delays and uneven geographical coverage in the IRG-controlled areas. Payables to suppliers (mostly to energy suppliers) have continued to build up, disrupting fuel imports and the supply of electricity. Debt service to external creditors (except for IDA and IMF) has been halted since 2015. While official data remain unavailable, growing evidence suggests that the widening government deficit has been financed by the CBY overdraft facility. Without stable sources of foreign exchange, expansionary monetary policy has accelerated the depreciation of the Yemeni rial. Given Yemen's high dependence on imports, the weakening of the currency has passed through to domestic prices, eroding the purchasing power of households and businesses.

The *de facto* authorities (DFA) in Sana'a, the country's main commercial and financial center, apply a different policy framework reflecting constraints and conditions in their area of control. The complete ban on the use of new banknotes since December 2019 (notes printed after September 2016 when the CBY headquarters was moved to Aden) has effectively segmented the DFA-controlled areas from the impact of macroeconomic policy implemented by the IRG and CBY (Aden).

Fiscal policy of the DFA operates under a cash-constrained balanced budget. The structure of DFA's budget reflects the absence of hydrocarbon revenue. The collection of corporate profit and sales taxes and customs revenue, the three largest revenue sources, was affected negatively by COVID-19-related trade slowdown and movement restrictions, and administrative disruption caused by flooding. So far in 2020, the DFA has disbursed half-month salaries to public sector workers under its controlled areas every other month. Since late 2019, the value of the rial circulating in the governorates under the DFA (old banknotes) has been broadly stable on the parallel market, and significant inflation has not been observed.

Deteriorating economic conditions have likely translated into widespread poverty. Accurate projections are unable to be produced in the current environment. The last national poverty rate was estimated using data prior

to the conflict, and is a difficult base from which to estimate how poverty has changed given the profound impacts the conflict has had on the country. Despite the lack of a precise projection of poverty, it is clear that the conflict has placed an extraordinary stress on households. This stress cannot be exclusively captured by monetary poverty alone. Observation suggests that households lack access to food and many basic and essential services, such as health and education, and are experiencing a widespread forced displacement crisis. Approximately 80 percent of respondents of a monthly mobile phone survey conducted by the World Food Program (WFP) had difficulty accessing either food or basic services. All of these difficulties have been exacerbated by COVID-19, with increasing households having trouble accessing food markets, receiving pay due to difficulties in reaching jobs, and accessing medical care due to local capacity being overwhelmed. The worsening conditions peaked by June 2020 and, as of September 2020, remained significantly worse than at the beginning of the pandemic.

Economic and social prospects for the remainder of 2020 and beyond are highly uncertain. A gradual recovery of global oil prices would help ease the strain on public finances governorates under the IRG and reduce the recourse to central bank financing. However, with ongoing political and security situations, socioeconomic conditions will remain difficult. Urgent progress to address the current restrictions of access to supplies and fuel imports through Hodeidah would improve the provision of public services and the operational environment for humanitarian operations. A cessation of hostilities and eventual political reconciliation, including the return of unitary macroeconomic policy implementation, are prerequisites for the reconstruction of the economy and rebuilding of social fabric.

Objectives of the DNA

The key objective of the third phase of the Yemen DNA is to provide the WBG, the GoY, and the international community with an update on the impact of the crisis on the population, physical assets, infrastructure, service delivery, and institutions of the Republic of Yemen. It also provides a preliminary estimate of the need for reconstruction of physical infrastructure and restoration of service delivery that may be useful in planning recovery. This third phase also aims to contribute to the implementation and planning of current and future WBG operations in Yemen.

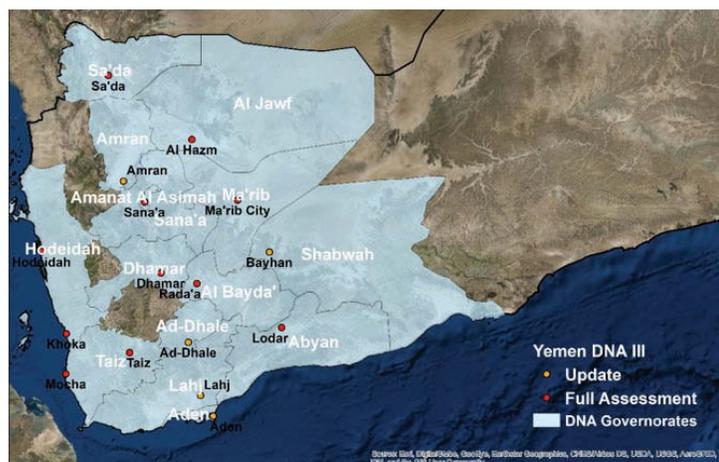
Scope

Temporal scope: Damage and needs were calculated according to the actual or estimated pre-March 2015 baseline situation. The cutoff date for an initial round of comprehensive data collection and analysis was April 2018. The damage and needs estimates were updated in early 2020 based on data collected as of January 2020 (see below).

Sectoral scope: The assessment is conducted for the following 12 sectors: education, food security, governance, health, housing, information and communications technology (ICT), power, social protection, social resilience, solid waste management, transport, and water, sanitation, and hygiene (WASH).

Geographic scope: The third phase of the Yemen DNA is primarily a city-level assessment. For most sectors, the assessment was conducted in the following 16 cities: Ad-Dhale, Aden, Al Hazm, Amran, Bayhan, Dhamar, Hodeidah, Khoka, Lahj, Lodar, Ma'rib City, Mocha, Rada'a, Sa'da, Sana'a, and Taiz (figure O.2). These cities were selected in consultation with the GoY because they (i) are important regional centers or (ii) have experienced significant levels of conflict. For this third phase, 11 cities were newly assessed based on data and information

FIGURE O.2 The 16 DNA Cities of the Yemen DNA Phase 3



available as of April 2018, and later updated to January 2020.⁷ For the remaining five cities,⁸ the findings from the second phase of the DNA were updated based on inferences from conflict dynamics, without soliciting any new damage facility-level data. Whenever sufficient and accurate information was available, the assessment was extended to cover the governorates in which the target cities were located. Certain sectors—governance, social protection, social resilience, and food security—were assessed at the governorate level or at the national level.⁹

2020 update: In early 2020, the damage and needs estimates as of April 2018 were updated to take into account the conflict dynamics occurring between May 2018 and January 2020. The update covers all 16 DNA cities and includes the education, food security, health, housing, ICT, power, social protection, solid waste management, transport, and WASH sectors. The assessments of the governance and social resilience sectors are based on qualitative data collection (including focus group discussions and key informant interviews) that was conducted in spring 2018; whenever more recent information was available, it has been updated.

Methodology¹⁰

Given the ongoing nature of the conflict and the WBG's lack of access on the ground, this assessment is primarily remote based but validated through ground-based information in selected areas. Remote data sources include 50 cm resolution satellite imagery, (social) media analytics, data mining, and publicly available information. Where possible, the analysis relies on primary data based on field surveys as well as reports from donor partners (e.g., the United Nations) and local agencies (e.g., local water and sanitation corporations). Moreover, the remotely sourced data have been triangulated and validated whenever possible against ground-based information obtained from the GoY or international partners. For the city of Taiz, the Yemeni Ministry of Planning and International Cooperation provided primary data. For the cities of Sana'a and Hodeidah, the United Nations Office for Project Services (UNOPS) conducted detailed spot checks to validate the physical and operational status of selected facilities.

7 Al Hazm, Dhamar, Hodeidah, Khoka, Lodar, Ma'rib City, Mocha, Rada'a, Sa'da, Sana'a, and Taiz.

8 Ad-Dhale, Aden, Amran, Bayhan, and Lahj.

9 Governorates assessed for selected sectors in DNA Phase 3 include: Abyan, Ad-Dhale, Aden, Al Bayda', Al Jawf, Amanat Al Asimah, Amran, Dhamar, Hodeidah, Lahj, Ma'rib, Sa'da, Sana'a, Shabwah, and Taiz.

10 More detailed information on the methodology can be found in the annex.

Depending on the availability of data and sector-specific characteristics, individual sector assessments relied on several variations (inventory-based, percentage-based, mixed, qualitative) of the standard Damage and Loss Assessment (DaLA) methodology.¹¹

To quantify physical damage, the cost was calculated based on the number of physical units (e.g., facilities, square meters, kilometers of roads), their physical status (partially damaged or completely destroyed), and the estimated pre-crisis unit cost associated with each asset class. Completely destroyed assets were costed at 100 percent of the unit cost; partially damaged assets, at 40 percent. For most sectors, the pre-crisis unit costs are expressed in U.S. dollars, and therefore no currency conversion was necessary as part of this assessment. For the food security and social protection analysis, prices were expressed in local currency and converted into U.S. dollars.

The assessment also includes an estimation of forward-looking sectoral recovery and reconstruction needs. Infrastructure reconstruction needs across the various sectors are based on converting the damage to current prices, taking into account estimated inflation, security and insurance premiums, as well as a “build back better” factor (e.g., earthquake-resistant reconstruction, disability-inclusive design, and so on). Service delivery restoration needs to take into account “softer” and non-infrastructure-related aspects, such as staffing, fuel, equipment, human resources, and machinery, which are necessary to provide services on par with the pre-crisis level. The resulting recovery and reconstruction needs estimates are then prioritized and distributed over the short-term (1 year) and the medium-term (2–5 years) based on sectoral priorities. Based on the damage and needs assessments, each sector report proposes sequenced priorities to restore sector outcomes to pre-crisis levels.

The largely remote nature of the assessment and the uncertainties surrounding the unit-cost estimates mandated the use of a damage and needs range for each sector. The low and high estimates were calculated with a 10 percent margin from the damage/needs cost.

The 2020 update is based on sample-based facility assessments relying on publicly available satellite imagery and satellite-derived data, social media analysis, regional and local publicly available reporting, international humanitarian reporting, as well as neighborhood-level conflict assessment that were used for damage inference purposes. Whenever possible, the updated findings were validated through local and international ground partners.

Limitations

This DNA, conducted during an ongoing conflict and relying primarily on remote data sources, is not a comprehensive assessment founded on detailed, ground-based data. Instead, the DNA is a broad-brush assessment that can provide an indicative picture of the damage to infrastructure, the interruptions in service delivery, the impact on institutions, and the resulting recovery and reconstruction needs. While the third phase further expanded both the geographic and sectoral scope of earlier efforts, the estimates of damages and needs are not indicative for the entire country. In addition, the assessment is based on data as of early 2018, which were subsequently updated to reflect conflict dynamics until January 2020; some figures may already have changed owing to the ongoing conflict. Finally, since the assessment relies on data collected until January 2020, it does not cover COVID-19 and the related impact on human life, service delivery, institutions, and economic livelihoods. Whenever possible, sector reports reference the estimated impact.

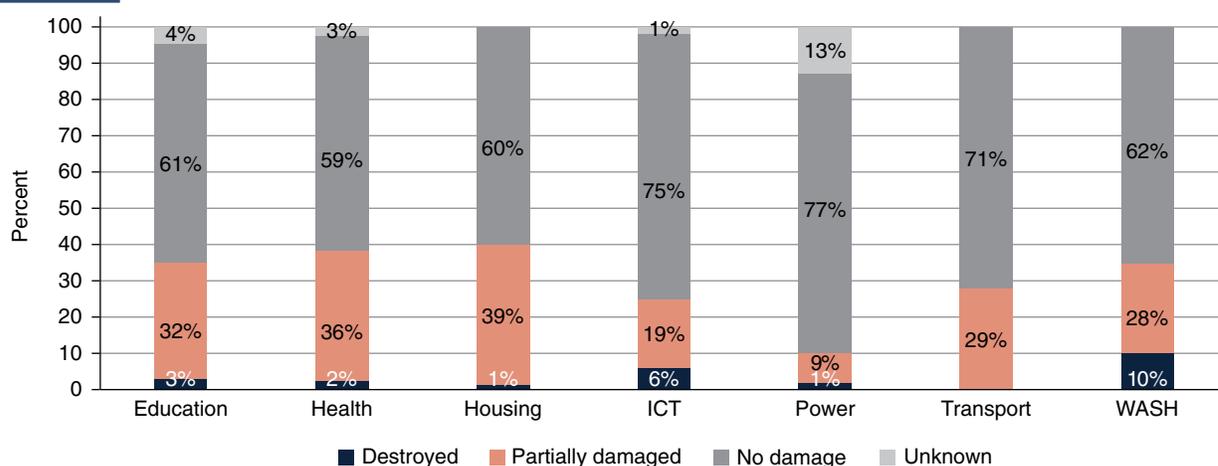
¹¹ The methodology was developed by the Economic Commission for Latin America and the Caribbean in the 1970s. The approach has become an internationally recognized tool for quantifying the impact of disasters of various kinds and for estimating how much reconstruction is likely to cost.

Findings

Physical Damage (city-level)

The conflict's impact on physical assets in the sectors that underwent a facility-level assessment is summarized in figure O.3. Sector-specific damage was worse in the housing sector, where 40 percent of units have been either partially damaged (39 percent) or completely destroyed (1 percent). The education, health, transport, and WASH sectors have also been severely affected, with overall damage ranging from 29 percent (transport¹²) to 38 percent (health and WASH). The power and ICT sectors have been somewhat less affected, with damage levels of 10 percent and 25 percent, respectively.

FIGURE O.3 Physical Damage Levels by Sector (in %)



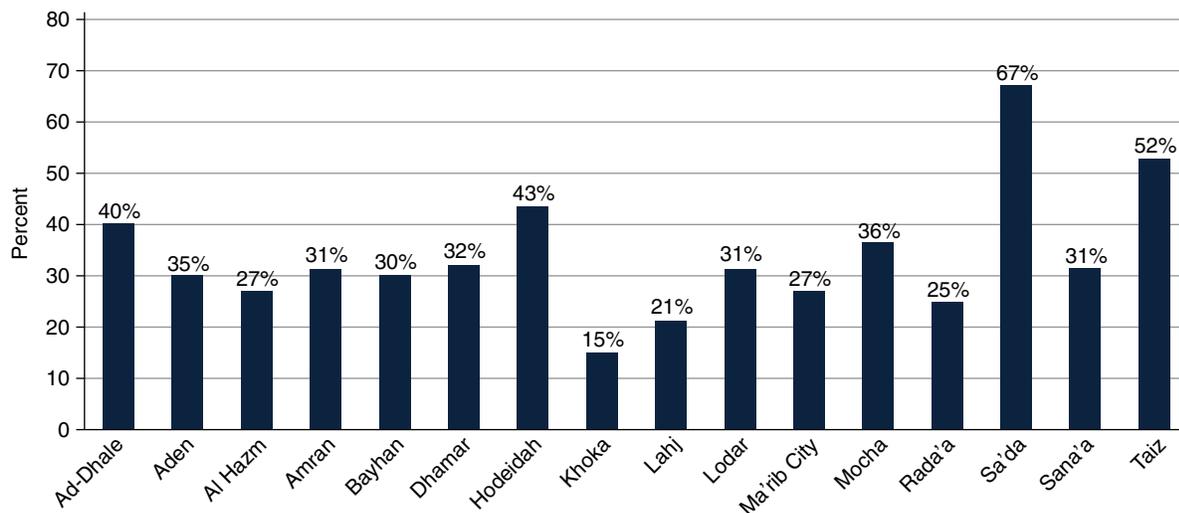
The city with the highest proportion of damaged physical assets is Sa'da, with 67 percent of its facilities either completely destroyed or partially damaged (figure O.4). All sectors in Sa'da except WASH have suffered from more than 50 percent of damage. The two assets comprising Sa'da's power sector have been damaged, and the health and housing sectors have been significantly affected with damage levels of 79 percent and 66 percent, respectively. Sa'da is followed by Taiz, with average damage levels of 52 percent. Here, the housing and education sectors show the greatest damage, at 83 percent and 57 percent, respectively. Hodeidah is the third most-affected city with average damage levels of 43 percent, driven largely by damage to the WASH and housing sectors (60 percent and 47 percent, respectively). Aden, Dhamar, and Sana'a have average physical damage levels around 30 percent, even though there are certain sectors in these cities (e.g., power in Aden and Dhamar, WASH in Sana'a) where damage levels are 45 percent or more.

Functionality of Services (city-level)

In general, reduced functionality in many sectors reflects not just physical damage but also factors such as institutional capacity, staffing and payment of salaries, and access to electricity. For example, many WASH and health facilities have limited functionality owing to the lack of fuel to power generators. Understanding these cross-sectoral linkages is critical when planning recovery and reconstruction.

¹² The transport analysis did not differentiate between partially damaged or completely destroyed assets. For this graph, all assets were categorized as partially damaged.

FIGURE O.4 Physical Damage Levels by City (in %)



With regard to operational status, the power sector appears to be the most seriously affected, with just 14 percent of facilities at least partially functioning despite relatively limited physical damage (figure O.5). More than 85 percent of power facilities are not functioning at all, largely for lack of fuel. Needless to say, the power supply has been sharply curtailed. The WASH and transport sectors have also been significantly affected, with 28 percent and 29 percent, respectively, of nonoperational assets.

The city whose functions appear to be most seriously compromised is Sa'da, where just 31 percent of facilities, on average, are functioning across the six sectors assessed (figure O.6). Sa'da is followed closely by Taiz, with a functionality rate of 39 percent. The cities of Khoka, Ad-Dhale, and Mocha seem to be the least affected, with functionality at 88, 84, and 82 percent, respectively. The capital, Sana'a, has an average functionality level of 71 percent.

FIGURE O.5 Operational Status by Sector

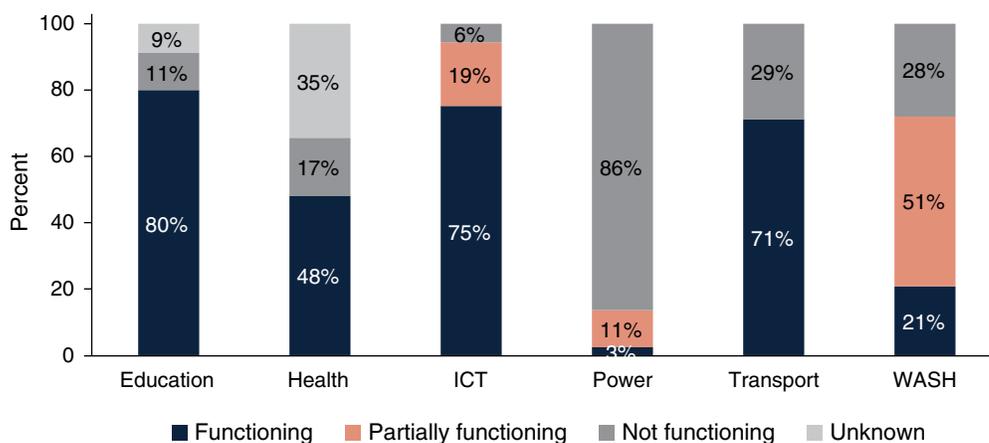
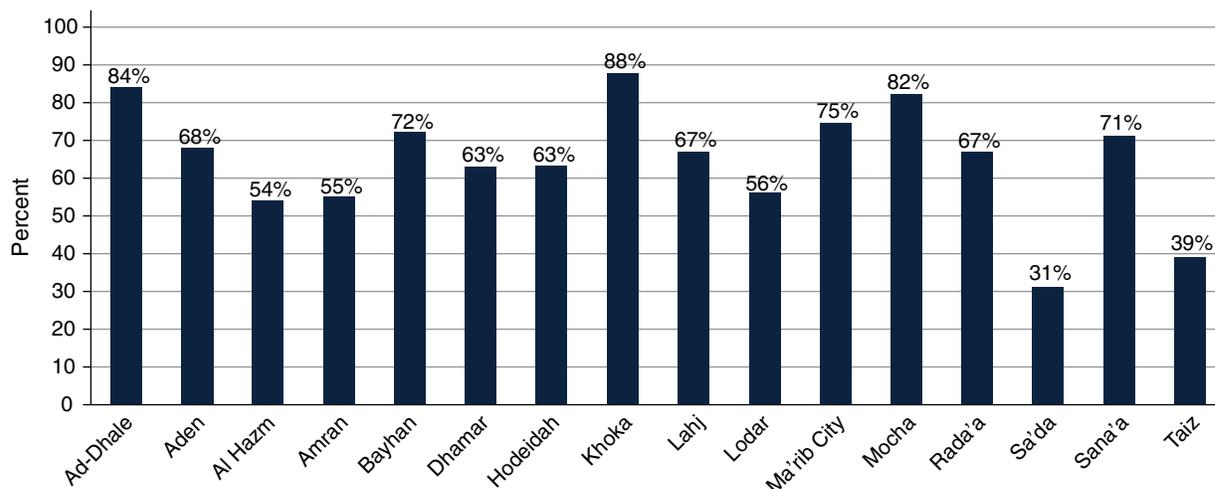


FIGURE O.6 Functionality of Services by City (in %)



Damage Cost (city-level)

As of January 2020, damage in the 16 cities is estimated to total between US\$6.8 (low estimate) and US\$8.3 billion (figure O.7a and table O.1).¹³ Housing is by far the most-affected sector, with damage costs ranging between US\$5.1 and US\$6.2 billion, representing around 74 percent of the total damage cost (figure O.7b). Housing is followed by health (US\$605–740 million) and power (US\$422–516 million). Estimated damages in the WASH, transport, and education sectors are also in the hundreds of millions. In the ICT and solid waste management sectors, estimates are comparatively low, reflecting the limited number of assets assessed and the lack of comprehensive data (given the largely remote-based assessment).

Sana'a has suffered the greatest damage across the 16 DNA cities, with damage costs estimated at US\$2.4–3.0 billion, or 36 percent of the total (figure O.8). Sana'a is followed by Taiz, with US\$1.4–1.7 billion (20 percent) of the total. Owing in large part to their relatively small size, the cities of Ad-Dhale, Al Hazm, Bayhan, Khoka, and Lodar each represent 1 percent or less of the total damage costs.

Findings for the sectors for which a damage quantification was conducted at the governorate level are shown in table O.2. Governorate-level damage costs to the transport sector are estimated to range between US\$779 and US\$953 million. For the WASH sector, they range from US\$421 to US\$515 million.

Recovery and Reconstruction Needs

Overall, the recovery and reconstruction needs assessed in this third phase of the DNA are estimated to range between US\$20 and US\$25 billion over five years (table O.3). The estimated needs are US\$4.6–5.6 billion in year 1 and US\$15.5–19.0 billion in years 2–5.

13 Throughout the report, the low and high damage estimates were calculated with a 10 percent margin of the average damage value.

FIGURE O.7 Damage Cost by Sector for the 16 DNA Cities

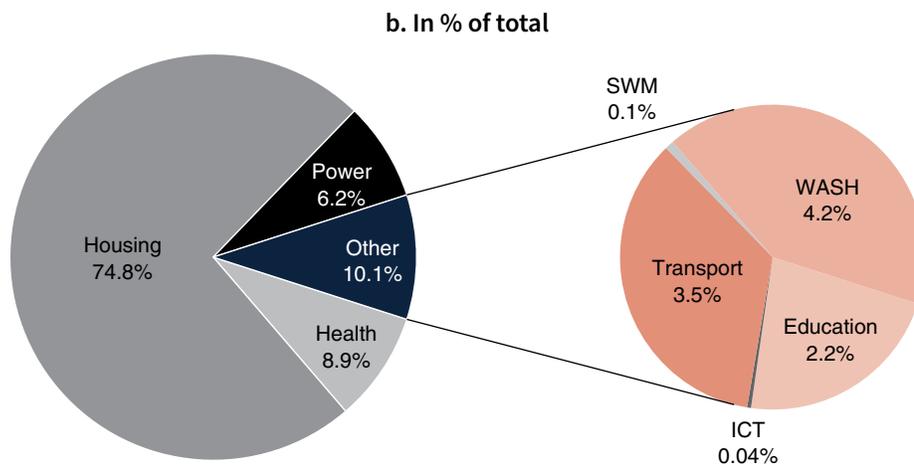
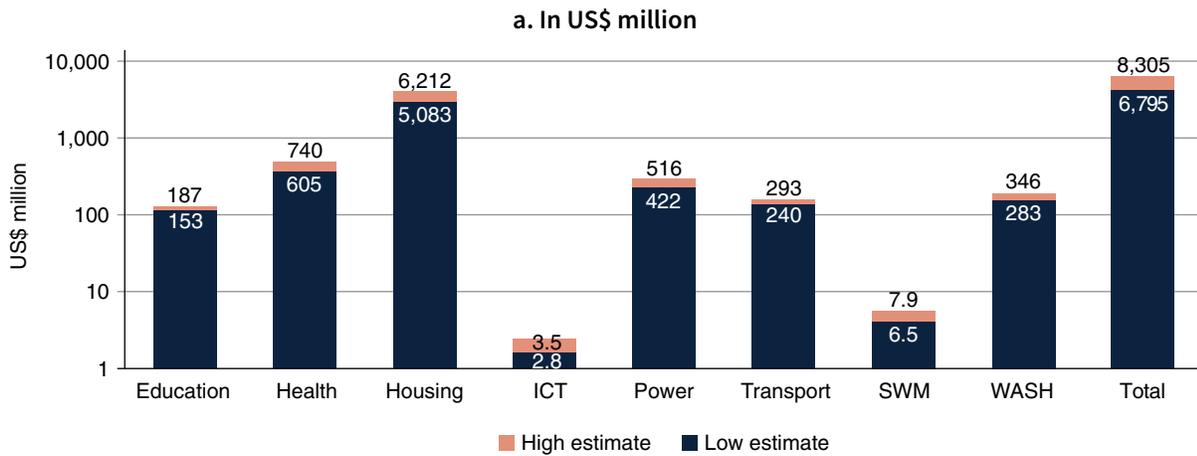


FIGURE O.8 Damage Cost by City for the 16 DNA Cities (in US\$ million and % of total)

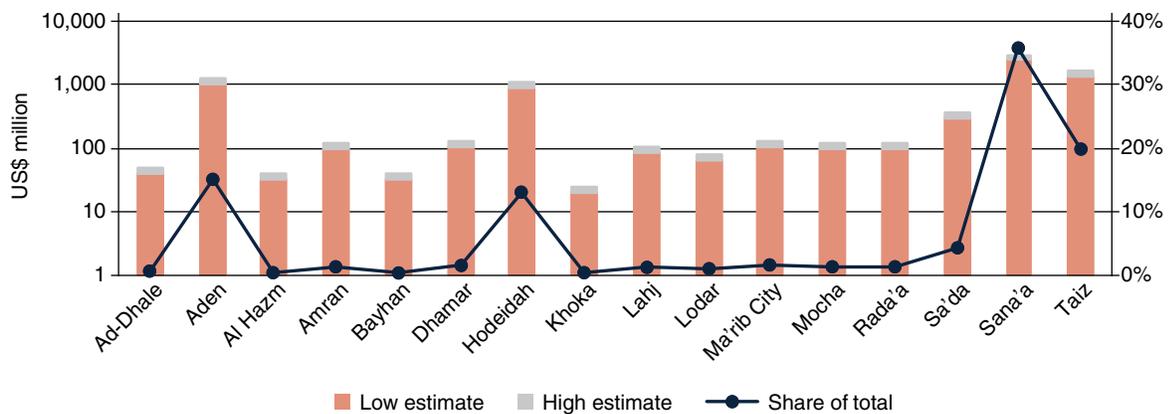


Table O.2 Damage Cost by Sector at City and Governorate Levels (in US\$ million)

City level		
Sector	Damage cost	
	Low estimate	High estimate
Education	153	187
Health	605	740
Housing	5,083	6,212
ICT	2.8	3.5
Power	422	516
Transport	240	293
Solid waste management	6.5	7.9
WASH	283	346
Total	6,795	8,305
Governorate level		
Sector	Damage cost	
	Low estimate	High estimate
Transport	779	953
WASH	421	515
Total	1,201	1,467

City level: Needs across the 16 DNA cities are estimated at US\$13–15 billion over five years (figure O.9): US\$2.5–3.1 billion in year 1 and US\$10–12 billion in years 2–5. By sector, 61 percent of the total need is in the housing sector, where the need ranges from US\$7.6 to US\$9.3 billion (figure O.10). Needs in the energy sector are also significant, with overall estimates ranging from US\$2.0 to US\$2.5 billion (16 percent of the total), primarily for fuel to stem the service delivery gap. Health sector needs account for 10 percent of the total.

The city with the greatest need is Sana'a, which will require US\$4.7–5.7 billion for recovery and reconstruction, or 37 percent of the total (figure O.10). Sana'a is followed by Taiz (US\$2.2–2.7 billion, or 18 percent of the total) and Aden (US\$2.0–2.4 billion, or 16 percent). Despite its relatively small size, Sa'da accounts for 4 percent of the total need.

Whenever sufficient information was available, recovery needs were further disaggregated into infrastructure reconstruction and service delivery rehabilitation needs (see table O.4). Of the estimated US\$13–15 billion in total recovery needs at the city level, infrastructure reconstruction is estimated to account for US\$11–13 billion, while the remaining US\$2.0–2.4 billion cover service delivery restoration needs. Even though their overall share of total recovery needs is relatively low, service delivery restoration needs are particularly high in the power sector, where they account for more than 50 percent of recovery needs. They also cover a high share of recovery needs in the education and WASH sectors (37 and 35 percent, respectively).

Table O.3 Needs by Sector at City, Governorate, and National Levels (in US\$ million)

City level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Education	82	100	329	402	411	502
Health	254	311	1,017	1,243	1,271	1,554
Housing	1,525	1,864	6,099	7,455	7,624	9,319
ICT	4	4	3	3	6.1	7.5
Power	408	499	1,634	1,997	2,042	2,496
Transport	109	133	254	310	363	443
SWM	2	3	10	12	12	15
WASH	153	186	610	746	763	932
Total	2,537	3,101	9,956	12,168	12,493	15,269
Governorate level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Food security	965	1,180	1,556	1,901	2,521	3,081
Transport	354	432	825	1,008	1,179	1,440
WASH	224	274	896	1,095	1,120	1,369
Total	1,543	1,885	3,277	4,005	4,819	5,890
National level						
Sector	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low	High	Low	High	Low	High
Social protection	788	963	3,152	3,853	3,940	4,816
Total	788	963	3,152	3,853	3,940	4,816
Grand Total^a	4,606	5,630	15,520	18,969	20,127	24,599

a. The grand total uses the governorate level (not the city-level) estimates for the transport and WASH sectors.

FIGURE O.9 City-Level Recovery and Reconstruction Needs by Sector

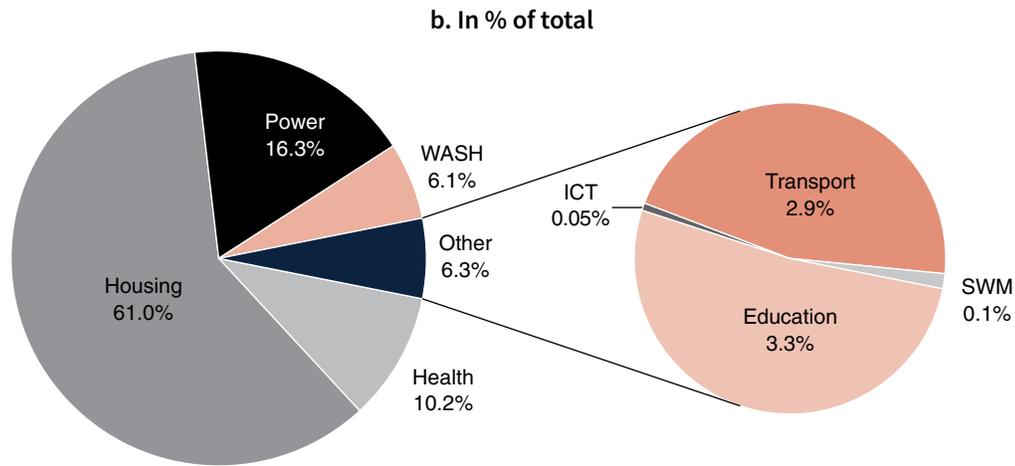
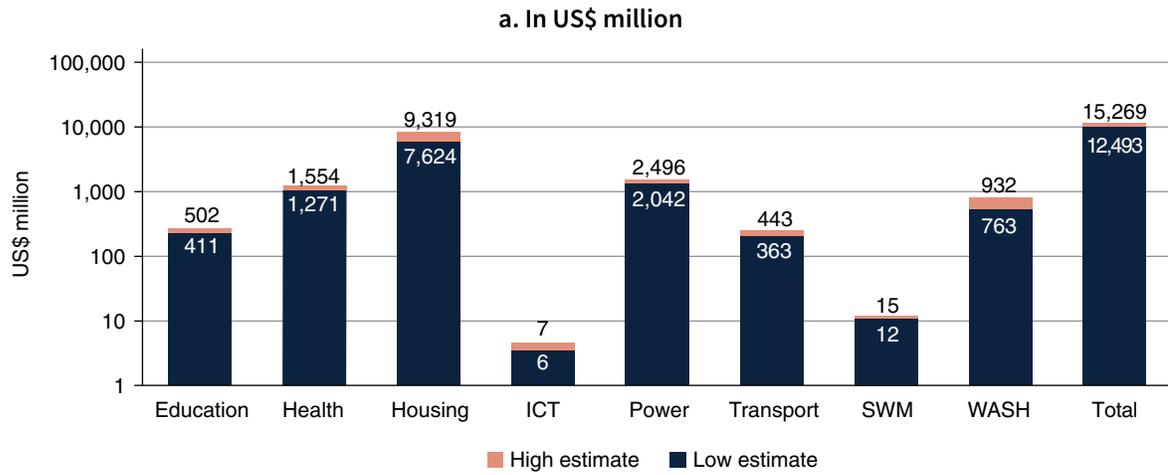


FIGURE O.10 City-Level Recovery and Reconstruction Needs by City

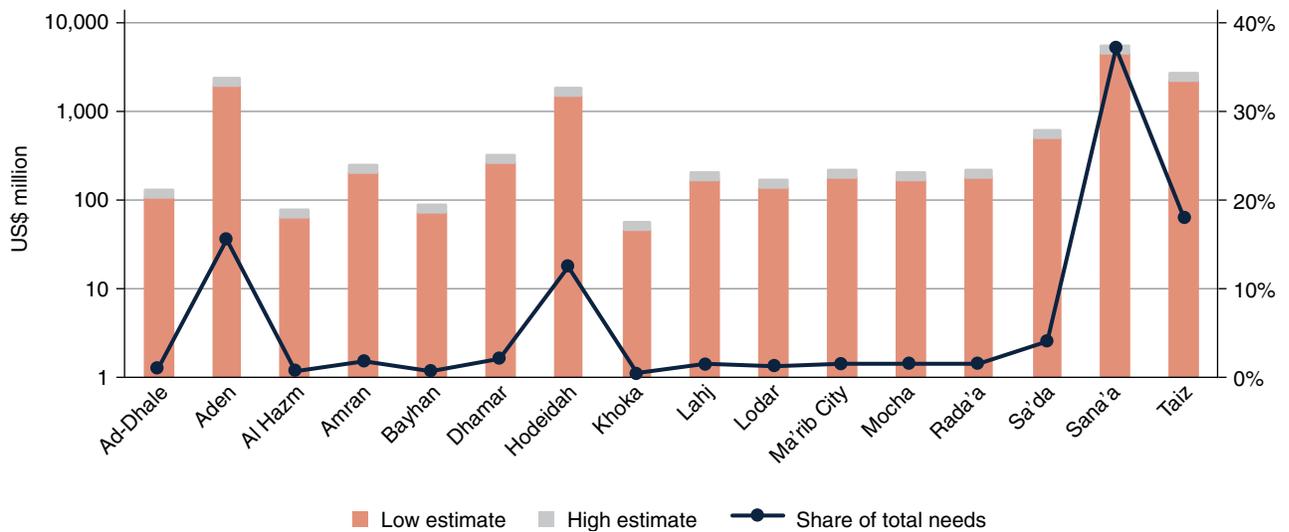


Table O.4 City-Level Recovery Needs by Needs Category and by Sector (in US\$ million)

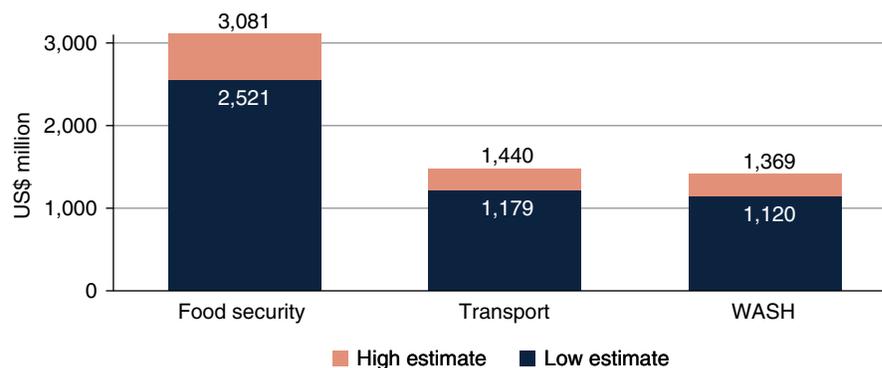
Sector	Needs (over 5 years)	
	Low estimate	High estimate
Education	411	502
<i>O/w infrastructure reconstruction</i>	260	318
<i>O/w service delivery restoration</i>	151	185
Health	1,271	1,554
<i>O/w infrastructure reconstruction</i>	1,059	1,295
<i>O/w service delivery restoration</i>	212	259
Housing	7,624	9,319
<i>O/w infrastructure reconstruction</i>	7,624	9,319
<i>O/w service delivery restoration</i>	N/A	N/A
ICT	6.1	7.5
<i>O/w infrastructure reconstruction</i>	5.0	6.1
<i>O/w service delivery restoration</i>	1.1	1.4
Power	2,042	2,496
<i>O/w infrastructure reconstruction</i>	738	902
<i>O/w service delivery restoration</i>	1,304	1,594
Transport	363	443
<i>o/w infrastructure reconstruction</i>	336	410
<i>O/w service delivery restoration</i>	27	33
Solid waste management	12	15
<i>O/w infrastructure reconstruction</i>	12	15
<i>O/w service delivery restoration</i>	N/A	N/A
WASH	763	932
<i>O/w infrastructure reconstruction</i>	495	605
<i>O/w service delivery restoration</i>	268	327
Total Recovery Needs	12,493	15,269
<i>O/w infrastructure reconstruction</i>	10,530	12,870
<i>O/w service delivery restoration</i>	1,963	2,399

Note: O/w = of which.

Governorate level: Recovery and reconstruction needs were assessed at the governorate level for the transport, WASH, and food security sectors (figure O.11). These sectors all require significant support to return to pre-crisis levels. Needs are estimated to range between US\$4.8 and US\$5.9 billion over five years: US\$1.5–1.9 in year 1, and US\$3.3–4.0 in years 2–5. Needs in the food security sector alone are estimated to range from US\$2.5 to US\$3.1 billion.

National level: Recovery needs in the social protection sector are estimated at the national level and range from US\$3.9 to US\$4.8 billion: US\$788–963 million in year 1 and US\$3.2–3.9 billion in years 2–5.

FIGURE O.11 Governorate-Level Recovery and Reconstruction Needs



Summaries of Sector Reports

Governance and Institution Building

As a result of the evolving crisis in Yemen, the country's already weak governance systems have continued to deteriorate, leading to the disintegration of several key institutions responsible for revenue and expenditure management, the weakening of the civil service to deliver core services, the erosion of legitimacy and trust in public institutions, as well as the deterioration of public accountability mechanisms. This chapter of the DNA offers a unique and contextually informed approach to governance, in an attempt to enhance the breadth and depth of the Yemen DNA series. It also provides some initial insights on how to better align the proposed interventions with the priorities identified by a surveyed sample of 5,000 Yemenis, thus shedding light on issues of legitimacy and accountability that might hinder the transition toward sustainable peace.

The nearly six years of conflict have had a significant impact on the wider governance structure and political landscape of Yemen, and on how Yemenis view the performance of the government at different levels. One of the main channels through which the governance structure and institutions have been negatively impacted is the loss of public financial resources: the total domestic revenue collection dipped below 5 percent of gross domestic product (GDP), due mainly to depressed direct and indirect tax collection, the weakening of customs administration, as well as an overall decline in economic activity. Over the period, the Central Bank of Yemen (CBY) moved its headquarters to Aden, leaving much of the existing capacity in Sana'a, thereby creating new uncertainties and adjustment imperatives for the Yemeni financial sector, and breaking the centralized decision-making chain. As a result, the integrity of the overall public financial management system has been put in doubt: an approved budget ceased to exist since 2014; multi-year revenue or expenditure planning no longer takes place; budget execution and credibility have suffered significantly; no financial reporting information is available for the last few years; most administrative entities process procurements through direct contracting; internal audit operations are restricted by staffing constraints; and no externally audited financial statements have been produced since December 2014. As a result of the lack of fiscal resources and other urgent priorities in combination with the ongoing political crisis in Yemen, many public employees have ceased to consistently receive salaries, which has brought the provision of crucial public services to the verge of collapse while also weakening one of the main ties between the government and the Yemeni people. These challenges have been exacerbated by a declining capacity within the public administration both at the central and local levels and increased insecurity, with key informant survey data suggesting that more than 50 percent of government staff have ceased to be present at their posts, although actual attendance varies considerably across governorates. According to focus groups studies, this has resulted in decreased access to health, education, and water/sanitation services, higher prices, and greater waiting time and transaction

costs required to obtain these services. These service delivery challenges have increased the incidence of informal payments, and formal complaint and redress mechanisms have all but disappeared. Moreover, the results of the online survey conducted during the summer of 2019 point to a decline in trust in the local and national leaders, particularly when it comes to the respondents' belief in the efforts made to achieve peace and restore physical and economic security for the population. While *de jure* protections are in place for freedom of speech, assembly, and the right to information, violence has increased since 2014 against demonstrators, civil society organizations, and the media, and any type of fiscal transparency has been discontinued.

Going forward, the needs related to improving Yemen's governance environment are both as broad—spanning a variety of institutions responsible for core government functions and the delivery of services—as they are deep—involving multiple layers of society and political economy webs necessary to restore the social contract and levels of trust. While the sequencing of recovery efforts will be dependent on several factors related to the evolution of the situation on the ground, a number of institutions, routine processes, and policies will need to be reinstated to ensure effective, accountable, and inclusive governance systems. First, it is critical to support the restoration of core governance functions, including the provision of basic services, building legitimacy for an eventual new government, as well as supporting the formation of a new social contract. This could be achieved by reviving normal budget operations and Yemen's revenue management and administration capacity, which will include increasing both indirect and direct taxes, as well as re-establishing customs administration facilities in key ports. Such a process might begin with the development of a unified emergency budget and include a simple mechanism for selection and allocation of funds for reconstruction, which could be prioritized in the context of a Recovery and Peacebuilding Needs Assessment (RPBA). In parallel, it is necessary to assess the institutional capacity of different local and national institutions in order to develop a concrete plan to reactivate the critical service delivery systems, essential to rebuild trust and legitimacy in the government and mend the social contract. Therefore, it will be critical to restore the CBY's operations, rebuild cash balances in the Treasury Single Account, restart the Accounting and Financial Management Information System (AFMIS), conduct an inventory of arrears, as well as resume public investment management systems. These efforts should be complemented by the reactivation or introduction of fundamental controls to prevent fiscal leakages during the recovery period, including support for institutions overseeing national procurement and flexible procurement arrangements. All of these needs should be addressed in a sequenced, integrated, and strategic manner in order to restore gradually the integrity of Yemen's public financial management system, without which recovery will lack the required domestic and external support and could even hinder the peacebuilding process by creating more grievances.

Equally important for the government's ability to deliver services and restore trust and legitimacy, are a strong and capable public service as well as basic accountability institutions. In the short-term, the government needs to resume the payment of civil servant salaries in order to ensure that vital health, education, and water and sanitation services do not collapse, thus allowing for some restoration of the population's trust in the government's ability to respond to their needs. In the medium-term, the government will need to address wider civil service reforms to ensure accountability and fairness in recruitment, control over the public sector wage bill, as well as the necessary human resource capacity for service delivery. Likewise, to strengthen public accountability, the government needs to restore key citizen engagement mechanisms, including those for complaints and redress, as a positive measure for restoring trust and promoting inclusion in the short-term. In the medium-term, specific measures may include improving budget transparency and citizens participation in policy formulation and monitoring, as well as supporting larger national anticorruption strategies and institutions.

Social Resilience

The conflict has had a significant impact on Yemen's society, and has strained relationships between social groups, entrenching divisions along political, geographic, and tribal lines while also creating new ones. It has undermined traditional tribal conflict-resolution mechanisms in a context of increased violence and competition

for resources. The conflict has deepened the vulnerability of groups such as women and created a large population of internally displaced persons (IDPs).

Despite these tensions, there have been reports of community solidarity and social resilience across Yemen. Faced with substantial challenges, community members and tribal leaders, as well as women and youth leaders have come together to address urgent public service deficits, such as in water distribution, solid waste cleanup, basic health services, formal and informal education, as well as mediation and peace-building efforts at the local level. Working with local actors can create opportunities to foster collaboration between groups and communities to manage reconstruction efforts, delivery of services, and development of infrastructure. This would be the first step in a long and arduous process of moving toward broader community resilience.

Local councils and civil society organizations (CSOs) have been stepping up to take greater responsibility for the management of local resources and to liaise with humanitarian actors. Basic services that are provided in an inclusive manner at the municipal level need to be identified and supported to the extent possible. Approaches that promote the interface between local governance structures and communities may improve overall governance, coordination, and provision of services. In this regard, efforts should be made to collaborate closely with local nongovernmental organizations (NGOs) that are already engaged in communities. Current efforts to promote community engagement in the planning and provision of public services and infrastructure ought to be scaled up, and community-based services that address the needs of vulnerable groups such as women and girls, former combatants, survivors of violence, and those affected by trauma need to be supported.

A coherent and comprehensive response is required to address the IDP situation, starting with a detailed profile of the various segments of the IDP population. Ongoing conflict-sensitive youth policies, including those that foster employment opportunities, skills development, and youth leadership and empowerment need to be brought to scale. Any efforts to promote social solidarity, community trust, and collaboration should take into consideration societal realities on the ground. Instead of aiming to “restore” the previous status quo, recovery efforts at the community level should build on transformations, some of which are positive and offer potential entry points for programming. Opportunities to promote citizen participation, including through the use of new technologies, need to be further supported.

Education

Across the 16 cities assessed in the third phase of the Yemen Dynamic Needs Assessment (DNA Phase 3), about 35 percent of education facilities have suffered some degree of damage, and 3 percent are completely destroyed. Around 80 percent of assessed education facilities are functioning. Secondary schools compose the largest share of nonfunctional facilities. Of cities, Sa'da is the worst off: 62 percent of education facilities are reported as damaged and only 22 percent as functional. In Taiz, 58 percent of facilities are either damaged or destroyed. In Sana'a, 30 percent of the 539 assessed facilities, representing about half of all assessed education facilities in Yemen, have been partially damaged or fully destroyed. *Total damage to the education sector in the 16 cities assessed is estimated to range between US\$153 million and US\$187 million.*

Until recently, there has been no central budget in Yemen since 2014, and the civil service has been severely impacted by the crisis. The majority of teachers' salaries in some regions have gone unpaid for several years now, and there is a shortage of textbooks. A lack of basic services—water and sanitation, electricity—and insecurity around schools pose major challenges. Some schools have been occupied by armed groups or used as shelters for internally displaced persons, further limiting access to education for children in those communities. It should be noted that several humanitarian aid agencies have significantly helped rebuild damaged education facilities, and communities in Yemen have shown a high degree of resilience during the years of conflict. Yet the damage is

profound. *The overall recovery and reconstruction costs of rebuilding the education sector in the 16 cities assessed are estimated to range between US\$411 million and US\$502 million.*

Priority interventions need to consider infrastructure reconstruction as well as service delivery. While the reconstruction of partially and fully damaged education facilities is a priority, focusing on the restoration of education services, particularly at the basic education level, is of utmost importance in the short-term.

Food Security

Yemen is facing an unprecedented food security crisis.¹⁴ The Integrated Food Security Phase Classification (IPC) analysis conducted from December 2018 to January 2019 indicated that a total of 15.9 million people, representing 53 percent of the population, are severely food insecure, despite the ongoing humanitarian food assistance. This figure includes 17 percent of the population (about 5 million people) classified in IPC Phase 4 (Emergency) and 36 percent (about 10.8 million people) in IPC Phase 3 (Crisis), as well as an additional 63,500 people in IPC Phase 5 (Catastrophe).¹⁵ Almost two million children under the age of five are estimated to be affected by acute malnutrition, of which 360,000 are suffering from severe acute malnutrition. In addition, almost a quarter of women of childbearing age are malnourished, with the increased risk of poor pregnancy outcomes.

Three-quarters of all surveyed households indicated that their economic situation had worsened during the crisis. The DNA shows that loss of agricultural income in particular, loss of income from other sources, and a spike in the prices of basic food staples due to scarcity underlie the dramatic rise in food insecurity. The conflict has severely disrupted food markets, transportation, and distribution, threatening food-insecure populations that are also the least likely to have access to basic services, such as water and electricity. At the governorate level, flows of internally displaced persons (IDP) put pressure on both food supplies and prices, with outsized effects on particular cities and governorates. The costs of recovering food security in the 15 governorates assessed in the DNA Phase 3 are estimated at between US\$2.5 billion and US\$3.1 billion over five years.

Priority interventions in the short-term include restoring agricultural input and output markets; expanding cash-for-work programs; and assisting conflict-affected small-scale farmers, livestock producers, and fishermen to return to production. In the medium-term, the Republic of Yemen must develop a new strategy and approach to revitalize the entire sector, including by addressing water scarcity, supporting value chain development, and defining policies for agribusiness reform.

Health

About 38 percent of Yemen's health facilities sustained some degree of damage, with around 2 percent of health facilities shown to be completely destroyed. Sa'da suffered the greatest impact: 78 percent of its health facilities were reported as damaged or destroyed. Taiz was the second-most-affected city; here, 50 percent of facilities were either damaged or destroyed. As for operational status, Sa'da reported 86 percent of its health facilities as not functioning. Across the 16 DNA cities, only 49 percent of health facilities of all types were functioning. Private

14 The Declaration of the World Summit on Food Security defines the concept as follows: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Declaration of the World Summit on Food Security, FAO, 2009, p. 1).

15 The Integrated Food Security Phased Classification (IPC) is an international interagency working group that uses standardized protocols (tools and procedures) to respond to the need for a common approach for classifying various food insecurity situations, within and among countries, and across time. Acute food insecurity is classified according to 5 phases: (1) None/Minimal; (2) Stressed; (3) Crisis; (4) Emergency; and (5) Humanitarian Catastrophe/Famine.

hospitals made up the highest share of nonfunctional facilities in relative terms. *Total damage to the health sector in the 16 DNA Phase 3 cities is estimated to range between US\$605 million and US\$740 million.*

The needs assessment shows that shortages in medical supplies, drugs, fuel, and critical medical staff, in addition to limited access to the electricity grid and the shortage of diesel fuel for standby generators are the major challenges hindering health facilities' functionality. Moreover, most health care providers have not been paid for several months due to the fiscal crisis and other complexities. *Overall recovery and reconstruction needs in the health sector in the 16 DNA Phase 3 cities are estimated to range between US\$1.3 billion and US\$1.6 billion.*

Priority interventions need to incorporate infrastructure reconstruction needs and soft needs, such as addressing the immediate challenges precipitating the acute shortage of health staff to restore service delivery. It is also important to strengthen the rapid response system to better prepare for future crises, and to strengthen public health interventions, such as prevention and control of communicable diseases; immunization against childhood preventable diseases; and emergency reproductive, maternal, and child health interventions.

Housing

This analysis indicates that 41 percent of all housing assets in the 16 assessed cities have been subject to damage, most of it partial and indirect (that is, collateral damage). In relative terms, nonstandard units are the most affected, followed by houses and apartment buildings. However, if housing assets are expressed in units instead of buildings, apartments are the most affected asset type in absolute terms. Housing damage is spread unevenly across the 16 cities. Taiz, Mocha, and Sa'da have been severely affected, with more than 60 percent of their housing stock damaged. In Sana'a, the largest city in Yemen, 40 percent of the housing stock has been affected to some extent. Given the large size of Sana'a, its damaged housing stock alone represents 38 percent of all damage in the 16 cities. Sana'a, together with Taiz, Aden, Hodeidah, and Sa'da, represent more than 90 percent of the damaged housing stock in the 16 cities. *Total damage to the housing sector in the 16 DNA cities is estimated to range between US\$5.1 billion and US\$6.2 billion.*

Yemen's growing housing needs cannot be disentangled from pre-crisis conditions that have been further exacerbated by the conflict. Three segments of the population—namely IDPs, returnees, and many of those who remained where they live—have been affected by the conflict. As the needs of these groups differ, supporting them will require distinct approaches and flexible solutions. This includes approaches to infrastructure rehabilitation, service restoration, land and property solutions, dispute resolution, compensation, subsidies, and structure rehabilitation, among others. Efforts to address emerging needs should be strategically phased over time, prioritizing a subset of the population at a time. It is necessary to leverage all available public and private resources to meet immediate and future needs. *Overall recovery and reconstruction needs in the housing sector in the 16 DNA cities are estimated to range between US\$7.6 billion and US\$9.3 billion.*

Housing sector priorities going forward are twofold: immediate recovery and long-term development. In the short-term, it is important to articulate a strategy to address the shelter needs of the conflict-affected population and pilot an emergency shelter assistance program that focuses on the needs of high-priority communities. These first steps will enable subsequent investments in the restoration of basic services and provision of flexible shelter solutions to address the differing needs of the affected groups. In the long-term, housing sector development requires launching a series of reforms to address the systemic issues facing the sector along the supply and demand value chain.

Information and Communication Technology

About 19 percent of mobile network assets have been damaged, and 6 percent completely destroyed. These figures are likely an underestimation, however, since assets such as towers and shelters may not always be visible through satellite imagery. In the face of tremendous obstacles, mobile operators have continued to restore and reconstruct their towers and networks whenever possible to maintain service. Of the 16 cities analyzed during the third phase of the Dynamic Needs Assessment (DNA Phase 3), Hodeidah was the hardest hit with US\$1.1–1.4 million in terms of damage costs. Sa'da was the second-most affected by conflict, with US\$0.6–0.7 million in damage costs. While it is not possible to make a city-level assessment of fiber and copper lines, the cost of damages incurred to the national fixed backbone network was reportedly over US\$47 million as of end-2017.

Mobile operators are facing insurmountable pressures from high fuel prices, blockades of equipment imports, and the difficult-to-predict costs of conducting transactions outside a legal and regulatory framework. Mobile phone penetration has fallen by 11 percent since 2015, indicating that some citizens are losing access to communication services. The availability of communication infrastructure, for both basic voice and Internet, is essential to facilitate residents' return to affected areas, and to keep families connected, and is a cornerstone of the development of commercial and economic activities. Access to mobile phone services, in particular, becomes critical in crisis situations, when information regarding military action, medical assistance, food and water supplies, and the location of family members may mean the difference between life and death. *The overall recovery and reconstruction needs of the mobile segment of the telecommunications sector in the 16 cities assessed are estimated to cost between US\$6.1 million and US\$7.5 million.*

Priority interventions need to incorporate not only investment in infrastructure but also the reinforcement of the legal and regulatory framework. This will in turn facilitate an enabling environment for a competitive and adaptable telecommunications market. Telecommunications by nature thrive on increased connections between people, not their segmentation. The strength and resilience of any national communications network thus depends on open access across geographical and regulatory areas. Once this is achieved, value added services such as mobile money and mobile banking would further support recovery and reconstruction.

Power

Persistent conflict has significantly degraded infrastructure critical to Yemen's power sector. About 49 percent of the assessed power sector assets, excluding towers,¹⁶ show some degree of physical damage,¹⁷ with 5 percent of power sector facilities completely destroyed. Five cities, including Dhamar, Khoka, Rada'a, Sa'da, and Taiz, completely lack access to public electricity service. Only Lodar, Ma'rib City, and Mocha are reported to have relatively reliable electricity service. While much of the lack of functionality is due to conflict-induced physical impact—particularly in Taiz and Sa'da—the power sector also faces challenges due to fuel shortages, lack of proper maintenance, looting, and lack of financing. Across the 16 cities¹⁸ covered in this sectoral assessment, only 12 percent of power sector facilities¹⁹ are fully functioning.

The needs assessment shows that restoring public service delivery in the assessed cities would require: (i) rehabilitating the physical infrastructure (estimated between US\$738–902 million over five years), and (ii) restoring

16 Towers are excluded from these figures due to their large number (259) and comparatively low unit cost (US\$6,025) compared to e.g., US\$4.5 million for a transmission substation), which skews the distribution of physical impact.

17 This figure includes assets that are partially damaged or fully destroyed.

18 Fifteen cities are focused on in this chapter because of lack of data on Khoka.

19 Excluding towers.

fuel supplies and system operations (estimated at US\$261–319 million annually). The reconstruction effort would require a comprehensive approach to grid rehabilitation, including replacement and reconstruction of critical components of power plants and transmission and distribution substations, as well as civil works to repair and replace distribution towers and cables. This would involve significant international and domestic procurement and contracting to qualified partners.

Given the extent of the damage, a phased approach that focuses on restoring electricity to critical public service facilities should determine the priority and sequencing of grid rehabilitation. In the short-term, public electricity supply could be restored via municipal or regional grids. This would involve investments in transmission and distribution grids, as well as the restoration of fuel linkages and of a solar sector driven by the private sector. To restore the functionality of the national grid, large-scale infrastructure—including transmission lines, power plants, and new utility-scale capacity—would need to be reconstructed over the medium- to long-term (three to five years). *Overall recovery and reconstruction needs in the power sector in the 16 assessed cities are estimated to cost US\$2.0–2.5 billion over 5 years.*

Technical solutions and supply chains for distributed generation, driven largely by the private sector, have emerged as coping strategies during the conflict. Short-term support should focus on strengthening these service delivery models, with the aim of both supporting the development of the supply chain and expanding access to low-income households and critical services. In particular, privately supplied distributed energy sources—both diesel generators and solar panels—could be used to restore electricity services to critical facilities in the health, water, and agricultural sectors.

Social Protection

The conflict in Yemen has led to a massive increase in the poverty and vulnerability of local populations amid rising unemployment, nonpayment of salaries, destruction of productive assets, collapse of subsidies, inflation, and multiple and successive shocks. This has intensified the need for social safety nets. Meanwhile, those programs that covered some portion of the population before the crisis now face funding, operational, and capacity constraints on their ability to provide effective social protection.

Yemen's social protection architecture consists of (i) social assistance and (ii) social insurance. Social assistance is provided primarily through programs run by the Social Welfare Fund (SWF) and Social Fund for Development (SFD). The SWF's targeted unconditional cash transfer program, which covered 1.5 million households before the crisis, would now need to cover an estimated 1.85 million households, incurring a total cost of US\$2.11 billion over a five-year period to provide coverage comparable to pre-crisis levels. The SFD would require an additional US\$1.2 billion over the next five years to bring its operational service delivery up to pre-crisis levels (including for the cash-for-work program). The operating costs and infrastructure damages to both these institutions are estimated at US\$100 million over five years. To reinstate pension funds (not including to the security and military sectors) would require another US\$968 million over five years.

Several other developments attributable to the conflict, such as increased insecurity and economic uncertainty, and reduced mobility and access to services have also affected the social protection and jobs landscape in Yemen. These are not easy to quantify in monetary terms, but are nonetheless significant. Factors such as firm closures, layoffs, unemployment and underemployment, nonpayment of public sector salaries, women's reduced labor force participation, a shrunken resource base for pension funds, the weakened capacity of national social protection institutions and their policy coordination, and uncertainty regarding remittances from Gulf Cooperation Council (GCC) countries accentuate the need for social protection in the months and years to come.

To restore the social protection sector, including social assistance and pensions, to its pre-crisis levels would require an estimated US\$3.9–4.8 billion over a five-year period.

Solid Waste Management

The conflict has had a significant impact on the solid waste management sector, which was already facing challenges before the crisis. Among other effects, waste collection has slowed down due to a lack of fuel, damaged or stolen equipment, citizens using alternatives to disposal sites, an influx of internally displaced persons (IDPs) placing additional pressure on the system, and a reduction in the tax revenues of local authorities, which led to a halt in salary payments to public sector workers. In the capital of Sana'a, trash removal was perceived to be insufficient in most neighborhoods, and only three dumpsites serve the entire city. In Hodeidah, residents described current trash removal as insufficient or nonexistent in 15 of the 16 neighborhoods surveyed. In Taiz, solid waste management has come to a virtual standstill. *Total damage to the solid waste management sector in the 16 DNA Phase 3 cities is estimated to range between US\$6.5 million and US\$7.9 million.*

To restore Yemen's solid waste management system back to its pre-crisis condition, investments in (i) waste removal; (ii) waste collection, transport, and disposal; (iii) waste transfer stations; and (iv) disposal facilities are needed in the short and medium-term. The upgrade of dumpsites to sanitary landfills is considered a long-term measure. *Overall recovery and reconstruction needs in the 16 DNA Phase 3 cities are estimated to range between US\$12 million and US\$15 million.*

The most immediate priority is the collection of solid waste from streets in urban areas, with the objective of supporting public health by restoring an environmentally and hygienically acceptable situation. The existing dumpsites will need to be made ready for urgent, immediate waste covering and levelling.

Transport

The ongoing crisis in Yemen has severely impacted the country's transport infrastructure, with major roads, bridges, ports, and airports partially damaged or destroyed during the past three years. About 29 percent of the total intra-urban road network shows some degree of damage, and 1,511 kilometers (km) have been completely destroyed. Three cities (Al Hazm, Taiz, and Sa'da) have seen 50 percent or more of their road infrastructure damaged, with Al Hazm having the highest damage, at 70 percent, followed by Taiz and Sa'da at 51 percent. In terms of kilometers of road damaged, Sana'a (396 km), Hodeidah (254 km), and Taiz (218 km) have the highest number, representing nearly 60 percent of the total. Damage has also been incurred to ports, including the Port of Hodeidah, the nation's key entry point for food imports, significantly hampering its capacity. Sana'a, Aden, Hodeidah, and Taiz airports sustained heavy damage, and remain closed or have had limited operations since the start of the conflict. *The total damage to the intra-urban roads infrastructure, including street lighting, in the 16 cities considered in the DNA Phase 3 is estimated to cost between US\$240 million and US\$293 million. At the governorate level, transport sector's damage costs, including of both intra- and inter-urban roads, bridges, ports, and airports is between US\$780 million and US\$953 million.*

Apart from physical damage to the road network, mobility and access to markets and services remain limited due to shortages of fuel supplies, neglect of maintenance, high transportation costs, and road blocks, increasing the costs of transportation. The conflict has led to the stoppage of major road and transport infrastructure projects, including the routine maintenance of roads and bridges, thus eliminating income-earning opportunities for thousands of workers throughout the country. Labor-based maintenance and rehabilitation interventions need to be undertaken to improve mobility and access. In addition, the Port of Hodeidah needs to be restored, as Yemen imports nearly 90 percent of its food through this crucial facility. Sana'a International Airport, the largest hub of

passenger air travel, needs to be fully reopened. *Overall recovery and reconstruction needs in the transport sector in the 16 cities assessed are estimated to be between US\$363 million and US\$443 million over a five-year period. This estimate becomes US\$1.2–1.4 billion at the governorate level, which includes large port and airport infrastructure.*

Priorities for the transport sector in the short-term include, among others, rebuilding 5,000–6,000 km of critical roads, rehabilitating crucial airports and ports, delineating clear roles and responsibilities for road maintenance, and mobilizing financing for road maintenance and rehabilitation. In the medium- to long-term, the business-as-usual functioning of the Ministry of Public Works and Highways (MoPWH) needs to be reestablished. It will also be critical to restore sustainable financing to the sector.

Water, Sanitation, and Hygiene

The conflict in Yemen has had a dire effect on the performance of water supply and sanitation facilities in the country. Of the water supply, sanitation, and hygiene (WASH) assets analyzed in the DNA Phase 3, an estimated 38 percent were affected, with 28 percent estimated to be damaged and 10 percent destroyed. The functionality of assets varied greatly; apart from a destroyed desalination plant in Hodeidah, sewage lifting and pumping stations had the lowest level of operational functionality, followed by sewage pressure trucks and water tower/tanks. WASH assets in Hodeidah and Taiz sustained the greatest damage when considered as a share of these cities' total WASH assets (both at 60 percent). But if the damage is expressed in dollar terms, Sana'a takes the lion's share (25 percent of total WASH damage costs), followed by Taiz and Aden (each 18 percent), and then Hodeidah (13 percent). *Total damage to the WASH sector in the 16 cities considered in the DNA Phase 3 is estimated to cost between US\$283 million and US\$346 million.*

To restore services in the near term, it will be essential to secure fuel in order to operate facilities such as pumping stations, wastewater treatment plants, and wells. While fuel is an expensive energy source and suboptimal due to greenhouse gas emissions and the limited scope of its application, it is a practical one when time is short. In the medium-term, off-grid renewable energy solutions like solar and wind could be better utilized. *The estimated recovery and reconstruction needs for the short- and medium-term are between US\$763 million and US\$932 million.*

In the long run, electricity generation and transmission infrastructure needs to be rehabilitated to ensure a reliable and affordable energy source for treatment plants, pumping stations, and other key WASH infrastructure. There is also a need to repair or replace equipment and machinery used in operating WASH assets. In addition, equipment and spare parts need to be procured and meters reinstalled where they have been destroyed or damaged. New construction will be needed to replace destroyed infrastructure, and it will be crucial to nurture the capacity of WASH sector institutions so that any recovery efforts are sustained and WASH service delivery and access continue to improve.

Toward Recovery and Resilience

As Yemen moves toward peace, the findings of the DNA series can serve as important analytical underpinnings for a more detailed prioritization and sequencing of recovery needs, for example through follow-up assessments or a more comprehensive RPBA. The sheer size of the recovery needs, coupled with the limited amount of domestic and international financial resources, require a careful approach towards needs prioritization and sequencing that should be based on the following guiding principles:

National leadership and ownership: Strong buy-in from the GoY and national institutions will be critical to ensure that the recovery process contributes effectively to the creation of citizen-state trust and social cohesion. The GoY and national institutions will have the ultimate responsibility to ensure successful implementation of

recovery interventions and the appropriate use and allocation of resources. Dedicated capacity building initiatives might be necessary to ensure sufficient absorptive capacity of national institutions for effectively coordinating this process.

Access and equity: Throughout the recovery process, the Government must strive to provide accessible, equitable, and affordable services and opportunities to all of its citizens, which will be critical to create broad-level trust between citizens and the state.

Community participation, civil society, and the private sector: Involving civil society organizations (CSOs), local communities and the private sector will be important to ensure a successful and inclusive recovery process. CSOs tend to be well connected with local communities and can play an important role in both the prioritization and implementation of recovery interventions. Increased community participation in planning and implementation of interventions, combined with an increased sense of community responsibility in the ownership and maintenance of service facilities and community infrastructure, will help rebuild trust in the Government. Finally, the private sector can mobilize sizeable funding and expertise, and will play a key role in infrastructure rehabilitation.

Centralized planning and coordination, and decentralized implementation: While the national government will have to play a critical role in planning and coordination recovery investments, implementation at the local level should be actively promoted. This includes ensuring clear mandates and sufficient financial resources and capacity of local government institutions.

Building back better and smarter: In order to address some of the underlying drivers of conflict and instability in Yemen, the recovery needs to go beyond a return to the status quo that prevailed before the crisis. For example, the recovery process should ensure that recovery efforts take into account forward-looking peacebuilding dividends as well as additional shock and stress factors, such as natural disasters, climate change, pandemics, and other crises.

Conflict sensitivity and ‘Do No Harm’: To ensure that the recovery priorities do not exacerbate pre-existing conflict dynamics and contribute actively to peacebuilding and social cohesion, they should be based on a solid and regularly updated conflict analysis that can help direct and adjust priorities and interventions as needed. Sources of conflict that have existed prior to the crisis will need to be addressed and integrated into the recovery response. As the crisis in Yemen has been characterized by significant forced displacement, the recovery process will also need to address the needs of both the displaced and their host communities in order to avoid creating tensions between these two groups.

Targeting the most vulnerable: Throughout the recovery process, special attention needs to be given to the most vulnerable segments of the population, including women, children, youth, the elderly, IDPs, and people with disabilities, which have likely suffered disproportionately from the crisis. The needs prioritization and sequencing process should rely on a bottom-up and participatory approach to ensure that the needs and priorities of the most vulnerable are addressed in recovery interventions.

Transparency and communication: The recovery process in Yemen should be based on a transparent approach with inclusive consultations of national, regional, and local stakeholders. To ensure sufficient buy-in for Yemen’s recovery vision, objectives, and priorities, clear and transparent communication of the prioritization and sequencing process, and its findings will be important to ensure people’s trust in the process. Citizens also need to be made aware of services, assistance packages, grants, and credit opportunities that become available as part of the recovery process.

1

Education

Pre-crisis Sector Conditions

Before 2015, indicators of access, quality, and equity suggested that the education sector was fragile but improving. Yemen had made progress in expanding access to basic education. The net enrollment rate in basic school increased from 65 percent in 1999 to approximately 85 percent in 2013.²⁰ Girls' enrollment in basic education increased during that period from 44 percent to 76 percent. Despite these considerable achievements, Yemen was far from reaching the Millennium Development Goal (MDG) target that all boys and girls complete basic education by 2015. Completion rates remained low, with only 67 percent of those who entered Grade 1 completing their basic education. The net enrollment rate in secondary school was 50 percent for boys and 36 percent for girls in 2013, indicating a low transition rate from basic to secondary education. With a gross enrollment rate of less than 1 percent, early childhood education was in short supply. In 2011, the adult literacy rate was 80 percent for men and 45 percent for women, and among youth aged 15–24, these rates were 96 percent and 72 percent, respectively.²¹

Before the conflict, the education sector was highly centralized. The Ministry of Education (MoE) in Sana'a was the single entity that supervised early childhood, basic, and general secondary education policy development and service delivery, coordinating closely with local and international development partners.

According to the MoE's Midterm Results Framework of 2012, Yemen's education sector suffered from a US\$250 million financing gap, including support for out-of-school children and girls in rural areas, as well as interventions for adult literacy and special education. The level of school autonomy and accountability was uneven across districts and governorates. Engagement with the private sector was also limited.²²

Sectoral Damage Assessment

Aggregate Analysis

This assessment covers 1,311 education facilities, including basic education schools (501), schools that provide both basic and secondary education (280), secondary schools (97), vocational schools (29), and colleges and universities (89), as well as local education offices (6).²³ The analysis reveals that as of early 2020, 32 percent (413 facilities) of all education facilities have been partially damaged; less than 3 percent are destroyed (36 facilities). Of the 501 basic schools across Yemen, 33 percent (163) have been damaged and less than 3 percent (14) destroyed.²⁴

20 UIS Statistics: <http://uis.unesco.org/en/country/ye>.

21 World Bank: <data.worldbank.org/country/yemen-republic>.

22 World Bank, SABER School Autonomy and Accountability Survey 2015.

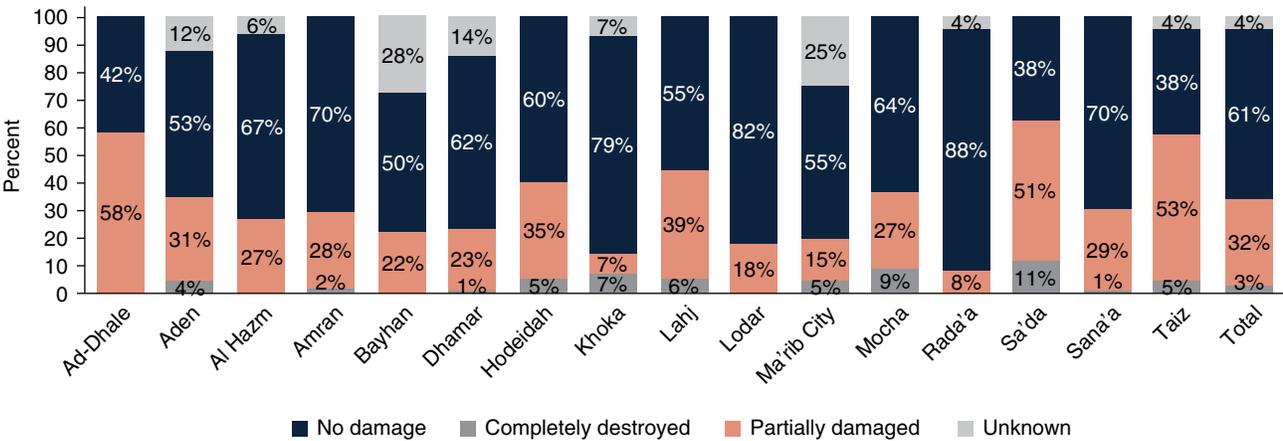
23 Another 309 education facilities could not be correctly categorized; they are referred to as "unknown" education facilities.

24 Of the 280 combined basic and secondary schools, 190 (27 percent) have been damaged and 10 (less than 4 percent) destroyed. Thirteen of the 29 vocational schools and 26 of the 89 colleges/universities have been damaged or destroyed.

It is important to note that the intensity of the damage and its effects vary by city (figure 1.1). In the case of Taiz, 58 percent of the 131 education facilities assessed have been damaged or destroyed, in contrast to 8 percent of the 24 education facilities in Rada'a. In Sana'a, 30 percent of the 539 assessed facilities, representing about half of all assessed education facilities in Yemen, have been damaged or destroyed.

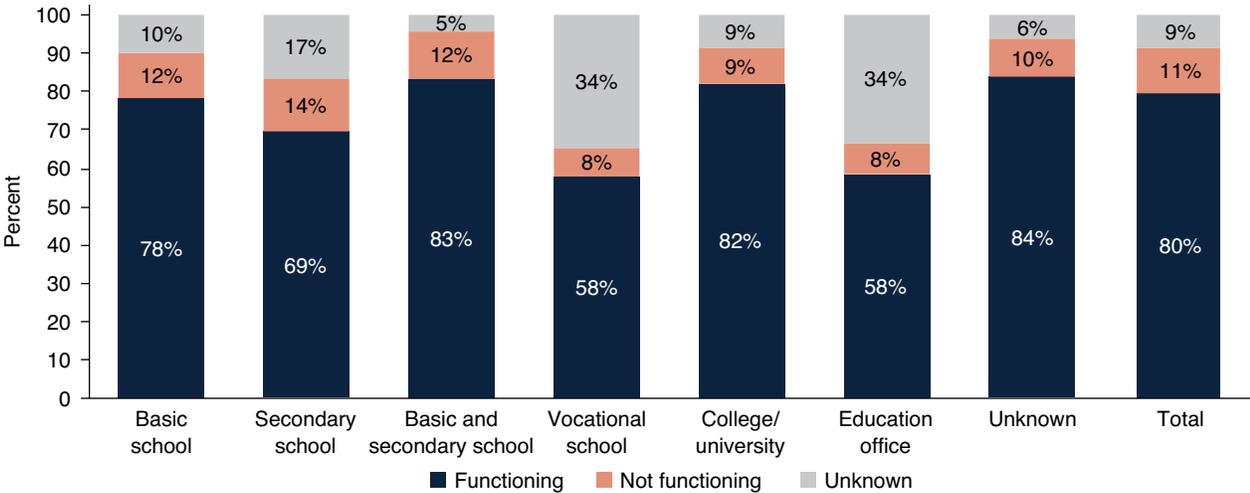
In addition to damage and destruction, the DNA Phase 3 also seeks to estimate the aggregate impact of the crisis on the functionality of education facilities (figure 1.2). In total, 80 percent of all education facilities are estimated to be functioning, 11 percent are not functioning, and the operational status of 9 percent remains unknown. Of basic, combined, and secondary schools, about 79 percent are functioning, 12–14 percent are not functioning,

FIGURE 1.1 Physical Status of Educational Facilities in 16 Cities (2018)



Source: World Bank estimates.

FIGURE 1.2 Operational Status of Education Sector by Asset Type



Source: World Bank estimates.

and the operational status of the remainder is unknown. Only 58 percent of the 29 vocational schools are functioning, while the operational status of 34 percent is unknown. Colleges/universities seem less affected: 9 percent are not functioning, and the operational status of another 9 percent is unknown.

Textbooks are scarce because printing has been disrupted, and teachers have not been paid for several years now resulting in many teachers leaving in pursuit of other work. Conflict-related damage and the conversion of schools to IDP shelters (for example, in Mocha and Taiz), and shortages of electricity and running water (as in Hodeidah) pose difficult challenges. An influx of IDPs has led to overcrowding in those schools that are functioning. Despite these challenges, there are reconstruction efforts and local initiatives to provide relief, revive schools, and respond to public health risks, such as a recent cholera outbreak.

City-Level Analysis

Dhamar

Dhamar's education sector appears largely undamaged and largely functional as of January 2020. Of the 97 education facilities that were assessed, 60 had not been damaged (62 percent), 22 were partially damaged (23 percent), and one facility had been destroyed.²⁵ Of the facilities assessed, all are estimated to be functioning with the exception of one facility. A lack of textbooks, shortage of teachers, and the use of schools for noneducational purposes are the key challenges impacting the education sector in Dhamar. Textbooks are scarce because textbook printing has been disrupted in other parts of the country. Teachers in Dhamar have not been paid for several months, prompting them to go on strike or leave their profession in pursuit of other work.²⁶ The Dhamar Office of Education and Health launched a campaign to raise awareness of the risk and prevention of cholera targeting 70,000 students across 50 schools. The Dhamar Municipal Services Department also partnered with schools to implement a cleanliness awareness campaign among students. Reconstruction of school facilities in Dhamar appears to be limited, as of January 2020.

Hodeidah

In the city of Hodeidah, 112 education facilities were assessed: 67 education facilities had not been damaged (60 percent), 39 were damaged (35 percent), and six fully destroyed (5 percent). This includes damage to two of Hodeidah's major universities, which have been forced to consolidate or relocate due to extensive damage to their facilities. In terms of functionality, around 70 percent of all education facilities are considered as functioning as of January 2020. According to a statement from the United Nations Children's Fund (UNICEF) from November 2018, more than 60,000 boys and girls were out of school because of the fighting in and around the city.²⁷ The sector has also experienced shortages of teachers, supplies, and educational material. The UNICEF reported in October 2017 that 12,000 teachers were on strike to demand payment of their salaries. According to a local media report from November 2017, ongoing water shortages had reduced student attendance at local schools as families were pulling their children out of school in order to fetch water for their households. In addition, shortages of electricity and running water throughout Hodeidah had impacted the functionality of schools. In Hodeidah, schools have played an important role in educating and raising awareness about communicable diseases and public health, especially in light of recent cholera and diphtheria outbreaks. Many schools had also organized schoolyard clean-up campaigns for their students, promoting both health and environmental awareness.

25 The physical status of 14 education facilities in Dhamar is unknown.

26 See: <http://almasdaronline.com/article/89295>.

27 <https://www.unicef.org/mena/press-releases/conflict-shuts-third-schools-yemens-port-city-hudaydah>.

Ma'rib City

In Ma'rib City, 20 education facilities were assessed: 11 had not been damaged, four had been damaged, and the physical status of five is unknown. 80 percent of facilities were estimated to be operational, as of January 2020. The significant IDP influx into Ma'rib City has likely reduced overall facility- and sector-level functionality. For example, the number of students increased by more than 50% between 2015 and 2018.²⁸ In addition, at least three education facilities appear to have been converted to IDP use as of October 2019 based on information from the International Organization for Migration (IOM). While one IDP camp in the city had dedicated education facilities, children at other camps attended public schools, which were reportedly overcrowded and experiencing shortages of teachers and supplies.²⁹ To respond to this influx of IDPs, the local education authorities have set up temporary education facilities. For example, a March 2019 local media report claims that local government officials opened five new schools for IDPs in Ma'rib City to relieve overcrowding.³⁰ There are also signs that the sector has undergone systematic rehabilitation and expansion efforts over the last 18 months. For example, the Saba Regional University, Ma'rib's main higher education facility, is expanding and is reportedly preparing to open departments of medicine, literature, and mining engineering as of September 2019. Despite these positive developments, teacher and textbook shortages continue to pose significant challenges to sector functionality; as of March 2019, the governorate as a whole only employed 379 teachers.

Mocha

In the city of Mocha, 11 education facilities were assessed. Of these, seven were not damaged, three damaged, and one destroyed. Sector functionality has been significantly impacted by IDP inflows. Several schools have been converted into IDP shelters, and mosques have reportedly been converted into temporary classrooms—albeit without chairs, desks, or educational materials. Other temporary classrooms are located under tents or in partially damaged schools. Teachers at these schools appear to be frequently unpaid volunteers with no teaching credentials. Overall, teacher and textbook shortages, high rates of student dropouts, and frequent school closures pose challenges to service delivery.

Sana'a

Of the 539 education facilities assessed in Sana'a, 377 (70 percent) were undamaged, 156 (29 percent) partially damaged, and 6 (1 percent) fully destroyed. Qualitative reports confirm these figures, estimating that a third of all education facilities were damaged and that 28 percent of the city's school-age population was without access to formal education as of April 2018. Overcrowded schools, a lack of textbooks, and a shortage of teachers due to unpaid salaries all impact service delivery in the city. As of October 2017, for example, public schools were not fully operating because of a widespread teacher strike protesting two years' worth of unpaid salaries. Attempted political influence over textbooks and curricula has limited the availability of textbooks in the city and nationwide, and printing has been disrupted. Efforts at schools go beyond education to address health issues. Cholera and diphtheria outbreaks have impacted students, and immunization campaigns at schools are being supported by international organizations. Other local humanitarian efforts include the distribution of school bags, food baskets, and (winter) clothing to impoverished students via schools. More recently, there is anecdotal evidence of widespread small-scale rehabilitation efforts as of January 2020. Social media posts by and about education facilities showcase clean-up efforts and newly repainted courtyards and buildings. The partial resumption of teacher salaries may also have increased functionality within the education sector.

28 In 2015, taken as the benchmark, the number of students was 60,000. In 2018, the number of students exceeds 90,000 (information provided by the Ma'rib Governorate).

29 IOM Yemen, *Ma'rib City Displacement Sites*, August–October 2019.

30 https://Ma'rib-gov.com/news_details.php?sid=1377.

Taiz

In the city of Taiz, of the 131 education facilities assessed, 50 were found to be undamaged (38 percent), 69 damaged (53 percent), and 6 destroyed (5 percent). More than 30 percent of schools in Taiz are estimated as being not functional and many are closed due to continued violence, unrepaired damage, and occupation by armed forces. Staff at public schools, including Taiz University, have not been paid since 2016. Overall, the education sector remains far below pre-crisis capacity, with anecdotal evidence suggesting low enrollment rates in higher education and extremely limited classroom materials. For example, social media posts from October 2019 show images of students sitting in schoolrooms with unfinished cinderblock walls and no blackboards or desks. Despite these challenges, there is evidence of widespread efforts to revive and physically rehabilitate the city's schools. Many facilities show evidence of local-level rehabilitation efforts, such as students repainting walls or local charities cleaning up schoolyards. Government initiatives have provided supplies for students, training for teachers (including psychosocial support training), health awareness campaigns, and mobilized university students to teach high school students.

Damage Quantification

The total costs of the damage suffered by the education sector across the 16 assessed cities is estimated at US\$153–187 million (table 1.1). The majority of this is for education facilities in Sana'a (38 percent), followed by Hodeidah (17 percent) and Aden (14 percent). The damage costs for these three cities make up more than half of the total damage costs. Taiz and Sa'da also suffered significant damage (11 percent and 5 percent, respectively). See table 1.2 for a detailed inventory of damage, by type of facility, and figure 1.3 for the distribution of the costs by city.

Table 1.1 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	3.9	4.7
Aden	21.9	26.7
Al Hazm	1.2	1.5
Amran	3.6	4.4
Bayhan	0.6	0.8
Dhamar	6.2	7.5
Hodeidah	26.0	31.8
Khoka	0.8	1.0
Lahj	2.3	2.8
Lodar	2.2	2.6
Ma'rib City	0.7	0.9
Mocha	0.7	0.9
Rada'a	0.8	0.9
Sa'da	8.0	9.8
Sana'a	57.4	70.1
Taiz	16.6	20.3
Total	152.9	186.8

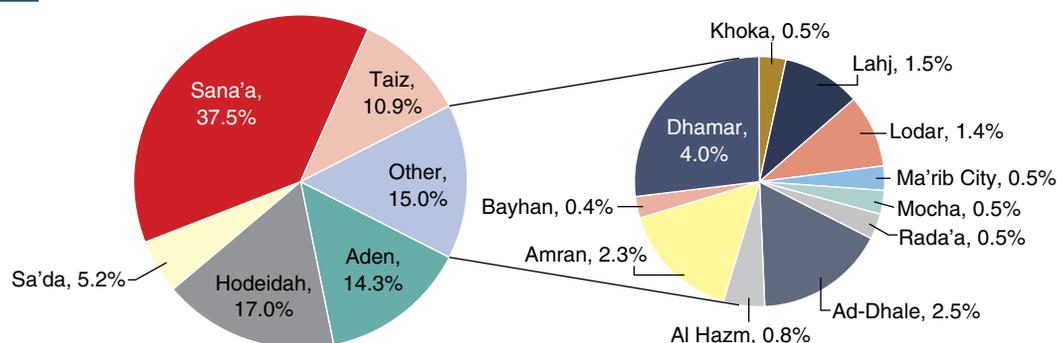
Source: World Bank estimates.

Table 1.2 Damage Inventory: School Facilities in 16 Cities

Asset types	Baseline	No damage	Partially damaged	Completely destroyed	Total assets damaged	Unknown
Basic school	501	301	163	14	177	23
Secondary school	97	56	30	4	34	7
Basic and secondary school	280	176	93	6	99	5
Vocational school	29	13	11	1	12	4
College/university	89	62	22	4	26	1
Education office	6	3	2	0	2	1
Unknown	309	195	92	7	98	15
Total	1,311	806	413	36	449	56

Source: World Bank.

FIGURE 1.3 Damage Cost Distribution by City (in %)



Source: World Bank estimates.

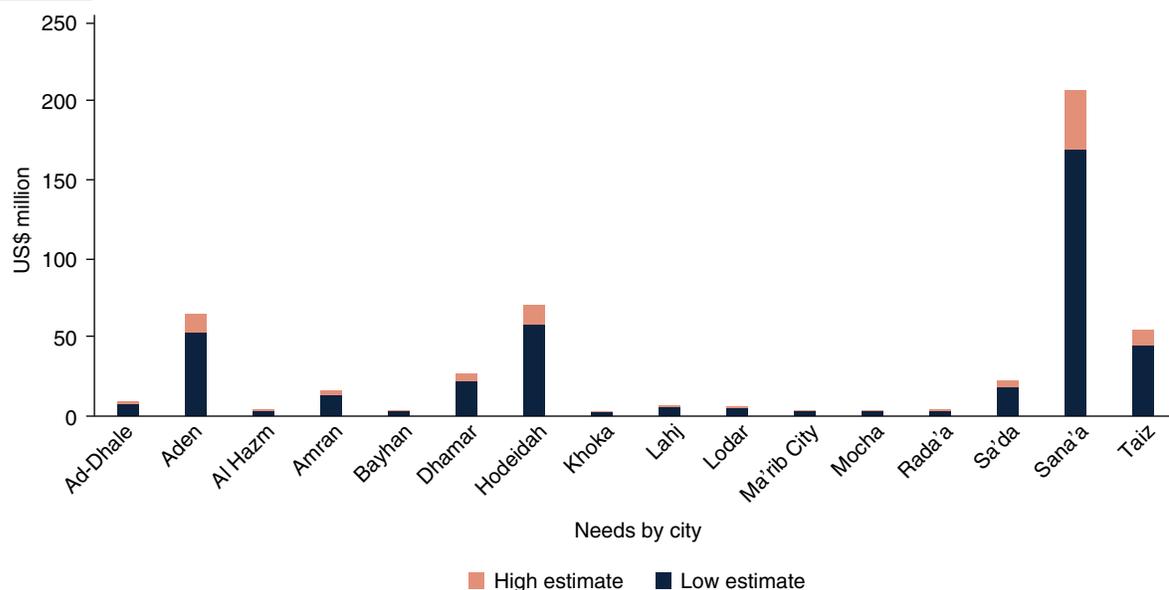
Sectoral Needs Assessment

The recovery and reconstruction needs of the education sector in Yemen are estimated to cost US\$411–502 million over a period of five years. The cost of restoring service delivery is about 37 percent of the total. This would include salaries for teachers and administrative staff, textbooks and other learning materials, and other school supplies. Given that teacher salaries and textbooks are lacking across all cities in Yemen, even in functioning schools, their cost was partially accounted for in places where some schools are functioning.³¹

It is recommended that priority be given to basic schools, and then to those schools that combine basic and secondary education classrooms. These two types of schools serve the most children in Yemen. Of the 781 basic and combined education facilities assessed, 277 (35 percent) have been damaged or destroyed. In terms of location, the reconstruction and restoration of educational facilities in Sana'a and Taiz are critical priorities (figure 1.4 and table 1.3). Half of the assessed education facilities were in Sana'a alone, and 30 percent of these were found

³¹ More precisely, in Sana'a, Hodeidah, Dhamar, Mocha, Sa'da, and Amran, costs of teacher salaries and learning materials, as well as other supplies, have been calculated even if an education facility has been assessed as functioning. For the remaining cities, those components have been included only for education facilities assessed as not functioning.

FIGURE 1.4 Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)



Source: World Bank estimates.

Table 1.3 Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2-5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	1.5	1.8	5.9	7.2	7.4	9.0
Aden	10.6	12.9	42.2	51.6	52.8	64.5
Al Hazm	0.6	0.8	2.5	3.1	3.1	3.8
Amran	2.6	3.2	10.4	12.7	13.0	15.9
Bayhan	0.5	0.7	2.1	2.6	2.7	3.3
Dhamar	4.4	5.3	17.5	21.4	21.9	26.7
Hodeidah	11.5	14.1	46.2	56.5	57.7	70.6
Khoka	0.5	0.6	2.0	2.4	2.5	3.0
Lahj	1.1	1.3	4.2	5.1	5.3	6.4
Lodar	1.0	1.2	3.9	4.8	4.9	6.0
Ma'rib City	0.5	0.6	2.1	2.6	2.6	3.2
Mocha	0.5	0.7	2.1	2.6	2.7	3.3
Rada'a	0.6	0.8	2.5	3.0	3.1	3.8
Sa'da	3.6	4.4	14.5	17.7	18.1	22.1
Sana'a	33.8	41.3	135.1	165.1	168.9	206.4
Taiz	8.9	10.9	35.7	43.6	44.6	54.5
<i>Infrastructure reconstruction, total all cities</i>	52.0	63.5	207.9	254.1	259.9	317.6
<i>Service delivery restoration, total all cities</i>	30.3	37.0	121.0	147.9	151.3	184.9
Grand total, all cities	82.2	100.5	328.9	402.0	411.1	502.5

to be damaged or destroyed. Taiz, meanwhile, has been hit extremely hard: 58 percent of its education facilities are damaged or destroyed. Currently, 65 percent of education facilities are functioning in Taiz, and the remaining require urgent reconstruction and restoration. Hodeidah and Aden also require priority interventions.

An effective and rapid recovery of the education sector in Yemen would offer children an opportunity for uninterrupted education services, even during conflict, benefiting their cognitive development and psychosocial well-being.

Priorities Going Forward

Based on the damages assessed, priorities in the short-term (up to one year) include teacher salaries, neutral textbooks and other learning materials, and support for parents to send their children to school (through conditional cash transfers, nutrition programs, and so on), as well as temporary learning facilities, particularly in areas most affected by the conflict and where formal schools are not functioning. While the reconstruction of partially and fully damaged education facilities is a priority, particularly at the basic education level, focusing on the restoration of education services is of utmost importance in the short-term.

In the medium-term (2–5 years), teachers' training is a priority, particularly in view of the psychosocial support needed by children who experienced violence and trauma during the conflict. In addition, the provision of remedial learning opportunities for children who dropped out of the education system due to the conflict is a priority, alongside continued reconstruction of damaged and destroyed education facilities across the country.

In the long-term (5–10 years), further rehabilitation of schools, and reform of the secondary and vocational education systems, as well as parallel modernization of the higher education system, can be envisaged.

2

Food Security

Pre-crisis Food Security Situation

Before the current conflict, Yemen's food security faced dire challenges including high population growth, a dearth of domestic supply, poor access to social infrastructure, high fuel prices, and fiscal crises. About 41 percent of Yemen's population, that is, about 11 million people, were food insecure before the current conflict escalated.³² These people had limited or no access to sufficient and nutritious food, and had to eat relatively cheap, nutrition-poor food or skip meals. The prevalence of food insecurity was much higher in rural than in urban areas; about 48 percent of the rural population and 26 percent of those in urban areas were food insecure in 2014. For instance, the prevalence of food insecurity was about 41 percent in the Sana'a governorate overall, while it was 25 percent in the city of Sana'a. Similarly, there were significant differences in the prevalence of food insecurity across governorates (figure 2.1). Food insecurity was particularly high in the Sa'da, Lahj, Shabwah, and Al Bayda' governorates (60–70 percent), and less prevalent in Ma'rib (35 percent) and Al Jawf (36 percent) governorates. According to the results of the Comprehensive Food Security Survey (CFSS) in 2014, only 12.4 percent of children aged 6–24 months met the World Health Organization (WHO) recommendation for minimum dietary diversity, and over 85 percent were likely to have poor micronutrient content in their diets. Of women aged 15–49 years, 24.2 percent were malnourished, and 14.4 percent severely malnourished.

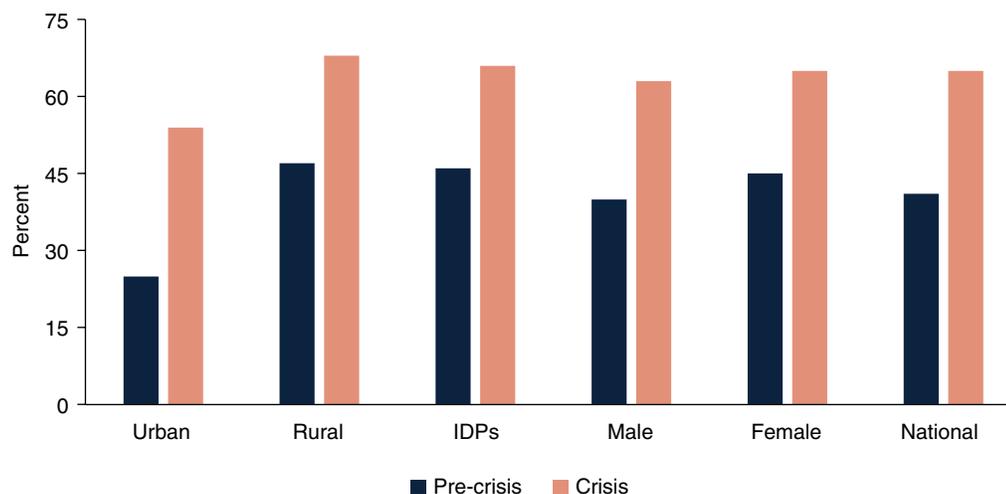
Domestic Food Production

Agriculture and fisheries are the most important non-oil sectors for the Yemeni economy, generating 11 percent of gross domestic product (GDP) and 6 percent of exports. Prior to the outbreak of the conflict, the agriculture sector employed 29.2 percent of the workforce,³³ and was the main source of income for 73 percent of the population, either directly or indirectly through services and industries serving the rural economy. Furthermore, economic dependence on agriculture had been growing, as opportunities in the industrial and services sectors dwindled starting in 2000. Yet despite the importance of the sector, agricultural productivity was low overall, because of insufficient availability of inputs and postharvest losses, inadequate marketing systems, low human resource capacity, and lack of infrastructure. The principal agricultural systems were situated in the rain-fed highlands characterized by terraced agriculture for coffee, fruits, grains, and *qat*, and extensive livestock production, and in the plains where irrigated horticulture and field crops predominated. About 75 percent of agricultural production came from rain-fed highland areas, which were home to 60 percent of the population. Domestic crop production met less than a quarter of the total food demand of the country, whereas livestock production met more than 60 percent of domestic demand.

32 World Food Program (WFP), Comprehensive Food Security Survey (CFSS), 2014. The Declaration of the World Summit on Food Security defines the concept as follows: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Declaration of the World Summit on Food Security, FAO, 2009, p. 1).

33 International Labour Organization, ILOSTAT Database, November 2017. (<https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=YE>).

FIGURE 2.2 Prevalence of Food Insecurity in Yemen, 2015 and 2017



Source: World Food Program (WFP), Comprehensive Food Security Survey (CFSS), 2014; WFP, FAO (Food and Agriculture Organization), and UNICEF (United Nations Children’s Fund), *Emergency Food Security and Nutrition Assessment (EFSNA)*, 2017.
Note: IDPs = internally displaced persons.

latest integrated Food Security Phased Classification (IPC) analysis conducted from December 2018 to January 2019 indicated that a total of 15.9 million people, i.e., 53 percent of the population, are severely food insecure, despite the ongoing humanitarian food assistance (HFA). This figure includes 17 percent of the population (about 5 million people) classified in IPC Phase 4 (Emergency) and 36 percent (about 10.8 million people) in IPC Phase 3 (Crisis) as well as the additional 63,500 people in IPC Phase 5 (Catastrophe). Almost 2 million children under the age of five are estimated to be affected by acute malnutrition, of which 360,000 are suffering from severe acute malnutrition.³⁵ In addition, almost a quarter of women of childbearing age are malnourished, with the increased risk of poor pregnancy outcomes.³⁶

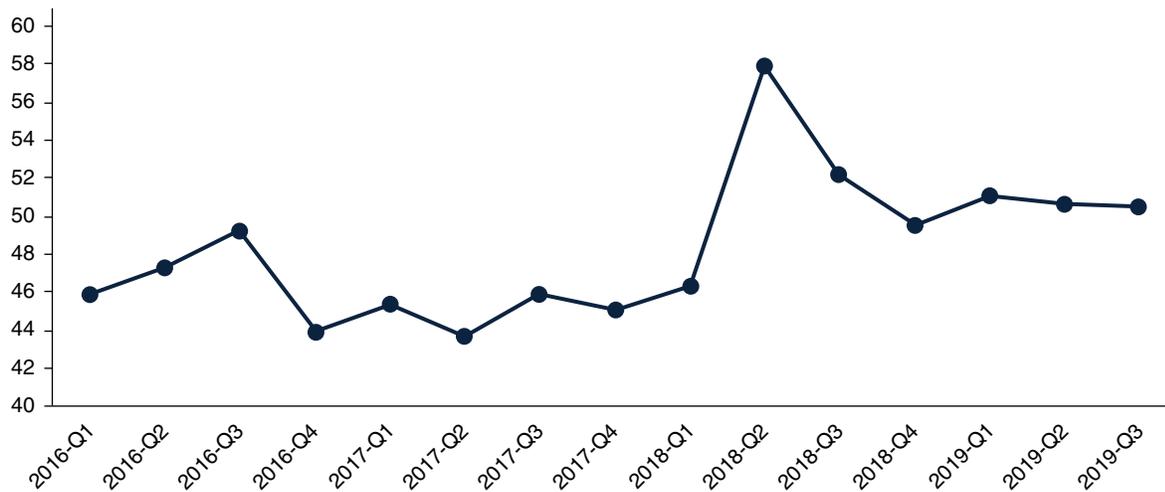
In addition to the significant worsening of an already poor food security situation, there have been a number of conflict-related shocks that have caused the food security situation to rapidly change over time. These shocks included, for example, the suspension of public salary payments in 2016, many instances of sudden changes in conflict intensity in the country, disruptions to the food supply chain, and the balance of payments crisis at the end of 2018 and beginning of 2019, which reduced the ability to import necessary food in the country. Monthly mobile phone monitoring conducted by the WFP demonstrates the significant changes to food security nationally over the entire course of the conflict (figure 2.3).³⁷

35 IPC Yemen—Food insecurity situation (in the presence of Humanitarian Food Assistance) in Yemen from 12/01/2018 to 01/31/2019. see also: <http://www.fao.org/emergencies/countries/detail/en/c/161523/>.

36 <https://www.unicef.org/yemen/nutrition>.

37 For one example of a detailed analysis of the impact of conflict-related shocks on food security, see: <https://www.sciencedirect.com/science/article/abs/pii/S0305750X20300486>.

FIGURE 2.3 Average Food Consumption Scores, 2016–2019³⁸

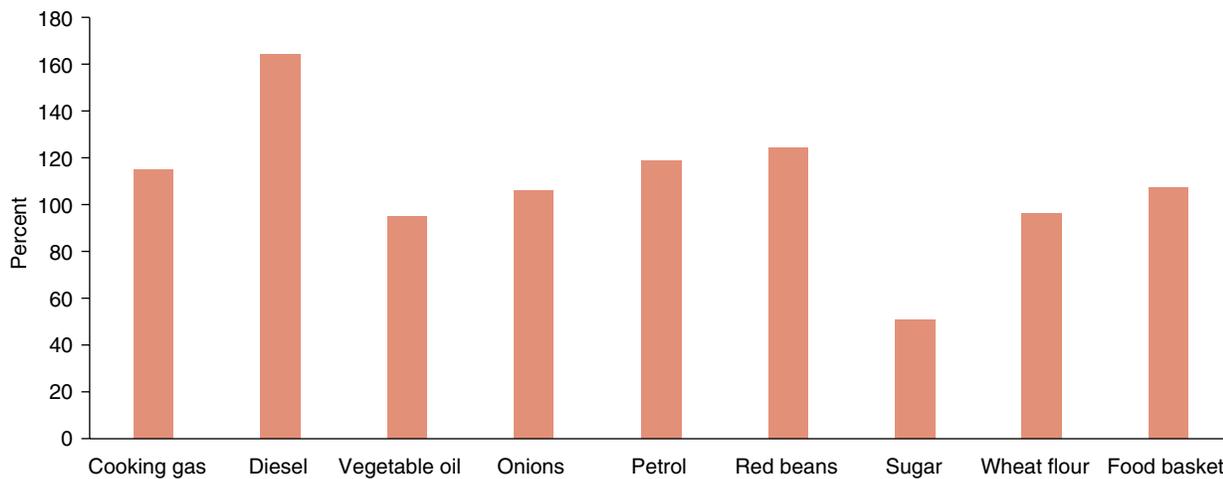


Source: World Food Program (WFP), monthly mobile Vulnerability Analysis and Mapping (mVAM) surveys.

Impact on the Cost of Food and on Selected Prices

The current conflict has significantly raised the cost of living for the majority of people in the country, pushing some of the marginally food-secure population into food insecurity. Compared to the pre-crisis period, the national average monthly per capita cost of the minimum food basket rose by 106 percent.³⁹ Prices of necessary commodities, including red beans, onions, petrol, and cooking gas more than doubled between March 2015 and December 2019; the price of wheat flour rose 95 percent in the same period (figure 2.4). These developments

FIGURE 2.4 Percentage Increase in Commodity Prices (March 2015–December 2019)



Source: FAO-FSTS Monthly Market Price Monitoring Bulletin (December 2019).

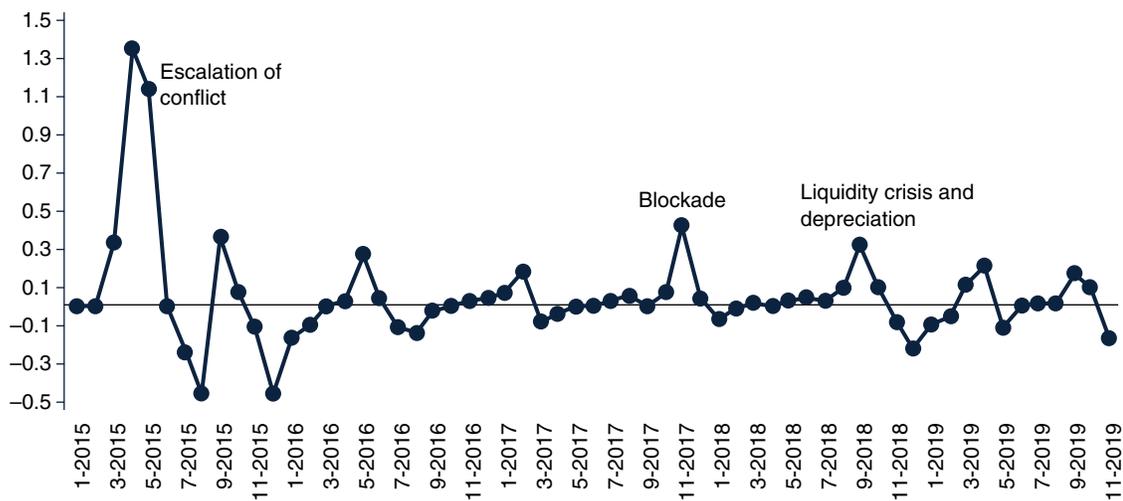
³⁸ The “Food consumption score” (FCS) is a score calculated using the frequency of consumption of different food groups consumed by a household during the seven days before the survey.

³⁹ According to data from the WFP’s Market Watch report (February 2018). The minimum or survival food basket is a composite of food staples needed to satisfy people’s basic caloric intake needs. As of January 2018, the food basket (or its cost equivalent) meets only 80 percent of the monthly household food needs.

match survey data from 2017 when three-quarters of surveyed households indicated that their economic situation was worse than pre-crisis.⁴⁰

Importantly, conflict-related shocks have the potential to have a particularly large impact on fuel prices (figure 2.5). Fuel on its own accounts for a significant share of the overall household budget. Since fuel is an essential commodity (e.g., to power generators for electricity or to enable transport to reach jobs), households are unable to quickly substitute away from fuel in the event of price spikes. Additionally, fuel is a key input required to transport imported food across the country. As a result, volatile fuel prices can have a significant impact on food prices. Indeed, large spikes in fuel prices have led to immediate declines in food security and access to a number of basic services (e.g., access to water deliveries, access to municipal trash collection, etc.).

FIGURE 2.5 Percentage Change in Diesel Prices (2015–2019)



Source: WFP global price database.

Impact on Facilities for Accessing Food

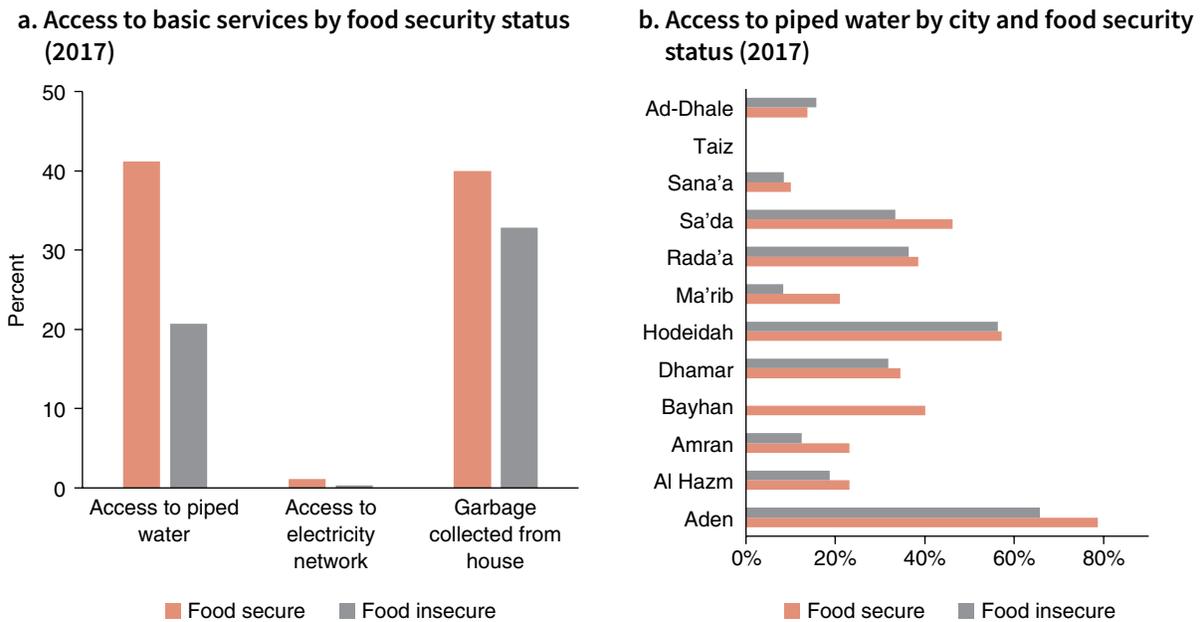
Conflict-related destruction of infrastructure and market facilities, and disruption of service delivery have also affected food insecurity. Extensive damage to road infrastructure and the closure of main roads have limited the availability of food staples, triggering stark price increases that have further exacerbated Yemen’s food crisis. The effects of the conflict on ports and import logistics, as well as new import restrictions, have greatly limited the availability of food in local markets. The functioning of markets is particularly critical for food security in Yemen. While about 85 percent of the main staple, wheat, was imported before the conflict, conflict-related effects on agricultural output and transportation have pushed this up to about 95 percent of the national requirements. Most families rely on markets for food; market disruptions therefore have dire implications for food security in Yemen.

Cross-Sectoral Impacts

In nearly all cities covered by the Dynamic Needs Assessment (DNA) Phase 3, there is a strong correlation between food insecurity and lack of access to basic services, such as water, electricity, health care, and education (figure 2.6).

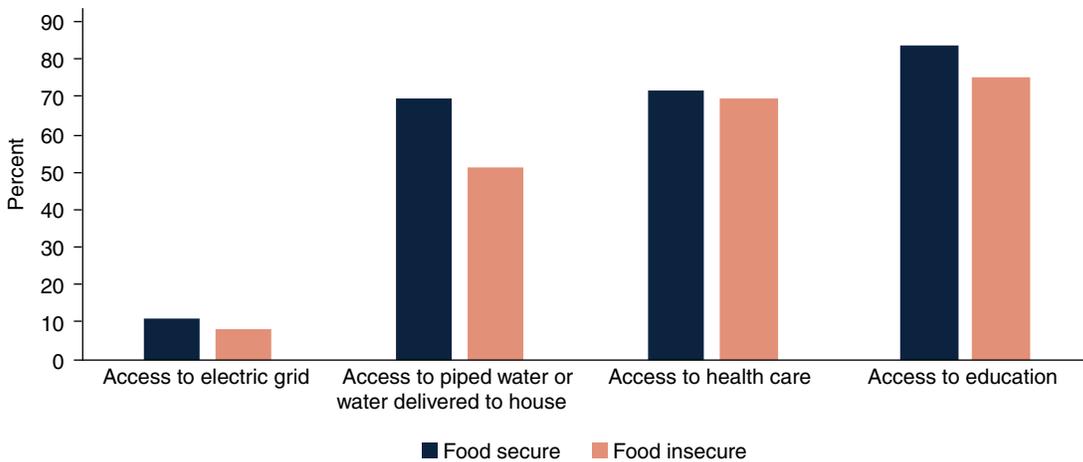
40 WFP, FAO (Food and Agriculture Organization), and UNICEF (United Nations Children’s Fund), *The Emergency Food Security and Nutrition Assessment (EFSNA)*, 2017.

FIGURE 2.6 Access to Basic Services by Food Security Status



Source: WFP Mobile Vulnerability Analysis and Mapping Survey, November 2017.

c. Access to basic services by food security status (2019)



Source: Mobile phone survey conducted by the World Bank in April 2019 for access to electric grid and access to piped water or water delivered to the home; WFP Mobile Vulnerability Analysis and Mapping Survey, December 2019, for access to health care and access to education.

Governorate-Level Analysis

Impact on Prevalence of Food Insecurity

The adverse effect of the crisis on food security has been widespread across governorates (figure 2.7). Considered as a percentage of the total population, the greatest food insecurity was observed in Abyan, Shabwah, Ad-Dhale, Lahj, Sana'a, and Sa'da, at above 80 percent. These governorates also experienced the greatest increase in the prevalence of food insecurity between 2015 and 2017. The increase was as high as 40 percent in two of these governorates, Sana'a and Abyan (to compare, the increase was about 10 percent in Dhamar and Al Jawf).

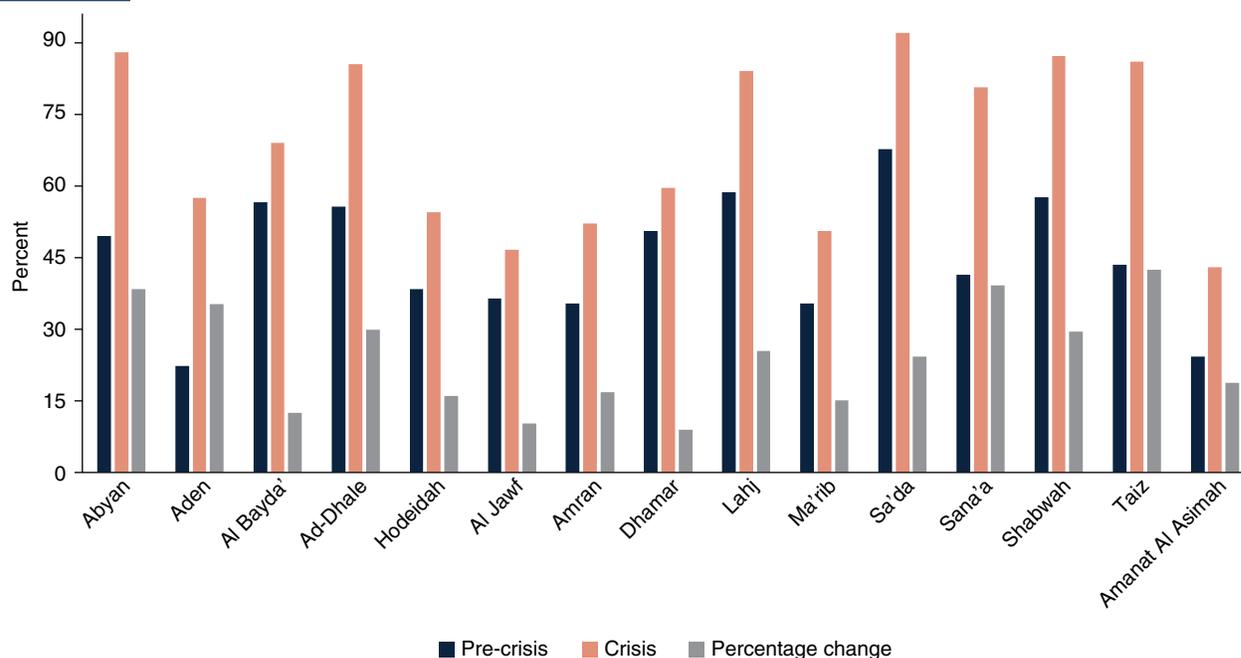
Impact on the Cost of Living and on Selected Commodity Prices

In December 2019, the monthly cost of the minimum food basket in the Taiz, Ad-Dhale, Aden, Al Bayda', Dhamar, and Lahj governorates significantly exceeded the national average. As markets in those governorates became more fragmented, the supply of food commodities suffered, driving prices up (table 2.1). This chain reaction further deteriorated the food security of vulnerable households in these governorates.

Impact on Facilities for Accessing Food

The conflict has severely disrupted food markets, transportation, and distribution. For instance, the Yemen Logistics Cluster reported that in January 2018 major roads were closed and/or were difficult to access in the southwest (Hodeidah and Taiz governorates), the northwest (Sa'da, and the western part of the Al Jawf governorate), and central areas (Al Bayda', Ma'rib, and Sana'a governorates). In October 2017, there were some significant disruptions of transport on most major roads and minimal or no activity on the coastal road between Hodeidah and Aden. Similarly, market activities in Abyan and Al Bayda' had been partially disrupted.

FIGURE 2.7 Governorate-Level Prevalence of Food Insecurity before and during Conflict (2014–2017)



Source: World Food Program (WFP), Comprehensive Food Security Survey (CFSS), 2014; WFP, FAO (Food and Agriculture Organization), and UNICEF (United Nations Children's Fund), *Emergency Food Security and Nutrition Assessment (EFSNA)*, 2017.

Table 2.1 Conflict Has Increased the Cost of Living

Governorate	Percent change in cost of food compared with pre-crisis period (2014–2019)								
	Cooking gas	Diesel	Vegetable oil	Onion	Petrol	Red beans	Sugar	Wheat flour	Food basket
Abyan	136	161	85	176	147	167	57	85	107
Aden	164	171	131	111	120	164	54	99	126
Al Bayda'	119	187	134	119	137	150	53	105	126
Ad-Dhale	67	147	120	143	122	108	87	119	128
Hodeidah	5	251	88	95	132	151	31	82	96
Al Jawf	30	89	44	-13	47	92	50	82	76
Amran	104	202	86	141	131	115	45	105	114
Dhamar	260	201	139	118	152	128	48	119	125
Lahj	95	149	80	127	121	105	47	119	124
Ma'rib	-9	50	30	38	11	92	40	46	52
Sa'da	222	192	72	166	139	41	46	87	80
Sana'a	155	140	44	27	134	108	40	46	57
Shabwah	67	145	67	119	122	177	60	107	120
Taiz	201	183	121	95	135	210	69	131	158
Amanat Al Asimah	97	187	175	126	131	58	23	97	104
Average	114	164	94	106	119	124	50	95	106

Source: FAO-FSTS Monthly Market Price Monitoring Bulletin (December 2019).

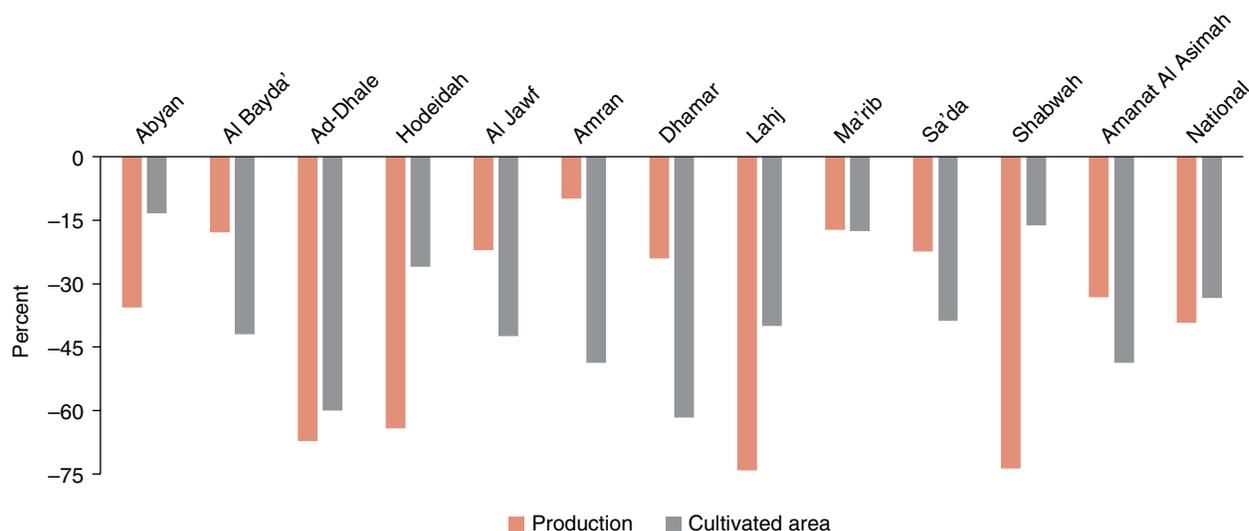
Loss Estimate

Income Effects

Loss of agricultural income: The persistent conflict and water scarcity continue to significantly compromise livelihoods and production in the agricultural sector. Already in 2016, the total locally grown food supply was 62 percent of pre-crisis levels, mainly due to a reduction in the cultivated areas. The conflict resulted in a shortage of inputs such as seeds, fertilizers, and fuel; damaged agricultural equipment, irrigation systems, and storage facilities; and deteriorated water and electricity services and logistical chains. The absence of electricity and fuel, as well as the damage to production facilities, led to the disruption of locally manufactured supplies of production inputs for agriculture. The shortage of animal fodder and veterinary services led to a decline in livestock production. By the end of 2016, the livestock herds of approximately 45 percent of households with livestock had shrunk in size, either due to untreated diseases or because they were sold or butchered to cover basic needs.⁴¹ Income from sales of produce declined amid the disruption of markets, resulting in depressed farm-gate prices and higher sale prices in urban areas. The loss in agricultural production and cultivated land was the greatest in Shabwah, Lahj, Ad-Dhale, and Hodeidah governorates (figure 2.8).

41 WFP, FAO (Food and Agriculture Organization), and UNICEF (United Nations Children's Fund), *The Emergency Food Security and Nutrition Assessment (EFSNA)*, 2017.

FIGURE 2.8 Percentage Change in Agricultural Production and Cultivated Area (2014–2017)



Source: World Food Program (WFP), Comprehensive Food Security Survey (CFSS), 2014; WFP, FAO (Food and Agriculture Organization), and UNICEF (United Nations Children’s Fund), Emergency Food Security and Nutrition Assessment (EFSNA), 2017.

The agricultural sector, the main source of employment in Yemen, is also the sector most affected by the crisis: almost 50 percent of workers lost their jobs, while 40 percent of households who depend on agriculture for their livelihoods suffered a decline in agricultural production. By the end of 2016, this drop in agricultural production was equivalent to a US\$964.5 million (constant 2010) loss in the national value-added of agriculture compared with the pre-crisis level. Since then, the loss has likely increased due to the ongoing conflict.

Loss in household incomes from other sources: Incomes have fallen and many public sector workers have gone for months—even years—without pay. More than half of all households have had to buy food on credit. As of January 2020, the overall economic situation has further deteriorated with additional restrictions on imports including food, serious deficits of foreign exchange and local currency liquidity especially in the North, and variations in the value of the currency that continue to push millions of people to the brink of famine.

Price Effect (Cost of Living)

Table 2.2 estimates the loss incurred by households, averaged at the governorate level, because of the higher costs of food due to the crisis. The estimates are based on a measure of the additional costs households had to pay for a minimum food basket, relying on data from December 2019 compared with the pre-crisis level.⁴²

42 These calculations consider only the increase in the cost of the minimum food basket and do not consider the long-lasting impacts (such as on earnings and productivity) of food and nutrition insecurity.

Table 2.2 Governorate-Level Losses due to Higher Cost of Food (in YRI million and US\$ million)⁴³

Governorate	Low estimate		High estimate	
	YRI	US\$	YRI	US\$
Abyan	15,642	63	19,118	76
Aden	30,034	120	36,708	147
Al Bayda'	24,657	99	30,136	121
Ad-Dhale	23,753	95	29,032	116
Hodeidah	79,033	316	96,596	386
Al Jawf	11,526	46	14,088	56
Amran	30,856	123	37,713	151
Dhamar	61,541	246	75,217	301
Lahj	31,415	126	38,397	154
Ma'rib	4,493	18	5,491	22
Sa'da	22,139	89	27,059	108
Sana'a	20,977	84	25,638	103
Shabwah	19,549	78	23,894	96
Taiz	129,313	517	158,049	632
Amanat Al Asimah	79,036	316	96,599	386
Total	583,965	2,336	713,735	2,855

Source: World Bank estimates.

Sectoral Needs Assessment

The Costs of Returning to Pre-crisis Levels of Food Insecurity

These costs are calculated based on a defined proportion of the minimum food basket.⁴⁴ Table 2.3 estimates the financial resources required to achieve the pre-crisis level of food insecurity, that is, to restore food security to the portion of the population that has become food insecure since March 2015. At the governorate level, this depends on the cost of the minimum food basket, the severity of food insecurity, and the size of the internally displaced person (IDP) population (that is, the net IDP inflow). Depending on the characteristics of the food-insecure population, the financial needs are calculated to cover different proportions of the cost of the minimum food basket. Recovery needs are estimated to range from US\$2.5 billion to US\$3.1 billion over five years.

Priorities Going Forward

The following measures, taken at different time periods, would be critical to improve food security in Yemen.

43 The losses in US\$ are expressed using the exchange rate of 1 US\$ = 250 YRI. When using the market exchange rate (estimated at 1 US\$ = 588 YRI in December 2019), then the total losses convert to US\$993–1,214 million.

44 FAO-FSTS Monthly Market Price Monitoring Bulletin (December 2019).

Table 2.3 Governorate-Level Needs to Ensure Food Security (in YRI million and US\$ million)⁴⁵

Governorate	Short-term (year 1)				Medium-term (years 2–5)				Total (over 5 years)			
	YRI		US\$		YRI		US\$		YRI		US\$	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Abyan	8,770	10,719	35	43	14,921	18,237	60	73	23,691	28,956	95	116
Ad-Dhale	12,591	15,389	50	62	22,203	27,137	89	109	34,794	42,526	139	170
Aden	13,325	16,286	53	65	17,929	21,913	72	88	31,253	38,199	125	153
Al Bayda'	4,027	4,922	16	20	6,673	8,156	27	33	10,700	13,078	43	52
Al Jawf	1,897	2,318	8	9	2,825	3,453	11	14	4,722	5,772	19	23
Amanat Al Asimah	25,425	31,075	102	124	16,800	20,533	67	82	42,225	51,608	169	206
Amran	11,258	13,760	45	55	25,500	31,166	102	125	36,758	44,927	147	180
Dhamar	15,868	19,394	63	78	32,284	39,459	129	158	48,152	58,853	193	235
Hodeidah	24,240	29,627	97	119	39,356	48,101	157	192	63,596	77,728	254	311
Lahj	12,648	15,458	51	62	22,556	27,568	90	110	35,204	43,027	141	172
Ma'rib	2,543	3,108	10	12	5,208	6,365	21	25	7,751	9,473	31	38
Sa'da	12,194	14,903	49	60	19,349	23,649	77	95	31,543	38,552	126	154
Sana'a	20,258	24,759	81	99	34,216	41,819	137	167	54,474	66,579	218	266
Shabwah	8,060	9,851	32	39	13,155	16,079	53	64	21,215	25,930	85	104
Taiz	68,170	83,319	273	333	11,593	14,169	464	567	18,410	22,501	736	900
Grand total, all governorates	241,273	294,889	965	1,180	388,909	475,334	1,556	1,901	630,182	770,223	2,521	3,081

Source: World Bank estimates.

Note: The estimates cover 60 (year 1), 25 (year 2), and 10 (years 3–5) percent of the cost of the minimum food basket for individuals who are borderline food insecure; 85 (year 1), 50 (year 2), and 25 (years 3–5) percent of this cost for those who are severely food insecure; and 100 (year 1), 75 (year 2), and 50 (years 3–5) for IDPs.

Short-Term Priorities (up to 1 year)

- Support cross-cutting issues and measures to reduce disaster risk. Given Yemen's vulnerability to numerous shocks, an early warning system must be established to monitor hazards and mitigate or prevent their impact on food security and nutrition.
- Assist conflict-affected small-scale farmers, livestock producers, and fishermen to return to production through a farm and fisheries restoration support package focused on key inputs, income generation, and livelihood assistance.
- Expand cash-for-work programs to rehabilitate community infrastructure.
- Revitalize electricity systems to run irrigation systems.
- Restore agricultural input and output markets and increase delivery of agriculture services. This includes rebuilding local enterprises that produce inputs for the sector, resuming international trade of agricultural commodities and reopening export facilities, and providing investment support to agricultural producers to

45 The needs in US\$ are expressed using the exchange rate of 1 US\$ = 250 YRI. When using the market exchange rate (estimated at 1 US\$ = 588 YRI in December 2019), then the total needs convert to US\$1.1–1.3 billion.

restore and enhance agricultural production, including investments in irrigation and community water supply infrastructure.

Medium-Term Priorities (2–5 years)

- Develop a new vision for the sector to realize its full potential and contribute to sustainable growth. The strategy would need to: (i) address water scarcity issues in view of the area’s vulnerability to climate changes and fluctuations; (ii) define policies to support the development of value chains and create long-term employment opportunities in the sector; and (iii) reform agricultural business models and support services to improve sector productivity and food security.
- Improve access to finance among farmers and small and medium farm enterprises.
- Rehabilitate critical infrastructure, including irrigation systems, and grain and fodder storage.

Long-Term Priorities (5–10 years)

- Invest in modern technologies to increase the resilience of households against shocks.
- Design financing mechanisms and instruments to draw private sector engagement.
- Develop a coordinated approach to rural investment, which integrates energy, communications, and road infrastructure.
- While immediate attention to reconstructing agricultural infrastructure and markets may allow Yemen to increase its domestic production levels, it will be crucial to reassess agricultural policy and water strategies over the long-term. Given Yemen’s agricultural potential, improved water management, sustainable crop production management, and the introduction of modern agriculture water-saving and production techniques will all need to be part of a long-term reconstruction effort.

3

Governance and Institution Building

This chapter seeks to pioneer a unique and contextually informed approach to governance, in an attempt to enhance the breadth and depth of the Yemen Dynamic Needs Assessment (DNA) series. Governance, as defined in the *2017 World Development Report*, is “the process through which state and nonstate actors interact to design and implement policies within a given set of formal and informal rules that shape and are shaped by power.” Based on this definition, and the DNA’s objective to assess the impacts of Yemen’s ongoing crisis, the primary question that this chapter seeks to answer is “What functions, institutions, and capacities have changed in Yemen as a result of the crisis—from the pre-crisis period until now—and what are the needs for the future?” Because of the diverse sources of information used, this chapter also offers some initial insights on how to better align the proposed interventions with the priorities identified by the respondents, as well as tackle issues of legitimacy and corruption that might hinder the transition toward sustainable peace. The analysis conceptualizes *governance* in terms of state institutions with qualified human resources, as well as the processes used for planning, revenue mobilization, budgeting, procurement, financial management, oversight, and citizen engagement to ensure the transparent, efficient, and accountable use of public resources and delivery of services. For the purposes of this chapter, *governance* also encompasses the formal and informal rules that regulate the interactions between state and nonstate actors (citizens and the private sector), and the views of how such rules are implemented by the population, which may have changed as a result of the crisis.

Approach

This chapter takes a pragmatic look at the data from many information sources to analyze Yemen’s governance environment since the current crisis started in 2014. The analysis presented in the chapter uses a diverse set of data sources and has been developed at two different points in time. In 2018, as a first level of analysis, key data were gathered from secondary sources, including a number of leading international and national research institutions, think tanks, and civil society organizations (CSOs), as well as previous analytical and remote survey work carried out by the World Bank and other development organizations.⁴⁶ This information was complemented by a second level of analysis based on primary data collected through a series of key informant interviews (KIIs) and focus group discussions (FGDs) carried out in the spring of 2018 in order to: (i) confirm the validity of external studies and indicators, and (ii) present the perspective of civil servants and citizens who are experiencing the effects of the crisis firsthand. In the summer of 2019, additional survey data was collected remotely,⁴⁷ allowing the team to provide new insights on the views and opinions that Yemenis have of their public institutions, both at the central and local levels, as well as on their existing challenges and priorities for peacebuilding and reconstruction.

46 These include, among others: the World Bank’s Country and Institutional Policy Assessments (CPIA) and 2017 Yemen Policy Note Series, as well as (CPIAs), the Bertelsmann Stiftung Transformation Index (BTI), World Governance Indicators (WGIs), the Open Budget Index (OBI), the Freedom in the World Index (Freedom House), the Corruption Perception Index (CPI) (Transparency International), and the Building for Peace report.

47 The survey data was collected remotely as part of the background work for the development of the forthcoming report “Building for Peace: Reconstruction for Security, Equity and Sustainable Peace in MENA”, in partnership with RIWI Corporation.

BOX 3.1 Categories of Future Governance and Institutional Needs

Transitioning from conflict toward sustainable peace is a prolonged journey that requires the removal of violence and insecurity and the creation of social cohesion, equitable economic opportunities, and accountable institutions for all individuals. This requires a greater focus on the people most affected and most vulnerable and on the options available to create inclusive institutions, including focusing on the accumulated grievances that initially triggered the violence. This chapter articulates its governance analysis along the following public sector functions:

Revenue mobilization and management: the capacity of the state to raise fiscal resources for the functioning of the government and the delivery of public services. Elements evaluated include tax administration contributing to both direct and indirect fiscal outturns as well as customs administration in an import-dependent context.

Strategic planning and public expenditure management: the ability of the state, and the center of government in particular, to engage in strategic planning for development needs, as well as to engage in multi-year budgeting to allocate resources and expenditures, achieve strategic objectives, plan and manage capital investments, as well as monitor and report on results.

Budget execution and oversight: the ability of the state to execute planned expenditures in a manner that ensures efficacy and efficiency in the use of public resources. Elements evaluated include budget execution, financial management and reporting, and public procurement as well as the oversight mechanisms needed to ensure internal control and external monitoring of resources.

Core human resource (HR) capacities and resources needed for service delivery: the capacities of the state to provide core services in critical sectors at both the national and subnational level. Elements evaluated include the payment of civil servant salaries, the efficacy of the public administration, including adequate human resources, as well as the capacity for service delivery at the decentralized subnational levels.

Public accountability mechanisms: a multitude of “demand side” governance elements, including the arrangements in place to ensure the capacity of citizens, voice and civil society, and other non-governmental institutions to safeguard the public interests, and the availability and transparency of the public information needed for citizens to make informed decisions and to participate in the political process. This includes also the role that the larger accountability environment—including opportunities for corruption, rent-seeking, state capture, and exclusion—plays in the context of and how it shapes the interrelations of the state, citizens, and the private sector. These mechanisms are critical for the development of citizens’ trust in state institutions and the well-functioning and inclusive public sector institutions.

It should be noted that since this analysis focuses on the quality of the processes, institutions, rules, and regulations that may have been damaged or changed due to the crisis, it *does not* include a quantitative, “costed” assessment of the physical reconstruction requirements. Rather, the qualitative institutional analysis provided is a critical basis for an informed understanding of the existing governance situation on the ground, the ability of the government to carry out its physical reconstruction plans, and the risks associated with the transition period under uncertain conditions. In line with the DNA structure and guidelines, the proceeding analysis will first present a description of: (i) the pre-crisis situation (2014); (ii) the situation as of spring 2018; and (iii) future needs across a number of governance dimensions, noted in box 3.1. The chapter will then include selected findings from the online survey on citizen voices conducted in the summer of 2019.

Limitations

While the present approach seeks to provide an approximate description of Yemen's governance and public sector environment, there are essential limitations to the analysis, which should be noted. First, an over-reliance on secondary data produced at the national level may result in over-generalization at the expense of more nuanced governance performance at either the sectoral or regional levels. Second, the 2018 data collection was carried out only in five governorates (Sana'a, Aden, Taiz, Ma'rib, and Hodeidah) and included a limited number of respondents where the security situation allowed the enumerators access. Furthermore, while the online survey conducted in 2019 included a random sample of 5,195 respondents across all of Yemen, it is skewed to young males from affluent socioeconomic backgrounds that can afford Internet access. Thus, the information collected in both phases may suffer from sampling bias and/or provide an incomplete picture. In particular, the responses of public servants currently occupying government posts will necessarily reflect the biases of their particular political group. Third, while evidence is presented for both 2014 and 2018 with the goal of estimating changes in the governance structure due to conflict, it is difficult to establish a purely causal relationship between the changes observed and the current crisis, in comparison with other proximate factors. Finally, while a menu of existing needs and potential reform options is presented for the future, this analysis does not attempt to sequence these, as any post-conflict reconstruction and recovery plan will be contingent upon the future political settlement that exists. In the future, the selection of a framework of reforms should be selective and strategic, targeting those activities that have the most potential to enhance institutional capacity and legitimacy, not to over burden it. Finally, it is important to note that the analysis and forward-looking recommendations of the first section are based on data and information collected as of spring 2018; additional data collection and analysis would be required to ensure their continued validity.

Revenue Mobilization and Management

Pre-crisis Situation (2014)

Tax administration: At the outset of the crisis, total tax revenues had accounted for approximately 30 percent of government revenue in 2014, with an almost even split between direct and indirect taxes, representing a tax to GDP ratio of approximately 10 percent. By contrast, hydrocarbon revenues comprised nearly 50 percent of government revenues, primarily derived from exports and domestic consumption of crude oil and natural gas. Although revenue collection had already started declining since 2011, amid a declining volume of crude exports and the sharp fall in global oil prices, adequate legislation and procedures were in place through 2014 for all major taxes, both direct and indirect. Moreover, a number of good tax administration practices were in place were in place, including: (i) a taxpayer registration database using a unique tax identification number (TIN) for each payer; (ii) strategic information and outreach programs, including annual taxpayer education campaigns; (iii) a tax appeals process set out in the relevant tax legislation; and (iv) a central tax authority, which had recently been organized along functional lines.

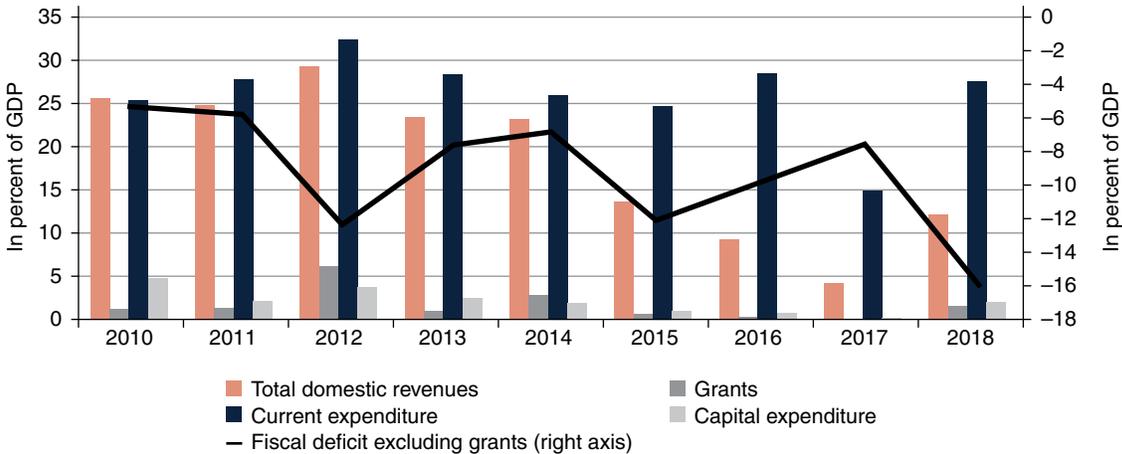
Customs administration: Yemen had taken steps to improve trade in the pre-crisis period, including becoming a member of the WTO in 2015 and reforming trade laws to comply with WTO disciplines for customs valuation and related procedures. However, the political instability which started in 2011 had already begun to negatively impacted customs revenues and administration. In particular, the *2015 Doing Business Report* ranked Yemen 134th out of 189 economies for ease of trading across borders, and Yemen's score in the Logistics Performance Index declined from 63rd in 2012 to 151st out of 160 countries in 2014, representing a performance considerably below the Middle East and North Africa (MENA) average. During the period, customs clearance was sluggish, taking an average of 29 days to export, 27 days to import, and the effectiveness of checks and balances was limited, given the substantial discretionary power of the Customs Department both for valuations as well as for penalties applied.

Subnational revenues: In the pre-crisis period, decentralized entities received revenues from a combination of central subsidies and local resources (e.g. local taxes and service fees). Central-level functions were deconcentrated at the governorate level, where the Ministry of Finance (MoF) and Ministry of Civil Service and Pensions (MoCSI) did not have their own sources of revenue and primarily relied on allocations from the central level. Other service delivery entities such as the City Cleaning and Improvement Fund (CCIF), local water and sanitation corporations (LWSCs), and health-care facilities were able to collect additional revenues from service/consumption fees, in addition to the allocations that they received from the central level. In the pre-crisis period, all districts collected local taxes and duties. In port cities such as Hodeidah and Aden, additional revenues came from taxes, customs duties, *zakat* (donations), miscellaneous service fees, as well as central subsidies. Survey data suggest that all financial resources/revenues collected at the governorate/district level were deposited into the appropriate accounts with the Central Bank of Yemen (CBY) according to the law. During the pre-crisis period, some governorates even took steps to raise additional revenues: Sana'a and Taiz sought to improve their revenue administration and collection mechanisms, while Hodeidah and Aden worked to increase control over collectors as well as improve the capacity of control and audit functions.

Situation as of Spring 2018

Tax administration: While some improvements were made to the tax administration in the pre-crisis period, progress has since stalled. As noted in figure 3.1, total domestic revenues have declined significantly since 2014, due to a major disruption in crude oil exports and depressed economic activity in the non-hydrocarbon sector. Tax revenue performance, in particular in the North, has been negatively affected by the nonpayment of salaries to civil servants since August 2016, which undermines the collection of direct taxes from these public sector workers. Also, tax administration capacity has become increasingly fragmented across the country as revenues are now split between the internationally recognized government in Aden and the de facto authorities in Sana'a. While data is not available to estimate the type and amount of taxes collected in areas controlled by the de facto authorities, it is likely to be significant as Sana'a has historically been the center of much of the country's administrative and business activity. Finally, incentives for tax compliance may be negatively affected as public service delivery has been reduced in many parts of the country, which further constrains fiscal resources available to the government.

FIGURE 3.1 Revenue and Expenditure Trends, 2010–2018



Sources: Yemen Ministry of Finance, Yemen Statistical Office, staff of the International Monetary Fund (IMF) and World Bank.

Customs administration: As a result of the current crisis, total imports and exports are estimated to have dropped by more than 50 percent between 2014 and 2015.⁴⁸ Much of this decline is due to significant damage to four of Yemen's seven major ports, which has resulted in temporary and permanent port closures. Indicators measuring customs administration performance has likewise declined. The Doing Business Reports for both 2017 and 2018 rank Yemen in last place (189th) for trading across borders. Moreover, as noted in recent Country Policy and Institutional Assessments (CPIAs), no up-to-date published customs clearance procedures are available to facilitate traders' business activities, and informal payments are common at entry points for imported and exported goods.

Subnational revenues: At the governorate-level suggests, municipalities have been forced to develop a number of coping mechanisms as a result of declining fiscal receipts from the central level and lack of liquidity at the CBY. In particular, this affects central-level functions deconcentrated to the governorate level, such as to the MoF and MoCSI, which in the past relied on subventions from the central government. Such entities have been forced to reduce their expenses to a minimum. Other service delivery entities such as the CCIF, the LWSC, and health-care facilities continue to collect revenues from service/consumption fees, but their income has largely declined. As a result, informal payments for education and medical services have increased in virtually all governorates where interviews were conducted (box 3.2). Some governorates have noted a decline in resources, given that central government transfers from the CBY have been disrupted, especially those to rebel-controlled areas. By contrast, in Ma'rib, revenues from propane gas and oil by-products, taxes, and zakat have actually led to an increase in revenues, according to respondents. In port cities such as Hodeidah, most of the local revenues have been diverted to the capital city Sana'a, thereby increasing their reliance on aid provided by international donor organizations. Survey data also suggest that financial resources/revenues collected in Sana'a and Taiz are only occasionally deposited into revenue accounts in the CBY based in Sana'a. Survey data also suggest that financial resources/revenues collected in Sana'a and Taiz are only occasionally deposited into revenue accounts in the CBY based in Sana'a.

Future Needs and Prioritization (2018)

Tax administration: In terms of future needs to rebuild the tax administration, the 2017 Yemen Policy Note Series identifies a number of critical measures, which are still relevant to the current situation. Potential future needs include: (i) reestablishing a centralized tax administration with adequate human resources; (ii) restarting collection of income taxes, using a uniform tax rate for the sake of simplicity; and (iii) facilitating, accelerating, and professionalizing the private sector's required interactions with tax authorities. As noted, Yemen has already developed important pillars for driving tax reform as an outcome of the National Dialogue Conference of 2013–14, which if reconfirmed in a post crisis reconciliation agreement, would serve as a cornerstone to commence a tax reform agenda.⁴⁹

Customs administration: The 2017 Yemen Policy Note Series also identifies a number of future needs for improving customs administration and revenues. Those relevant to the current situation include the following: (i) reestablish customs administration facilities at key ports; (ii) improve human resource (HR) capacity for levying import taxes in line with relevant legislation; (iii) improve customs officials' oversight and performance management to reduce opportunities for graft; and (iv) where necessary, contract third-party support for reestablishing the customs regime and conducting inspections, including possible improvements to the United Nations Verification and Inspection Mechanism for Yemen (UNVIM) system, in order to ensure efficiency and security. Given

48 Yemen Policy Note 2: Economic, Fiscal, and Social Challenges in the early phases of a Post Conflict Yemen.

49 Ibid.

that there are limited points of entry into Yemen through which the majority of imported commodities enter the country, these recommendations would help to ensure a relatively sizable and reliable stream of revenues that are administratively manageable.⁵⁰

Subnational revenues: A number of future needs exist with respect to tax and customs administration at the decentralized level. With respect to sources of revenues, all districts interviewed agreed on the importance of resuming central government transfers, increasing tax revenues, and diversifying the sources of revenues. In Hodeidah, respondents noted that customs revenues should not be transferred back to the central level, whereas in Aden, a restabilization of the security situation was the priority highlighted. Once the flow of fiscal revenues reaches a stable point, all entities noted that they would be willing to deposit financial resources/revenues collected at the governorate/district level back into the CBY. Also, respondents in Sana'a and Taiz expressed an interest in returning to the free provision of health care and education. Respondents in Ma'rib expressed an interest in becoming more self-reliant and depending on local resources, whereas the port cities Hodeidah and Aden highlighted the importance of lifting restrictions on ports, returning central subventions, and reestablishing security as a means of ensuring a stable revenue flow in the future.

Strategic Planning and Public Expenditure Management

Pre-crisis Situation (2014)

Policy planning and budgeting: At the outset of the crisis, the link between policies and the budget had already deteriorated as budget management began to function on an “emergency basis” mode in 2014. While the capital budget prepared by the MoF was linked with the public investment plan prepared by the Ministry of Planning and International Cooperation (MoPIC), recurrent cost implications of capital projects were only partially included in the budget. In addition, as noted by the CPIAs produced during the pre-crisis period, while noncapital policies and priorities were broadly reflected in the budget, there was a considerable difference in the magnitude of the plan and the actual budget, implying a lack of prioritization within budget constraints at the planning stage.

Multiyear budgeting: At the outset of the crisis, elements of forward budget planning were in place, both at an aggregate level and for the line ministries. The government prepared a Medium-Term Expenditure Framework (MTEF) for a three-year budget for the period 2014–16. On an aggregate level, fiscal forecasts of revenue and expenditure were likewise prepared for a rolling three-year time horizon, including the current year. As noted by the CPIAs prepared during the period, the Ministry of Planning still prepared a rolling public investment program (PIP) for a four-year period, and some sectors also developed individual MTEFs, although these were not in line with the aggregate macrofiscal forecasts.

Subnational planning and budgeting: At the governorate-level during the pre-crisis period, the MOF, Council of Ministers, and House of Representatives participated in three consecutive stages of budget approval for most of the government facilities (except for special funds like CCIF and other revenue-generating service providers like LWSC, which are considered independent economic units). During this period, local governments prepared a budget in advance of the coming fiscal year, which was typically approved by the governorate, and subsequently submitted to the MoF for inclusion in the national budget before discussion with the Cabinet and Parliament. Interviewees noted that budgeted funds for governorates/districts tended to arrive on time and in line with the annual allocated budget. Likewise, the budget was organized around line-item inputs for all surveyed governorates. Multiyear budget projects were provided for Sana'a, Taiz, and Ma'rib, while Hodeidah and Aden produced budgets on an annual basis.

50 Yemen Policy Note 2: Economic, Fiscal, and Social Challenges in the early phases of a Post Conflict Yemen.

Situation as of Spring 2018

Policy planning and budgeting: The 2016 decree to move the CBY from Sana'a to Aden, replace the Bank's Governor, and reshuffle the Board of Directors—which led to the existence of two separate authorities in Sana'a and in Aden—has created significant uncertainty for the overall public financial management system. In the absence of an approved budget since 2014, an expenditure plan using the 2014 budget ceilings was initially applied in 2015 and 2016, although the 2014 fiscal context was largely outdated in 2015, negatively impacting budget credibility. Likewise, as noted by recent CPIAs, the use of the AFMIS by the spending units stopped in most ministries. According to the most recent Bertelsmann Stiftung's Transformation Index (BTI), the two parallel governments engage in no nationwide policy coordination, and even within their apparatuses, horizontal and vertical cooperation is lacking.⁵¹

Multiyear budgeting: In the absence of a unified central government, any type of multiyear revenue or expenditure planning has ceased. The last development plan ran out in 2014, at the same time the last official budget was prepared. As noted by the BTI, the Recovery and Reconstruction Plan that the Aden-based government circulated among the donor community in summer 2016 was considerably beyond the capacities of Yemeni and international institutions. In January 2017, de facto authorities in Sana'a presented their own program, but it is unclear how this would be financed.⁵²

Subnational planning and budgeting: At the governorate-level, there are currently no budgets in place at the governorate/district levels, aside from 2014 budget figures, guided by the imperative to reduce expenses to a minimum. For instance, in Ma'rib, there is no budgeting done at the governorate-level other than financial provisions with respect to operational expenditures. As noted by respondents in Taiz and Aden, only revenue-generating agencies were able to prepare new budgets in the current context. As a result, there is no timely allocation of resources and little action has been taken to manage preexisting budget deficits at the local government level. Since no formal budget process exists, budgets are not prepared in advance of the coming fiscal year (other than those used in 2014), and no multiyear revenue or expenditure projections are included at the governorate level.

Future Needs and Prioritization (2018)

Policy planning and budgeting. As noted by the 2017 Yemen Policy Note Series, the legitimacy, trust building, and effectiveness of any expenditure program requires the restoration of normal budget operations in order to support the state administrative structure and to provide some degree of service delivery. In the immediate short-term, a realistic “emergency budget” for the post crisis fiscal year would need to be prepared. Going forward, preparing and launching a unified budget covering the whole country would be an important step to signal commitment to the peace process as well as to restore the integrity of the budget execution process in the reconstruction phase.⁵³

Multiyear budgeting: In order to restore multiyear forecasting, a simple mechanism for the selection and allocation of funds to reconstruction capital investment projects would need to be established and further developed over time.⁵⁴ Going forward, future planning could be organized within the context of a Recovery and Peacebuilding Assessment (RPBA), which provides a useful framework for prioritizing investments and aligning donor

51 Bertelsmann Stiftung, BTI 2018 Country Report — Yemen. Gütersloh: Bertelsmann Stiftung, 2018.

52 Ibid.

53 Yemen Policy Note 2: Economic, Fiscal, and Social Challenges in the Early Phases of a Post Conflict Yemen.

54 Ibid.

resources to fill financing gaps. As demonstrated in other countries where RPBA were prepared, this may involve setting up a dedicated secretariat to oversee the planning, coordination, and execution process.

Subnational planning and Budgeting: As data at the governorate-level suggests, a number of needs exist with respect to returning to normal budgetary operations in the future. In two revenue-generating regions, Ma'rib and Hodeidah, there is growing interest in establishing a decentralized revenue and expenditure planning process. Some survey respondents suggested that they would eventually like to be able to provide multi-year projections in the future, but in the current environment, such prospects are impossible without sufficient capacity building.

Budget Execution and Oversight

Pre-crisis Situation (2014)

Budget execution: Budget execution and budget credibility were reasonably maintained in the pre-crisis period. To be sure, in only one of five pre-crisis fiscal years (2010–14), did actual expenditure deviate by more than 10 percent from the originally approved budget. This reflects reasonably adequate budget execution given the political instability that followed the Arab Spring in 2011. As noted by relevant CPIAs, there was no system in place for the systematic monitoring of arrears in the pre-crisis period, although expenditure arrears were evaluated at the budget preparation stage and were found to amount to less than 1 percent of total expenditure.

Financial management and reporting During the pre-crisis period, quarterly budget execution reports were prepared and submitted within six weeks after the quarter-end and monthly reports were submitted within 15 days of month's end. Consolidated government accounts were prepared annually and covered revenue and expenditure information as well as financial assets and liabilities. According to the 2015 Open Budget Index (OBI), Yemen's score of 34 was significantly higher than its score in 2012, given that it increased the availability of budget information by publishing the Executive's Budget Proposal.⁵⁵

Public procurement: Yemen had been performing well with respect to reforming its procurement system and practices in the pre-crisis period. This included: (i) the development of procurement manuals and standard bidding documents (SDBs); (ii) the promulgation of the Procurement Law No. 23 of 2007; (iii) the development of executive regulations and bylaws; (iv) the restructuring of the High Tender Board (HTB); (v) the establishment of the High Authority for Tender Control (HATC) in 2009; (vi) the development of the Procurement Management Information System (PMIS) in 2014; (vii) the Parliamentary ratification of the Anti-Corruption Law No. 36; and (viii) the subsequent establishment of the Supreme National Authority for Combating Corruption (SNACC).

Controls and oversight: Budget controls and monitoring systems were already in an inadequate state in the pre-crisis period, mostly due to deficiencies in internal controls and internal audit. As noted in successive CPIAs, although the internal audit function covered all of the central government and other public bodies, operations were restricted by staffing constraints, and as a result, the Internal Audit Unit was unable to effectively fulfill its role and coverage. During this period, the effectiveness of the Central Organization for Control and Audit (COCA), the supreme audit institution, was hampered by lack of sufficient time to conduct the external audit as stipulated in the Finance Law as the MoF did not submit final accounts within six months of the close of the fiscal year.

Subnational budget execution and oversight: In the pre-crisis period, not all governorates/districts adequately kept track of budget execution information. However, all maintained a bank account at the CBY in the pre-crisis

55 International Open Budget Partnership. Open Budget Survey 2015—Yemen Country Report. <https://www.internationalbudget.org/wp-content/uploads/OBS2015-CS-Yemen-English.pdf>.

period and carried out monthly reconciliations either at the local level or through MoF representation at the local level. Likewise, monthly and quarterly financial reports were prepared in accordance with the legal requirements in the pre-crisis period, and internal control and procurement procedures were in place. HTB thresholds were generally respected during the pre-crisis period; tendering for procurements occurred through advertising, mostly through official newspapers.

Situation as of Spring 2018

Budget execution: As a result of the current crisis, budget execution and budget credibility declined significantly. In the absence of an approved budget since 2014, an expenditure plan using the 2014 budget ceilings was initially applied in 2015 and 2016, although the 2014 fiscal context is largely outdated. As in the past, there is no system for monitoring arrears; however, estimates of total of civil service salary arrears amount to approximately US\$5.2 billion as of September 2018, given that civil servants ceased to receive salaries since October 2016. In places where salaries are still/occasionally paid, the amounts have been greatly reduced and are inconsistent across governorates.

Financial management and reporting: Due to the current crisis, in-year fiscal reporting has likewise declined. Although monthly and quarterly budget execution reports were prepared, they were delayed in 2015 due to the conflict and no information exists on fiscal reporting for 2016 and 2017. As noted in the CPIAs conducted over the period, no updated information on consolidated government accounts has been produced since 2015, and financial statements have not been submitted for external audit since 2014. With respect to fiscal transparency, the Open Budget Survey notes a substantial decline between 2015 and 2017, with Yemen scoring 0 out of 100 with respect to budget information and public participation.

Public procurement: The oversight power and staff capacity of HATC and HTB have been affected considerably due to the reduction in budget for operation and irregularity in staff salary payment. Despite the procurement reforms started in the pre-crisis period, these activities were suspended in 2015 when the crisis erupted. Each line ministry maintains a list of all contracts awarded, and the HTB maintains a list of contracts above Yemeni riyals (YRIs) 125 million that were procured under the open tender method; however, none of these lists are currently published or made available to the public. Due to multiple systems for managing public resources and the arbitrary use of power, most administrative entities are resorting to what best suits them, including direct contracting by triggering article 19 of the procurement law. The number of cases reviewed by the HTB since the conflict started has declined considerably, from 126 cases in 2014 to 32 cases in 2017.

Controls and oversight: Budget controls and monitoring systems have remained inadequate, as in the pre-crisis period. Although the internal audit function covers all of central government and other public bodies, internal audit operations are restricted by staffing constraints, leaving the Internal Audit Unit unable to effectively fulfill its role. While the COCA institutional structure seems to have remained intact and staff continue to function, no audited financial statements have been produced since December 2014.

Subnational budget execution and oversight: With respect to data collected at the regional level, evidence suggests that while all entities maintain a Bank account at the CBY, they do so only in a nominal sense. Monthly reconciliations have continued, but have declined significantly in Sana'a, Taiz, Hodeidah, and Aden. Likewise, monthly financial reporting has become more infrequent across governorates. While Ma'rib submits financial reports on a regular basis and observes the Public Tenders Act and financial procedures, such reporting practices vary across the country. At the local level, the space for community members to participate in the planning process, monitor public spending, and provide feedback to public officials through local councils has diminished.

Future Needs and Prioritization (2018)

Budget execution: As noted in the 2017 Policy Note Series, restoring the operations of the CBY is an essential condition for improving public financial management and regaining macroeconomic stability. Going forward, it would likewise be necessary to develop a unified emergency budget, rebuild cash balances in the Treasury Single Account, restart the AFMIS, conduct an inventory of arrears, and resume public investment management systems. A second stage of reforms would include developing mitigation measures for fiduciary risks, hiring monitoring agents, ensuring the integrity of payroll data and controls for budget execution, enforcing ceilings, and setting a schedule for the liquidation of arrears.

Financial management and reporting: A number of steps will be necessary to improve financial management and reporting, which will be essential for building trust and confidence. As noted in the 2017 policy note series, producing timely and reliable information about the budget and its execution will help to open doors for public debate and will help facilitate accountability over the use of public resources to citizens and development partners alike. Subsequently, once the crisis is over, key budgetary institutions should work to publish relevant information, including at minimum an Enacted Budget, a citizens budget, and a year-end report.

Public procurement: In terms of future needs for public procurement, a number of needs remain which will need to be addressed in the future, including, inter alia: (i) lack of transparency in procurement decisions, due in part to unclear distribution of power; (ii) multiple systems for managing public resources and service delivery, with varying degrees of effectiveness, inclusiveness, and legitimacy; (iii) weak institutional capacity for oversight and implementation; and (iv) the need to develop a procurement strategy that empowers the local institutions at all levels, both central and sub-national. Accordingly, a first stage of support in the post crisis period would include planning a flexible procurement framework, rebuilding procurement capacity in key service delivery institutions, and including and oversight national institutions such as the HATC and HTB.

Controls and oversight: In terms of future needs for improving budget controls and oversight, it will be important to ensure that fundamental controls are in place to prevent fiscal leakages during the recovery period. Under the presumption that expenditure priority will initially be placed on payments of civil servant salaries, securing the integrity of payroll data and controls will be imperative. This would include performing bottom-up and top-down payroll cleaning exercises based on biometric data as well as ensuring that audit and control mechanisms are in place to ensure that “ghost workers” and “double dippers” do not reenter the payroll. Additional capacity building can be provided for COCA to oversee large civil work contracts in the reconstruction period.

Subnational budget execution and oversight: Going forward, all regional entities expressed a willingness to maintain a bank account with the CBY, to carry out monthly reconciliations, to prepare timely financial reports, as well as to scale-up their use of internal controls. To implement an effective recovery and reconstruction program, there is a clear need to enhance the quality, efficiency, and transparency of the country’s public financial management system and procurement operations. In particular, reforms are needed in: (i) the professionalization of procurement cadres; (ii) information and communications technology (ICT) and data (further developing the existing PMIS facilities, including e-procurement, at the governorate, directorate, and district levels); and (iii) the promotion of transparency, specifically through the Open Contracting Data Standard (OCDS).

Core Capacities and Resources for Service Delivery

Pre-crisis Situation (2014)

Salaries and wage bill: At the outset of the crisis, approximately 1.25 million Yemenis—both civil and military employees—were receiving public sector wages.^{56, 57} The total monthly cost of these wages, not including pensions, was approximately YRI 75 billion, or 36 percent of the federal government budget.^{58, 59} As a result, Yemen's wage bill as a percentage of total expenditures exceeded MENA's regional standards in the pre-crisis period. The CBY disbursed salaries through its local branches, located in every governorate, and a computerized database for civil service personnel was in place, which was built on the basis of the job survey carried out in 1998, capturing their job information. However, this database was not regularly maintained, nor was it linked to the payroll database, whereas their biometric database was fragmented.

Public administration: The quality of public administration was poor even before the crisis began. Virtually all CPIA indicators had declined, with the public sector management and institutions cluster declining from 2.9 in 2010 to 2.7 in 2014. Likewise, already in 2014, all of the World Governance Indicators (WGIs) had deteriorated from their 2010 scores, including those measuring political stability, government effectiveness, regulatory quality, and rule of law. While a number of de jure practices and procedures were in place governing meritocracy in recruitment during the pre-crisis period—including advertising posts through a computerized database, conducting competitive competency-based recruitment examinations, and publishing the names of hired candidates in local newspapers—evidence of de facto implementation of these guidelines cannot be confirmed. According to Freedom House, no merit-based competitive selection process existed de facto for civil-service positions, and recruitment occurred largely through informal networks and academic qualifications varied considerably within the civil service, particularly for senior level appointments.

Subnational capacities for service delivery: At the governorate-level, survey data suggests that no staff had been lost in the pre-conflict period and staff attendance was monitored through a combination of attendance sheets and fingerprint readers. Salaries, while low, were paid to all staff including those responsible for service delivery at the regional levels. During this period, adequate staff numbers were present in hospitals, schools, and sanitation facilities to ensure the satisfactory delivery of public services. In social service delivery sectors, CSOs and nongovernmental organizations (NGOs) also helped to provide services, often as part of donor-funded projects. Nevertheless, capacity gaps were noted in the pre-crisis period across core government functions (for example, finance/management, accounting, planning, internal audit, and information technology [IT]) as well as in service delivery sectors (for example, medical staff, teachers, civil engineers, and so on). In the pre-crisis period, most entities surveyed were aware of these capacity gaps and had reliable information on internal capacity and training challenges.⁶⁰

56 <https://reliefweb.int/sites/reliefweb.int/files/resources/wfp288497.pdf>

57 <http://www.yemenembassy.org/wp-content/uploads/2017/03/salaries-Paper-1.pdf>

58 <http://www.iris-france.org/wp-content/uploads/2017/04/IARAN-YEMEN-6-month-analysis-REPORT-1.pdf>

59 <http://www.yemenembassy.org/wp-content/uploads/2017/03/salaries-Paper-1.pdf>

60 It should be noted that the responses given on this topic were solicited from service delivery providers themselves, which may introduce an upward bias, particularly in the self-assessment of their roles and performance in the pre-crisis period.

Situation as of Spring 2018

Salaries and wage bill: As a result of the crisis, public employees ceased receiving salaries in August of 2016.⁶¹ Since then, public sector salary payments have been sporadic, partial, or entirely unavailable in most of Yemen. Accordingly, the disruption/suspension of public-sector salaries has exacerbated Yemen's economic crisis by significantly reducing the purchasing power of Yemeni citizens who depended on public sector salaries prior to the crisis. It has also affected the provision of crucial public services, which have been drastically curtailed or ended altogether as employees have left their jobs in a number of governorates. Strikes and protests have become more prevalent, and anecdotal evidence suggests that the incidence of informal payments for services has increased (box 3.2).

Public administration: As a result of the current crisis, as well as subsequent interruptions caused to the payment of civil servants since September 2016, public administration capacity has declined significantly below its 2014 pre-crisis levels. In particular, the current crisis has resulted in the destruction and loss of information in records and databases, the loss of administrative leaders in core functions including those in the Ministry of Civil Service and Insurance (MoCSI), as well as administrative dislocations that have occurred as a result of the split in government. To be sure, reports like the Bertelsmann (2018) and Doing Business (2017), and the Worldwide Governance Indicators (2017) are among the most reliable sources and support the conclusion that Yemen's institutional and governance systems were frail to start and have continued to deteriorate over the past few years. Moreover, as demonstrated by successive CPIA assessments over there period, virtually all public sector management and institutions indicators have declined below the fragile state threshold, including, among others, indicators measuring the quality of budgetary and financial management, efficiency of revenue mobilization, quality of public administration, as well as transparency, accountability, and corruption in the public sector.⁶²

Subnational capacities for service delivery: At the regional level, key informant interview data notes that more than 50 percent of government staff have ceased to be present, either because of lack of salary payment, relocation, or death; however, actual attendance varies considerably across governorates. While mechanisms are in place to ensure staff attendance, Sana'a, Hodeidah, and Taiz no longer enforce these. All governorates report that there are not enough staff—including doctors, teachers, and sanitation workers—to provide basic services. CSOs have become increasingly active, as they benefit from foreign funding of their operations. Capacity gaps have been identified in Sana'a, Ma'rib, and Aden, and specific training needs have been identified in all governorates with the exception of Hodeidah.

Future Needs and Prioritization (2018)

Salaries and wage bill: To prevent the total collapse of public services, the greatest need is the resumption of civil servant salaries in key sectors. In this regard, key priorities include establishing baseline payroll data on the basis of December 2014 payroll information, subjecting all subsequent changes to the relevant legal provisions of civil service legislation, as well as assessing and continue developing the outputs of the biometric identification system towards achieving the desired objectives. Going forward, it will be necessary to (i) ensure the quality and veracity of payroll data including "bottom-up" and "top-down" verification; (ii) put in place a flow-of-funds mechanism vis-à-vis the CBY in order to help rebuild capacity and provide urgently needed liquidity, while properly safeguarding funds; (iii) develop mechanisms through which individual civil servants can receive payments, given uneven access to financial institutions; and (iv) put in place the necessary internal audit and external oversight functions.

61 <http://www.iris-france.org/wp-content/uploads/2017/04/IARAN-YEMEN-6-month-analysis-REPORT-1.pdf>

62 Source: <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>

Public administration: In addition to the immediate resumption of salary payments, urgent attention is needed to support wider civil service reforms, to ensure effective recruitment in the public positions, and to guarantee the accountability and fairness with respect to wages. Such medium-term measures would include support for: (i) a systematic and fair pay package as well as performance-based culture; (ii) improving internal and external controls and audit capacity; (iii) systems to verify staff attendance; and (iv) assessing the sustainability of the wage bill in the medium- to long-term.

Subnational capacities for service delivery: At the governorate-level, a number of needs with respect to HR capacity for service delivery in the future. With respect to staff absenteeism, many of the entities surveyed do not see a solution unless the crisis is ended and/or the salary payments are resumed. Given insufficient staff numbers, all entities expect that CSOs and international organizations will continue to support service delivery into the future. With respect to filling capacity gaps in the future, the specific needs identified include: (i) reforming the educational process to better align training with labor market needs; (ii) retraining institutional leaders, and training other staff in areas such as accounting, procurement, storehouse, and budgeting; (iii) providing training in management, planning, health care, education, environmental health, computer/ software applications, and revenue collection; (iv) providing sufficient budget allocations to cover the gaps; (v) establishing training institutes as well as allocating adequate budgets to training and development in each entity; and (vi) training administrative staff.

Public Accountability

Pre-crisis Situation (2014)

Citizen voice and accountability: In the pre-crisis period, successive CPIA assessments note that the government had shown good recognition of the importance of community and civil society involvement in development planning and local service delivery. According to the WGI, the score for voice and accountability expanded in the 2010–14 period, largely as a result of changes linked to the 2011 Arab Spring uprising. During the pre-crisis period, the country's ranking on Transparency International's Corruption Perception Index (CPI) actually improved by one place in 2014 in comparison with 2013. Nevertheless, according to BTI 2014, the SNACC was effectively blocked by a ministerial decree in January 2013. Numerous attacks on journalists were reported by Freedom House, which noted that while freedom of association was constitutionally guaranteed and several thousand NGOs worked in the country, their ability to operate was restricted in practice.

Transparency: At the outset of the crisis, citizens had a right to request government information and basic government records; however, while there were few legal restrictions to freedom of expression and freedom of information was protected by law (Information Law of 2012), protection against abuse was missing. Reporters Without Borders indicated a slight improvement between 2011 and 2013 in the World Press Freedom Index, with Yemen moving from 171st to 169th place out of 179 countries. The MoF placed key fiscal data on its website including annual budget documents to enhance transparency in the budget-making process by allowing civil society, the academia, and citizens to contribute in the budget discussions in the Parliament through representatives of their constituencies. In 2012, Yemen was re-acknowledged as a compliant member of the Extractive Industries Transparency Initiative (EITI), a status had temporarily been suspended in June 2011.

Subnational citizen engagement: In the pre-crisis period, many governorates already began engaging with civil society organizations in a number of areas. While the MoF and MOSCI as well as revenue authorities did not explicitly engage with civil society in the pre-crisis periods, there was considerable engagement across governorates on issues related to health, education, water and sanitation, environment, social welfare, and anticorruption. Governorate-level entities accepted citizen feedback through local council representatives, complaint boxes, hotlines, and online media.

Situation as of Spring 2018

Citizen voice and accountability: As a result of the current crisis, citizen voice and accountability has declined considerably. As formal mechanisms for service delivery have all but disappeared as many central government functions and institutions have disintegrated, and as a majority have undergone changes in their leadership, the predominance of non-state communal and tribal actors in the provision of vital social services, justice, and security has increased. As a result, formal mechanisms for citizen voice have all but disappeared, and as noted in box 3.2 below, tribal structures have increasingly been used for citizens to voice complaints with respect to service delivery; however, women have largely been excluded from this process. These dynamics are likewise reflected in the 2018, which suggests that BTI, after a few years of almost unlimited freedom of association and assembly, since 2014, state and nonstate actors increasingly use violence against demonstrators, CSOs, and the media.⁶³ Likewise, by 2016, all of the WGI scores had continued to decline significantly below their 2010 and 2014 scores, including indicators measuring declining voice and accountability, rule of law, and control of corruption.

Transparency: Although a good legal framework for access to information has been put into place with the support of previous support from the World Bank, the current environment makes it difficult to implement in practice. The Yemeni NGO Studies and Media Economic Center reported 275 cases of violations of media freedom; 11 journalists were killed in 2016 alone. Finally, in terms of budget transparency, the Open Budget Survey notes that Yemen has significantly decreased the availability of budget information by failing to produce the executive's budget proposal, the enacted budget, in-year reports, and the year-end report. Given the difficulty of abiding by EITI principles during the ongoing crisis, the EITI board decided that Yemen should be delisted and suspended from the organization in February 2015.

Subnational citizen engagement: As a result of the crisis, local governments continue to engage with civil society, albeit on a more limited basis. While MOF and MOSCI agencies as well as revenue authorities do not engage with civil society, other entities have reduced their scope of engagement to the following areas: humanitarian assistance and social welfare (Sana'a); psychiatric support, internally displaced person (IDP) shelter initiatives, education, health, and water, sanitation, and hygiene (WASH) (Taiz); and malnutrition, internally displaced person (IDP) shelter initiatives, education, humanitarian assistance, and social welfare (Ma'rib). While most entities still accept citizen feedback as in the pre-crisis era, in some governorates, such as Taiz, these initiatives have been largely suspended (box 3.2).

63 Bertelsmann Stiftung, BTI 2018 Country Report—Yemen. Gütersloh: Bertelsmann Stiftung, 2018.

BOX 3.2 Informal Payments and Citizen Complaint/Redress Mechanisms

A Focus Group Study was carried out in five governorates including Sana'a, Taiz, Ma'rib, Hodeidah, and Aden to solicit citizen perceptions with respect to Informal Payments and Citizen Complaint/Redress Mechanisms. Findings include the following:

Informal Payments

- With respect to schools and educational services, informal payments were typically not made either before the crisis or currently, according to almost all respondents. In places where bribes were asked (women in Taiz and Hodeidah), focus group respondents noted the resumption of teacher salaries in the future would remedy the situation.
- With respect to health services, bribe paying for services is more common as a result of the crisis. In the past, bribes were typically asked only from female respondents, whereas as a result of the constrained services due to the crisis, men and women in almost every governorate now noted an increase in requests for informal and additional payments to access health services. To remedy this in the future, respondents noted a need for improved oversight and control in hospitals.
- With respect to water and sanitation services, bribe paying was neither an issue before nor as a result of the crisis, as the structure of service provision requires little individual discretion.

Complaint and Redress Mechanisms

- In Sana'a, there was no complaint/redress mechanism in place for citizens before the crisis or currently, although some male participants said they can make complaints to supervisors at community level.
- In Taiz, the opposite dynamic was noted, with respondents noting that there was an adequate complaint and redress structure in place before the conflict, but not currently.
- In Ma'rib, while there was no perception of a complaint/redress mechanism in place before the conflict, only men currently feel that they have a voice and venue to express their dissatisfaction with poor services.
- In Hodeidah, both men and women felt it was not possible to make a complaint or receive redress, either before the conflict or currently.
- In Aden, both men and women felt able to make complaints in the instances of poor service delivery, but only men feel that they still have this right currently.

Future Needs and Prioritization (2018)

Citizen voice and accountability: While the parliament resumed its work in Sana'a, limited mechanisms for citizen engagement make it difficult for the acting government to actively consider the will of the people as well as the CSOs that represent them. Accordingly, restoring mechanisms that facilitate the state-citizen interface could be a positive step toward restoring trust and promoting inclusion in the short-term. In the medium-term, support can be provided to help renew or revise the National Anti-Corruption Strategy (NACS) as well as the SNACC. Other relevant public institutions, like the COCA and HATC, could be supported by improving their HR and administrative capacities to increase their respective caseloads.

Transparency: With respect to improving transparency in Yemen, specific measures would include addressing budget transparency, if and when a unified budget is produced in the future. As noted by the Open Budget Survey, such efforts might include producing and publishing an executive budget proposal, a year-end report, in-year reports, an audit report, an enacted budget, a citizens' budget, a prebudget statement, and/or a midyear review. Another step to be prioritized in the future is providing the information necessary to become EITI compliant, given the large revenues surrounding Yemen's hydrocarbon sector.

Subnational citizen engagement: Key Informant survey data collected at the governorate-level suggests that in the future, local governments would like to engage with CSOs on a number of additional issues including: reconstruction / rehabilitation; awareness about utility bill payments, continued participatory activities in health care, development of controls and anticorruption mechanisms, water and sanitation, youth and sports, community development, and economic empowerment of youth and women. With respect to citizen feedback mechanisms, all governorates expressed an interest in restoring pre-crisis mechanisms as well as expanding them through training, and introducing new mechanisms including hotlines, call centers, and social-media channels.

Listening to the Voices of Yemeni People: 2019 Online Survey on Challenges and Trust

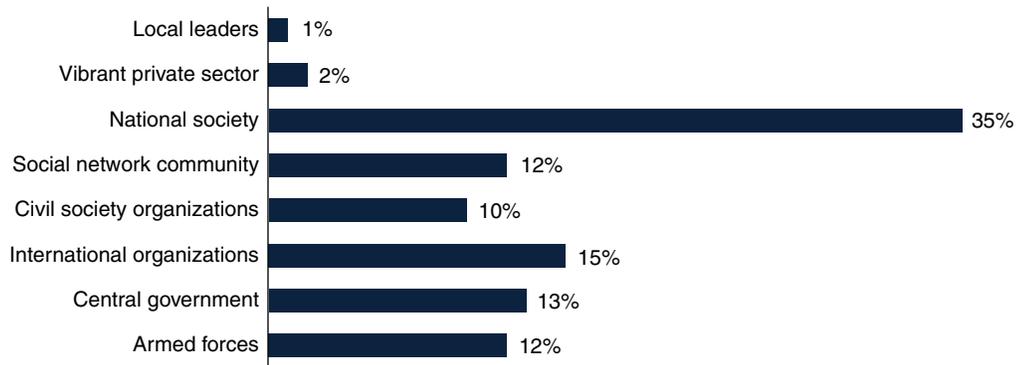
Background

As part of the research for the Building for Peace report, the World Bank partnered with RIWI Corporation in March–July 2019 to assess the views of people in Iraq, Libya, and Yemen on what the international community has managed to achieve in resolving these conflict situations. Where there are many official statistics, subjective perceptions are an illuminating and complimentary stream of insight. It is not official statistics that drive people's behaviors, decisions, motivations, or shape hopes and fears—but perceptions. Arguably, perceptions of reality are equally important to understanding reality than objective statistics. They are therefore an important supplement to traditional sources of data.

In total, 4,455 Iraqis, 4,514 Libyans, and 5,195 Yemenis fully completed the surveys, with roughly the same questionnaire used in all three countries. On the surface, there are some similarities in the wavering belief toward leaders to actually deliver effective change, and a loss of hope for their children's future. All three countries show exasperation with the government, local leaders, and foreign intervention. Instead, respondents expressed the highest trust in national society (not in national governments or international actors), high levels of perception of security, as well as a strong sense of empowerment in people's own individual ability to improve their personal economic situation. The responses paint a picture similar to the ones in Wave V of the Arab Barometer surveys in Iraq, Libya, and Yemen,⁶⁴ confirming once again the general loss of trust in leaders to deliver effective change and the dissatisfaction with the ongoing efforts to tackle the challenges in people's day-to-day lives.

64 Arab Barometer Wave V, 2018. Data on Iraq, Libya and Yemen available at <https://www.arabbarometer.org/survey-data/data-analysis-tool/>

FIGURE 3.2 Who Do You Trust the Most to Successfully Improve Your (or your family’s) Economic Situation?



YE.8. n = 8,137.

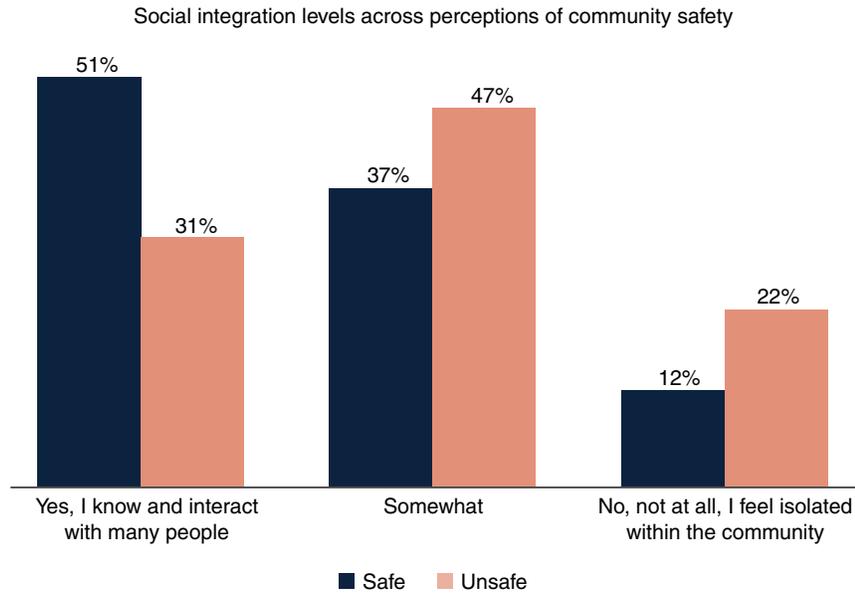
Key Results

The people in Yemen experience their country’s conflict in a variety of ways in their day to day lives, reflected by the marked lack of consensus among views of grievances, peacebuilding, trusted actors, and vision for the future.

A pulse on the economic situation in Yemen reveals that one third of Yemenis are unemployed, and almost half do not perceive themselves to be in good financial health, with difficulties to afford food. A vast majority of respondents feel they live in a safe place, though this does not seem to be tied to a belief in leaders to provide for their protection, as only half of respondents hold this trust. Nor do respondents have an overwhelming belief in their leaders to deliver effective change, as only a little over half of the respondents believe their leaders can change their communities or their country. More people have trust in their own agency and abilities, as three quarters of respondents feel personally able to improve their own economic situation. Other than themselves, the most trusted actor to improve people’s own economic situation seems to be the Yemeni society (by one third of the respondents), with no clear second choice across the other actors. Quite clearly, the private sector and local leaders are held in the least trust (figure 3.2).

The survey indicates a fairly strong level of social cohesion, as about 80 percent of respondents indicated that they neither have any issues in doing business with people from outside their communities, nor would they mind if their children made friends with children from other communities. In response to a question on whether the respondents felt they were integrated within their communities, over 85 percent of participants responded they feel somewhat or very integrated (figure 3.3).

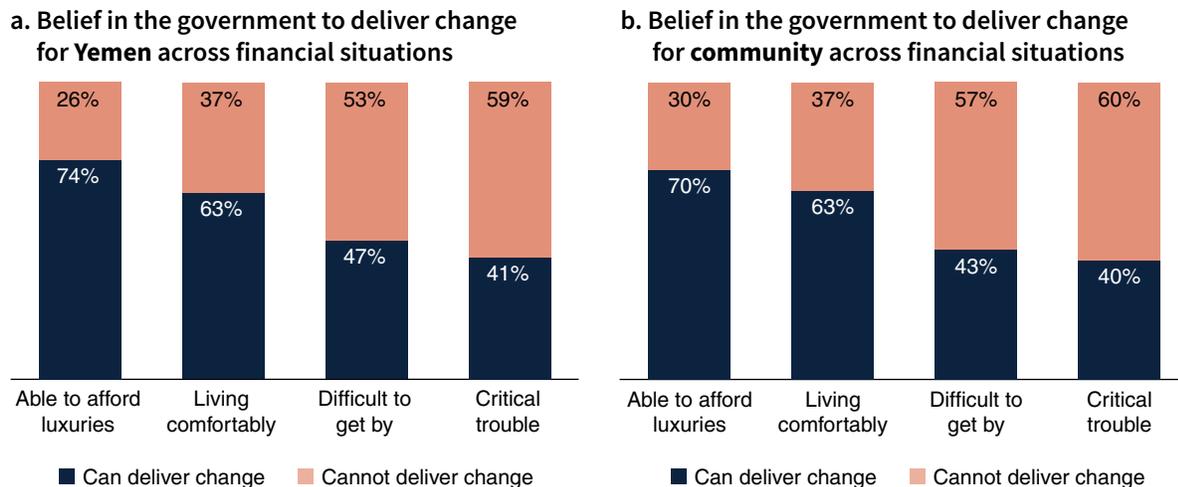
FIGURE 3.3 Cross-Answers to the Questions “Do You Feel Part of Your Local Community” and “Do You Feel Safe in Your Local Community”



YE.5.2. n = 14,354.

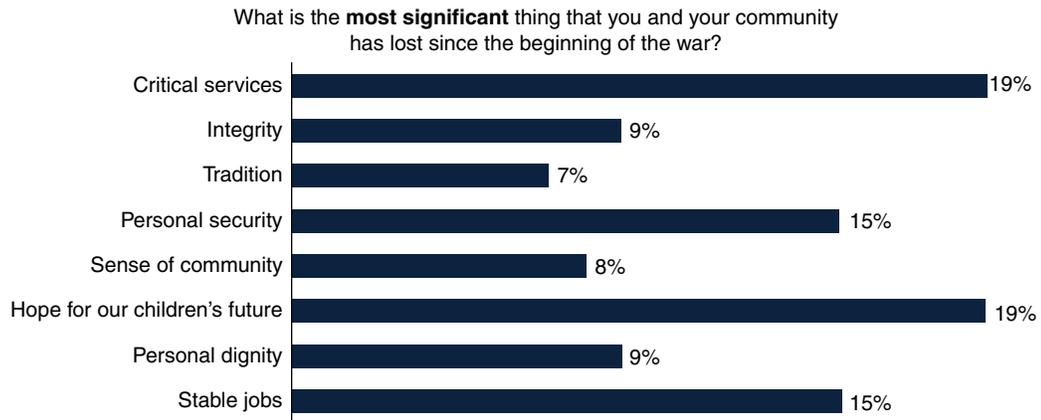
Figures 3.3 and 3.4 illustrate a generally positive correlation between perceived safety and social cohesion on the one hand, and perceived health and trust in local leaders to deliver change on the other hand (with a stronger inclination toward change targeting local communities, but the relationship also exists among those who believe leaders can deliver change for the whole of Yemen). Those who do not believe their leaders can deliver change for either Yemen or their communities point to distrust with the leadership itself, hinting at issues of corruption, integrity, efficiency, accountability, and poor economic policies. Those who do believe their leaders can deliver change do not point to any structural weaknesses, but to their engagement and effectiveness on the

FIGURE 3.4 Belief in the Government to Deliver Change for All of Yemen and for the Respondents’ Community across Financial Situations



YE.6b.4. n = 6,450.

FIGURE 3.5 Most Significant Loss since the Beginning of the Conflict

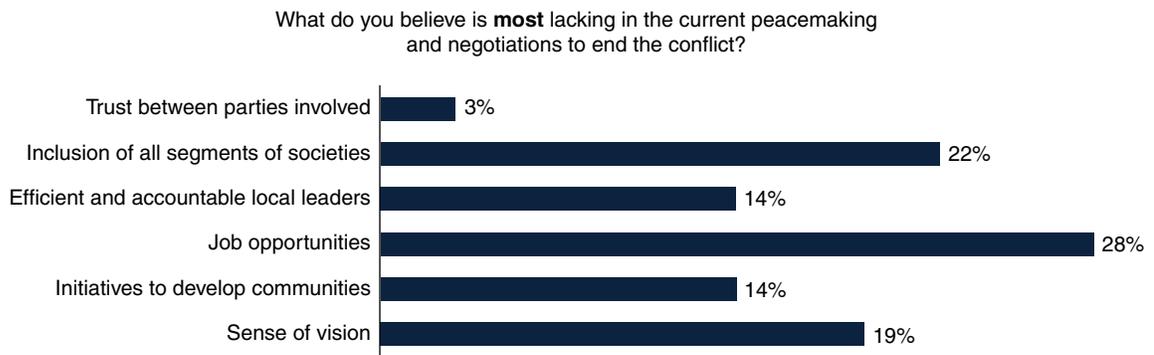


YE.11. n = 8,307.

ground—focusing on job creation, inclusion of all segments of society, support for local initiatives, and community cohesion. The geographical distribution of the responses point to a stronger trust in the government in areas where participants reported higher perceptions of security and a better financial situation. The lack of consensus on what are the most important things the respondents have lost since the beginning of the conflict reflect the gravity of the destruction of the intangible assets, such as hope for the children's future and services (figure 3.5), which is also correlated with the lack of trust in leadership.

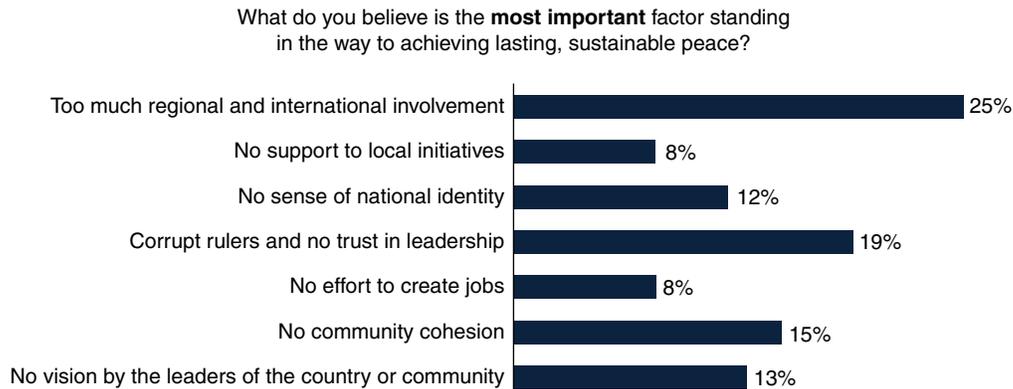
With regard to the conflict, Yemenis strongly feel they have lost many things, including a hope for their children's future, critical services, personal security, and stable jobs (figure 3.5). Yemenis also find that current peacebuilding efforts lack many important elements, such as job opportunities and the inclusion of all segments of society (figure 3.6). Even though it is unclear from the data what is the single most important element needed to achieve a sustainable peace, respondents point to several elements that are critically needed—better education, less

FIGURE 3.6 Priorities for Peacebuilding



YE.12. n = 4,748.

FIGURE 3.7 Factors Standing in the Way of Achieving Sustainable Peace



YE.13b. n = 1,619.

foreign involvement, and enhanced cooperation among community groups. It seems that neither the local, central, nor international actors are perceived to be acting in the interest of establishing peace. According to the surveys, the two main things standing in the way of establishing peace are too much international involvement and corrupt rulers, closely followed by the exclusion of some communities from the political and economic spheres (figure 3.7). Respondents who are in a healthier and more optimistic position are somewhat more likely to focus on things like a loss of tradition or wanting more citizen involvement, identifying these as secondary concerns, now that they are not in a crisis situation.

4

Health

Disclaimer

The 2020 health sector update is primarily based on satellite imagery and (social) media analysis. Due to movement restrictions currently imposed in the country due to the COVID-19 crisis, validation through ground partners was not feasible. Accordingly, the findings in this chapter should be interpreted with caution and should not be used for decision making given the limitations.

Pre-crisis Sector Conditions

Before the conflict, the health system in Yemen was characterized by significant disparities in health status, coupled with inadequate financial protection, inequitable distribution of resources, and weak financial capacity.

Health Status

Prior to the crisis, communicable diseases were the main cause of death, while lower respiratory infections, diarrheal disease, and congenital anomalies accounted for around 43 percent of all mortalities.⁶⁵ The maternal mortality ratio was high, at 416 deaths per 100,000 live births, concentrated among rural women with low incomes.⁶⁶ With socioeconomic and geographic disparities, the child malnutrition rate and infant and under-five mortality rates (69/1,000 and 78.2/1,000, respectively)⁶⁷ were among the highest in the world. Likewise, widespread inequality was manifested through domestic violence, particularly against women, and widespread female genital mutilation (38 percent).⁶⁸ The total fertility rate (TFR) remained high at 4.4 per woman,⁶⁹ with a low contraceptive prevalence of 28 percent,⁷⁰ one of the most serious health risks for Yemeni women. Figure 4.1 displays the leading causes of disability-adjusted life years in Yemen between 1990 and 2010.

Access to Health Care and Financial Protection

Because of insufficient functional health care facilities, absenteeism among health workers, and limited health insurance coverage characterized by unaffordable prepaid schemes, more than half of Yemenis lacked access to

65 IHME (Institute of Health Metrics and Evaluation), “GBD (Global Burden of Disease),” IHME, Washington, DC, 2010.

66 Trends in maternal mortality: 1990 to 2015: estimates by the World Health Organization (WHO), the United Nations Children’s Fund (UNICEF), the United Nations Population Fund (UNFPA), the World Bank Group, and the United Nations Population Division.

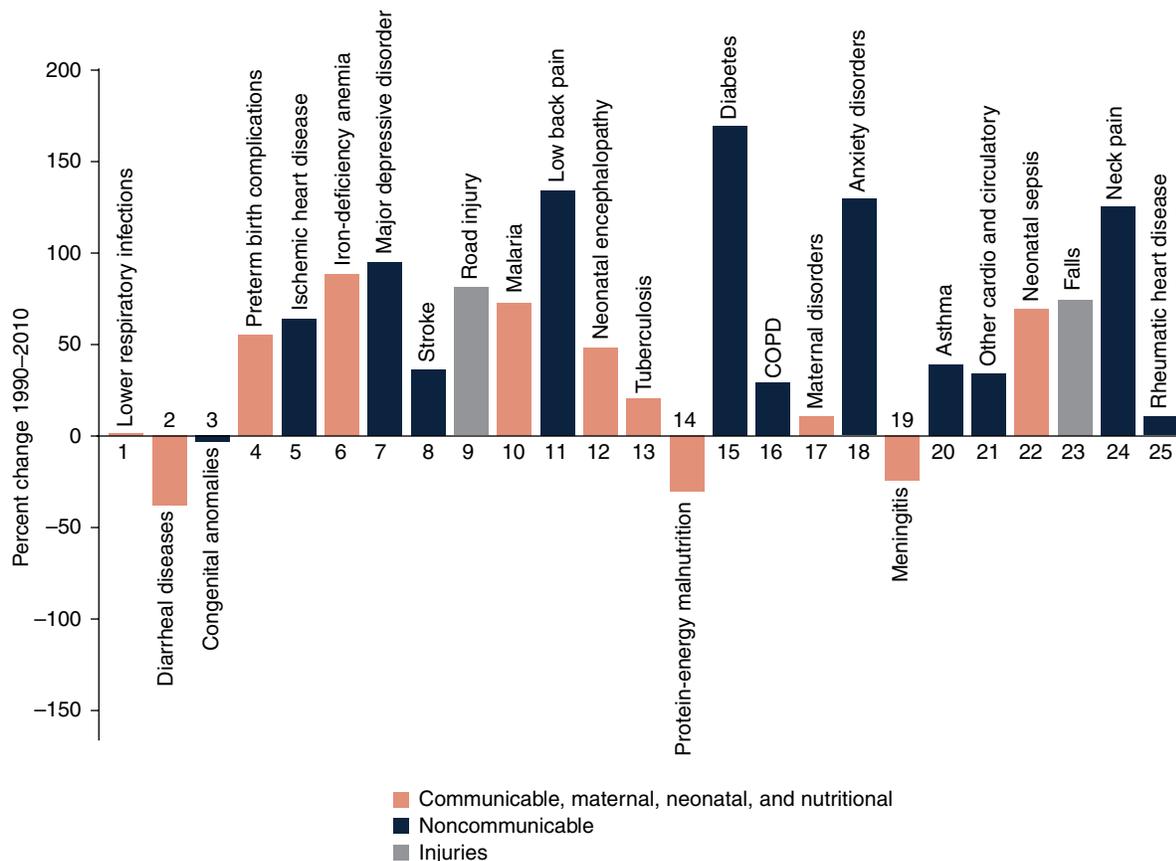
67 UNDP (United Nations Development Programme), “Yemen: Reduce Child Mortality: Where We Are,” <http://www.ye.undp.org/content/yemen/en/home/post-2015/mdgoverview/overview/mdg4.html>.

68 WHO (World Health Organization), “Female Genital Mutilation and Other Harmful Practices,” WHO, Geneva, 2013.

69 World Bank Data.

70 UNICEF, *Gender Equality Profile: Status of Girls and Women in the Middle East and North Africa* (Regional office for the Middle East and North Africa: UNICEF, 2011).

FIGURE 4.1 Leading Causes of Disability-Adjusted Life Years (DALYs), Yemen, 1990–2010



Source: IHME 2010.

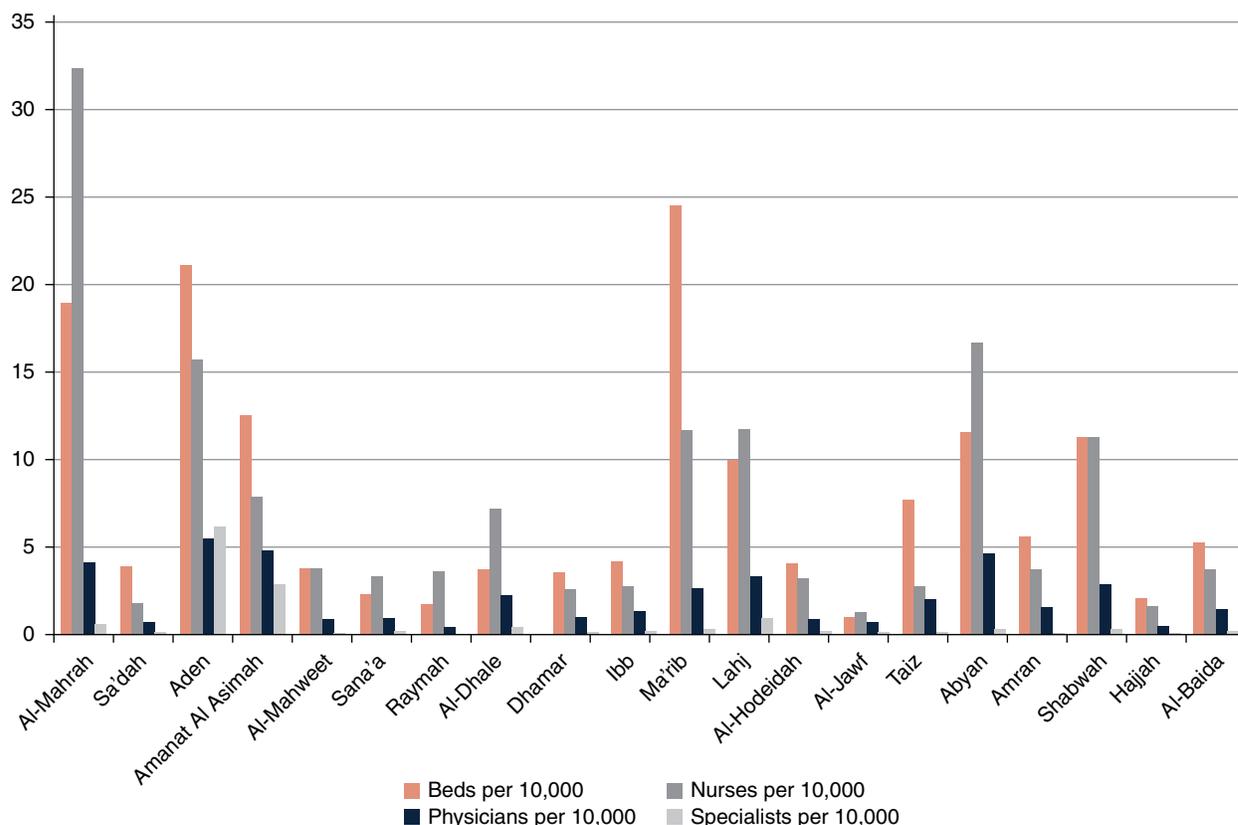
Note: COPD = chronic obstructive pulmonary disease.

health care before the current crisis in 2015, mainly in rural areas. The patterns of gender and geographic inequality become particularly clear when it comes to the distribution of facilities and services among the population. In addition, health insurance in Yemen was limited while prepaid schemes were often unaffordable for the general population. And although most morbidities and mortalities are avoidable, the resource allocation for primary health care (PHC) did not appear to be a priority. Spending on health in Yemen was the lowest in the Middle East and North Africa (MENA) region, estimated at about 5.3 percent of the gross domestic product (GDP), of which 27 percent represented the government’s share.

Service Delivery

The low quality and quantity of health care services, due to limited public funds and low institutional capacity, engendered a significant level of dissatisfaction among both patients and providers. The Ministry of Public Health and Population (MoPHP) is the main provider of health care at all levels of services, with around 16,695 beds distributed inequitably across the country (2 referral hospitals, 54 general hospitals, 183 district hospitals, 852 health centers, 2,929 PHC units, and 39 health units). Before the crisis, the private health sector was developing fast in Yemen’s urban areas (comprising 175 hospitals, 323 polyclinics, 580 health centers, 1,793 clinics, 770 dental clinics, 99 radiology clinics, 3,315 pharmacies, and 4,133 drug stores), and out-of-pocket (OOP) expenditures were on the rise. Yemen was facing a human resource crisis in the public sector owing to an overly urban-focused

FIGURE 4.2 Health Resources by Province, Yemen, 2011



Source: MoPHP 2011.

distribution of human resources and serious shortages in staff skilled in maternal, neonatal, and child health. Around 42 percent of physicians were concentrated in only four governorates (Al-Mahrah, Aden, Sana'a, and Abyan), covering less than 20 percent of the population, with a clear shortage of female staff. Among the 16 cities assessed in the Dynamic Needs Assessment (DNA) Phase 3, Taiz and Dhamar had the lowest number of nurses and physicians per 10,000 people (figure 4.2).⁷¹

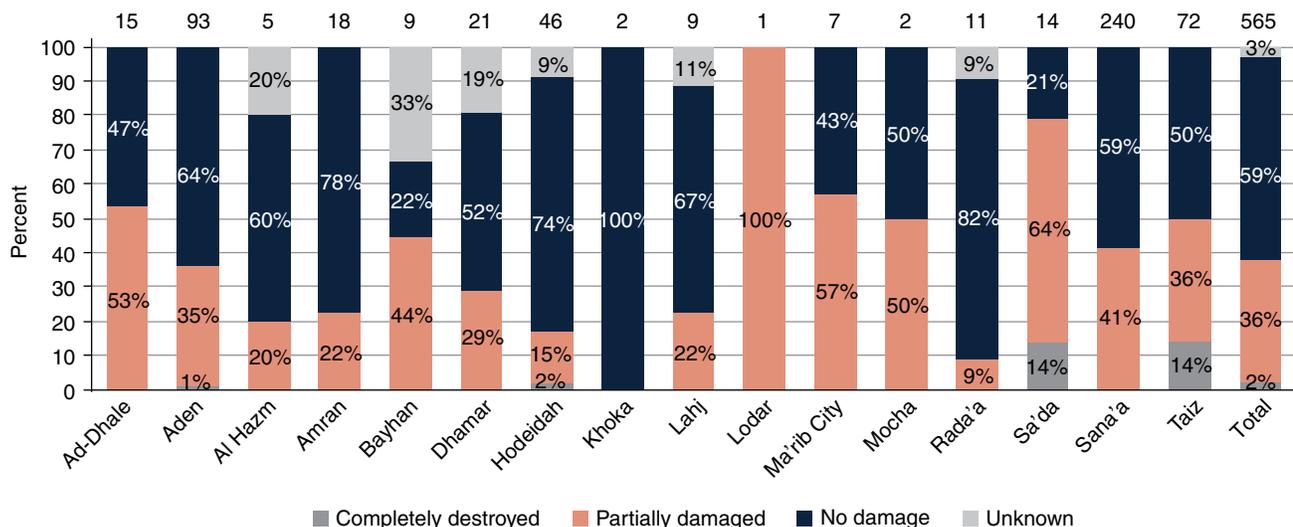
Sectoral Damage Assessment

Aggregate Analysis

The ongoing conflict has jeopardized the fundamentals of the Yemeni health system and its ability to meet basic health needs. This DNA evaluates 560 health facilities (HFs) across 16 cities and estimates that 205 facilities are partially damaged (36 percent), and 14 facilities are destroyed (2 percent), with the highest physical damage rates in Loda, where the city's only facility is estimated to be partially damaged. In Taiz and Sa'da, 14 percent of the facilities are estimated as destroyed, with 36 percent partially damaged in Taiz and 64 percent partially damaged in Sa'da (figure 4.3).

71 Abdulwahed Al Serouri, John Øvretveit, Ali A. Al-Mudhwah, and Majed Yahia Al-Gonaid, "Strengthening Health Systems in Yemen: Review of Evidence and Implications for Effective Actions for the Poor," in *Health Management—Different Approaches and Solutions*, ed. Krzysztof Śmigórski (Croatia: InTech, 2011).

FIGURE 4.3 Physical Status of Health Facilities in 16 Yemeni Cities

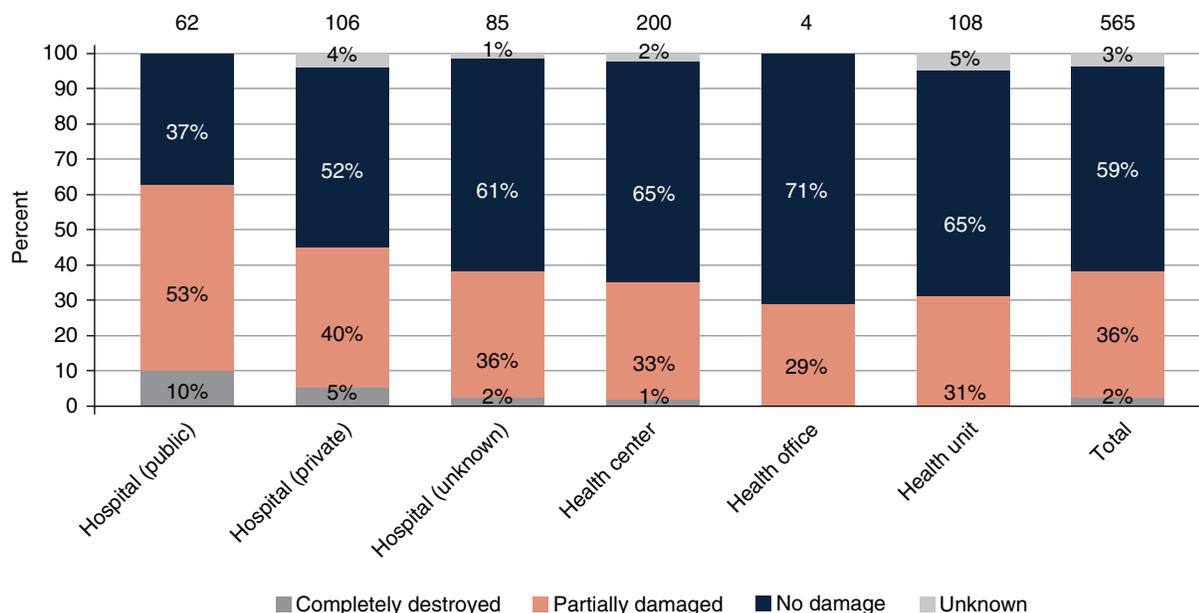


Source: World Bank estimates.

Comparing the impact of the conflict on different facility types, the analysis shows that hospitals are most affected, with 118 out of 253 hospitals (47 percent) either damaged or destroyed (63 percent public, 45 percent private, and 38 percent unknown), as illustrated in figure 4.4.

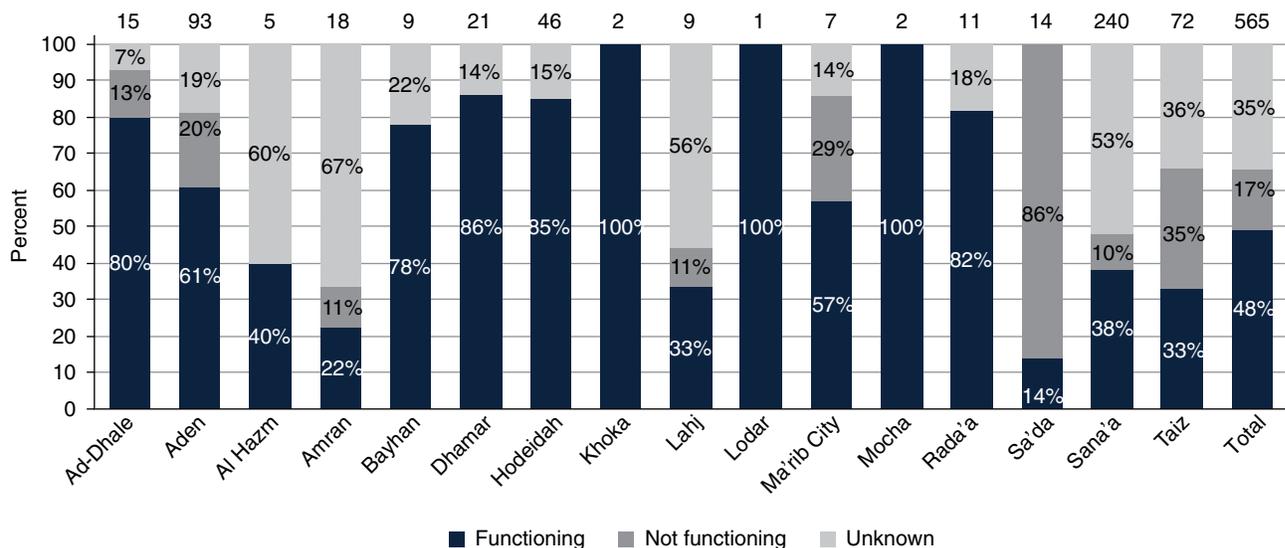
In terms of functionality, 96 health facilities are estimated to be nonfunctional (17 percent), with a particularly large number of nonfunctional facilities in Sa'da (86 percent), Taiz (35 percent), and Ma'rib City (29 percent) (figure 4.5). All the available data indicate that shortages in medical supplies, drugs, and critical medical staff, in addition to limited access to the electricity grid and a shortage of diesel fuel for standby generators, are the major

FIGURE 4.4 Physical Damage by Health Facility Type



Source: World Bank estimates.

FIGURE 4.5 Operational Status of the Health Facilities in 16 Yemeni Cities



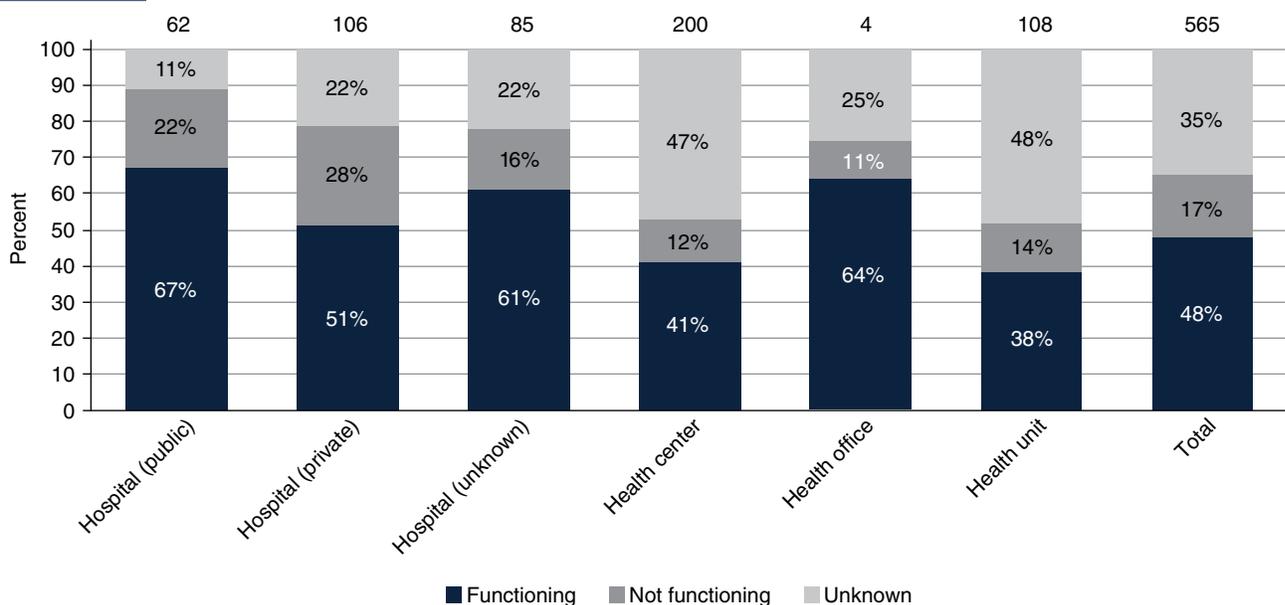
Source: World Bank estimates.

Note: Due to the primarily remote nature of the assessment, the operational status of many health facilities could not be assessed with certainty. These facilities make up the “unknown” category.

challenges hindering health facilities’ functionality. Moreover, most health care providers have not been paid for several months due to the fiscal crisis and other complexities.

The available data show that 57 out of 253 assessed hospitals (22 percent) are not functioning (22 percent public, 28 percent private, and 16 percent unknown), as well as 12 percent of health centers (figure 4.6). Given the reported challenges that have been affecting health services in Yemen, such as the shortage of medical staff and scarcity of medical supplies and medications, most of the functioning facilities are likely to operate at a reduced level.

FIGURE 4.6 Operational Status of Health Sector by Asset Type



Source: World Bank estimates.

The health system has been battling a famine, a cholera outbreak, spreading diphtheria, insufficient public funds, and a human resource crisis. Many facilities are left nonoperational and deserted by staff owing to the nonpayment of salaries or security risks. The shortage of health inputs has left millions of people without access to health care, and the collapse of the sanitation system created an ideal environment for different diseases such as cholera and diphtheria.

City-Level Analysis

Out of 240 health facilities in **Sana'a**, 141 facilities sustained no damage (59 percent), while 99 sustained partial damage (41 percent). Regarding functionality, 91 health facilities are functioning (80 percent), and 23 facilities are reported as not functioning (10 percent), and the operational statuses of the rest are unknown. One of the major challenges that has been affecting the health sector in Sana'a is a shortage of medicine and soaring prices. For instance, medicines for chronic illnesses have become scarce, with 57 types of cancer medicines and about 8 kidney dialysis medications becoming commercially unavailable. Moreover, health-care providers have suffered from salary shortages, which has forced most of them to take additional jobs in the private sector to be able to support their families.

Out of 72 health facilities in **Taiz**, 36 facilities sustained no damage (50 percent), while 26 facilities were reported partially damaged (36 percent) and 10 facilities were estimated as destroyed (14 percent). Regarding functionality, 22 health facilities are functioning (29 percent), while 25 facilities were reported not functioning (35 percent); the operational status of the remaining 26 facilities is unknown (36 percent). In addition to medicine shortages, there has been evidence that the free medicines in public health facilities are often illegally sold to for-profit pharmacies or smuggled out of the city to other governorates, which means that patients may need to buy their own medications and bring them to the hospitals. Medications commonly sold through the informal market in Taiz include insulin, albumin, painkillers, antihypertensives, and antibiotics. As for human resources, Taiz has been facing severe shortages of medical staff, particularly of specialists, and most of the city's specialty wards have closed due to a lack of staff and funds.

In **Hodeidah**, the available data suggest that out of 46 facilities, seven facilities have sustained partial damage (15 percent), one facility has been destroyed (2 percent), and 34 facilities have sustained no damage (74 percent); the physical status of the remaining four facilities is unknown. Regarding functionality: 39 health facilities are functioning (85 percent) while seven facilities are not functioning (15 percent). The health sector is still facing numerous challenges, including power outages, shortages of medicine and funds, and overcrowding, all of which have negatively impacted service provision. Also, a major source of stress on the health sector in Hodeidah since May 2017 can be attributed to the blockade of Hodeidah's port, which has delayed shipments of medical supplies to the city and exacerbated already dire fuel shortages. There have been severe shortages in salary payments in the city, for instance, the staff at Al-Thawra Hospital, the largest hospital in the city, have not received salaries in over a year.⁷² Moreover, as of January 2018, the medical staff in Hodeidah were struggling to contain and cope with a diphtheria outbreak.

In **Mocha**, the available data suggest that there are two facilities. Only one has sustained partial damage but both are functioning. Mocha has been facing challenges of shortages in medicines, staff, and blood supplies. For instance, Mocha Hospital lacks basic staff due to shortages in salaries and insecurity. Because of the city's proximity to a hotspot of conflict, the number of internally displaced persons (IDPs) has fluctuated over the past year, and in March 2017 local news reported that 45,000 people around Mocha were reportedly forced from their

72 Iona Craig, "Only God Can Save Us': Yemeni Children Starve as Aid Is Held at Border," *The Guardian*, November 12, 2017, <https://www.theguardian.com/world/2017/nov/12/millions-on-brink-of-famine-in-yemen-as-saudi-arabia-tightens-blockade>.

homes due to the conflict; at the same time Mocha has received thousands of IDPs from villages that are closer to the frontlines. It is impossible for Mocha Hospital to accommodate the increased demand for health services.

The available data in **Dhamar** suggest that out of the 21 facilities in the city, six facilities sustained partial damage (29 percent), eleven facilities sustained no damage (52 percent), and the status of the remaining four facilities is unknown. Even though 18 health facilities are reportedly functioning (86 percent), they suffer from decreased capacity, due to shortages in medications, supplies, and medical staff. For example, in January 2018 the dialysis center in Dhamar reported that it could operate only 12 out of its 35 beds due to shortages of medicines and dialysis solution.

As for **Ad-Dhale**, out of the 15 health facilities, seven facilities reported no damage (47 percent), while the remaining eight facilities reported partial damage (53 percent). Eighty percent were functioning, 13 percent were not functioning, and one facility was unaccounted for.

In **Aden**, 34 of the city's 93 facilities (36 percent) were reported damaged or destroyed, while the remaining 59 facilities sustained no damage (64 percent). In terms of functionality, 56 facilities were functioning (61 percent), 19 facilities were not functioning (20 percent), and the operational status of the remaining 18 facilities was unknown.

In **Amran**, out of the 18 identified facilities, 14 facilities had sustained no damage (78 percent), and four facilities had sustained partial damage (22 percent). Four facilities were functioning (22 percent), two facilities were not functioning (11 percent), and the status of the remaining 12 facilities was unknown (67 percent).

As for **Bayhan**, the available data suggested that nine health facilities were operating in the city before the conflict, of which seven were confirmed functioning (78 percent) and two were unaccounted for (22 percent), which registers similar results as the previous phases of this DNA. Regarding physical status, two facilities sustained no damage (22 percent), four sustained partial damage (44 percent), and the remaining three facilities were unaccounted for.

Similarly, in **Lahj**, the available data show that out of the nine facilities in the city, two sustained partial damage (22 percent), six sustained no damage (67 percent), while there is no data on the physical status of the remaining facility. As for functionality, three facilities were functioning (33 percent), one facility was not functioning (11 percent), while the remaining five facilities were unaccounted for.

In **Sa'da**, the data suggest that out of 14 facilities, three sustained no damage (21 percent), nine sustained partial damage (64 percent), and the remaining two facilities were destroyed (14 percent). Only two facilities were confirmed as functioning, while the remaining facilities were estimated to be not functioning (86 percent), similar to the DNA Phase II results.

As for **Rada'a**, there are 11 facilities, out of which one facility was partially damaged (9 percent) and nine facilities sustained no damage (82 percent). There is no data on the remaining facility. Regarding operational status, nine facilities were functioning (82 percent), and the remaining two facilities were unaccounted for.

Of two facilities in **Khoka**, both are functioning and not damaged. While in **Lodar**, there is only one facility, which sustained some damage, but is still functioning.

In **Ma'rib City** there are seven facilities, of which four had sustained partial damage (57 percent), and the remaining three facilities had sustained no damage (43 percent). As for functionality, four facilities were functioning (57 percent), two facilities were not functioning (29 percent), and the operational status of the remainder was unknown.

Of five facilities in **Al Hazm**, one facility was partially damaged (20 percent), three sustained no damage (60 percent), and the physical status of the remainder was unknown. And in terms of operational status, two facilities were functioning (40 percent), while the status of the remaining facilities was unknown.

Cross-Sectoral Analysis

Damage to different sectors like **solid waste management** and water, sanitation and hygiene (**WASH**) affect health outcomes even if the health sector is functioning. Before the conflict, Sana'a was the only city that had a designated facility to handle medical waste. But this facility has since been destroyed, allowing the contamination of municipal waste with medical waste. This contamination poses a public health crisis that could lead to numerous diseases with serious complications, in addition to posing a huge threat to the water supply as toxic and medical waste can infiltrate the city's water supply and affect those residents who consume the contaminated water.

The WASH sector in most Yemeni cities has received a great deal of nongovernmental organization (NGO) support, as it has been closely linked to a public health crisis—the cholera outbreak. Interventions to control the outbreak have included awareness campaigns among civilians and well owners about proper hygiene and water treatment in addition to distribution of water sterilization materials to ensure proper chlorination of public network water. For example, cities such as Dhamar and Hodeidah have launched awareness campaigns on the risks and prevention of communicable diseases including cholera and diphtheria. Even with the support, the accumulation of stagnant water in the streets due to frequent sewer backups are precipitating the spread of diseases such as cholera, vector-borne diseases, and parasites.

Damage Quantification

Physical damage to health facilities in the 16 DNA cities is estimated to be US\$605–740 million (table 4.1). Sana'a, Taiz, and Aden were the most affected cities, with damage costs estimated at US\$199–243 million, US\$139–170 million, and US\$70–86 million, respectively (table 4.2).

Table 4.1 Damage Inventory: Health Facilities in 16 Cities

Asset types	Baseline	No damage	Partially damaged	Completely destroyed	Total assets damaged	Unknown
Hospital (public)	62	23	33	6	39	0
Hospital (private)	106	55	42	5	47	4
Hospital (unknown)	85	52	30	2	32	1
Health center	200	129	66	1	67	4
Health office	4	3	1	0	1	0
Health unit	108	70	33	0	33	5
Total	565	332	205	14	219	14

Source: World Bank estimates.

Table 4.2 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	13	15
Aden	70	86
Al Hazm	7	9
Amran	27	33
Bayhan	20	24
Dhamar	11	14
Hodeidah	42	51
Khoka	0	0
Lahj	10	12
Lodar	7	9
Ma'rib City	9	11
Mocha	9	11
Rada'a	0.6	0.8
Sa'da	42	52
Sana'a	199	243
Taiz	139	170
Total	605	740

Source: World Bank estimates.

Sectoral Needs Assessment

The health system capacity is crippled by infrastructure damage and lack of service delivery. Overall, the cost of infrastructure reconstruction and service delivery restoration of conflict-afflicted health facilities in the 16 cities is estimated to range between US\$1.3 billion and US\$1.6 billion over five years (table 4.3).

Infrastructure Reconstruction

For a cost-effective reconstruction process, investments should be based on the demographic and epidemiological profile of the population and conflict intensity in the facilities' catchment areas. The rehabilitation of specific health facilities should be prioritized according to an inpatient and outpatient needs assessment. The DNA findings suggest that the conflict afflicted almost 63 percent and reduced the functionality of more than 22 percent of the public hospitals in the 16 cities. The conflict did not spare the PHC facilities either: 34 percent of health centers sustained partial or complete damage, and only 41 percent are functioning. In addition, Sana'a, Aden, Hodeidah, and Taiz, with the largest population sizes (thus, more health needs), merit more attention to guarantee primary and secondary health care service delivery at feasible levels. To have at least one functioning general hospital per governorate and a convenient number of fully functional PHC facilities serving the catchment area is highly needed.

Table 4.3 Recovery and Reconstruction Needs (by city) over Five Years (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	4.6	5.6	18.3	22.3	22.8	27.9
Aden	31.5	38.5	126.1	154.1	157.7	192.7
Al Hazm	2.6	3.2	10.6	12.9	13.2	16.1
Amran	10.3	12.6	41.4	50.5	51.7	63.2
Bayhan	7.0	8.6	28.0	34.3	35.0	42.8
Dhamar	5.5	6.7	22.1	27.0	27.6	33.7
Hodeidah	15.9	19.5	63.8	78.0	79.7	97.5
Khoka	0.2	0.2	0.6	0.8	0.8	1.0
Lahj	3.6	4.4	14.5	17.7	18.2	22.2
Lodar	2.7	3.3	10.7	13.0	13.3	16.3
Ma'rib City	3.5	4.3	14.1	17.2	17.6	21.5
Mocha	3.3	4.0	13.1	16.1	16.4	20.1
Rada'a	0.8	0.9	3.0	3.7	3.8	4.6
Sa'da	15.4	18.9	61.8	75.5	77.2	94.4
Sana'a	94.3	115.2	377.2	461.0	471.5	576.2
Taiz	52.9	64.7	211.7	258.8	264.7	323.5
<i>Infrastructure reconstruction, total all cities</i>	211.9	258.9	847.5	1,035.8	1,059.3	1,294.7
<i>Service delivery restoration, total all cities</i>	42.4	51.8	169.5	207.2	211.9	258.9
Grand total, all cities	254.2	310.7	1,017.0	1,243.0	1,271.2	1,553.7

Service Delivery Restoration

Given limited implementation capacity and scarce resources, a health care service delivery model is needed to address ongoing conflict-related needs.

Community- and facility-based efforts are necessary. Examples include:

- Deepening emergency reproductive and maternal and child health interventions
- Preventing and controlling the spreading outbreak of cholera, diphtheria, and communicable diseases
- Providing basic health care at the PHC level especially for patients seeking chronic disease treatment

Still, scarcity of medical supplies and essential medicines together with shortage of staff (and specifically female doctors) jeopardize service delivery in Yemen's health sector. Ensuring the availability of funding for the operational costs of needed health services is essential to overcome the challenges. Moreover, enhancing the capacity of health personnel and strengthening the epidemic preparedness of the health sector are necessary to restore service delivery in Yemen.

Priorities Going Forward

Short-Term Priorities (up to 1 year)

- Address one of the immediate challenges precipitating the acute shortage of health staff, by regularly paying salaries to health staff.
- Build the capacity of local institutions and health staff to cope with the ongoing challenges linked with health services provision.
- Provide a basic package of services at all feasible levels—community level through mobile clinics, fixed PHC facilities, and integrated outreach services.

Medium-Term Priorities (2–5 years)

- Strengthen public health interventions, such as prevention and control of communicable diseases, immunization against childhood preventable diseases, and emergency reproductive and maternal and child health interventions
- Strengthen and expand early warning systems, outbreak preparedness, and rapid response systems;
- Identify changes in both the demographic and epidemiological profiles of the Yemeni population in order to better address their specific needs.

Long-Term Priorities (5–10 years)

- Review salaries and incentives, especially of staff working in rural and remote areas.
- Rehabilitate the affected health facilities, starting with health facilities providing public health services, ensuring that there is at least one functioning general hospital per governorate.
- Develop a master plan or road map to coordinate the participation of all stakeholders including the United Nations (UN) agencies, NGOs, and donors together with the MoPHP in order to ensure an efficient allocation of all available resources.

5

Housing

Pre-crisis Sector Conditions

Before the conflict, a limited supply of affordable housing was one of the main challenges facing Yemen's urban centers. This resulted from both supply-side restrictions as well as demand-side constraints.

*Access to adequate housing was constrained by the suboptimal functioning of the housing and land markets. Systems for administering land tenure security, including land registration and dispute resolution, were ineffective; state land management was inefficient; and planning regulations were restrictive and outdated, among other issues.*⁷³

Formal housing was unaffordable to most people. Poverty and unemployment were prominent in Yemen; in 2015, nominal gross domestic product (GDP) per capita was US\$1,401.9.⁷⁴ The house price-to-income ratio in Yemen was 17.2,⁷⁵ which is exceptionally high.⁷⁶

These challenges resulted in a proliferation of informal settlements and alarming levels of overcrowding. An estimated 60 percent of Yemen's urban population lived in informal settlements.⁷⁷ Overcrowding was reported in 20 percent of the temporary substandard units.⁷⁸ The high urban growth rate—4.2 percent,⁷⁹ compared with the overall population growth rate of 2.5 percent⁸⁰—increased the burden on urban centers. The cities most affected by the rapid growth of slums include Taiz, Hodeidah, Sana'a, and Aden.

The majority of urban housing was self built. It is estimated that 68 percent of total housing production was carried out by owners; the rest was produced mainly by private construction firms.⁸¹ Some low-income housing was provided by the state.⁸²

Although individual houses were the most common, apartment buildings were on the rise. As per the 2004 national census, the housing stock in urban areas consisted primarily of houses (68 percent) and apartment units (24 percent).⁸³ It is estimated that the proportion of apartment units has significantly increased in the fifteen years since.

73 World Bank, "Republic of Yemen—Urban Land Policy and Administration" (policy note, World Bank, Washington, DC, 2005).

74 World Bank Open Data, "GDP per Capita (current US\$)," World Bank, Washington, DC, 2015.

75 Abdullah Al-Abed, "Urban Housing Supply and Affordability in Yemen," *Journal of Architecture and Planning* 27, no. 1 (2014): 17–28.

76 In a well-functioning market, 3–5 would be expected for house-price-to-income ratio.

77 Republic of Yemen, *National Report (2016)*, submitted to the Third United Nations Conference on Housing and Sustainable Urban Development: HABITAT III, Quito/Ecuador.

78 Enas Shaqra'a, Nurwati Badarulzaman, Ruhizal Roosli, *Residents' Perception of the Affordability of Private Housing Schemes: Lessons from Aden, Yemen*, Procedia—Social and Behavioral Science, Volume 202, August 2015. Overcrowding generally takes place when housing per person is below 16 square meters. In Yemen, 20 percent of temporary substandard units have an estimated average of four square meters per person.

79 World Bank Open Data, "Urban Population Growth (Annual %)," World Bank, Washington, DC, 2015.

80 World Bank Open Data, "Population Growth (Annual %)," World Bank, Washington, DC, 2015.

81 Al-Abed, "Urban Housing Supply and Affordability in Yemen."

82 Republic of Yemen, *National Report (2016)*.

83 Yemen Official Population and Housing Census 2004.

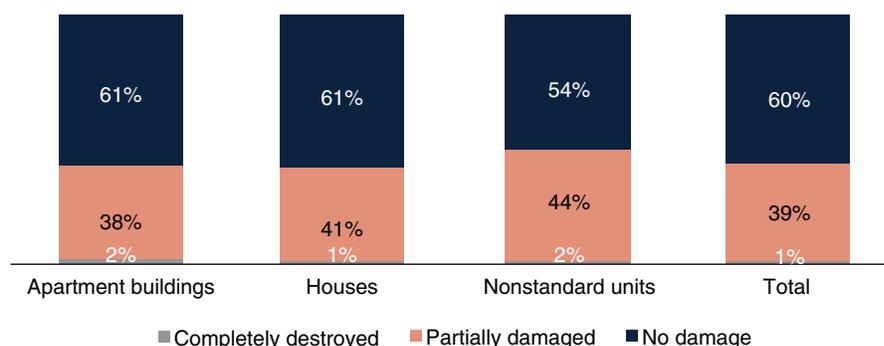
Sectoral Damage Assessment

Aggregate Analysis

The baseline housing stock in the 16 cities considered in the Damage and Needs Assessment (DNA) Phase 3 is estimated at about 500,000 residential units. This includes around 169,600 houses, and 35,800 apartment buildings (each building has multiple units with a range of 2–14 units per building, and an average of 8 units per building), in addition to a little more than 30,600 nonstandard units. As per the 2004 national census, the number of housing units in Yemen exceeded 2.8 million, 24 percent of which (around 850,000 units) were in urban areas.⁸⁴ (These numbers have likely increased significantly over the past 15 years.) Thus, the selected cities contain about 60 percent of the nation’s total urban housing stock.

This analysis indicates that 40 percent of all housing assets in the assessed cities were subject to damage, most of it partial and indirect (that is, collateral damage). Less than 2 percent of the housing stock has been destroyed beyond repair. In terms of asset types, nonstandard units are the most affected in relative terms: more than 46 percent are damaged to some extent, followed by houses at 42 percent, and apartment buildings at 40 percent (figure 5.1). In absolute numbers, houses are the most affected asset type; however, if housing assets are expressed in units and not buildings, apartments have received the brunt of the damage with more than 113,000 units being affected (see table 5.1).

FIGURE 5.1 Damage to the Housing Stock by Type



Source: World Bank estimates.

Table 5.1 Damage Inventory: Housing Stock in 16 Cities

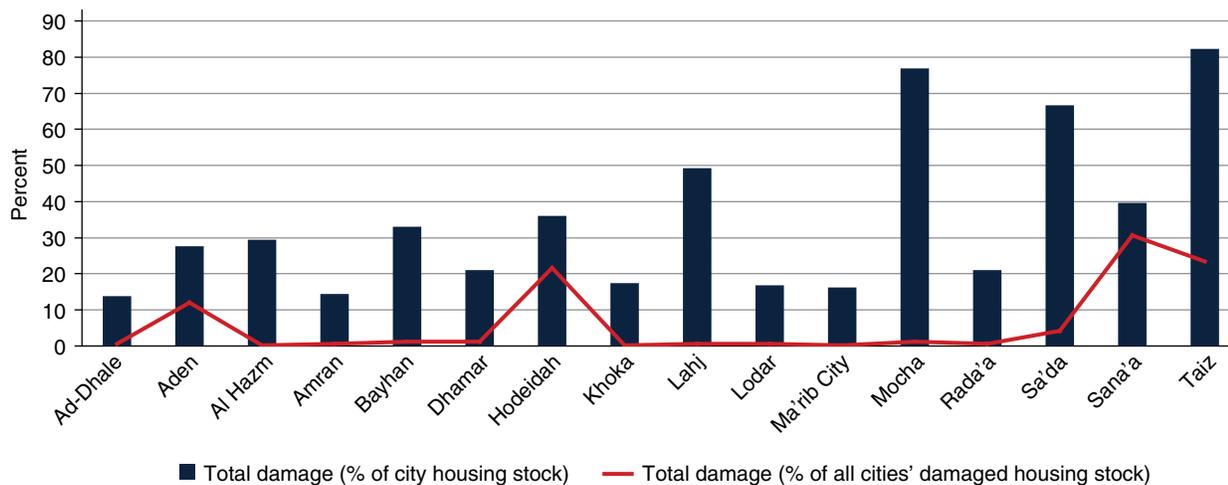
Asset types	Baseline	Partially damaged	Completely destroyed	Total assets damaged
Apartment building	35,868	13,453	707	14,160
Apartment units ^a	268,944	107,624	5,656	113,280
House	169,649	64,544	2,143	66,687
Nonstandard housing unit	30,649	13,590	471	14,061
Total (buildings)	236,166	91,586	3,322	94,908
Total (units)	469,242	185,758	8,270	194,028

Source: World Bank estimates.

a. Each apartment building was estimated to have eight apartments (on average).

84 Yemen Official Population and Housing Census 2004.

FIGURE 5.2 Damage to the Housing Stock in 16 Assessed Cities



Source: World Bank estimates.

Housing damage is spread unevenly across the 16 assessed cities. Taiz, Mocha, and Sa'da have been severely affected: more than 60 percent of their housing stock is damaged. The damage in Sana'a, the largest city of Yemen, is considerable, at 40 percent. Given the large size of Sana'a, it alone represents 31 percent of all damaged housing stock in the 16 cities. Sana'a, together with Taiz, Aden, Hodeidah, and Sa'da, encompass more than 90 percent of the damaged housing stock in the 16 cities (figure 5.2).

City-Level Analysis

This section provides a brief profile of four cities, namely Sana'a, Taiz, Hodeidah, and Ma'rib City, looking at damage to housing, population inflows and outflows, and the current shelter conditions of internally displaced persons (IDPs) and returnees. The four cities were selected to provide a snapshot of the impact of the conflict on four cities with distinct differences in size, conflict dynamics, damage levels, and population movements.

Sana'a

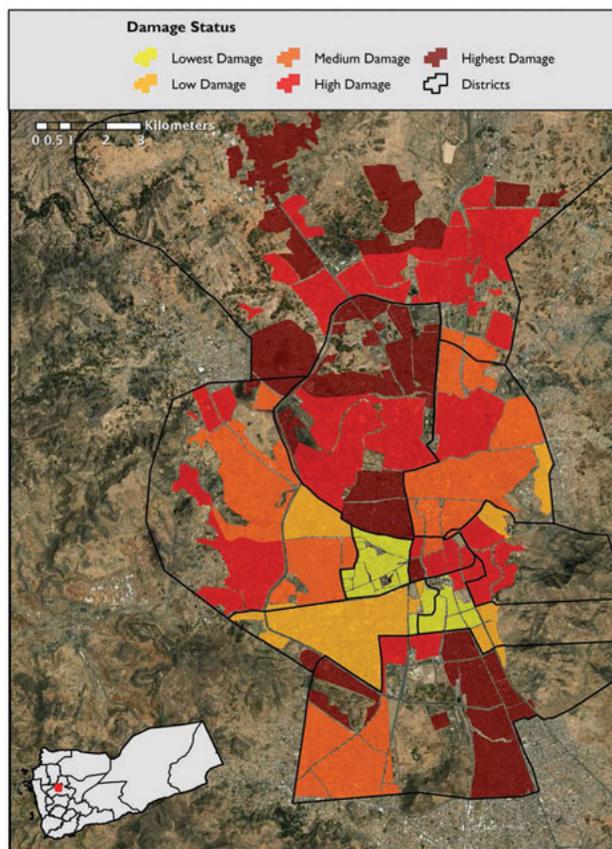
Sana'a is one of the oldest continuously inhabited cities in the world and the largest city in Yemen with a population estimated at 2.7 million in 2015.⁸⁵ Damage to housing stock in Sana'a is estimated at 40 percent. Around 6,500 apartment buildings and 17,300 houses have been estimated as damaged. The conflict's effects are spread across the city, but a higher level of damage can be detected at the outskirts, where many formal residential neighborhoods and informal settlements are located (figure 5.3).

The Old City of Sana'a, a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, contains 6,000 houses, including famous multistory tower houses.⁸⁶ Twenty percent of residential buildings in the Old City of Sana'a are estimated to be damaged.

85 European Commission, "Global Human Settlement: City Centers Database (2015), Sana'a (Yem)." <http://ghsl.jrc.ec.europa.eu/ccdb2016visual.php#>

86 UNESCO (United Nations Educational, Scientific and Cultural Organization), "Web Page: Culture, World Heritage Center, the list, World Heritage list, Old City of Sana'a," 2018.

FIGURE 5.3 Damage Levels and Distribution in Sana'a



Source: World Bank.

Amid a breakdown of public services and security, Sana'a has been subject to both inflows and outflows of IDPs. As of December 2018, more than 440,000 IDPs were estimated to live in Sana'a,⁸⁷ likely occupying more than 65,000 housing units or 30 percent of the city's pre-crisis housing stock.⁸⁸ A sizeable number of IDPs are also locating in informal settlements, such as the Dharawan settlement just outside Sana'a that hosts 270 IDP families. The overall number of IDPs in Sana'a has likely increased further due to a significant influx of IDPs from Hodeidah during 2019. According to data from the International Organization of Migration (IOM) from October 2017, an estimated 89 percent of IDPs are renting, and 11 percent live with host families.⁸⁹

Hodeidah

Hodeidah is situated on the Red Sea. Its population was estimated to be 540,000 in 2015.⁹⁰

Even though Hodeidah witnessed an IDP influx in the earlier years of the conflict, this trend has been completely reversed over the last years when intense conflict caused hundreds of thousands to flee the city. This has led to

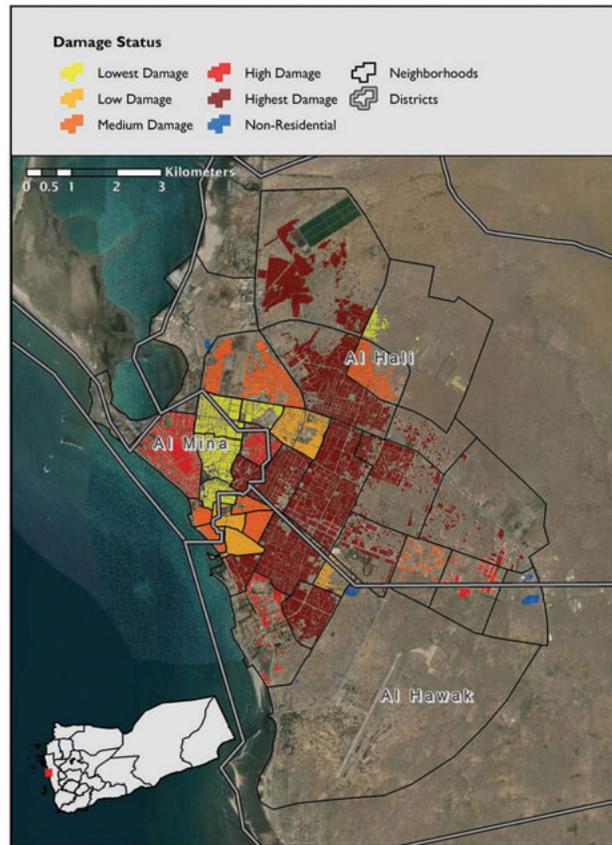
87 International Organization for Migration (IOM), *Yemen Area Assessment, Round 37*. IOM, March 2019.

88 Assuming an average family size of 6.7 people per household.

89 Data on Amanat Al Asimah from IOM (International Organization for Migration), *Task Force on Population Movement | TFPM: Yemen | 16th Report—October 2017*. IOM, 2017).

90 European Commission, "Global Human Settlement: City Centers Database (2015), Al-Hudaydah (Yem)." <http://ghsl.jrc.ec.europa.eu/ccdb2016visual.php#>

FIGURE 5.4 Damage Levels and Distribution in Hodeidah



a dramatic population decrease to an estimated 180,000 inhabitants at the beginning of 2020. These inhabitants are likely to occupy around 26,900 of the city's 69,100 housing units (or roughly 39 percent). The recent conflict dynamics have also significantly impacted the city's housing stock, with damaged housing assets increasing from 11 to 41 percent between March 2018 and January 2020 (figure 5.4). Damaged housing units in Hodeidah are estimated at more than 24,800. The significantly reduced population in Hodeidah suggests that a high percentage of the city's housing stock may be vacant, indicating a potential excess of housing supply despite the significant housing damage.

According to IOM estimates from December 2017, about 45 percent of IDPs in the Hodeidah governorate live in critical shelter conditions, including collective centers or spontaneous settlements; 11 percent live in rented accommodations; while the rest are hosted by residents.⁹¹

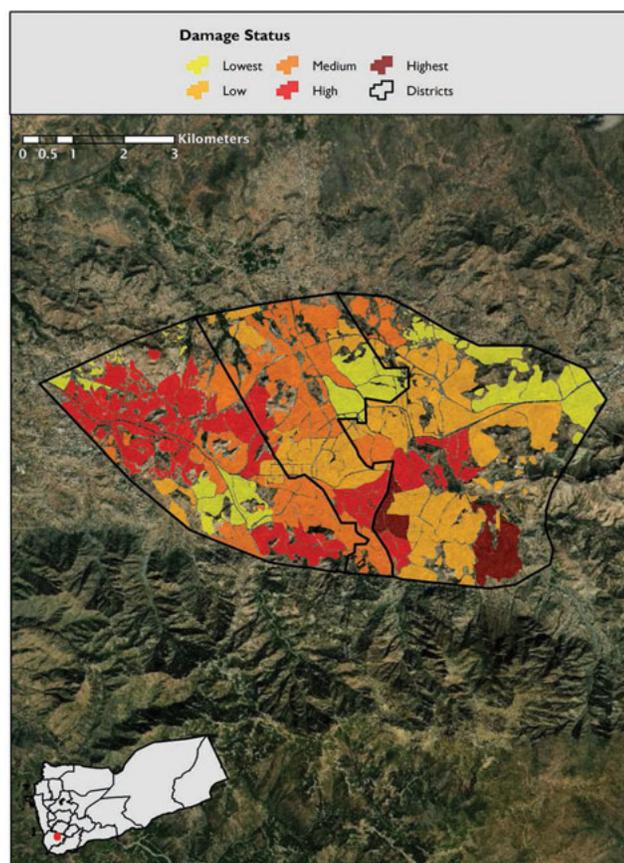
Taiz

Taiz, Yemen's cultural capital, had a population of more than 600,000 in 2015.⁹² The city was severely hit by the conflict: 80 percent of its housing stock is estimated to be damaged, and 3 percent is destroyed beyond repair. Satellite imagery and collateral damage estimates shows that approximately 2,600 apartment buildings (or 20,800 apartment units) and 17,600 houses have been impacted to some extent. The map in figure 5.5 demonstrates

91 Data on Hodeidah governorate from IOM, *Task Force on Population Movement*.

92 Population projection.

FIGURE 5.5 Damage Levels and Distribution in Taiz



Source: World Bank.

how the city's neighborhoods have been affected disproportionately; with the highest damage level occurring on the west side of the city.

More than 250,000 people may have fled Taiz during the first two years of the conflict. However, Taiz has also seen a significant influx of IDPs, primarily from the governorate's rural areas. As a result, it is estimated that the city has only seen a moderate population decrease over the five years of the conflict.⁹³ Based on the high damage level to the city's housing assets, it is estimated that most of the current population is living in buildings that have been damaged by the conflict. According to October 2017 IOM data, fifty-five percent of IDPs in the Taiz governorate live in private accommodations, 16 percent are renting, and around 7 percent live in critical shelter conditions.⁹⁴

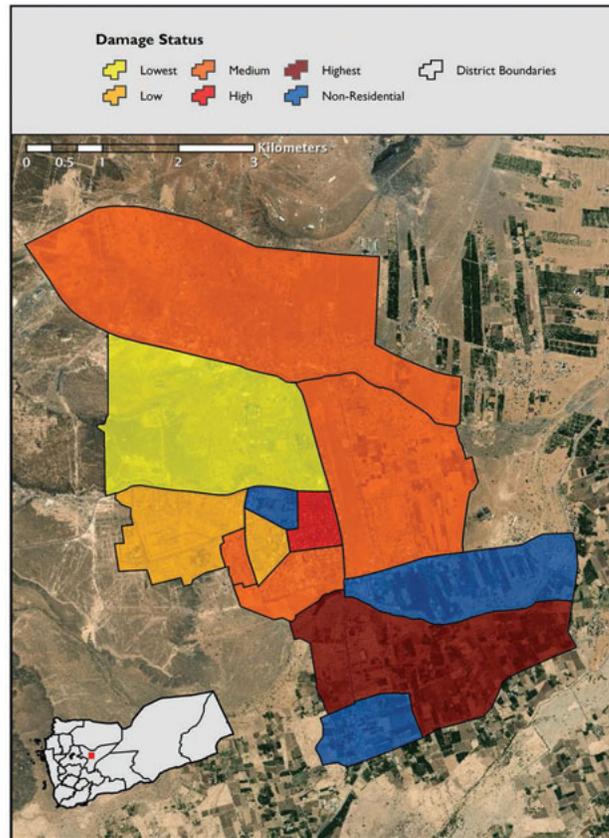
Ma'rib City

Ma'rib City is a small, provincial town, with a pre-crisis population estimated at almost 20,000 in 2014. An estimated 16 percent of its housing stock is damaged, with the highest damage levels concentrated in the southern parts of the city (figure 5.6). The town experienced intense fighting throughout most of 2015, and a quarter of the original city population left as a result. Most of the direct fighting ceased by late 2015, however, and since then

93 Internal Displacement Monitoring Centre, *Yemen: Urban Displacement in a Rural Society*, October 2019.

94 Data on Taiz governorate from IOM, *Task Force on Population Movement*.

FIGURE 5.6 Housing Damage Levels and Distribution in Ma'rib City (2020)



Source: World Bank.

the population has increased significantly due to a massive inflow of IDPs to an estimated 370,000 people in early 2020.⁹⁵ As of September 2019, Ma'rib City had 13 recorded displacement sites hosting approximately 48,000 IDPs.⁹⁶ The remaining IDPs are likely residing in newly built housing structures,⁹⁷ with host families, and in informal housing units (especially in Rumaylan). The high influx of IDPs has provided stimulus to the local economy, even though it has significantly strained local resources and put additional pressures on service delivery.

Damage Quantification

The damage cost to the housing stock across the 16 assessed cities is estimated at US\$5.1–6.2 billion (table 5.2). Sana'a accounts for 38 percent of the overall damage value.

95 Using population projections and September 2019 IOM data on IDP inflow/outflow adjusted to the city level.

96 IOM Yemen, *Ma'rib City Displacement Sites, August–October 2019*.

97 A rapid satellite imagery sample in Ma'rib found the expansion of housing stock between April 2018 and January 2020 mainly concentrated in the North Gate, az-Zira'a/al-Matar, and ar-Rawda neighborhoods.

Table 5.2 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	9.4	11.5
Aden	631.4	771.8
Al Hazm	21.3	26.1
Amran	31.8	38.9
Bayhan	5.3	6.5
Dhamar	74.4	90.9
Hodeidah	688.2	841.2
Khoka	12.6	15.4
Lahj	61.2	74.8
Lodar	47.8	58.4
Ma'rib City	87.6	107.1
Mocha	80.1	97.9
Rada'a	92.6	113.2
Sa'da	225.5	275.6
Sana'a	1,916.2	2,342.0
Taiz	1,097.3	1,341.1
Total	5,082.9	6,212.4

Source: World Bank estimates.

Note: The costs were estimated based on several assumptions; the cost of the construction of one square meter (m²) is US\$450. The average size of a house is 150 m², an apartment is 120 m², and a nonstandard unit is 60 m².

Sectoral Needs Assessment

The growing housing sector needs in Yemen cannot be disentangled from pre-crisis conditions. These conditions, including poverty, informality, overcrowding, and lack of services, have been further exacerbated by the conflict and need to be considered comprehensively when addressing current housing sector needs.

In Yemen, three segments of the population, namely IDPs, returnees, and many of those who remained where they live, have been affected by the conflict. The effect on the living conditions of these groups has varied. For example: houses have been damaged; access to basic services has been compromised; population influx has created additional pressure in certain areas; overcrowding has increased in areas where IDPs are living with host families; more informal settlements have been created to provide shelter for the displaced, very likely in areas more vulnerable to natural hazards; and schools and other basic service facilities are being used to house some of the displaced. Many of these issues require priority attention.

As the needs of these three population groups differ, supporting them will require distinct approaches and flexible solutions. This includes approaches to infrastructure rehabilitation, service restoration, land and property solutions, dispute resolution, compensation, subsidies, structure rehabilitation, and so on. Community participation is essential to the effective integration of social and economic aspects into the spatial dimension of recovery.

The repair of damaged structures alone is estimated at US\$7.6–9.3 billion. Under the assumption that all identified needs would be addressed in five years (which is an optimistic scenario in this case) and spread equally

Table 5.3 Recovery and Reconstruction Needs over Five Years (in US\$ million)

City	Short-term (year 1)		Medium-term (years 2-5)		Total	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	2.8	3.5	11.3	13.8	14.2	17.3
Aden	189.4	231.5	757.7	926.1	947.2	1,157.6
Al Hazm	6.4	7.8	25.6	31.3	32.0	39.1
Amran	9.6	11.7	38.2	46.7	47.8	58.4
Bayhan	1.6	2.0	6.4	7.8	8.0	9.8
Dhamar	22.3	27.3	89.3	109.1	111.6	136.4
Hodeidah	206.5	252.3	825.9	1,009.4	1,032.3	1,261.7
Khoka	3.8	4.6	15.1	18.4	18.9	23.1
Lahj	18.4	22.4	73.4	89.8	91.8	112.2
Lodar	14.3	17.5	57.3	70.1	71.7	87.6
Ma'rib City	26.3	32.1	105.1	128.5	131.4	160.6
Mocha	24.0	29.4	96.2	117.5	120.2	146.9
Rada'a	27.8	34.0	111.1	135.8	138.9	169.8
Sa'da	67.6	82.7	270.6	330.7	338.2	413.4
Sana'a	574.9	702.6	2,299.4	2,810.4	2,874.3	3,513.0
Taiz	329.2	402.3	1,316.7	1,609.4	1,645.9	2,011.7
Total	1,524.9	1,863.7	6,099.4	7,454.9	7,624.3	9,318.6

Source: World Bank estimates.

Note: Needs figures are based on damage figures multiplied by a factor (1.5) that counts for potential inflation, a security premium, and a "build back better" factor.

over the years, the share of needs to be met each year is estimated at US\$1.5–1.9 billion (table 5.3). This is a huge undertaking, amounting to almost 5 percent of Yemen's pre-conflict nominal GDP of US\$37.7 billion.⁹⁸ Therefore, efforts to address the emerging needs should be strategically phased over time, prioritizing a subset of the population at a time. This will require leveraging available public and private resources to meet immediate and future needs.

Priorities Going Forward

Housing sector priorities going forward are two-fold: immediate recovery, and long-term development.

Short-Term Priorities (up to 1 year)

- Articulate a strategy to address the shelter needs of the conflict-affected population (Note: this is a prerequisite to all further interventions). Ideally, the strategy should be part of a broader housing policy framework for the entire sector. Developing the strategy for addressing shelter needs would entail:
 - An assessment of the conflict-affected population (Who is affected? Where do they come from? What is their current shelter condition? At what level do they have access to services? Who is the most vulnerable?). Here, it will be

98 World Bank Open Data, "GDP (Current US\$)," World Bank, Washington, DC, 2015.

important to not just focus on the areas with the highest housing damage, but to pay close attention to cities and geographic areas that have been receiving a significant IDP influx and cannot provide sufficient housing supply.

- A detailed assessment of damaged housing structures and supporting infrastructure (level of damage, structural integrity, and so on). In this context, it is important to note that this assessment has found that apartment units are the most affected housing asset type in absolute numbers.
- A process for the identification and prioritization of communities, groups, and subgroups for support, focusing on areas that have not only suffered from considerable damage but also have a high potential for resuming economic activities and attracting returnees, as well as communities experiencing rapid population growth due to an influx of displaced.
- Pilot an emergency shelter assistance program that focuses on the needs of high-priority communities, groups, and subgroups as pinpointed by the identification and prioritization process outlined in the strategy.
- Put forward a housing policy framework that identifies and addresses the systemic and deep-rooted challenges facing the overall housing sector in Yemen.

Medium-Term Priorities (2–5 years)

- Carry out basic participatory diagnostics of identified communities, groups, and subgroups on a rolling priority basis (collecting data on, for example, demographic characteristics, land and property tenure status, housing damage, level of access to services, infrastructure status, local governance structures, and so on).
- Invest in restoring basic services and providing flexible shelter solutions to address the differing needs of affected groups and communities based on preidentified priorities and as funding becomes available.
- Develop a monitoring and evaluation system that allows for an iterative process of implementation and path correction based on a closed feedback loop system.

Long-Term Priorities (5–10 years)

- Launch a series of reforms to address the systemic issues facing the housing sector, along the supply and demand value chain, including access to land, building regulations, infrastructure provision, construction sector development, legal and regulatory frameworks, construction finance, housing finance, and housing subsidies.
- Continue to identify and support communities, groups, and subgroups by restoring and upgrading basic services and providing shelter and housing solutions on a priority basis.
- Undertake local economic development initiatives with the aim of increasing population incomes, and thereby improving living conditions.

6

Information and Communications Technology

Pre-crisis Sector Conditions

Even before the recent crisis, telecommunications service operators in Yemen had to contend with diverse challenges. These included poor national transport and energy infrastructure, a constraining policy and regulatory environment, high levels of poverty, and low levels of digital literacy. Despite this, the fiscal impact of the telecommunications sector was substantial. It brought foreign currency into the economy, which had a stabilizing effect on the Yemeni riyal, and provided much-needed revenue for the central budget. Government revenues from the sector were reportedly second only to declining revenues from the hydrocarbon industry.⁹⁹

In regard to the legal, policy, and regulatory framework for the telecommunications sector, foundations for positive reforms were being laid. A draft Telecommunications Law planned the establishment of an independent regulatory authority to make way for a more liberalized market. And the Ministry of Telecommunication and Information Technology (MoTIT) was preparing to award 4G licenses to increase competition for high-speed mobile Internet services. This would have allowed Yemen to leapfrog its technology use, at a time when less than 11 percent¹⁰⁰ of the population had access to high-speed mobile Internet services (the Middle East and North Africa [MENA] average was 40 percent).¹⁰¹

Service delivery was hampered by the fact that only Yemen Mobile, the state-owned mobile operator, was allowed to invest in 3G networks and thus was the sole provider of Internet and data-enabled mobile devices (smartphones, tablet computers). The three private operators, while waiting for their licenses to be upgraded to allow for faster networks, continued to provide what their existing licenses allowed, which were only 2G (no data access) and 2.75G (limited data access) services (table 6.1). The price of telecommunications services was high: in 2015, Yemen ranked either last or second to last among 19 MENA countries in terms of the price of phone calls, short message service (SMS), data packages, and fixed broadband Internet services.

The state-owned Public Telecommunications Company (PTC) and its subsidiary, TeleYemen, were the sole providers of Internet services. PTC had developed an important fiber optic network, an essential facility, of about 13,000 kilometers (km) reaching primary and secondary cities as well as many rural locations. The 500,000 Internet subscribers (residential and businesses) to PTC's Internet service had access to an asymmetric digital subscriber line (ADSL) that offered speeds up to 4 megabits per second (Mbps).

TeleYemen also managed the country's international connectivity infrastructure. International connectivity was provided through satellite links; three submarine cables landing in Ghaidha, Aden, and Hodeidah (figure 6.1); and a terrestrial fiber cable linking to Saudi Arabia through the Sa'da governorate. There were three Intelsat stations (two Indian Ocean region and one Atlantic Ocean region), one Intersputnik station, and two Arabsat stations.

99 About 30 percent of mobile phone revenues consist of foreign currencies.

100 Unique subscribers are around 4 percent, but users number almost 3,000,000, that is, 11 percent of the population.

101 <https://www.gsma.com/mobileeconomy/mena/>

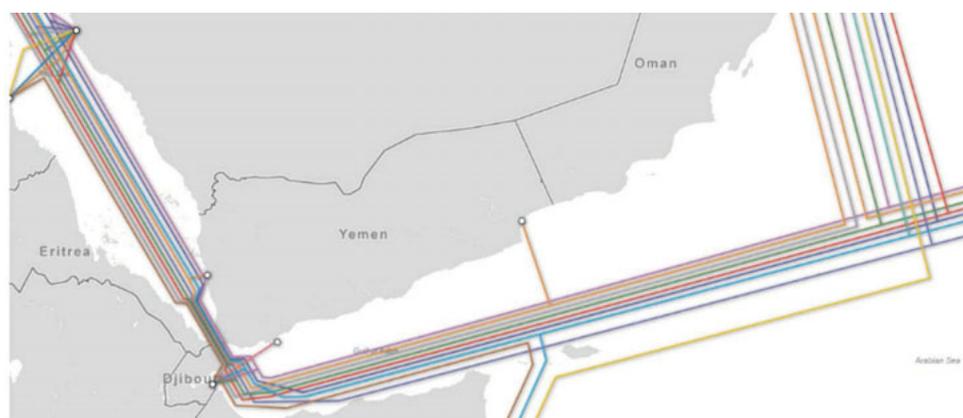
Table 6.1 Mobile Phone Market Structure (as of January 2020)

Operator	Market share (%)	No. of subscribers (million)	Technology	Spectrum allocations (as of 2016)	Ownership (as of 2016)
MTN Yemen	28.9	4.5	GSM (2G, 2.75G)	2×11.2 MHz 900 MHz 2×10 MHz 1800 MHz	Majority owned by South Africa's MTN Group (83%).
Yemen Mobile	41.1	6.4	CDMA2000 1× (2.5G) CDMA2000 1×EV-DO	824–834 MHz (uplink) 869–879 MHz, 10×2 MHz (downlink)	PTC (59.3%); other government stakeholders (17.1%); private entities and individuals (23.5%).
Sabafon	25.3	3.9	GSM (2G, 2.75G)	2×11.2 MHz 900 MHz 2×10 MHz 1800 MHz	Al-Ahmar Group (60%+); Bahraini Batelco (26.9%); others (including Iran Foreign Investment Company).
Y-Telecom (HiTS Unitel)	4.7	0.7	GSM (2G)	8×2 MHz in 900 MHz (mainband)	Mainly Kuwait- and Saudi-based investment firms and private investors from Yemen, UAE, Saudi Arabia, Syria, and Kuwait.

Source: PTC data from 2013, updates from Telegeography.

Note: CDMA = code-division multiple access; GSM = Global System for Mobile Communications; MHz = megahertz; PTC = Public Telecommunications Company; UAE = United Arab Emirates.

FIGURE 6.1 Submarine Cables Landing in Yemen



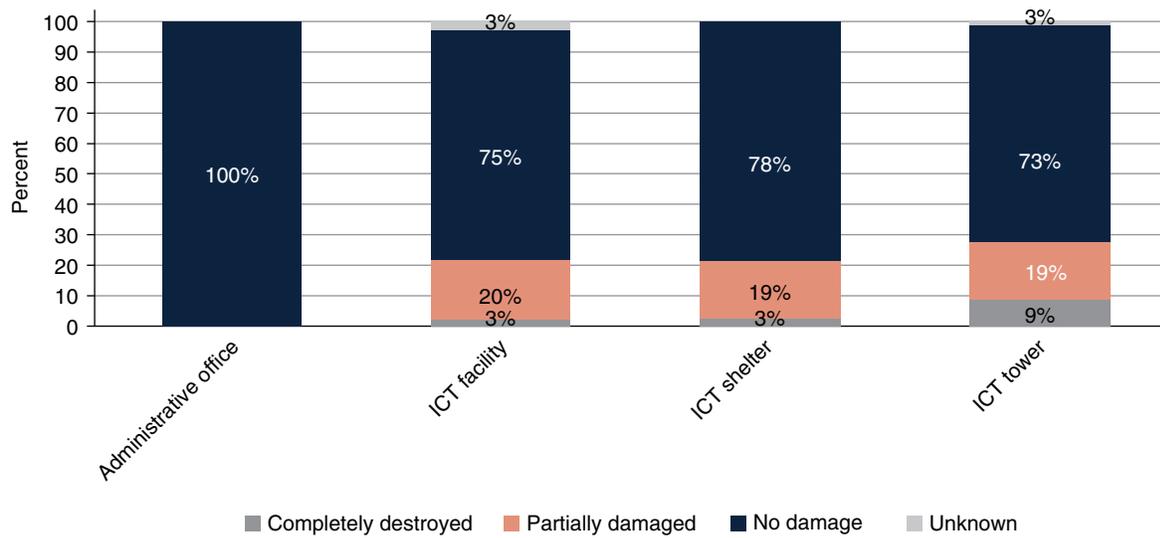
Source: Telegeography.

Sectoral Damage Assessment

Aggregate Analysis

According to this assessment, 36, or roughly 25 percent, of the 141 baseline assets of the information and communications technology (ICT) sector were either partially damaged or destroyed since the onset of the crisis (figure 6.2). This damage estimate is likely an underestimation since assets such as towers and shelters may not be visible through satellite imagery. Data collected by the Office for Planning and International Cooperation were

FIGURE 6.2 Physical Damage to ICT Sector Assets by Facility Type



Source: World Bank estimates.

Note: ICT = information and communication technology.

used to validate the report findings. This comparison showed significant underestimation of the satellite imagery for the city of Taiz. Evident from the social media analytics, mobile operators continued to restore and reconstruct their towers and networks whenever access has been possible to maintain service. The greatest damage was observed in Hodeidah and Sa'da, where 75 percent of mobile network assets were reported damaged, and Dhamar, where 33 percent of facilities were damaged or destroyed.

Because this assessment was conducted remotely, it focuses on mobile towers or masts visible through satellite imagery. Both underground and aerial fiber and copper networks are difficult to capture through satellite imagery. Yet, it is important to note that mobile networks rely on the national fiber backbone network, and this should be considered when estimating reconstruction costs. Damages incurred to the national fixed backbone network (figure 6.3) since the onset of the conflict are estimated at over US\$45 million. As of March 2018, out of the 32,135 km of copper lines in the country pre-conflict, 315.5 km have been damaged. Out of 12,181 km of fiber optic cables, 158 km have been damaged. Furthermore, out of 1,129,398 fixed lines, only 568,980 subscriptions are active, indicating a significant reduction in access to telephony and the Internet.

FIGURE 6.3 Damage to National Backbone Facilities



City-Level Analysis

What follows is an overview of the physical damage and functionality levels of mobile networks and related infrastructure in five of the cities analyzed during the DNA Phase 3.

Dhamar

As Dhamar is situated on the main road connecting Sana'a and a number of other governorates, it has likely benefitted from being close to PTC's backbone network that runs parallel to the road. OpenSignal data suggest that as of November 2017, a strong received signal strength indicator (RSSI)¹⁰² (greater than -85 decibels, dB) was available throughout the city. According to local news report in January 2019, the local communications company had recently built and equipped five new Yemen Mobile signal boosting stations in and around Dhamar. OpenSignal data from January 2020 indicates that ICT functionality has further increased. Yemen Net, Yemen's largest cellular service provider, appears to provide full 2G/3G coverage in the city's center.

Hodeidah

Ten of 13 facilities in the city appear to be damaged or destroyed, a slight deterioration compared to the Yemen DNA Phase II. The local Telecom Infrastructure Office, which was badly damaged in February 2017, had not been repaired as of the writing of this report.¹⁰³ In April 2017, of 21 Internet cafés surveyed in Hodeidah, 76 percent were functioning during pre-crisis hours. Since then, the situation has deteriorated. Local media articles suggest frequent telecommunications outages during the reporting period. Outages were reported in July 2018, September 2018, March 2019, and April 2019. Publicly available information suggests the cause of these outages include damaged or nonfunctioning ICT infrastructure; deliberate shutting off of cellular and Internet access as a form of control; and ICT damage as a result of conflict or deliberate sabotage. Yemen Net, Yemen's largest cellular service provider, appears to provide full 2G/3G and 4G coverage in Hodeidah's city center, according to OpenSignal data from January 2020 (see figure 6.4). However, OpenSignal estimates the mobile data speeds are extremely slow, with a download speed of approximately 1.04 mbps and an upload speed of 0.14 mbps.

Communication is critical for humanitarian services, and United Nations (UN) agencies are increasingly relying on the United Nation's Emergency Telecommunications Cluster (ETC), a global network of organizations that work together to provide shared communications services in humanitarian emergencies. Diesel fuel shortages in Hodeidah have been cited as one of the main impediments to the functioning of the city's ICT network.¹⁰⁴

Mocha

Outages were very frequent during a period of heavy fighting in the area (May 2015 to February 2017), and became longer as fighting intensified. From February to April 2017, Mocha reportedly lost all telecommunications access as a result of two conflict-related events. This included outages of fixed communications (Internet and landlines), Yemen Mobile's network, and MTN and Yemen Mobile towers in the area that had been destroyed earlier, leaving Mocha and the surrounding area without telecommunications access. More specifically, the outages were likely caused by network damage at Jabal Annar, approximately 35 km from Mocha, and secondly, several points on the network route ThoBab-Bab Al-Mandab-Ras Alarah-Khor Omaira were affected due to sabotage. There was also damage inside the Central Office building of Mocha as a result of shell fragments that fell down in the yard of the building at this time. Social media reports indicate that damage and sabotage of key ICT infrastructure are often strategic, intended to cause citywide communication blackouts and service disruption.

102 In telecommunications, RSSI is a measurement of the power present in a received radio signal.

103 <https://www.sabanews.net/ar/news463619.htm>

104 Ibid.

FIGURE 6.4 Received Signal Strength Indicator (RSSI) in the City of Hodeidah



Source: OpenSignal.

Note: OpenSignal collects data from its application users; therefore, the map does not provide a comprehensive analysis of wireless signal availability across the targeted area, but rather a measure of signal strength in areas where OpenSignal users are active.

Since then, ICT functionality has significantly improved over the last few years. As of January 2020, Mocha's ICT infrastructure appears to be undamaged. Yemen Net appears to provide 2G/3G coverage in Mocha's city center. However, cell, Internet, and landline service appears generally unreliable, with at least one report of a five-day ICT outage in April 2018 due to damaged cables.

Sana'a

This assessment identified 42 ICT facilities in Sana'a; of these, 38 were undamaged (90 percent), 3 were damaged (7 percent), and 1 was destroyed (2 percent). As of January 2020, ICT services appeared to be at least intermittently available in most parts of Sana'a. Yemen Net appears to provide full 2G/3G coverage; 4G service does not appear to be available. According to OpenSignal, the mobile data speeds are extremely slow, with a download speed of approximately 0.94 mbps and an upload speed of 0.2 mbps. There are sporadic reports of service interruption.

Throughout Yemen, people rely on cybercafés to meet Internet needs beyond those available via mobile phone. Of 45 cybercafés surveyed in Sana'a in 2018, 84 percent were operating at full or reduced hours, while the remaining 16 percent were permanently closed. One of the facilities was a solar-powered cybercafé whose 15 250-watt solar panels and 16 150-ampere batteries together provided 18 hours of daily power to the facility. For residents of Sana'a, Internet cafés represent an important point of access to the world (figure 6.5). The cost of purchasing a computer and a digital subscriber line [DSL] hook-up, in addition to a monthly subscription, is prohibitive for

FIGURE 6.5 Internet Café Listed for Sale in Sana'a, 2017



Note: Images of a solar-powered cybercafé listed for sale, published on social media on January 13, 2017.

many households. Students at the University of Sana'a and other schools rely on the Internet for supplementary learning materials for subjects such as science, math, and information technology. Both women and men use Facebook and WhatsApp groups to sell and buy supplies and services, and an Internet café especially for women opened in Sana'a in 2013.

Taiz

Taiz's telecommunications infrastructure appears to have deteriorated since the May 2017 DNA Phase II assessment. Widespread looting of telecommunications cables has reportedly reduced communications coverage, cutting off phone and Internet services to thousands of Taiz residents. On January 24, 2018, local press reported that an armed group looted cables that cut off services to 8,400 landlines and Internet customers in the center of the city. Local reports indicate that armed groups sell these cables for their copper (figure 6.7). Despite damage to the ICT infrastructure, functionality seems to have increased recently. As of January 2020, Yemen Net appears to provide full 2G/3G in Taiz's city center; although publicly available information suggests occasional outages, for example in September when the city lost Internet connection following minor damage to fiberoptic ground cables in the an-Najd area outside the city.

FIGURE 6.6 Destroyed Mobile Network Tower



Note: Image of a destroyed communications tower that caused ICT outages in ThoBab in Taiz Governorate, published on social media on November 26, 2016.

FIGURE 6.7 Stolen Copper Cables



Note: Image of copper cables stripped of their rubber casing in a storehouse in Taiz, January 2018.

Damage Quantification

The total cost of damage to the mobile network is estimated to be US\$2.8–3.5 million in the 16 assessed cities (tables 6.2 and 6.3). As mentioned earlier, this is most likely an underestimation of the true damage incurred. Mobile assets may not be big enough to show up on satellite imagery, and mobile towers are often set up on the outskirts of cities, beyond the areas this assessment covered. In addition to the mobile network, the total cost of damage to the national fixed networks, not covered in detail in this assessment, is estimated at more than US\$47 million as of March 2018.

Table 6.2 Damage Inventory Table

	Baseline	Partially damaged	Completely destroyed	Total assets damaged
Mobile assets: towers and base stations	64	12	6	18
ICT facility: central office	35	7	1	8
Mobile assets: shelters and power	42	8	1	9
Total	141	27	8	35

Source: World Bank estimates.

Table 6.3 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	—	—
Aden	0.3	0.4
Al Hazm	—	—
Amran	—	—
Bayhan	0.1	0.1
Dhamar	0.2	0.2
Hodeidah	1.1	1.4
Khoka	—	—
Lahj	—	—
Lodar	—	—
Ma'rib City	0.1	0.1
Mocha	—	—
Rada'a	—	—
Sa'da	0.6	0.7
Sana'a	0.3	0.3
Taiz	—	—
Total	2.8	3.5

Source: World Bank estimates.

Sectoral Needs Assessment

Recent reports indicate that mobile operators are facing escalating pressures from high fuel prices, blockades of equipment imports, and the difficult-to-predict costs of conducting transactions outside the legal and regulatory framework. Restoration will require not only investment in infrastructure and capacity building, but the reinforcement of the legal and regulatory framework needed to ensure an enabling environment for a competitive and technology-adaptable telecommunications market. The overall recovery and reconstruction needs of mobile networks in the 16 Phase 3 DNA cities are estimated to cost between US\$6.1 million and US\$7.5 million (table 6.4).

The reconstruction of the fixed network is more complex and costly than that of the mobile networks since most cities' connectivity is based on legacy fixed networks that are now defunct. The restoration of the fixed network would best focus on the deployment of an adaptable network that can enable fast Internet and data services and is based on new fiberoptic infrastructure. The restoration of Internet infrastructure should prioritize the reconstruction of: (i) a state-of-the-art fiber access network reaching major commercial and public establishments such as schools, hospitals, and so on; and (ii) a fiber network upon which data service providers and mobile operators rely to facilitate Internet and data traffic between cities.

The availability of communications infrastructure, for both basic voice and Internet, is essential to the return of residents to affected areas, and the connectivity of families, and is a cornerstone of the development of commercial and economic activities. Access to mobile phone services becomes critical in crisis situations where

Table 6.4 Recovery and Reconstruction Needs over Five Years (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Aden	0.4	0.5	0.3	0.3	0.6	0.8
Bayhan	0.1	0.1	0.1	0.1	0.1	0.2
Dhamar	0.2	0.3	0.2	0.2	0.4	0.5
Hodeidah	1.4	1.7	1.0	1.3	2.4	3.0
Ma'rib City	0.1	0.1	0.0	0.1	0.1	0.1
Sa'da	0.7	0.9	0.5	0.7	1.3	1.6
Sana'a	0.3	0.4	0.2	0.3	0.6	0.7
Taiz	0.3	0.4	0.2	0.3	0.6	0.7
<i>Infrastructure reconstruction, total all cities</i>	3.2	3.9	1.7	2.1	5.0	6.1
<i>Service delivery restoration, total all cities</i>	0.3	0.3	0.9	1.0	1.1	1.4
Grand total, all cities	3.5	4.3	2.6	3.2	6.1	7.5

Source: World Bank estimates.

information regarding military action, medical assistance, food and water supplies, and the location of family members can mean the difference between life and death. Future recovery plans should take into consideration the needs of all types of users—individuals, the private sector, government agencies, and humanitarian agencies.

Priorities Going Forward

The principle of network externalities should be considered when planning the reconstruction of Yemen's telecommunications sector. Telecommunication by nature thrives on increased connections between people, not segmentation. The strength and resilience of any national communications network thus depends on enhanced interconnection and open access across geographical and regulatory areas. Social media reports of the emergence of unlicensed operators in Ad-Dhale and a possible new telecommunications operator in Aden and some southern regions are causes for concern. While new entrants would, under normal circumstances, offer healthy competition, in a policy and regulatory vacuum, they could lead to a fragmented market (as in Somalia).

It is important to note that the restoration and revival of the telecommunications sector will rely on the lifting of an embargo that is currently preventing all telecommunications operators (private and public) from importing equipment for maintenance, replacement, and expansion. All equipment must come from outside Yemen. This, together with formal recognition of (and adherence to) the legal and regulatory framework set up before the crisis, is critical to preserve the unity and stability of telecommunications entities and ensure the continuity of minimum services. Once the communications network is stabilized, value added services, such as mobile money and mobile banking, could then be pursued.

Based on the importance of rectifying communication networks in Yemen's cities, several key interventions should be prioritized as follows:

Short-Term Priorities (1 year and more)

- Deployment of a very small aperture terminal (VSAT) for provision of emergency communications for use by government, humanitarian agencies, and the broader public in areas where conflict is ongoing.
- Executive decision to allow all operators to use their existing spectrum bands to provide 4G services.
- The laying of fiber optic cables along with any new infrastructure that can carry fiber optic cables—roads, power grids, railroads, and so on.¹⁰⁵

Medium-Term Priorities (2–5 years)

- Public investment in national fiber backbone infrastructure.
- Compensation of mobile operators based on nationwide infrastructure damage assessment.
- Enactment of the draft Telecommunications Law and establishment of an Independent Regulatory Authority.

Long-Term Priorities (5–10 years)

- Taxation regime in line with global best practices.
- Harmonization of licenses.
- Management of spectrum frequency.

¹⁰⁵ About 75 percent of the cost of laying fiber is in digging the trenches for the ducts and other necessary groundwork. The global trend is for fiber ducts to be built alongside electricity grids and highways, among other utility infrastructure. It will therefore be most cost efficient to allow deployment of fiber via linear infrastructure, in particular for electricity grids and roads/highways.

7

Power

Pre-crisis Sector Conditions

Even before the conflict, much of Yemen's population was deprived of basic electricity services. Yemen had the lowest electricity access rate in the Middle East and North Africa (MENA) region. Access to electricity—from either on-grid or off-grid sources—was estimated at between 52 percent¹⁰⁶ and 72 percent in 2014.¹⁰⁷ This had severe consequences for socioeconomic development and poverty. The country's per capita electricity consumption stood at 217 kilowatt-hours (kWh) in 2014, less than one-sixth of the regional average.¹⁰⁸ Electricity supply, estimated at 1,519 megawatts (MW) in 2015,¹⁰⁹ and demand were seriously out of balance, with supply capacity 20 percent below peak demand.¹¹⁰ Most grid-connected consumers suffered from frequent daily load shedding.¹¹¹ Despite significant direct and indirect subsidies, the sector was unable to generate the affordable, reliable, and sufficient electricity needed to sustain economic growth, nor to sustainably increase the coverage of electricity services in rural areas.

Progress in the power sector had been very slow. The only major power generation infrastructure completed by the national, public sector electricity utility (Public Electricity Corporation, PEC) in the last 15 years was the 340 MW gas-fired Ma'rib power plant, which was contracted in 2005 and came online in 2009.¹¹² Similarly, only 200 kilometers (km) of 400 kilovolt (kV) lines and 185 km of 132 kV lines were completed between 2004 and 2015. PEC had also made little progress on improving its operational efficiency and quality of service, or reducing high electricity losses. Some 40 percent of Yemen's power generation was lost in the transmission and distribution (T&D) system in 2012.¹¹³

With the exception of the Ma'rib plant, most electricity was generated by old and inefficient PEC plants fired by heavy fuel oil (HFO) or diesel, and small HFO/diesel units contracted through private suppliers. HFO/diesel units provided electricity only at high costs and by generating considerable air pollution. In 2010, HFO- and diesel-fired power accounted for about 70 percent of grid-connected generation. Amid frequent blackouts and a dearth of grid-connected supply, industry and commercial establishments and households used millions of small diesel units.

106 Arab Union of Electricity, "Statistical Bulletin," 2016, http://www.auptde.org/Article_Files/inside%202017.pdf

107 World Bank, IEA (International Energy Agency), and ESMAP (Energy Sector Management Assistance Program), "Sustainable Energy for All (SE4ALL) database, SE4ALL Global Tracking Framework led jointly by the World Bank, International Energy Agency, and the Energy Sector Management Assistance Program," 2017, <http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>

108 IEA, *Key World Energy Statistics 2016* (Paris: IEA, 2016).

109 Arab Union of Electricity, "Statistical Bulletin 2004–2016," 2016. <http://www.auptde.org/Publications.aspx?lang=en&CID=36>

110 World Bank, *Yemen Power Sector Reform Strategy: Towards Improved Performance and Financial Sustainability* (Washington, DC: World Bank, 2013).

111 When electricity demand exceeds available supply capacity, voltage and frequency in the system can fall below critical thresholds, requiring the system operator to temporarily disconnect certain parts of the grid (referred to as "load shedding" or "brown outs"). If the system operator cannot respond fast enough, imbalances between supply and demand can lead to widespread blackouts.

112 World Bank, *Yemen Power Sector Reform Strategy*.

113 Compared with total T&D losses of less than 10 percent in developed countries and of less than 20 percent in many developing countries.

Prior to the crisis, despite an average consumer tariff of about US\$0.08 per kWh, which is higher than the consumer prices in most MENA countries, revenues covered only about 25 percent of the economic cost of supply. In 2014, direct and indirect subsidies to the power sector cost the country over 10 percent of its gross domestic product (GDP).¹¹⁴ The poor state of the PEC's finances was the main reason for underinvestment in the sector, while the lack of a coherent and transparent framework for private sector participation prevented sector development beyond PEC.

Sectoral Damage Assessment

Aggregate Analysis

The ongoing conflict in Yemen has significantly worsened the electricity supply situation from an already low level, with severe implications for water, sanitation, and hygiene (WASH) services, and thus overall health. The percentage of Yemen's population with access to public electricity fell from 66 percent in 2014 to below 10 percent by the end of 2017.¹¹⁵ A recent phone survey¹¹⁶ commissioned by the World Bank found that, as of end-2019, around 12 percent of the population relied solely on public electricity. Night-time light emissions visible from satellite imagery indicate a reduction in electricity consumption of about 75 percent (figure 7.1).¹¹⁷ Amid fuel shortages and diesel price volatility, fuel-based electricity generation fell by 77 percent in just one year, between 2014 and 2015, before recovering slightly, especially in the South.¹¹⁸ The impacts of the power sector's collapse have been devastating: electricity is a binding constraint for critical service facilities that do not have the means to invest in alternative energy sources. These include health facilities and vaccine cold chains. The dearth of electricity is affecting water supply and sanitation, food supply, banking services, and more. Even where diesel generators were adopted for emergency power supply during the conflict, fuel shortages are severely constraining service delivery.

This Dynamic Needs Assessment (DNA) covers seven types of power system assets in 15 cities:¹¹⁹ large thermal power plants; smaller, distributed-generation units; transmission substations; distribution substations; transmission towers; transformers; and administrative offices.¹²⁰ Transmission lines and upstream energy infrastructure related to the oil and gas industry were outside the scope of this assessment. The cities assessed were Ad-Dhale, Aden, Al Hazm, Amran, Bayhan, Dhamar, Hodeidah, Lahj, Lodar, Ma'rib City, Mocha, Rada'a, Sa'da, Sana'a, and Taiz, all of the 16 cities covered by the DNA Phase 3 except Khoka, for which data were inadequate.

About half of the assessed power sector assets, excluding towers,¹²¹ exhibited some degree of damage,¹²² and 5 percent were completely destroyed. Four out of seven major power plants had some degree of damage and

114 World Bank, *Republic of Yemen: Power Sector Reform and Development—Back to the Basics* (Washington, DC: World Bank, 2015).

115 The *Yemen Humanitarian Response Situation Report* (Save the Children, October 2016) estimated access to grid-based electricity at 10 percent. Phone survey results from November 2017 by the World Food Program (WFP) indicate that less than 1 percent of households relied on the electricity grid as their main source of electricity.

116 The survey was conducted between October and December 2019 by a Yemeni consulting firm. The sample size was around 1,000 households from all governorates.

117 Thiemo Fetzer, "Using R to Study the Yemen Conflict with Night Light Images," <http://freigeist.devmag.net/r/979-using-r-measuring-the-yemen-conflict-from-high-frequency-night-light-images.html>

118 Ibid.

119 Excludes Khoka due to lack of data.

120 Administrative offices are buildings next to power plants that are used for administrative purposes. This asset class does not include buildings of the Ministry of Electricity and Energy or the Ministry of Oil and Resources.

121 Towers are excluded from these figures due to their large number (259) and comparatively low asset value (US\$6,025 compared with, for example, US\$4,514,286 for a transmission substation), which skews the distribution of sectoral damages.

122 This figure includes assets that are partially damaged or fully destroyed.

FIGURE 7.1 Nighttime Satellite Images from 2012 (left) and March 2018 (right)

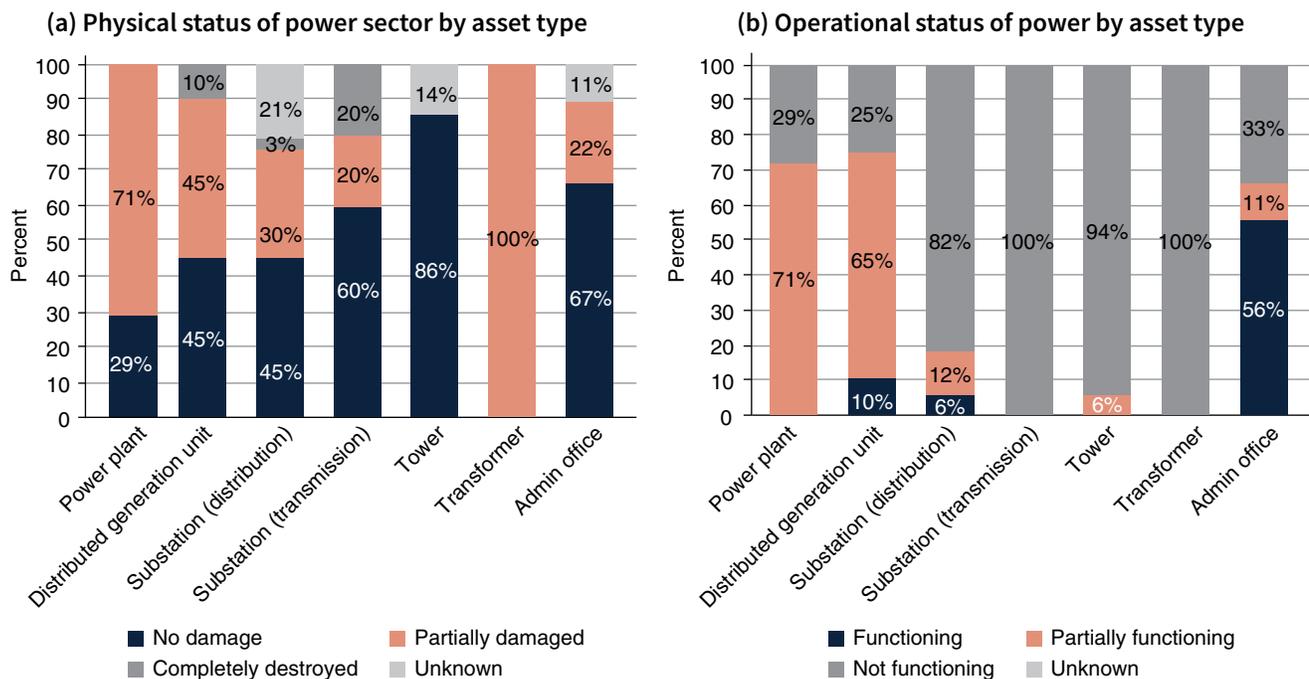
Images indicate a decline in lighting from an already low level



Source: NASA: <https://worldview.earthdata.nasa.gov/>; Suomi National Polar-orbiting Partnership satellite platform: <https://ladsweb.modaps.eosdis.nasa.gov/missions-and-measurements/viirs/>.

Note: Light emissions around Ma'rib and Seiyun are at least partly from gas flaring in addition to household lighting, businesses and public light posts.

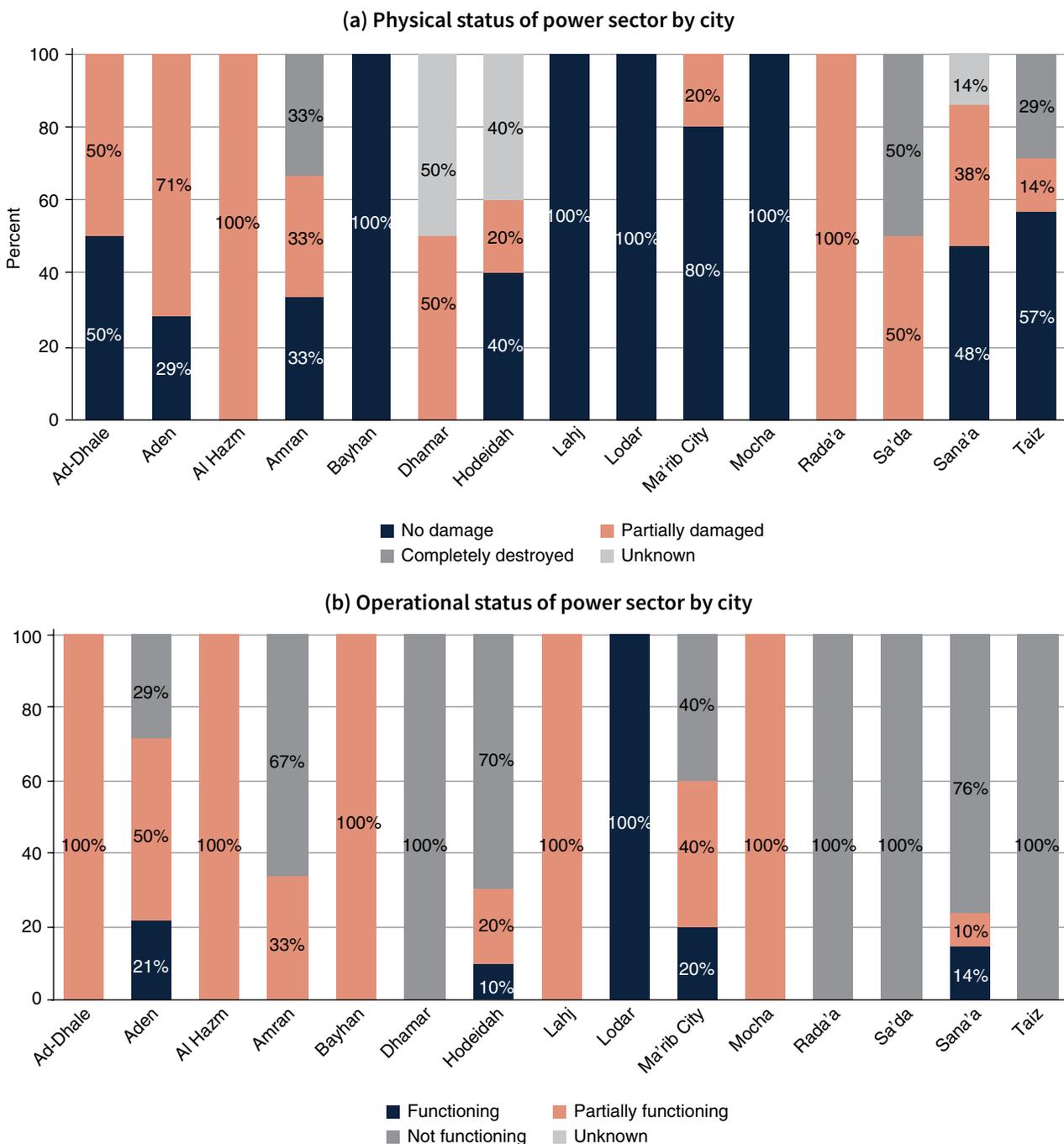
FIGURE 7.2 Physical and Operational Status of Power System Assets in 15 Cities



Source: World Bank estimates.

none of them were fully functioning (figure 7.2b), while 55 percent of the distributed generation units were damaged, and 90 percent were functioning only partially or not at all. None of the assessed transmission substations was functioning. The deterioration of this upstream infrastructure severely constrains overall sector functionality, as some downstream assets are left to sit idle despite exhibiting no or only partial damage.

FIGURE 7.3 Physical and Operational Status of the Power Sector by City (excluding towers)



Source: World Bank estimates.

Four of the 11 qualitatively assessed cities had no access to public grid electricity services, while the remaining typically had only sporadic access (see figure 7.3). At least 50 percent of the power assets in nine cities were not functioning. While the lack of electricity access in some instances is due directly to conflict-related damage to power infrastructure—for example, in Taiz or Sa'da, where 57 percent and 50 percent of power sector assets were completely destroyed, respectively.

In many cities the absence or shortage of public electricity is due to other systemic factors, including:

- **Fuel shortages.** In cities where the public grid is at least partially functioning, diesel fuel shortages often lead to intermittent availability of power. Diesel fuel shortages have also severely impacted the operations of the WASH sector. For example, in the absence of public electricity services, water is being pumped using diesel generators. The power shortage has also negatively affected health facilities, particularly in Hodeidah and Taiz, where blockades further limit the inadequate supply of fuel. As diesel scarcity has grown rampant, fuel prices have risen sharply. An informal market for diesel has also emerged in several cities, including Hodeidah and Taiz. In Aden, the government is making efforts to provide diesel and fuel oil to operate functioning power plants. In the North, the authorities have engaged the private sector to manage fuel supply and power plant operation.
- **Financial challenges of local branches of the Public Electricity Corporation.** Poor collection of electricity bills and illegal connections have further strained the finances of local power companies. As there has been no central budget since 2014, financial challenges have limited these companies' abilities to rehabilitate power infrastructure as well as pay employee salaries. For example, nonpayment of salaries prompted employee strikes for several months in 2016 in Dhamar and Lodar, further reducing capacity. Addressing the challenges are one of the key steps needed to restore PEC's functionality.
- **Lack of proper operation and maintenance.** In several cities, including Dhamar, Lodar, and Sana'a, urban power infrastructure has deteriorated in part due to insufficient investments in operation and maintenance. This was a problem before the conflict, and has been possibly aggravated by the loss of qualified personnel; nonpayment of public sector salaries (although salary payments are being made in the South); and unavailability of maintenance supplies and spare parts. In addition, in Taiz, the looting of power infrastructure to strip and sell its copper has become common.

In the absence of reliable public electricity or diesel fuel supply, solar power is becoming a common coping mechanism in both the private and public sector. A market assessment commissioned by the World Bank in 2016 estimated that the market penetration of solar power for lighting or appliances was as high as 75 percent of households in selected urban areas, including Sana'a where air conditioning needs are generally low.¹²³ The aforementioned phone surveyed confirmed the prevalence of small-scale solar systems in Yemen: As of end-2019, an average of 75 percent of households nationwide use solar systems as primary source of electricity, with even larger shares in rural areas and in the North. The share rises to 82 percent if accounting for both primary and secondary sources. Other key cities in which solar energy is a key coping mechanism include Hodeidah and Taiz. A recent World Food Program (WFP) phone survey conducted in November 2017 indicated that in 14 of 22 governorates, solar energy was the main household energy source, and solar systems were being increasingly adopted in the health and WASH sectors, often supported by nongovernmental organizations (NGOs) or other international organizations.

City-Level Analysis

The following section provides more detailed information on conflict impacts in 11 cities where data and information were most readily available. Table 7.1 provides a summary of all 11 cities, and additional information, including an overview of physical damage and functionality levels of the public power supply, coping mechanisms, and—where possible—the impact on other sectors.

123 RCREEE (Regional Center for Renewable Energy and Energy Efficiency), *Assessment of the Status of Solar PV in Yemen* (Cairo, Egypt: RCREEE, 2017).

Table 7.1 Current Status of Public Electricity Supply in 11 Assessed Cities

City	Public electricity (hours/day)	Critical infrastructure damage	Primary cause of power shortage	Coping mechanisms
Al Hazm	A few hours of access per day after 5 p.m.	A distributed generation unit, the city's primary electrical facility, is damaged but remains functional	Fuel shortages	Efforts have been made to provide diesel to the city's distributed generation units; while solar panels are available for sale, it is unclear how widespread their use is
Dhamar	No access	While key infrastructure may be partially damaged, the main electric substations are reportedly not functioning due to the shutdown of the Ma'rib and Ras Kathib power plants	Reliance on the Ma'rib gas power plant, which went offline in 2015 (repairs made this year made it possible for the power plant to generate around 55 MW out of its 341 MW capacity); also, systemic problems exist due to lack of maintenance, equipment shortages, and financial difficulties	Residents are using commercial generators and individual solar photovoltaic (PV) systems to meet electricity needs; public facilities such as hospitals, schools, and pumping stations rely on diesel-powered generators and, increasingly, solar PV
Hodeidah	The majority of residents have no access; one neighborhood has access 4–10 hours per day	Damaged infrastructure, including power cables, transformers, utility poles, and distributed generation units. The Ras Kathib power plant has been damaged.	Fuel shortages, which have worsened since May 2017, and degradation of infrastructure due to damage, theft, neglect, and overuse	Many households depend on solar power, and some use private generators; fuel is expensive and often sourced from the informal market
Khoka	No access	No major power infrastructure was identified	Unclear; likely limited service even pre-conflict	Evidence of limited solar PV use
Lodar	Access with frequent power outages	Despite damage sustained to Lodar's distributed generation unit, power was relatively reliable until institutional constraints reduced power supply	Financial constraints—including unpaid debts—have forced outages; diesel fuel shortages and lack of spare parts also limit functionality	None reported
Ma'rib	Generally, there is access, but with occasional local transformer failures	The Ma'rib gas power plant became nonoperational in 2015 due to a lack of maintenance, physical damage, and the inability to evacuate power as a result of a damaged transmission line. Repairs made in 2020 made it possible for the plant to generate 55 MW of its 341 MW capacity	Rapidly growing electricity demands due to increase in population (large IDP inflows), decreasing financial sustainability of the electric authority due to illegal connections, and nonpayment of electricity bills	Local authorities have sought to expand power infrastructure. Media outlets reported US\$40 million of repairs were completed in May 2020. However, the facility is reportedly only able to generate 55 MW of electricity, significantly below its pre-crisis design levels (341 MW). Local media also reported a second phase of repairs was planned to expand the facility's capacity and connect it to the grid.

Table 7.1 Continued

City	Public electricity (hours/day)	Critical infrastructure damage	Primary cause of power shortage	Coping mechanisms
Mocha	24-hour access	Mocha's power sector, although shut down during two years of fighting, has been extensively restored	The Mocha power plant is supplying local demand but not operating at full capacity due to a lack of functioning transmission lines for evacuation to Taiz; also suffers from fuel shortages	Most rehabilitation efforts have been made by the Emirati Red Cross to restore public electricity access, including through solar water pumps
Rada'a	No access	The main power facility, a distribution substation that is only partially damaged, is not functioning due to its reliance on the Ma'rib gas power plant	Reliance on the Ma'rib gas power plant, which is not fully functioning	No coping mechanisms reported in the residential sector, but a school and two health facilities have installed solar PV
Sa'da	No access	The main power generation units in the city are damaged	Power sector remains nonfunctional due to aerial bombardment and damage to critical infrastructure	None reported
Sana'a	Unequal access, ranging from zero access to up to 11–17 hours in some areas of the city	Destruction of high-voltage power lines connecting the city to the Ma'rib power plant; damage to the distributed generation facility mainly used for operating water, sanitation, and hygiene (WASH) infrastructure	Connection to the primary power source for Sana'a has been destroyed and diesel fuel is scarce	Solar battery systems and commercial generators are the primary source of residential electricity; however, low-quality products have eroded consumer confidence in PV, and affordability remains a challenge
Taiz	No access	Destruction of the Usayfira distributed generation unit, Taiz's primary source of electricity; damage to high-voltage lines connecting Taiz to the Mocha power plant	Infrastructure damage and difficulty in obtaining diesel fuel	Solar is the primary means of electricity for household use and its usage has continued to rise; however, affordability remains a challenge. Private power companies have been allowed to operate.

Source: World Bank estimates.

Dhamar

Status of public power supply: Dhamar reportedly has no access to public electricity, due largely to its reliance on the Ma'rib and Ras Kathib power plants, both of which went partially or completely offline as early as in 2015. However, while the key bottleneck is the shutdown of these power plants, Dhamar's public electricity service suffered from systemic issues even before the current crisis. These issues included technical difficulties with transformers due to lack of maintenance, equipment shortages experienced after loaning transformers to nearby cities, and unpaid employee salaries that resulted in strikes.

Coping mechanisms: The local population generally relies on commercial generators or individual solar systems to meet their electricity needs; however, 60 percent of surveyed residents reported no access to any source

of power. Solar power is also increasingly being utilized in public facilities. The local water and sewage association has begun to transition its diesel-powered facilities to solar. The first phase of this transition, completed in November 2017, involved the installation of five solar-powered pumps; eleven more were to be installed in the second phase. Two schools had installed solar water pumps as of January 2018.

Impact on critical services: For those facilities that have not yet transitioned their diesel systems to solar, persistent diesel fuel shortages have resulted in the disruption of water and sanitation services.

Hodeidah

Status of public power supply: On-the-ground surveys indicate that less than 19 percent of households have access to the public electricity compared with 80 to 100 percent before 2014. Surveys of 10 facilities in the area indicate that 40 percent were not damaged, but only one facility was functional as of January 2020. Despite publicized large-scale infrastructure repair programs led by the Hodeidah electricity department, power access has not noticeably improved since the May 2017 DNA Phase II. Recent conflict dynamics have exacerbated the situation. Analysis of night-time illumination between March 2018 and November 2019 in Hodeidah suggests an overall 30 percent decline in illumination. Due to diesel fuel and HFO shortages, the city is assessed as having no or only very limited access to public network electricity. Additional challenges include the theft of electrical materials, and grids degraded by years of neglect and overuse.

Coping mechanisms: The Hodeidah electricity department has reportedly undertaken efforts to repair and expand the capacity of Hodeidah's two distributed generation units. In order to fuel the facilities, the department announced plans to establish a fund to purchase diesel and HFO for the public network during the summer months of 2018. However, it is unclear whether the authorities will be able to find the financial resources needed to accomplish this.

The use of private solar power has expanded greatly amid the power shortages of the ongoing crisis. Solar panels and batteries are commercially available to local residents, and local NGOs are reported to have installed solar panels in some low-income residences. Around 54 percent of residents have turned to private generators to meet their basic power needs. This source of power is expensive, costing a small family around US\$144 per month. The fuel shortage has also resulted in an informal market, which local municipal authorities are attempting to crack down on in response to public pressure.

Impact on critical services: Lack of electricity or steady diesel fuel supply is a critical impediment to the functioning of WASH infrastructure. Reports indicate that power outages and inadequate diesel supply are also affecting operations at health facilities in Hodeidah. In August 2017, Al-Salkhana Hospital made an urgent request that local authorities provide a permanent supply of diesel fuel to the electrical station supporting the Al-Salkhana, Al-Thawra, and military hospitals; a kidney dialysis center; and other medical facilities in the town.

Mocha

Status of public power supply: The Emirati Red Crescent (ERC) helped restore functionality to the city's power infrastructure, repairing transformers and providing emergency maintenance. The Mocha power plant, which was damaged in July 2019, has reportedly been repaired with support from the ERC but is likely to operate at limited capacity. Today, the city of Mocha generally receives 24 hours of electricity service, though it frequently faces HFO shortages. Other cities in the governorate are not receiving services from this plant due to the state of the connecting infrastructure.

Coping mechanisms: The ERC appears to be installing solar-powered water pumps within the city and in the surrounding rural areas.

Impact on critical services: The power plant's limited operations have constrained desalination capacity. Several pumping stations are not functioning due to fuel shortages. Lack of a steady electricity or diesel fuel supply is a critical impediment to the functioning of WASH infrastructure.

Sana'a

Status of public power supply: While there is no consistently functioning public network as of January 2020, a limited number of public facilities may be operating sporadically. Access to public electricity is highly unequal: some neighborhoods report no access whereas two neighborhoods reported 11–17 hours of access a day. Still, on-the-ground surveys indicate that an average of 63 percent of residents rely on generators. The key bottlenecks to service delivery remain unchanged since the DNA Phase II. As in May 2017, challenges include the destruction of the high-voltage power lines connecting the city to the Ma'rib power plant and a lack of municipal authorities to procure replacement parts for key power infrastructure. Sana'a has also been susceptible to fuel shortages, and its power infrastructure continues to incur conflict-related damage. As a result, the cost of damage has increased by about 128 percent in Sana'a since the DNA Phase II. Local and social media report Yemen's Public Electricity Corporation has privatized two power generating facilities, the Hezyaz and Dhahban power plants, which are now privately operated and functioning at reduced capacity.

Coping mechanisms: Solar plus battery systems and commercial generators are the primary means of residential electricity supply. However, solar panel sales have decreased, as the poor quality of products on the market erode consumer confidence in the industry. Affordability and maintenance of solar systems remain a challenge, further limiting these systems' viability as a replacement for public electricity service. The United Nations High Commissioner for Refugees (UNHCR) has reportedly installed solar panels in at least one public school in Sana'a.

Impact on critical services: A lack of public electricity and diesel fuel shortages are the critical impediments to the functionality of the WASH sector. Heavy reliance on diesel has made water prices extremely volatile—since they depend on the cost of diesel fuel.

Taiz

Status of public power supply: Taiz still has no access to public electricity services. The primary source of power for the city, a distributed generation unit, as well as transmission infrastructure linking it to other power stations have sustained extensive conflict-related damage. Since the May 2017 DNA Phase II, the power infrastructure in Taiz has also fallen victim to systematic looting—particularly of cables, transformers, and utility poles.

Coping mechanisms: As the costs of power sector rehabilitation are prohibitive and conflict has continued in the city, no efforts have been made to restore the grid. However, solar photovoltaic (PV) has become widespread and is continuing to increase. NGOs have supported its use in Taiz, including in several public schools and to power streetlights. The Taiz Electricity Directorate has decided to allow private power companies to operate in the city. As of January 2019, these companies were supplying electricity to the neighborhoods of Shari'a Jamal, at-Tahrir, and Bir Basha, although they were reportedly charging up to 10 times the publicly set price for electricity. Analysis of night-time illumination between March 2018 and November 2019 in Taiz suggests an overall 70 percent increase in illumination, which could be linked to that decision.

Impact on critical services: Fuel shortages have impacted the functionality of health facilities, particularly medical equipment reliant on a steady power supply as well as medicines that require a functioning cold chain. Power outages have put patients at risk, both due to equipment failures as well as difficulties treating patients without proper lighting.

Damage Quantification

Physical damage to urban power infrastructure in the assessed cities is estimated at US\$422–516 million.

Tables 7.2 and 7.3 show damage estimates by asset type and city. By far the greatest damage was observed in Aden (US\$205–250 million), followed by Sana'a (US\$134–164 million) and Hodeidah (US\$51–62 million).

Table 7.2 Damage Inventory by Type of Asset (sum of all 15 assessed cities)

	Baseline	Partially damaged	Completely destroyed	Total assets damaged
Power plant	7	5	0	5
Distributed generation unit	20	9	2	11
Substation (distribution)	33	10	1	11
Substation (transmission)	5	1	1	2
Tower	259	1	0	1
Transformer	1	1	0	1
Administrative office	9	2	0	2
Total	334	29	4	33

Source: World Bank estimates.

Table 7.3 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	0.8	1.0
Aden	204.9	250.4
Al Hazm	0.5	0.6
Amran	18.5	22.6
Bayhan	0.0	0.0
Dhamar	0.8	1.0
Hodeidah	50.7	61.9
Khoka	0.0	0.0
Lahj	0.0	0.0
Lodar	0.0	0.0
Ma'rib City	0.8	1.0
Mocha	0.0	0.0
Rada'a	0.8	1.0
Sa'da	2.9	3.5
Sana'a	134.4	164.3
Taiz	6.9	8.4
Total	421.9	515.7

Source: World Bank estimates.

Note: Because of Khoka's small size and lack of identifiable infrastructure, no quantitative data are available for this city.

Sectoral Needs Assessment

Restoring public service delivery in the 15 assessed cities would require: (i) rehabilitating the physical infrastructure (estimated between US\$738–902 million over five years); and (ii) restoring fuel supplies and system operation (estimated between US\$261 million and US\$319 million annually). These estimates are conservative, in that they do not account for power system infrastructure outside the city boundaries. They also represent a conservative estimate of the variable costs of both fuel and nonfuel supplies.

To estimate service restoration costs (table 7.4), we assume electricity consumption per capita in the assessed cities at 250 kWh/per capita, which was the national average at its pre-crisis peak in 2013.¹²⁴

We assume the variable cost of electricity consumption as US\$0.20/kWh, which reflects the high cost of electricity from petroleum products using an aged power plant fleet. The real variable cost of generation may differ from this assumption; higher costs would be incurred if oil prices rebounded, while lower costs are possible if domestic natural gas production can be ramped up quickly. The calculation of the total cost of service restoration assumes full capacity and utilization from the first year. Note that the cost of fuel procurement is significantly

Table 7.4 Recovery and Reconstruction Needs over Five Years (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	6	7	23	28	29	35
Aden	113	138	453	554	566	692
Al Hazm	2	2	8	10	10	12
Amran	11	14	45	55	57	69
Bayhan	3	3	11	14	14	17
Dhamar	12	14	46	57	58	71
Hodeidah	44	54	177	216	221	271
Khoka	2	2	8	10	10	12
Lahj	1	2	6	7	7	9
Lodar	5	6	20	25	26	31
Ma'rib City	4	4	14	17	18	21
Mocha	4	5	15	18	19	23
Rada'a	4	4	14	18	18	22
Sa'da	3	4	14	17	17	21
Sana'a	175	213	698	853	873	1,067
Taiz	20	24	80	98	100	122
<i>Total infrastructure reconstruction</i>	148	181	591	722	738	902
<i>Total service delivery restoration</i>	261	319	1,043	1,275	1,304	1,594
Grand total, all cities	408	499	1,634	1,997	2,042	2,496

Source: World Bank estimates.

124 IEA, "Yemen: Statistical Indicators," 2018. <https://www.iea.org/countries/yemen>.

higher than that of infrastructure rehabilitation. As long as domestic oil and gas production remains subdued, restoring the power supply would depend on fuel imports, which are likely to remain constrained due to limited foreign exchange reserves. Any efforts to rebuild the energy infrastructure must consider its transition to alternative means of power production.

As is evident at the city level, conflict-induced damages—combined with looting and vandalism—have significantly deteriorated Yemen’s energy infrastructure at all levels. The reconstruction effort would require a comprehensive approach to grid rehabilitation, including the replacement and reconstruction of critical components of power plants and transmission and distribution substations, and civil works to repair and replace distribution towers and cables. This would take several years and can only start once the security situation allows international contractors to return to Yemen. Reconstructing the public grid would involve significant international and domestic procurement and the contracting of qualified partners. Given the extent of the damage, a phased approach that focuses on restoring electricity to critical public service facilities should determine the priority and sequencing of grid rehabilitation. The exact nature of the repairs and reconstruction required for each facility would need to be determined through site-specific engineering assessments. Given the nature of active conflict, such assessments are a highly challenging task, with significant implications for reconstruction costs.

Priorities Going Forward

The power system can be improved as it is rebuilt, allowing more equitable access and with more emphasis on renewable energy, distributed generation, and the private sector. Yemen has ample renewable energy resources, including solar, wind, and geothermal energy. The costs of the technologies needed to harness these resources have fallen steeply over the past five years. Already, a strong, private sector-driven supply chain has emerged for small to medium-sized solar systems. These developments give hope that the rebuilt power system can be more equitable, cleaner, and less dependent on fossil fuels.

Available information on the power sector and its institutions suggests that interventions to restore access to affordable electricity should be prioritized as follows:

Immediate-Term Priorities (3 months and more)

- Expand access to privately supplied, distributed generation, especially solar.
- Restore electricity services to critical facilities in the health, water, and agriculture sectors, even if rudimentary.
- Strengthen capacity of the private sector and municipality-level authorities who manage critical services.

Short-Term Priorities (1 year and more)

- Restore public electricity supply in selected urban areas through investments in T&D grids, particularly the national network 400/132 kV which connects several cities, and secure fuel supplies.
- Strengthen capacity of public institutions on a municipal/regional level to provide critical electricity services.
- Mainstream solar applications with enhanced technical quality.

Medium-Term Priorities (3–5 years)

- Reconstruct large-scale infrastructure, including transmission lines, power plants, and new utility-scale renewable energy capacity.
- Restore functionality of the national grid and distribution network.
- Strengthen capacity of national power sector institutions, including PEC, to provide electricity services.

Long-Term Priorities (more than 5 years)

- Establish and strengthen regulatory structures to continue to allow participation of private/distributed generators in electricity service provision.

In the short-term, expanding access to privately supplied distributed energy services—especially solar—and restoring electricity services to critical facilities in the health, water, and agricultural sectors should be prioritized. Both technical solutions and supply chains for distributed generation, driven largely by the private sector, have emerged as coping strategies during the conflict. Short-term engagement should focus on strengthening these service delivery models, with the aim of supporting the development of the supply chain and expanding access to low-income households via small-scale solar systems. Expansion of electricity access to critical public services, such as water pumping, health, or other public services, could be done using larger solar systems, possibly with batteries or as solar-diesel hybrid systems. Focusing on distributed solar would also strengthen the private sector, reduce dependency on scarce diesel fuel, and improve the resilience of energy infrastructure.

To restore public electricity supply, the most feasible approach is to start from municipal or regional grids and then gradually expand the reach of supply through interconnections. Many of the major transmission linkages in the country are damaged, suggesting that grid-based electricity supply has to be restored on a regional level first before moving to the national level. To that end, municipal authorities will need material and equipment to rehabilitate the heavily damaged urban distribution networks. The focus should be on standardized grid components and material that can be procured rapidly. Emphasis should be on restoring the electricity supply to critical public services such as street lighting, water pumping, telecommunications, public services, health, and education. This would be achieved by prioritizing those districts and parts of the grid that offer the highest dividend in terms of restoring public services—for example, circuits that connect hospitals or water infrastructure. Strengthening service delivery on a municipal level would contribute to a more distributed service delivery model and build the capacity critical for the reconstruction phase.

8

Social Protection and Jobs

The conflict in Yemen has led to a massive increase in the poverty and vulnerability of local populations amid rising unemployment, nonpayment of salaries, destruction of productive assets, collapse of subsidies, inflation, and multiple and successive shocks. This has intensified the need for social safety nets. Meanwhile, those programs that covered some portion of the population before the crisis now face funding, operational, and capacity constraints on their ability to provide effective social protection.

Yemen's social protection architecture consists of (i) social assistance and (ii) social insurance. Social assistance is provided primarily through programs run by the Social Welfare Fund (SWF) and Social Fund for Development (SFD). The SWF's targeted unconditional cash transfer program, which covered 1.5 million households before the crisis, would now need to cover an estimated 1.85 million households, incurring a total cost of US\$1.55 billion over a five-year period to provide coverage comparable to pre-crisis levels. The SFD would require an additional US\$1.2 billion over the next five years to bring its operational service delivery up to pre-crisis levels (including for the cash-for-work program). The operating costs and infrastructure damages to both these institutions are estimated at US\$20 million. To reinstate pension funds (not including to the security and military sectors) would require another US\$888 million over five years.

Several other developments attributable to the conflict, such as increased insecurity and economic uncertainty, and reduced mobility and access to services have also affected the social protection and jobs landscape in Yemen. These are not easy to quantify in monetary terms, but are nonetheless significant. Factors such as firm closures, layoffs, unemployment and underemployment, nonpayment of public sector salaries, women's reduced labor force participation, a shrunken resource base for pension funds, the weakened capacity of national social protection institutions and their policy coordination, and uncertainty regarding remittances from Gulf Cooperation Council (GCC) countries accentuate the need for social protection in the months and years to come.

To restore the social protection sector, including social assistance and pensions, to its pre-crisis levels would require an estimated US\$4.26 billion over a five-year period.

Pre-crisis Condition of Social Protection and Jobs

Before the conflict, Yemen's social protection system comprised an array of social policies and programs that provided a diverse set of benefits to the population. These included:

- Energy subsidies;
- Contributory social security (pension) programs covering public and private sector employees in the formal sector;

- Social safety net (SSN) programs, including unconditional cash transfers through the Social Welfare Fund (SWF), conditional cash transfers through the cash-for-work (CFW) program implemented through the Social Fund for Development (SFD), and in-kind benefits for people with disabilities through the Disability Fund;
- Labor-intensive public works program implemented by the Public Works Project (PWP);
- Small and microenterprise development programs supported by the SFD, including financial services through microfinance institutions (MFIs) and nonfinancial services through the Small and Micro Enterprise Promotion Services (SMEPS) program, and the Agriculture and Fishery Promotion Fund; and
- Targeted community-based service delivery and livelihood support through the SFD.

The following discussion and analysis are limited to a subset of these programs for which the most detailed information is available.

Energy Subsidies

The largest component of public transfers before the crisis consisted of universal energy subsidies. Significant direct subsidies were provided for a variety of petroleum products, including diesel (for both transportation and electricity generation), petrol, kerosene, and liquefied petroleum gas (LPG). While subsidies absorbed a large percentage of gross domestic product, or GDP (about 7.4 percent in the 2012–2014 pre-crisis period, or roughly a third of public expenditures), they were an extremely inefficient way of delivering benefits and social protection to the poor and vulnerable. It was estimated that more than 77 percent of the direct subsidies for petroleum products accrued to the nonpoor, while only 23 percent went to the poor. The Government of Yemen undertook modest but unpopular steps toward reforming its hydrocarbon subsidy program between 2009 and 2014. In 2010, it was estimated that the removal of energy subsidies would lead to an increase in the poverty level by 3.0 percentage points (without any compensation), with rural households, particularly farm households, most affected, especially those that relied on irrigation-intensive crops for their incomes.¹²⁵ As of 2014, direct and indirect fuel subsidies were still absorbing a large share (6 percent) of GDP.

Social Fund for Development (SFD)

Prior to the crisis, the SFD operated in all of Yemen’s 333 districts, targeting poor and vulnerable communities and delivering a safety net of livelihood support, employment generation, community services and small-scale infrastructure, and financial and nonfinancial services to small and micro enterprises. These were delivered through three programs: (i) the cash-for-work (CFW) program; (ii) the Community and Local Development Program (which implemented labor-intensive public works, among other projects); and (iii) the Small and Micro Enterprise Development Program. The SFD implemented its programs through five-year programming cycles, providing targeted communities reliable access over the medium-term. Prior to the conflict, the SFD was implementing its phase IV program (2011–15) with a planned budget of US\$1.0 billion. Over the past two decades significant demand for the SFD’s interventions were met by expanded delivery capacity. SFD’s implementation and disbursement capacity peaked in 2014, when the program was disbursing US\$20 million per month or US\$240 million per year.

Safety Nets

The Social Welfare Fund (SWF) was Yemen’s largest targeted and unconditional cash transfer (UCT) program, covering 1.5 million poor and vulnerable households. Beneficiary households were initially identified by category; in

¹²⁵ World Bank, “Yemen Private Sector Growth and Social Protection Policy Grant” (Project Document, World Bank, Washington, DC, 2010).

2008, the SWF adopted a poverty-based targeting approach. While the program covered around 30 percent of the population, the exclusion error remained high. According to the 2014 Household Budget Survey (HBS), 60 percent of the poor were not covered by the program. The program also had a low benefit level, ranking among the least generous globally. The average benefit amount stood at Yemeni riyals (YRI) 5,000 per household per month. This accounted for about 9 percent of the expenditure of the poorest quintile in 2014 (HBS 2014), compared with the average 13 percent and 18 percent observed in low- and lower-middle-income countries, respectively.¹²⁶ The SWF program was publicly funded prior to the conflict, and benefits were delivered on a quarterly basis. The last payment was made by the government in December 2014.

Remittances also played a considerable role in supporting households in Yemen before the onset of the crisis (and continue to do so). According to the 2014 HBS, 11.2 percent of all households received remittances from within Yemen, while 17.6 percent received remittances from abroad. Their contribution to household income was substantial; on average, domestic remittances were equivalent to 13.4 percent of recipient households' consumption, while the share of foreign remittances was as high as 31.5 percent. In 2014, Yemen received an estimated US\$3.3 billion in overseas remittances, a majority of which came from GCC countries, with Saudi Arabia alone accounting for 61 percent. Remittances play an important social protection role as they are an important source of sustenance for the poor; recent data indicate that they are used primarily to meet households' basic daily expenses, such as for housing, health care, and education.¹²⁷

The cash-for-work program (CFW) was initially established as a response to the 2008 food crisis to protect the consumption of vulnerable households in food-insecure regions, and was subsequently adopted as an element of Yemen's social protection system. One of three main programs implemented by the SFD, the CFW program is an adaptive social safety net instrument, which scales up or down depending on the nature and scope of the shock/crisis and fund availability. The Government of Yemen adopted the program as a key social safety net to complement cash transfers from the SWF. The program was scaled up in 2011. In 2013, the program covered around 63,000 households with an average wage benefit of US\$500 per participating household. In 2014, the coverage declined to around 55,000 households, and in 2015 it declined to an insignificant level as the program's main donors suspended funding.

Pensions

Yemen's social insurance system consists of four distinct pension funds for workers in the military, security, private, and public/mixed sectors. These cover participants for old age, disability, death, and workplace injuries. There is no mandatory health insurance for those covered by pensions. Even before the crisis, Yemen did not have public insurance schemes to cover risks of unemployment and health. While pension funds covered all public employees, the coverage of private sector workers was very low. Enforcement of the social insurance law among private sector employers was weak, and employees had little awareness of the system. Pension funds depended on employer and employee contributions, as well as investments made by the pension institutions, typically in government bonds and treasury bills. The General Authority for Social Security and Pensions (GASSP) covered 589,806 civil servants (excluding military and security employees) and 124,051 retirees (pensioners), while the General Cooperation for Social Security (GCSS) had 90,000 private sector employee participants and only 11,114 pensioners.¹²⁸

¹²⁶ World Bank, *Atlas of Social Protection Indicators of Resilience and Equity* (Washington, DC: World Bank, 2018).

¹²⁷ Ministry of Planning and International Cooperation, "Yemeni Expatriates' Remittances: Last Resource Under Threat" (Yemen Socio-Economic Update, Issue 32, February 2018). <http://files.constantcontact.com/9fcbc1c9401/16267008-af70-4ab8-82bf-321cc57355fe.pdf>.

¹²⁸ Ministry of Planning and International Cooperation, "Social Protection Programs in Yemen: Current Situation and Donor Response," *Yemen Socio-Economic Update*, Issue 29, November 2017.

Jobs

Even before the onset of the crisis in 2014, Yemen's labor market faced serious structural challenges. Only 36.3 percent of the population participated in the labor force; women's participation was even lower, at 6 percent. Informal jobs accounted for about 75 percent of total jobs; 5 percent of these were informal arrangements with otherwise formal employers. The services sector accounted for 55.6 percent of total employment, while agriculture and industry accounted for 29.2 percent and 14.5 percent, respectively. Further, only about half the employed population was salaried, with the rest comprising own account production or contributing to family work. The educational levels of the labor force were relatively low: 23.9 percent of men and 29.1 percent of women in the labor force had no education, and 73.9 percent of men and 56 percent of women had no more than a basic education.¹²⁹

Sectoral Damage Assessment

Aggregate Analysis

The ongoing conflict in Yemen has taken a considerable toll on incomes and food insecurity in the country, exacerbating the need for social protection. Even before the conflict, poverty had been on an upward trajectory in Yemen, increasing from 35 percent to 49 percent between 2005 and 2014. The poor's share of the total population was estimated to have increased to 62–78 percent in 2016.¹³⁰ This increase in poverty is due to a combination of factors including lost jobs, housing damage, displacement, partial (or full) nonpayment of public sector wages, a higher prevalence of disease, and reduction in access to public and private transfers, including remittances. These factors have imposed the greatest burden on those who were poor even before the conflict, widening the inequality gap. The food security situation in the country has also worsened as a result of lowered purchasing power and market imperfections,¹³¹ including the impact of the conflict on the supply of food imports. These developments strain households' ability to protect human capital and also threaten to reverse the advances in education and health care made in the years before the conflict. As is the case in all public sectors, the conflict has weakened the overall social protection system, leading to the loss of policy coordination, planning, and sustainability. Extending social protection programs in general, and social safety nets in particular, to a larger number of poor and vulnerable people in Yemen is critical for the reconstruction agenda. Social protection instruments may be leveraged to enhance social cohesion, citizen participation, and transparency.

Subsidies

With the collapse of public revenues following the onset of conflict, energy subsidies collapsed as well, leaving prices to skyrocket. It is not possible to estimate the impact of this price increase on poverty amid a lack of data on the baseline poverty level. However, analysis of nutritional outcomes indicates that people have coped with the increase in fuel and electricity prices by shifting toward cheaper calorie sources. Also, a 2010 analysis¹³² estimated that the removal of subsidies would increase poverty by 3 percentage points. Of all energy products, kerosene is the item most used by the poor. Therefore, any future policy adjustments should consider protecting the poor against fluctuations in the price of kerosene. One option would be to add any increase in the price

129 International Labour Organization (ILO), *Yemen Damage and Needs Assessment: Crisis Impact on Employment and Labour Market* (Beirut: ILO, 2016).

130 World Bank, *Free Falling: Living Standards during Times of Conflict in Yemen* (Washington, DC: World Bank, 2017).

131 Gallup World Poll 2016 (<http://www.gallup.com/analytics/213704/world-poll.aspx>); World Bank 2017.

132 World Bank, *Yemen Private Sector Growth and Social Protection Development Policy Grant*, Report No. 55649-YE (Washington, DC: World Bank, 2010).

BOX 8.1 Impact of COVID-19 Pandemic on the Yemeni Population

The COVID-19 pandemic poses severe and far-reaching negative consequences for the Yemeni population that is already coping with the effects of conflict, food insecurity, and successive shocks. The economic effects of the pandemic on households could operate through direct and indirect channels. While the direct health effects of the pandemic on the Yemeni population are not fully known, as incidence spreads, economic activity and labor force productivity may fall, further exacerbating poverty and food insecurity. The indirect effects of the pandemic may also be substantial, operating through multiple mechanisms. First, despite the presence of large food stocks, globally and within countries, the FAO has warned of the risk of a looming food crisis due to the disruptions in supply chains, which could be especially damaging to Yemen.¹³³ Any imminent increases will severely affect Yemen, given its heavy reliance on imports of staples. COVID-19 is likely to have exacerbated income and food insecurity as well as unemployment and underemployment, especially among vulnerable groups. Finally, remittances from abroad, which are an important source of nonformal social protection, may also decline due to economic contraction and the resulting layoff and repatriation of Yemeni migrants in several destination countries, notably in the GCC.

of kerosene to the cash transfer amount (because of limited data on household consumption, the cost of this option is not estimated here).

Social Safety Nets (including SFD)

In 2014, when the poverty rate in the country was 49 percent, cash transfers covered 1.5 million beneficiary households, or three-fifths of the poor. To restore coverage of the poor to its pre-conflict level, policy makers would need to account for the subsequent increase in poverty. Assuming a poverty rate of 80 percent in 2020 (World Bank estimate), given a population size of 28.5 million, and an average household size of seven, if three-fifths of households below the poverty line are deemed eligible for cash transfers (as was the case pre-crisis), this would imply a coverage of 1.95 million households (4.07 million households × 80 percent poverty rate × 60 percent coverage). Further, high inflation has eroded the purchasing power of the SWF transfer amount. To maintain the real value (purchasing power) of the SWF transfer at its pre-conflict level (as of January 2015), the average would need to be increased from YRI 5,000 to YRI 11,710 per household per month.¹³⁴ For a target population of 1.95 million households, and assuming an average benefit amount of YRI 11,710 per household per month, this translates into an annual expenditure of about YRI 274 billion (US\$422 million at US\$1 = YRI 650¹³⁵) on SWF cash transfers.

As noted above, the SFD's operational capacity in 2014 stood at US\$20 million in disbursements per month. To reestablish this capacity would require US\$240 million a year. This would cover the CFW program (the safety net instrument for the working poor), and support of temporary employment for youth—a critical recovery objective—as well as support for small and medium enterprises. While hard to quantify, restoring the SFD's full capacity would also support Yemen's social cohesion and a bottom-up governance model. The SFD takes a community-based approach to development, with a focus on the empowerment of local authorities (for example, village cooperative councils and district authorities), youth, and women.

Jobs

The conflict in Yemen has negatively affected labor force participation and employment. According to a rapid assessment conducted by the International Labour Organization (ILO) in 2015, the labor force participation

133 FAO 2020. Yemen: Revised humanitarian response (May–December 2020): Coronavirus disease 2019 (COVID-19). Rome. <https://doi.org/10.4060/cb0200en>

134 Calculations based on estimated monthly national average cost of the minimum food basket (YRI/person) in Yemen between January 2015 (pre-conflict) and February 2020, provided by the WFP.

135 Yemen Monthly Economic Update March 2020/World Bank.

rate in the three largest population centers of Sana'a, Aden, and Hodeidah had declined by 13.8 percent in one year.¹³⁶ The loss was felt by a greater share of women (28 percent) than men (12.2 percent). Employment rates fell by 11.1 percent for men, 28 percent for women, and 12.8 percent in total. According to a national-level phone survey conducted by the World Food Programme (WFP) in October 2017, in about 32 percent of all households, the head of the household did not have any work in the month preceding the survey, and another 44 percent were working but for fewer than 15 days in a month. Over 80 percent of household heads stated that they would like to have more work than was currently available.¹³⁷

Agriculture accounted for a smaller share of employment pre-conflict (29.2 percent) than did services, but it registered a particularly sharp 49.7 percent decline in employment.¹³⁸ The services sector registered a decrease of 8 percent, while the loss of industry jobs was relatively small, at 4 percent. In Sana'a, Aden, and Hodeidah,¹³⁹ there were around 73,000 jobs in agriculture, 3,000 jobs in industry, and over 60,000 jobs in services. The closure of firms is behind a significant number of layoffs in the private sector. According to a study conducted by the Small and Micro Enterprise Promotion Service (SMEPS) in 2016,¹⁴⁰ workers in micro and small and medium enterprises (MSMEs) suffered a disproportionately higher rate of layoffs than did workers in larger firms. About 70 percent of MSMEs had laid off half or more of their staff since the onset of the crisis. A report from Al Araby found that 8 million Yemenis had lost their sources of income since the start of the crisis, including 4 million salaried workers, 3 million daily wage earners, and 1 million monthly earners.¹⁴¹

As of 2014, Yemen's public sector was the country's single largest employer, employing an estimated 1.25 million people in civilian and military jobs. In 2017, the majority of public sector employees had not been paid their salaries. Of an annual public sector salary bill (excluding the military) of US\$2.6 billion in 2014, unpaid salaries at the governorate level accounted for an estimated US\$2 billion in 2017.¹⁴² Unpaid salaries have reduced the purchasing power of affected households and increased their vulnerability, making the expansion of social protection an urgent priority. The COVID-19 crisis and resulting economic slowdown would have further increased the extent of unemployment and underemployment in the country, making its population even more vulnerable than before.

Pensions

Pension funds are the main source of income for households with elderly members retired from formal sector jobs. During the crisis, the sources through which pension institutions finance their payments have been severely hit. Earnings from government bonds were not accessible due to the liquidity crisis, and contributions from employees were also not available due to the nonpayment of public sector salaries.¹⁴³ Other factors include the departure of foreign and international firms, massive private sector layoffs in different industries including oil, and a subsequent fall in revenues, and damage to pensions institutions' assets. As of early 2018, forty-one percent of retirees (50,860) who were to be paid pensions by the GASSP had not received payments since March 2017, and those

136 International Labour Organization (ILO), *Yemen Damage and Needs Assessment: Crisis Impact on Employment and Labour Market* (Beirut: ILO, 2016).

137 <https://docs.wfp.org/api/documents/WFP-0000039964/download/>

138 According to the International Labour Organization (ILO), *Yemen Damage and Needs Assessment: Crisis Impact on Employment and Labour Market* (Beirut: ILO, 2016).

139 Ibid.

140 SMEPS, "Rapid Business Survey: Impact of the Yemen Crisis on Private Sector Activity" (Sana'a: Small and Micro Enterprise Promotion Service, 2016).

141 Al Araby, April 2017, <https://tinyurl.com/y79zlxqz>

142 For more details, refer to chapter 3 on Governance in this report.

143 Ministry of Planning and International Cooperation, "Social Protection Programs in Yemen," 2017.

covered by the GCSS (11,114 pensioners) had received payments only up to November 2017.¹⁴⁴ Further, retirees in the security and military sectors had not received pensions for months. The average pension amount is YRI 40,000 per pensioner per month. The GASSP alone faces a monthly deficit of YRI 2.4 billion in financing its payments. Further, the GCSS estimates losses to the tune of \$202 million in total, of which 40 percent is attributed to its deficit over 5 years.¹⁴⁵ Social insurance institutions across the board need assistance in meeting their obligations.

Remittances

The importance of remittances to the Yemeni economy has increased under crisis. Even as growth declined in the economy as a whole, the absolute value of remittance receipts remained stable at around US\$3.3 billion until 2015, rose to US\$3.7 billion in 2016, and dropped to the US\$3.4 billion level in 2017 (equivalent to 23.7 percent of GDP in 2017), providing support to households in Yemen and also arresting a further decline of the exchange rate. However, as the majority of these remittances come from GCC countries, and Saudi Arabia in particular, policy changes in these countries can pose threats to remittances. For example, escalating levies imposed on expatriate workers and their dependents in Saudi Arabia (as part of the nationalization of workforce policies), and job losses among Yemeni workers following the COVID-19 pandemic and resulting lockdowns and business closure in the GCC can lead to tens of thousands of Yemenis returning, reduce support offered to current remittance recipients, and increase the pressures of unemployment and poverty in Yemen.¹⁴⁶

Sectoral Needs Assessment

The costs of restoring Yemen's social protection mechanisms to pre-conflict levels are estimated with the following considerations and assumptions:

- The baseline is protected against the price increase of the minimum food basket and the pre-conflict level of coverage (percentage of the poor).
- The percentage coverage of the poor is set at 60 percent (that is, 60 percent of 77 percent of the total population). Estimates protect the purchasing power of the benefit amount, as in January 2015, and also factor in a 5 percent delivery cost, assuming delivery through the SWF and excluding SWF staff.
- The programmatic delivery capacity of the SFD is set to pre-crisis levels.
- The operational and rebuilding costs (for damages to infrastructure, offices, and so on) of the SFD and SWF are set at about 5 percent of the programmatic cost.
- Pension estimates include an annual deficit of funds and retroactive payments of pensioners who did not receive benefits since 2016.

Several variables that reflect conflict-related damages to social protection mechanisms, jobs, and pensions systems in Yemen (such as declines in labor force participation) cannot be directly or easily quantified or priced, but are important to consider nonetheless. Notably, the costs of restoring public and private sector jobs lost during the crisis are not included in the estimates offered in table 8.1. Yet the impact of unemployment and the

144 These are concentrated in the Al Jawf, Raymah, Al Mahawit, Sa'da, Al Bayda', Amran, Hajjah, Dhamar, Ibb, Sana'a, Hodeidah, Taiz, and Amanat Al Asimah governorates.

145 GCSS (2020).

146 Ministry of Planning and International Cooperation, "Yemeni Expatriates' Remittances: Last Resource Under Threat" (Yemen Socio-Economic Update, Issue 32, February 2018). <http://files.constantcontact.com/9fcbc1c9401/16267008-af70-4ab8-82bf-321cc57355fe.pdf>.

Table 8.1 Recovery and Reconstruction Needs over Five Years

	Annual funding required (YRI billion)	Short-term (year 1) (US\$ million)	Total (over 5 years) (US\$ million)
Social safety nets			
Social Welfare Fund (SWF)—unconditional cash transfers	274	422	2,110
Social Fund for Development (SFD)		240	1,200
Costs of SFD and SWF operations, and repairs of damage to infrastructure, including offices		20	100
<i>Social safety nets total</i>		682	3,410
Pensions			
General Authority for Social Security and Pensions (GASSP) annual deficit for pension payments	28.8	64	320
General Corporation for Social Security (GCSS) annual deficit (40% of total losses of GCSS)	10.4	16	80
General Corporation for Social Security (GCSS) annual payment ^a	5.3	12	60
Dues to 50,860 pensioners who were not paid since 2016 and the extension of coverage from 2016 to 2020	2.4	101.6	508
Pension fund for the security sector	—	—	—
Pension fund for the military sector	—	—	—
<i>Pensions total</i>		193.6	968
Jobs			
Needs for enhanced proactive employment in public and private sector	—	—	—
<i>Jobs total</i>			
Total (excluding unpaid salaries to civil servants and job losses in the private sector)		875.6	4,378

Source: World Bank estimates.

Note: The estimates assume the financing gaps will be constant in real terms over the five years.

^a11,114 retirees × 12 months × YRI 40,000 (see MoPIC 2017, “Social Protection Programs in Yemen”).

— = Not available.

nonpayment of salaries on the effectiveness of the social protection system is profound. The nonpayment of salaries to a large share of the public sector (amounting to US\$2 billion in arrears), as well as firm closures, layoffs, and nonpayment in the private sector (a value difficult to estimate) can leave households vulnerable to increased poverty and other risks. Many of those who drew wages from formal employment are now left to depend on other family members, putting a strain on limited household incomes.

Gender issues: Women are shouldering a disproportionately high share of conflict-related effects on social protection and jobs. Even before the conflict, women’s labor force participation in Yemen was low. Only 10 percent of women who were currently or previously married and aged 15–49 were employed.¹⁴⁷ An Oxfam report based on focus group interviews conducted in early 2016 found that 92 percent of interviewed women reported having

147 MoPHP (Ministry of Public Health and Population), CSO (Central Statistical Organization, Yemen), PAPFAM (Pan Arab Program for Family Health), and ICF International, *National Health and Demographic Survey 2013* (Rockville, Maryland, USA: MOPHP, CSO, PAPFAM, and ICF International, 2015).

no regular personal monthly income.¹⁴⁸ Women's low level of economic participation in the economy can reduce the resources available to them and also weaken their intra-household bargaining position. For example, Tandon¹⁴⁹ reports a significant decline in women's control over household spending decisions in the city of Sana'a following the onset of crisis in 2014. On the other hand, news reports have suggested that women shoulder greater responsibility for generating income as households face dwindling incomes and shocks.¹⁵⁰ Despite low female workforce participation in general, focus group participants interviewed by Oxfam in 2016 indicated that the conflict had weakened some cultural norms restricting women's ability to work, particularly in professions considered "shameful," such as those of butchers, barbers, or poultry sellers.¹⁵¹ In addition, international aid organizations provide services to bolster female participation in the workforce. For instance, in March 2017, GIZ announced it had worked with SMEPS to provide business coaching via WhatsApp to over 600 female entrepreneurs, including 80 private midwives.¹⁵²

Priorities Going Forward

Immediate to Short-Term Priorities (up to 1 year)

- Secure funding for the delivery of cash transfers to existing beneficiaries while modestly protecting the purchasing power of the benefit amount against inflation. This would include cash transfers under both the UCT (SWF) and CFW (SFD) programs.
- Expand coverage of both the UCT program (for the working poor) and the CFW program (for the unemployed poor) to pre-conflict levels of coverage (as a percentage of the total poor) to account for the expansion of poverty since 2014.
- Ensure payment of civil servants' salaries to protect nearly 1 million employees from falling into extreme poverty and to protect their dependents and their human capital.

Medium- to Long-Term Priorities (2 to 10 years)

- Expand the coverage of the cash transfer programs to cover a larger number of poor households. Specifically, expand the UCTs to 2.5 million households and introduce productive safety net elements to the UCT and CFW beneficiaries to promote their graduation out of poverty and into productivity.
- Expand technical and financial support of small and medium enterprises to generate and protect jobs.
- Support the SFD to play its critical role in promoting bottom-up and local development, good governance, and service delivery, while emphasizing the role of women and youth in Yemen's recovery and reconstruction.
- Support the health and education sectors to enhance the demand for nutrition, health care, and education among the poor and vulnerable (thus investing in human capital and recovering human capital losses).
- Reform pension funds to assure their sustainability, while at the same time not crowding out the public resources of other social protection programs that support poor and vulnerable households.

148 Oxfam, "From the Ground Up: Gender and Conflict Analysis in Yemen," 2016. <https://policy-practice.oxfam.org.uk/publications/from-the-ground-up-gender-and-conflict-analysis-in-yemen-620112>

149 S. Tandon, "When Rebels Attack: Quantifying the Impacts of Capturing Territory from the Government in Yemen" (mimeo, World Bank, Washington, DC, 2017).

150 <http://www.aljazeera.com/news/2015/12/yemen-widows-weakest-victim-war-151215061011411.html>

151 <https://policy-practice.oxfam.org.uk/publications/from-the-ground-up-gender-and-conflict-analysis-in-yemen-620112>

152 <https://www.giz.de/en/html/43612.html>

9

Social Resilience

In addition to its physical and economic impacts, the conflict has had a significant effect on the Yemeni society in general, and on specific social vulnerable groups, in particular. It has militarized communities, strained relationships between social groups, entrenching divisions along political, geographic, and tribal lines while also creating new ones. It has undermined traditional tribal conflict-resolution mechanisms in a context of increased violence and competition for resources. The conflict has deepened the vulnerability of groups such as women and created a large population of internally displaced persons (IDPs).

Yemen has a long-standing tradition of social solidarity and autonomous local initiatives largely framed within traditional and tribal sociopolitical structures and norms of self-help and cooperation.¹⁵³ However, since the onset of the conflict, preliminary evidence indicates that the polarization of communities has fueled sectarianism and undermined social solidarity. Moreover, the breakdown of law and order and the proliferation of weapons and local armed groups, the increased number of active combatants and the presence of radicalized groups in parts of Yemen¹⁵⁴ have changed social structures and weakened the social trust that binds groups and enables collaboration within communities. Abuses against women and girls, particularly in areas controlled by the de facto authorities, indicate that the pre-crisis social norms and tribal mechanisms no longer provide some protections for women.¹⁵⁵ Disruptions and widespread shortages in basic services have resulted in the emergence of new social disputes over equity and access. Some of these conflicts are reported to be evolving along preexisting tribal, sectarian, and political cleavages.¹⁵⁶ Also, reports of new tensions between IDPs and host communities over humanitarian assistance and access to local services have started to emerge.

Despite growing social tensions, there have been reports of community solidarity and social resilience across Yemen. Community members have come together to address public service deficits, such as in water distribution and solid waste cleanup. New actors are emerging at the local level to bridge divides. For instance, women, commonly viewed as more effective mediators between rival factions than men, seem to be maintaining connections across tribal, sectarian, and political divides.¹⁵⁷ This seems to be strengthening their role within some communities.¹⁵⁸ Women are also key actors in the formal and informal education of youth, often volunteering as teachers. Meanwhile, district-level councils and civil society organizations (CSOs) have been stepping up to take greater responsibility for the management of local resources and to liaise with humanitarian actors.

153 Sheila Carapico, *Civil Society in Yemen: The Political Economy of Activism in Modern Arabia* (Cambridge: Cambridge University Press, 2007). An example would be the local development associations (LDAs) of the 1970s. They were autonomous local initiatives, largely framed within traditional tribal sociopolitical structures and norms of self-help and cooperation, which have contributed significantly to transforming economic and social conditions at the local level. Building on both ad hoc and traditional tribal mechanisms of social cooperation, LDAs operated throughout the country, in urban as well as rural areas.

154 World Bank, *Demobilization, Disarmament, and Reintegration (DDR) in Yemen: Learning and Considerations to Inform DDR Policy and Programming in Yemen*, forthcoming.

155 Peace Track Initiative, 2019.

156 Shوقي Maktary and Katie Smith, *Pathways for Peace & Stability in Yemen* (Washington, DC: Search for Common Ground, 2017).

157 Ibid.

158 Ibid.

These impacts of the conflict have been neither uniform nor routine across the country. Any efforts to promote social solidarity, community trust, and collaboration will have to take into consideration regional differences, as well as the new relationships and societal realities developing on the ground. Instead of aiming to “restore” or “return to” a previous status quo, recovery efforts at the community level would have to consider and build on these various societal transformations, some of which are positive and offer potential entry points for programming.

This chapter aims to present some of the social impacts of the conflict and illustrate some coping mechanisms that communities have adopted in four major cities: Sana’a, Hodeidah, Taiz, and Ma’rib Cities. The aim is to provide some illustrations of the degree of social resilience manifest in these cities—and of the societal transformations taking place in urban areas in general—keeping in mind the highly diverse impacts across communities.¹⁵⁹ There are indications that these vary widely even between neighborhoods. Given this diversity, as well as difficulties accessing reliable data during active conflict, this assessment is neither comprehensive nor fully representative. It aims only to highlight some societal transformations in select communities to illustrate the kind of structural changes that seem to be taking place. A much more in-depth and comprehensive assessment would be needed to fully understand the impacts of the conflict across Yemeni society, including rural areas.

Methodology

This assessment focuses on the cities of Sana’a, Hodeidah, Taiz, and Ma’rib City and is based on publicly available primary and secondary data gathered through: (i) the Dynamic Needs Assessment (DNA) Phase 3 analysis of conflict-induced physical impact and service delivery; and (ii) a series of focus group discussions (FGDs) organized with end-users of public services in the selected cities that were conducted in spring 2018.¹⁶⁰ The information gathered from these sources was then validated through key expert interviews with Yemenis who have lived in or traveled to these cities at some point during the current conflict. Whenever possible, the assessment and the associated recovery priorities were updated to reflect information available as of January 2020.

City Profiles

Sana’a City

Sana’a was the designated national capital before the onset of the conflict. It houses the presidential palace, Parliament, the supreme court, and the head offices of the country’s ministries. The largest source of employment within the city is the public sector. In the last couple of decades, massive rural immigration into the city has placed a huge strain on its underdeveloped infrastructure and municipal services, particularly water. Sana’a is also the home of the Old City of Sana’a, a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site, which has a distinctive architectural character, most notably expressed in its ancient multi-story buildings decorated with geometric patterns. The Old City has suffered significant damage in the conflict.

159 While social resilience may take many forms, some common mechanisms are typically associated with the concept. These include the capacity of a community to generate consensus on a minimum set of resources, services, and rights; to allow its members to act within a normative system to make sense of changes; to sustain institutional mechanisms to resolve problems and conflicts among members; and to offer a broad form of governance that allows room for community members’ influence. These are the parameters in which this chapter attempts to examine the societal transformations taking place in select cities in the Republic of Yemen.

160 Two FGDs per city (one male and one female discussion) were conducted for a total of eight FGDs. These were conducted as part of a broader discussion of the access rates, quality, time, price, and other perceived characteristics of services available in the community. The respondents were asked relevant questions on community-level dispute resolution mechanisms, coping mechanisms, and accountability structures.

Sana'a was host to ground clashes (especially in two neighborhoods on the outskirts of the city with strategic importance) throughout 2015. The intensity of the fighting in these areas increased as the conflict evolved and spread to nearby areas. As of February 2016, large-scale ground fighting around the city ended but sporadic fighting ensued with intermittent periods of calm. The intensity of the violence has fluctuated throughout the conflict. Aerial bombardment has continued throughout 2018 and 2019, but at a significantly lower level compared to the first few years of the conflict. Low-scale ground clashes appear to have continued intermittently throughout 2019 into 2020.

Social Impacts of the Conflict and Community Responses

Given its strategic location, Sana'a has become a transit point for tens of thousands of IDPs fleeing violence in neighboring governorates. While Sana'a initially witnessed a large outflow of IDPs in the first years of the conflict, as of December 2018, more than 400,000 IDPs are estimated to live in the capital. This number has likely increased further due to a significant influx of IDPs from Hodeidah during 2019. About 89 percent of the IDPs coming into Sana'a live in rental accommodations rather than in IDP camps.¹⁶¹

The fighting has resulted in significant damage to infrastructure and disruptions to service delivery. In response, residents of Sana'a have resorted to various coping mechanisms. Amid the failure of public network electricity, residents have reverted to solar panel technology and commercial power generators to procure electricity for everyday household needs. Also, there are reports of Sana'a residents' innovative use of social media to overcome many of the service delivery challenges they face. For instance, residents are using messaging services such as WhatsApp to communicate the location of water distribution points, and are using social media platforms such as Facebook and YouTube to share information on sewer blockages and water outages.

At the same time, reports indicate an increased reliance on charitable donations and humanitarian aid. For instance, in response to overcrowding in schools, some local nongovernmental organizations (NGOs) have been distributing school bags, clothes, water, food baskets, winter clothing and blankets, and other assistance to school children, especially those from IDP families. These charities have especially benefited a growing number of low-income residents in Sana'a.

Sadly, informal water distribution has become an important vector for cholera transmission due to poor water quality and treatment. Local councils have responded to such outbreaks by launching immunization and information campaigns in schools.

Community participation and mobilization around the provision of public services are often mediated by local councils or local NGOs. Focus group discussions highlighted the limited cases of communities coming together voluntarily to solve collective challenges. However, the fieldwork highlighted an experience in one neighborhood where community members came together to ensure the equitable distribution of propane cooking gas tanks among community members. Upon learning of corrupt and abusive practices of a community leader (A'aqel) who had overseen this process, the residents came together voluntarily to nominate an informal parallel group—consisting of trusted members of the community—to oversee the process. Even though evidence of such voluntary community-based collaboration is not often reported, such incidences highlight the potential for community-led action.

161 Task Force on Population Movement (TFPM) Yemen, 16th Report (October 2017).

Local Governance Arrangements for Service Delivery

Faced with the impacts of the conflict, municipal services departments in Sana'a have stepped in to address some of the challenges faced by residents. However, they are functioning well below pre-crisis levels mainly due to the destruction of critical infrastructure and severe funding shortages. Before the crisis, they relied on water and electricity taxes for most of their funding. As water and electricity have been widely unavailable in the city since the onset of the conflict, the revenue available for services has decreased significantly. Also, as in other areas, there are reports of local councils in Sana'a being captured by armed groups.

Residents credit the municipal services departments with addressing many of their immediate needs, although the degree of services tend to vary by neighborhood. Residents have reported the removal of trash by municipal services, but at well below pre-crisis levels. Nearly 40 percent of the respondents to a November 2017 World Food Program (WFP) Mobile Vulnerability Analysis and Mapping survey stated that their trash was still being collected from their homes. Concerns around trash collection are magnified during the rainy season, due to the heightened risk of cholera transmission. In the meantime, while some street lighting was reportedly functioning in the city as of March 2018, mainly due to the installment of solar-powered lights, local media reports indicate that most streetlights have not been functioning since the city lost power in August 2015. Residents have also reported the role of local and international NGOs in supporting municipal services.

District-level municipal services departments have been involved in mobilizing community members to address some of the service delivery deficits. Efforts have included cleanup campaigns and the replanting of trees, shrubs, and lawns in public parks. While these efforts have not been routine or uniform across all neighborhoods, reports indicate that they have helped reinforce a sense of community among residents. Local councils have also tried to organize such campaigns, often around religious holidays, making them as inclusive as possible with the participation of women and basic and secondary school students.

Hodeidah City

Hodeidah is the fourth-largest city in Yemen and is the center of the Hodeidah governorate. Situated on the Red Sea, Hodeidah is the second-most important port in the country, and the lifeline for much of northern Yemen. Since Yemen has been depending heavily on food imports, the port city of Hodeidah has played a crucial role in access to food supplies for the country. This vital role has been disrupted repeatedly over extended periods over the course of the conflict.

Hodeidah witnessed moderate fighting throughout 2015, which caused damage to physical infrastructure including the Hodeidah Port, which lost all offloading cranes as a result. Since March 2018, the security conditions in and around Hodeidah have deteriorated significantly as the city became one of the key frontlines of the conflict.

Social Impacts of the Conflict and Community Responses

According to IOM estimates, in early 2015, at the onset of the conflict, the population in Hodeidah increased to about 550,000 due to an influx of IDPs. By early 2018, the population was estimated to have increased to over 600,000 as the conflict intensified in the neighboring Hajjah, Sa'da, and Taiz governorates. This trend has been completely reversed over the last two years when intense conflict caused hundreds of thousands to flee the city. This has led to a dramatic population decrease to an estimated 180,000 inhabitants at the beginning of 2020. According to IOM estimates from December 2017, about 45 percent of the IDPs in Hodeidah were living in settlements (collective centers or spontaneous settlements), while 21 percent were hosted by relatives.

Overall, the conflict has undermined the quality of, and access to, key public services. Fuel shortages have severely impacted the city's power supply and access to drinking water. The WFP's survey in November 2017 found that only 57 percent of respondents had access to pipe-borne water at home, while none were still connected to the public electricity grid. Meanwhile, 38 percent of respondents mentioned that trash was still collected from their homes—which is a relatively high rate compared with other municipalities (of the 16 cities assessed under the DNA Phase 3, only Sana'a, Rada'a, Dhamar, and Al Hazm reported higher percentages).

In response to these challenges, residents have resorted to various coping mechanisms, both at the individual and community levels. In response to power outages, many local residents have come to rely on solar panels with the support of local NGOs. For instance, on social media in February 2017, a local charity offered to install solar panels in the homes of poor Hodeidah residents.

In Hodeidah, the water, sanitation, and hygiene (WASH) sector has received a great deal of support from international and local NGOs because it is closely linked to public health. Since the severe outbreak of cholera in Hodeidah during the 2016–17 period, many NGOs involved in public health issues have become active in the city. Similarly, several international NGOs have been involved in supporting Hodeidah's solid waste removal. In March 2017, the Norwegian Refugee Council (NRC) supported a campaign to clean streets and neighborhoods in the Al-Mina' District, as well as the nearby coastal areas. In February 2018, the Hodeidah Municipal Services Department opened discussions with the International Rescue Committee (IRC) about organizing another cleanup campaign in Hodeidah.

Social media reports reveal that Hodeidah residents occasionally come together to carry out basic rehabilitation projects in their neighborhoods, such as unblocking sewage pipes. Similar reports mention the Hodeidah Municipal Services Department mobilizing the local population to help regulate and report solid waste accumulation in public areas. Many schools have organized schoolyard cleanup campaigns for their students. Yet, there is no widespread evidence of sustained collective action at the community level. Interview respondents observed that the community rarely, if ever, comes together to resolve problems collectively. Instead, residents seem to be reaching beyond community-level mechanisms to depend on support provided by local and international NGOs and humanitarian organizations.

Local Governance Arrangements for Service Delivery

Local councils have emerged as strong defenders of community interests, at times working beyond their remits. For instance, in response to pressure from residents angered by the high prices of cooking gas being sold on the informal market, the local council in Al-Hawak district is reported to have intervened by seizing gas canisters from local vendors refusing to sell their products on the open market. As has been mentioned, the Hodeidah Municipal Services Department has been active in carrying out trash removal campaigns. While some of these campaigns targeted unregulated dump sites, others aimed to remove garbage accumulated on main streets, traffic islands and roundabouts, and various neighborhoods.

Fieldwork indicates that in the absence of a formal justice system, residents are often relying on community leaders, such as tribal sheikhs, a'aqels (community leaders), and security leaders, to arbitrate conflicts between individuals. But there is no evidence that communities depend on these mechanisms in a systematic and sustained manner.

Taiz City

Taiz is Yemen's third-most populous urban center, after Sana'a and Aden, with the wider governorate being Yemen's most populous. Throughout Yemen's modern history, people from Taiz have had a strong reputation

for civic and political activism. A main factor in this has been popular dissatisfaction with the region's perceived political marginalization.

Taiz has traditionally been considered the cultural capital of Yemen and played a pivotal role in the 2011 uprising. While Sana'a took the media spotlight—as the platform for the elite power struggle—many regarded Taiz to be the heart of the uprising. Popular protests in Taiz were among the earliest and largest. These protests, peaceful at first, later turned violent, resulting in the death of many protesters. In the current conflict, Taiz has become a frontline and is presently under a military siege.

Since the onset of the conflict in March 2015 to date, the city has been facing severe violence. Multiple groups are fighting for control of strategic vantage positions and transit corridors around the city. Because of its vulnerable location, surrounded by mountains, many civilian areas in the city have suffered from significant shelling in recent years, and food supplies and trucked water supplies (the last remaining water source) have been repeatedly cut off.

Social Impacts of the Conflict and Community Responses

According to a recent report, in 2019, Taiz experienced an increase of more than 80 percent in casualties due to the escalation of fighting in heavily populated areas.¹⁶² Given the severity of its conditions during the conflict, Taiz has seen extremely high levels of outbound displacement in the early years of the conflict. According to the IOM, over 275,000 IDPs had left Taiz by the end of 2017, bringing the total population to around 390,000, compared with an estimated population of 615,000 in 2015. However, Taiz has more recently seen a significant influx of IDPs, primarily from the governorate's rural areas. As a result, it is estimated that the city has only seen a moderate population decrease over the five years of the conflict. Taiz—which is still densely populated—seems to be absorbing a high number of mostly poor displaced people from nearby rural areas of the governorate, including those who come for treatment to the city's overstressed hospitals.¹⁶³

According to estimates, almost 80 percent of the population of the Taiz governorate (2.3 million people) are in dire need of humanitarian assistance.¹⁶⁴ The conflict has significantly increased the price of essentials, including food and water, leaving much of the population malnourished. Meanwhile, severe infrastructure damage and difficulties in obtaining diesel fuel have left the electricity grid unable to function. Similarly, due to diesel fuel shortages, the availability of piped water has broken down since 2015. Most residents rely on purchased water trucked in from surrounding areas. The poorest members of the city are reportedly provided free access to small amounts of water by wealthier neighbors.

Similarly, physical damage to hospitals and clinics, lack of medicine, and shortages of funds and staff has left the health care system in Taiz on the verge of collapse. Meanwhile, the education sector has been crippled: most schools in Taiz are closed due to continued violence, unrepaired damage, occupation by armed forces, and a lack of funds to pay public sector teacher salaries.¹⁶⁵ There are also reports of increased street harassment of women and children, drug abuse, thefts and robberies, and the formation of criminal groups, among other daily security threats and incidents.¹⁶⁶ Nonfunctional street lighting further undermines personal security.

162 Save the Children, *Five Years of Fear and Loss. The devastating impact of war on the mental health of Yemen's children*, 2020.

163 Ginny Hill, "Yemen's Urban-Rural Divide and the Ultra-Localization of the Civil War" (workshop proceedings, organized by the LSE Middle East Centre, March 29, 2017).

164 Kate Nevens, "Community Responses to Conflict in Taiz" (memo presented at a workshop on "Yemen's Urban-Rural Divide and the Ultra-Localization of the Civil War" organized by the LSE Middle East Centre, March 29, 2017).

165 Ibid.

166 Description provided by Saferworld (2017) as context for their support to the locally led project called "Light it Up," which addresses the lack of street lighting and insecurity.

Municipal services in Taiz have been disrupted both by a lack of funding and damage to necessary facilities. As of April 2018, Taiz residents reported a heavy reliance on local and international NGOs for municipal service provision and infrastructure repair. International organizations and NGOs are active in providing municipal services in 21 out of 26 neighborhoods surveyed, while local NGOs are active in 9 neighborhoods, and the local government in only 1 neighborhood. Similarly, international organizations and NGOs are partially or fully responsible for infrastructure repairs in the 21 neighborhoods surveyed, while local NGOs and local government actors provide repairs in the remaining neighborhoods.

International NGOs have been significantly involved in the WASH sector in Taiz. In particular, a cholera outbreak in 2017 galvanized both local and international NGOs. In addition to launching chlorination campaigns, both local and international NGOs have been involved in philanthropic water distribution campaigns. Additionally, international NGOs have supported the development of solar power in Taiz in lieu of rehabilitating the public power grid.

The lack of economic opportunities and the high percentage of youth in the city (about 60 percent of the population) make the issue of livelihoods urgent. Reports of young men being paid to join local armed groups and increasing numbers of children dropping out of school—as well as incidents of street harassment, domestic violence, and sexual exploitation of women and children—highlight the impacts that conflict and violence have had on communities. In addition, the number of child marriages appears to be rising, and emerging reports suggest that women, particularly those in IDP camps, are being sexually exploited for income.¹⁶⁷

Local Governance Arrangements for Service Delivery

The ongoing military siege of this strategically located city has aggravated the humanitarian situation. Even before the conflict, the city faced significant problems relating to poor management of services, such as garbage disposal, poor sewerage and water systems, stray dogs, inadequate street lighting, and so on. Though local councils tried to address these problems at that time, their efforts were not backed by adequate resources. To some degree this fed Taiz residents' sense of marginalization. With the outbreak of the conflict, the deficits in public services and existing issues around garbage collection and sewers in the city have multiplied significantly, leading to fatal levels of disease outbreaks. This seems to have further weakened the already fraught relationship between Taiz residents and state institutions.

Ma'rib City

Though Ma'rib City is a small, provincial, desert town, it is of strategic importance to parties of the current conflict given its proximity to the capital city of Sana'a (just a 2.5-hour drive away). Additionally, the Ma'rib governorate produced almost half of Yemen's oil, all of its gas, and most of its electricity before the start of the conflict. Sana'a depends on Ma'rib for its electricity supply.

Ma'rib City experienced intense fighting throughout most of 2015, and the Ma'rib governorate experienced ground fighting mostly around its oil infrastructure, resulting in significant damage to these facilities. Though most of the direct fighting ceased by late 2015, Ma'rib City has reportedly witnessed intermittent ground shelling and clashes over the last four years.

¹⁶⁷ Nevens, "Community Responses to Conflict in Taiz."

Social Impacts of the Conflict and Community Responses

Since the end of the fighting, Ma'rib City has witnessed a rapid increase in population due to an influx of IDPs. By some estimates, the Ma'rib governorate has received nearly 1.5 million displaced people—compared to its original population of 250,000.¹⁶⁸ Many of these IDPs are concentrated in and around Ma'rib City. Adjusting for IDP inflows and outflows, the total population in Ma'rib City increased from 18,000 in 2015 to an estimated 37,000 in early 2020. As of October 2019, Ma'rib City had 13 recorded displacement sites hosting 6,851 IDP households.¹⁶⁹ This has put tremendous pressure on public services and on the city's already suffering infrastructure. However, the influx of displaced persons has also provided a new stimulus to the local economy, bringing new capital and cheap labor.¹⁷⁰ For instance, a Saba Region was established in Ma'rib City in 2017. Property prices in the city are said to have risen significantly.¹⁷¹

Ma'rib City has received significant help from international NGOs in expanding WASH services, especially for its IDP population. Ma'rib's education sector appears to have undergone systematic rehabilitation efforts between March 2018 and January 2020. Most schools are back in session, with the reconstruction of education facilities well underway.¹⁷² This has led to the return of students and teachers to Ma'rib City; 80 percent of schools were assessed as being fully functional, while some schools have been converted to IDP sites.¹⁷³ Improvements in governance and service delivery in Ma'rib City have been so noticeable that many citizens feel that the situation is better than before the war.¹⁷⁴ Before the conflict, local discontent with the perceived marginalization of the governorate as well as the presence of armed groups led to frequent acts of sabotage against the Ma'rib gas-driven power plant and oil pipelines in the governorate, leading to frequent interruptions. Since the onset of the conflict, such interruptions appear to have ceased.

At the same time, the large influx of IDPs has burdened the city's public resources significantly, resulting in sizeable economic pressures relating to food trade, transportation, housing, and basic services provision. Many of the residents surveyed expressed concern about the quality of and access to services amid overcrowding. For instance, though the local council of Ma'rib City has expanded its solid waste management program, it has not been able to keep up with the increase in waste production. Classrooms were reported to be overcrowded as well as textbook shortages due to the many school-aged children among the IDPs. In response, some schools have started offering evening classes as a solution.

Local Governance Arrangements for Service Delivery

Ma'rib City has a history of decentralized self-governance that is largely based on traditional tribal coordination. For centuries, the Ma'rib governorate has been ruled by a coalition of power-sharing tribes, which jointly govern Ma'rib City as the commercial center, with the aim of keeping it free of violence as part of the tribal alliance agreement. The tribal alliance has worked well in the context of the current conflict as it has been effective in settling intertribal disputes before they spill into the broader community. The conflict seems to have unified many of the tribes, and the tribal alliance is reported to be coordinating resources, troops, and arms in a collective manner. Meanwhile, the interests of residents are primarily articulated via tribal leaders, indicating a degree of strong tribal cohesion in the absence of modern state institutions.

168 Alkhatab Al-Rawhani, "Ma'rib: Local Changes and the Impact on the Future of Yemeni Politics" (memo presented at a workshop on "Yemen's Urban–Rural Divide and the Ultra-Localization of the Civil War" organized by the LSE Middle East Center, March 29, 2017).

169 IOM Yemen, *Ma'rib City Displacement Sites, August–October 2019*.

170 Peter Salisbury, "Yemen: National Chaos, Local Order" (research paper, Chatham House, London, December 20, 2017).

171 Ibid.

172 World Bank estimates.

173 Ibid.

174 Salisbury, "Yemen: National Chaos, Local Order."

Since the start of the conflict, Ma'rib City has formed a unique model of local governance, with the local council working closely with tribal and political representatives. The relocation of the Central Bank to Aden in August 2016 further strengthened the role of the governorate by allowing it to regain control over its finances. Consequently, this has enabled the Ma'rib governorate to provide monthly salaries to public employees, which has positively impacted services within Ma'rib City. Ma'rib is also the only governorate that still carries out development projects, including road and building construction, water projects, and expansion of the electricity network.¹⁷⁵ Electricity supply, which was historically limited to four districts in the governorate, now reaches nine out of the 14 districts.

Conclusion

While the scope of this assessment does not allow for in-depth analysis of social trends, community solidarity seems most prevalent where there is no active struggle over political and military control. This appears to be the case irrespective of the controlling faction. For instance, in Ma'rib City and Sana'a, where the political situation is relatively stable, higher levels of community collaboration were observed. On the other hand, in Taiz and Hodeidah, whose control is still being contested or is in imminent danger of being challenged, the degree of solidarity seems to be low.

The analysis does not point to a single model of social resilience. Within the same city, some neighborhoods have manifested a relatively high degree of resilience, with residents coming together to solve many local challenges. In other neighborhoods, the degree of social trust appears low. Such diversity seems to be driven by a multiplicity of factors—both historic and conflict related—that determine communities' range of possibilities and willingness to come together to address common problems. A conflict with highly disaggregated impacts across regions playing out against highly dissimilar societal structures seems to have created this patchwork of communities with varying degrees of resilience.

The ongoing conflict has also changed the landscape of NGOs in Yemen. Before the conflict, Yemen was one of the easiest countries in the Middle East and North Africa (MENA) region in which to register and set up an NGO. However, the number of NGOs has fallen during the conflict. Many have been forced to suspend projects due to lack of funding or personnel, and others have dissolved completely. In addition, the international focus on humanitarian projects has resulted in a lack of funds for nonhumanitarian NGOs, or forced them to shift focus.¹⁷⁶ Yet NGOs remain key actors in strengthening social resilience at the local level. In light of the various degrees of community mobilization, local-level NGOs that are responsive and accountable to communities have an important role to play. For one, they are connecting international NGOs with community-level initiatives. They are also well positioned to use the resources and knowledge of international NGOs to further tailor community efforts to maximize impact. They can also do more to link “pockets of resilience,” ensuring that various local-level initiatives have a broader impact.

In today's fluid context amid widespread disruption of public services, local councils are also playing an important role in supporting communities, though within the context of political-economy dynamics.

Meanwhile, in tribal areas such as Ma'rib City, tribal leaders play a significant role in local governance. They are mainly designated to lead decision-making processes within their local communities. In other parts of Yemen,

175 In June 2016, the local government rehabilitated part of the Ma'rib gas-powered plant by building a 132/33 kilovolt-ampere (kVA) distribution substation and connecting it to Ma'rib City via 132 kVA transmission lines. The project was estimated to cost US\$40 million and would provide 50 megawatts (MW) of power to Ma'rib City and the surrounding areas.

176 Maktary and Smith, *Pathways for Peace and Stability in Yemen*.

responsibility for these processes more or less depends on actors that include local armed groups, tribal leaders, local councils, and executive units.¹⁷⁷

Recommendations for Future Programming

- Current efforts to promote **community engagement** in the planning and provision of public services and infrastructure ought to be scaled up; community-based initiatives that address common interests and connect communities need to be supported. Community-based services to respond to the needs of vulnerable groups such as women and girls, the poorest, former combatants, and to provide support to survivors of violence and those affected by trauma, also need to be considered as a recovery priority.
- **Mapping of local social structures** and finding ways to engage with those and local actors can create opportunities to foster collaboration between groups and communities to manage reconstruction efforts, delivery of services, and development of infrastructure. This would be the first step in a long and arduous process of moving toward broader community resilience.
- A coherent and comprehensive response is required to address the **IDP situation**, starting with a detailed profile of the various segments of the IDP population, with special attention to social background, local family ties, economic vulnerability, gender, and special needs. Ongoing conflict-sensitive youth programs that support employment opportunities, skills development, and leadership and empowerment need to be brought to scale.
- Opportunities to promote **citizen participation**, including through the use of new technologies, need to be further developed and monitored.
- Basic services that are provided in an inclusive manner at the municipal level need to be identified and supported to the extent possible. In this regard, efforts should be made to **collaborate closely with local NGOs** that are already engaged with communities.
- Approaches that **promote the interface between local governance structures (such as local councils) and communities** may improve overall governance, coordination, and provision of services. In this regard, recent lessons learned in implementing citizen engagement mechanisms in fragile contexts would be highly relevant.

177 Executive units were initially created by the United Nations High Commissioner for Refugees (UNHCR) to coordinate activities related to IDPs and refugees. Armed groups have since taken control of them, and utilize their existing structures to govern at the governorate and district levels.

10

Solid Waste Management

Pre-crisis Sector Conditions

Stakeholder Analysis

Prior to the crisis, solid waste management (SWM) in Yemen was based on the involvement of public and private stakeholders. Public stakeholders included, at the local level: (i) local authorities, which provided waste collection services; and (ii) city cleaning and improvement funds (CCIFs), which financed SWM service provision through local taxation and central government transfers (most revenues came from local taxation rather than transfers), owned the equipment, and were responsible for its maintenance. Besides these local stakeholders, public actors at the central level included: (i) the Ministry of Finance (MoF), which provided transfers of funds to local authorities and CCIFs, and conducted financial oversight; (ii) the Ministry of Public Health and Population (MoPHP), which oversaw activities related to the management of medical waste; (iii) the Ministry of Public Works and Highways (MoPWH), which had the responsibility of collecting and disposing waste from construction and demolition sites; (iv) the Environmental Protection Agency (EPA), which was tasked with monitoring adherence to environmental laws and regulations; and (v) the Social Fund for Development (SFD), which financed capital investment in training and equipment related to the safe disposal of medical waste. The private sector's role in solid waste management in Yemen focused on providing recycling infrastructure and activities. There were about 50 registered recycling plants throughout the country, which provided livelihoods to hundreds of individuals through a formal and informal network of workers in several dumpsites across the country.

Preexisting Shortcomings of the Sector

Prior to the crisis, daily waste generation in Yemen was estimated to be 0.55–0.65 kilograms (kg) per capita in urban areas, with a projected yearly increase of 3 percent on a national level, driven by population growth and increased rural-urban internal migration flows. On average, waste collection rates reached 65 percent in major cities. Solid waste management in Yemen was already problematic before the crisis; most waste was disposed of in dumpsites, and there were no structured and properly managed sanitary landfills. Of 21 officially identified disposal sites, 15 were operated as open dumpsites; the remaining six were managed, albeit with very basic mechanisms and technical standards.

Sectoral Damage Assessment

Assessment Methodology

This damage assessment of the SWM sector is based on two primary sources of information: (i) qualitative information collected through social media analysis, mining of publicly available information, and on-the-ground surveys (which provided some insights into communities' general sense of dissatisfaction with waste collection, as well as the health hazards involved); and (ii) a detailed and current SWM analysis in the city of Sana'a, which was

identified as the reference point for the damage quantification. The analysis includes data on: (i) waste removal; (ii) waste collection, transport, and disposal; (iii) waste transfer stations; and (iv) disposal facilities. With a number of calibrated assumptions based on global knowledge of the SWM cycle, starting from the case of Sana'a, it was calculated that the average damage to solid waste management caused by the crisis varies from US\$1.35 to US\$2.02 per capita across the 16 cities covered in the Dynamic Needs Assessment (DNA) Phase 3. Adopting a per capita approach implies the assumption that citizens will again produce a similar quantity and quality of waste throughout the country as they did before the conflict intensified in 2015. The estimates were adjusted to the conflict's degree of impact on each city. Following a standardized formula-based approach, the assessment targeted only physical damage and disruption of services, without taking into account labor implications.

Aggregate Analysis

The conflict affected the SWM cycle in several ways: (i) waste collection slowed, due to a lack of fuel and damaged or stolen equipment (for example, collection trucks and vehicles); (ii) populations started to use alternatives to disposal sites; (iii) road access to some neighborhoods became blocked; (iv) an influx of internally displaced persons (IDPs) placed additional pressure on the system; (v) unexploded ordnances (UXOs) and explosive remnants of war (ERWs) are present throughout the country, with reports of ERWs being found in waste accumulations in several cities; (vi) a reduction in the tax revenues of local authorities and CCIFs led to a halt in salary payments to public sector workers, including those in waste management; and (vii) the withdrawal of many international donors halted the implementation of the National Strategy for Solid Waste Management. It should also be noted that due to import restrictions and decreased food availability, waste generation rates have in general decreased.

City-Level Analysis

The paragraphs below provide additional details on five cities—Sana'a, Hodeidah, Dhamar, Ma'rib City, and Taiz—where the conflict's degree of impact on the SWM sector is representative of the country as a whole.

Sana'a



Local and social media reports suggest that residents were not satisfied with the SWM levels in the city prior to the crisis. In the United Nations Development Programme's (UNDP's) August 2015 Emergency Waste Assessment, local authorities in Sana'a highlighted a lack of financial resources as one of the biggest obstacles to effective solid waste management. Yemen's growing financial challenges due to the crisis exacerbated this trend. In April 2018, trash removal in Sana'a was perceived to be insufficient in almost all neighborhoods. Surveyed residents estimated that 31 percent of garbage trucks were damaged, while 18 percent of garbage trucks were not functioning. Residents also reported that only three dumpsites currently serve the entire city. Despite two waste collection campaigns implemented by the United Nations Office for Project Services with funding from the World Bank, neighborhood-level waste removal remains insufficient to meet the population's needs. Of particular concern is

garbage accumulation in sewage and drainage infrastructure. Local and social media reports suggest that local communities regularly organize volunteer cleanup campaigns to manage solid waste accumulations in public areas.

Hodeidah



In Hodeidah, SWM services remain insufficient to meet the population’s needs, as attested by significant garbage accumulation throughout the city. Fuel shortages and a lack of garbage removal trucks are the primary factors reducing SWM services functionality. It appears that residents either throw their trash in the streets or at unregulated dumpsites that may or may not be even designated as such. At least half of the identified unregulated dumpsites are located near mosques (three dump sites, 23 percent) or public schools (four dump sites, 31 percent). The proximity of unregulated waste disposal sites to these buildings may pose a risk to public health, especially for vulnerable populations such as children.

Hodeidah’s main dumpsite is an expanding facility located 7 kilometers (km) north of the city. Local media report that a number of low-income residents have been living on or near the dumpsite for years, picking through the trash for food scraps and recyclable materials that can be resold to recycling plants. Their livelihood is gone since prices for plastic recyclables collapsed due to the closure of the local recycling plants. Even so, more people, many of them IDPs, have moved to the dumpsite, and face serious health risks. The area has no running water, and while a field hospital was operating in the area in 2014, it appears to have closed; the nearest health facility is 7 kilometers away, in the city proper. Local media report residents are suffering from scabies, dengue, malaria, and hepatitis. In the absence of a system for medical waste management, residents are at high risk of contracting diseases from contaminated waste.

Dhamar



Since the beginning of the crisis, local citizens have continued to complain about the accumulation of trash in Dhamar’s streets, even though the local Cleaning Fund appears committed to improving the situation and

is carrying out monthly clean-up campaigns. The absence of sufficient waste collection is likely due to lack of funds, a problem common to many municipalities throughout Yemen. Lack of awareness about proper sanitation practices, such as disposal of household waste in municipal dumpsters, also appears to have contributed to the problem, according to a social media post from August 2017. Residents reported insufficient waste collection both before and after the onset of conflict, estimating that trash removal is occurring less than one day a week in all neighborhoods surveyed. As of April 2019, the local Cleaning Fund's garbage trucks were damaged and in need of repair to continue functioning. The office was borrowing equipment from the Ministry of Public Works in the meantime. Communities continue to report inadequate solid waste removal, particularly during the rainy season, when relatively small amounts of trash can clog a sewer or a storm drain and cause it to overflow. In addition, the Dhamar dumpsite is in dire need of rehabilitation or relocation, as it is too small to accommodate the city's current needs. It needs new ports and channels for trucks, and the existing garbage needs to be tamped and leveled to prevent build-up.

Ma'rib City



Ma'rib City offers limited regular solid waste management services, supplemented by sporadic clean-up campaigns. The local Cleaning Fund appears reasonably well supplied with equipment. A local media article reported in November 2018 that the governorate had received three new garbage removal trucks and three new sewage pumping trucks, although it is unclear how many of these vehicles are destined for use in Ma'rib City. In general, the cleaning sector's budget in Ma'rib City is insufficient and does not meet the current operational needs. Beginning in March 2018, the Ma'rib Municipal Service Department began a campaign to name, shame, and fine individuals and business owners accused of public dumping. The payment of fines was reportedly enforced by local law enforcement.

Solid waste removal services are not equally distributed throughout the city. Multiple reports from social media suggest that the areas hosting large populations of IDPs and new residents are not adequately covered. According to an October 2019 IOM report, eight IDP sites receive regular municipal waste collection. At other sites, waste is dumped on site or burned, leading to serious public health and sanitation risks.

The Ma'rib City dumpsite appears to have been established at some point between 2003 and 2009, based on historical imagery. It is unclear whether it was created as an official municipal dumpsite or was simply a designated dumpsite that became the city's primary disposal site. Historical imagery shows the rapid growth of this facility, particularly after 2015. In February 2018, the Municipal Services Department announced that it was building a new road to the dumpsite, as the facility had grown to almost 2 square kilometers amid a rapid increase in the city's solid waste production. The dumpsite poses an increasingly urgent public health risk, both because of its proximity to residential areas and because of frequent fires in the dumpsite creating toxic smoke clouds. While some of these fires appear to be deliberately set to destroy toxic waste or expired food, social media posts suggest others are uncontrolled burns caused by improper management of dangerous waste.

Taiz

As early as May 2008, Taiz's solid waste management services were not meeting the needs of the city's expanding population. Funding shortages and a lack of equipment were the main obstacles. At that time, the SWM system

barely covered 60 percent of the population, according to a World Bank report. These issues were exacerbated by the conflict, leaving residents to take matters into their own hands. In August 2016, the Cleaning Fund in Taiz resumed the collection of revenues on a small scale and signed a number of agreements with a local NGO, which conducted two cleaning campaigns and repaired three malfunctioning equipment items. The Fund also signed an agreement with the International Federation of the Red Cross to conduct two cleaning campaigns and to repair four malfunctioning equipment items. In July 2016, local media reported that communities in Taiz crowd-funded a cleanup campaign using social media. It is not known if similar campaigns have been organized since. As of March 2017, the municipality had only seven SWM vehicles; three were nonfunctional and the remaining four were partially functional. In September 2017, Mercy Corps repaired waste containers, and, in January 2018, SFD organized a large-scale cleaning campaign that collected accumulated waste and repaired damaged waste containers. Several cleaning campaigns, led by Mercy Corps and UNICEF, have been launched since. Despite these efforts, trash removal remains insufficient to meet the population’s needs as of January 2020.

Damage Quantification

Based on the population of each city, damage costs to the SWM sector across the 16 cities assessed in the DNA Phase 3 is estimated to range between US\$6.45 million and US\$7.89 million. Table 10.1 summarizes the results.

Table 10.1 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	0.03	0.03
Aden	0.98	1.20
Al Hazm	0.03	0.03
Amran	0.19	0.23
Bayhan	0.03	0.04
Dhamar	0.23	0.28
Hodeidah	0.27	0.32
Khoka	0.02	0.03
Lahj	0.04	0.05
Lodar	0.03	0.04
Ma’rib City	0.04	0.05
Mocha	0.03	0.04
Rada’a	0.07	0.09
Sa’da	0.14	0.17
Sana’a	3.43	4.20
Taiz	0.91	1.11
Total	6.45	7.89

Sectoral Needs Assessment

To restore the Republic of Yemen’s SWM system back to its pre-crisis condition, investments in (i) waste removal; (ii) waste collection, transport, and disposal; (iii) waste transfer stations; and (iv) disposal facilities are needed in the short- and medium-term. To improve upon the pre-crisis baseline, the upgrade of dumpsites to sanitary

landfills is considered a long-term measure, not included in the monetary estimates. Using assumptions based on global knowledge of the SWM cycle and calibrated to the case of Sana'a, it was calculated that average SWM needs a range between US\$2.46 and US\$3.69 per capita across the 16 assessed cities. Following a standardized formula-based approach, the needs assessment targeted physical damage and disruption of services, as well as labor implications.

Based on the population of each city, total recovery and reconstruction needs across the 16 cities are estimated to range between US\$12.3 million and US\$15.0 million. This relatively low estimate compared to other sectors can be explained by the simple SWM systems in place prior to the crisis. Table 10.2 summarizes the results. Given the relatively limited needs and the SWM sector's critical importance for public health—in particular the prevention of diseases such as cholera—interventions in this sector can represent a significant value for money.

Table 10.2 Sequenced Recovery and Reconstruction Needs in SWM Sector, by City (in US\$ million)

City	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	0.01	0.01	0.05	0.06	0.06	0.07
Aden	0.42	0.52	1.70	2.08	2.12	2.60
Al Hazm	0.01	0.01	0.04	0.05	0.05	0.07
Amran	0.08	0.10	0.32	0.39	0.40	0.49
Bayhan	0.01	0.02	0.05	0.06	0.06	0.08
Dhamar	0.10	0.12	0.40	0.49	0.50	0.61
Hodeidah	0.12	0.14	0.46	0.56	0.58	0.70
Khoka	0.01	0.01	0.04	0.05	0.05	0.06
Lahj	0.02	0.02	0.07	0.09	0.09	0.11
Lodar	0.01	0.02	0.05	0.06	0.07	0.08
Ma'rib City	0.02	0.02	0.07	0.08	0.08	0.10
Mocha	0.01	0.02	0.05	0.06	0.06	0.08
Rada'a	0.03	0.04	0.13	0.16	0.16	0.20
Sa'da	0.06	0.07	0.24	0.29	0.30	0.36
Sana'a	1.14	1.40	4.58	5.60	5.72	6.99
Taiz	0.39	0.48	1.57	1.92	1.96	2.40
Total	2.45	3.00	9.81	11.99	12.26	14.99

Source: World Bank estimates.

Priorities Going Forward

Short-Term Priorities (up to 1 year)

The most immediate priority is the collection of solid waste from streets in urban areas, employing emergency equipment, with the aim of supporting public health by restoring an environmentally and hygienically acceptable situation. Since the accumulated waste from the targeted zones will be collected in dumpsites, these sites

will need to be made ready for urgent, immediate waste covering and levelling. The workforce to ensure these priorities will need to be paid regularly, including through emergency mechanisms. In the current context, addressing the issue of tariffs is not a priority.

Medium-Term Priorities (2–5 years)

The medium-term priority is to fully restore pre-crisis levels of solid waste management, with proper management at the municipal level, well-functioning equipment, adequate transfer stations, and fully functioning dumpsites that feature regular and immediate waste covering and levelling. The workforce would need to be paid on a regular basis via nonemergency mechanisms managed by municipalities, thus building management capacity to transition from the post-crisis emergency scenario. In this phase, tariffs would need to be regularly collected, at least at the level prior to the conflict, to ensure some basic level of financial sustainability.

Long-Term Priorities (5–10 years)

Long-term interventions include a review of the National Strategy for Solid Waste Management, calibrating it to actual needs; the closure of dumpsites and their transformation into sanitary landfills, with the involvement of the private sector and public-private partnership (PPP) schemes; and a full cost recovery tariff system, based on international best practice.

11

Transport

Pre-crisis Sector Conditions

Sectoral Characteristics and Conditions Prior to the Crisis

Before March 2015, Yemen's road network had gone through major expansion and improvements. The paved road network had grown from about 5,000 km in the early 1990s to nearly 16,000 km, linking not only governorates' capitals but also district centers and isolated remote villages scattered across the densely populated and rigid mountainous parts of the country. In early 2015, about 60 percent of the paved road network was in good condition, which was a great achievement compared with earlier times. To address the neglect of rural roads, the creation of the Rural Access Program (RAP) in 2001 led to an increase in rural roads investment, and more than 5,500 km of new rural roads were built. Despite progress, however, urgent periodic maintenance or major rehabilitation works were required, and several were envisioned.

Institutional Arrangements

Traditionally, the national road network and transport infrastructure in Yemen are managed by two-line ministries: the MoPWH and the Ministry of Transport (MoT). The MoPWH has overall responsibility for road infrastructure, including development strategies, expenditure programs, maintenance, and rehabilitation activities, and is comprised of four main units, including the Rural Access Program and the Road Maintenance Fund (RMF). The MoT is responsible for the strategic development, regulation and oversight of airports, civil aviation and meteorology, and maritime affairs, as well as freight and land transport. The MoT has established one maritime authority and three corporations. The Maritime Affairs Authority (MAA) is a statutory authority established under the Presidential Decree No. 352 of 2001. MAA is the national agency responsible for fulfilling the state's duties in relation to maritime affairs, according to the relevant laws and legislations in force. The three corporations are as follows: (i) Yemen Gulf of Aden Ports Corporation (YGAPC), (ii) Yemen Arabian Sea Ports Corporation (YASPC), and (iii) Yemen Red Sea Ports Corporation (YRSPC), and were established in 2007 under the Republican Decree No. 61, 62, and 63, respectively.

The air transport is managed by the Civil Aviation and Meteorological Authority (CAMA), which operates all airports, assures the safety and security of all airports, provides air traffic control, and maintains the meteorological services. The dual functions of CAMA makes oversight for the air transport sector difficult. However, despite its limitations, the air transport sector in Yemen has some important strengths. The sector complies with international standards and Yemen Airways is respected for its safety records and performance.

The MoT has limited institutional capacity, and its role in managing the transport sector's policies and priorities needs to be clarified. A World Bank Group study on decentralization in the transport sector, concluded in 2018, recommended the following: (a) for Roads transport, the gradual devolution of resources and responsibilities for the development and maintenance of regional and local roads to the governorates, while MoPWH maintains

central level authority over the primary road and highway network, as well as overall policy and oversight functions; and (b) for Maritime and Civil Aviation subsectors, the decentralization approach suggests delegation to port corporations and airport authorities. This model has already been adopted in the existing institutional arrangements in Yemen but needs to be deepened and strengthened in postconflict Yemen.

Inventory of Infrastructure Assets

Yemen has approximately 50,000 km of roads, of which only about 16,000 km are all-weather paved roads. The remaining 36,000 km are rural dirt/earth roads in bad condition due to poor geometric design and low levels of maintenance. Yemen has nine major airports, including in Sana'a (the largest in terms of passenger capacity), Aden, Al Mukalla-Ar Rayan, Sayoun, Taiz, and Hodeidah. In addition, there are a number of small multipurpose airports scattered all over the country, including Socotra Island International Airport, located offshore from mainland, in the Socotra Archipelago in the Arabian Sea. Yemen has four major ports—Hodeidah, Aden, Mocha, and Al Mukalla—with a number of small fishing port cities and specialized ports scattered around the Red Sea and the Arabian Sea. Yemen imports nearly 90 percent of its fuel, medicine, and staple food supply, including wheat and rice.

Sectoral Development Challenges

The MoPWH had made significant institutional progress, but its role and responsibilities in the road sector remained far too wide and overstretched prior to the crisis. Despite the establishment of an autonomous RMF in 1996, with its own revenue sources and maintenance planning capability, the road sector still suffered from inadequate road maintenance funding and management. At about US\$40 million a year, funding for road maintenance was insufficient.

Prior to the conflict, custom duties from all ports in Yemen generated approximately 70 percent of total customs revenues. The Hodeidah port accounted for 50 percent of the total revenues from seaports and 40 percent of the total revenues from custom duties and taxes generated by the Customs Authority in 2013, which amounted to more than US\$1.0 billion.

Yemen's civil aviation sector was facing a number of operational, financial, and institutional issues. Yemen's air transport is relatively small compared with other countries with a similar population size and gross domestic product (GDP). The national carrier, Yemen Airways, operated all domestic routes until 2008, when Felix was established with the aim of taking over the domestic passenger market.

Sectoral Damage Assessment

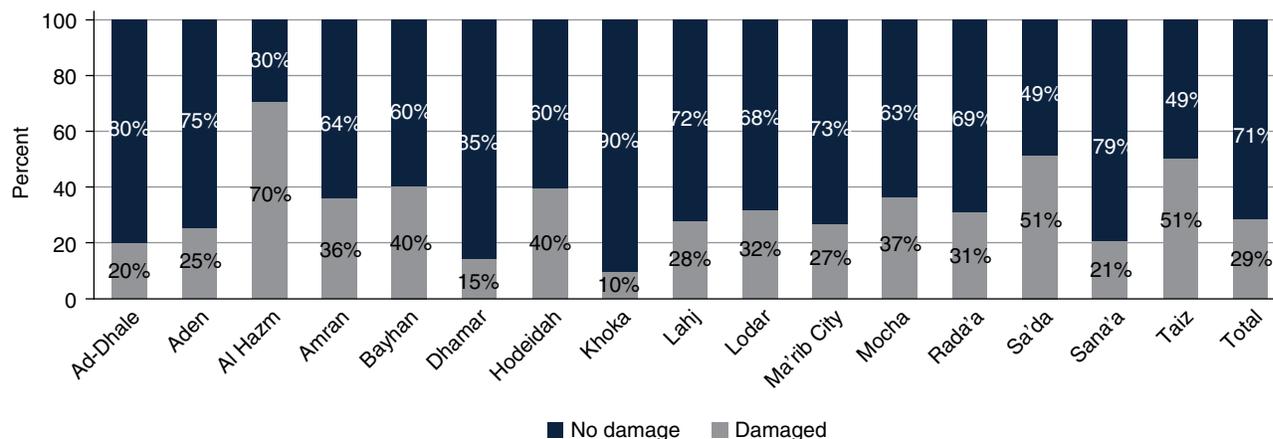
The transport sector's damage and needs were assessed at both the city and governorate levels. The city-level analysis includes intra-urban roads and street lights in 16 cities while the governorate-level figures include ports, airports, outer city bridges, and interurban roads as well as assets in the 16 cities.

Aggregate Analysis

Intra-urban Roads (City Level)

Intra-urban roads in the 16 cities assessed have been severely impacted by the conflict (figure 11.1). Major roads have been partially damaged or completely destroyed, rendering them unusable or capable of only limited operations. Overall, 29 percent of the total intra-urban road network has been damaged or destroyed. The share of

FIGURE 11.1 Intra-urban Road Damage by City



Source: World Bank estimates.

damage is largest in Al Hazm at 70 percent. This large share reflects prolonged fighting within a small city with a small road network. Al Hazm is followed by Sa'da and Taiz, at more than 50 percent—larger cities that have witnessed significant conflict levels.

Interurban Roads and Bridges (Governorate Level)

Since March 2015 (that is, the baseline date used to assess conflict-related damage), highways and bridges connecting major cities and economic facilities have been destroyed. Roads and bridges connecting major cities in the northern part of the country, including Sa'da, Amran, and Sana'a, in the south, Taiz and Aden, have been extensively damaged. The Aden-Taiz (178 km) highway linking the port city of Aden with the Taiz governorate and its population of 3.2 million has been severely damaged, and two major bridges along the strategic highway have been destroyed. In addition, the highway between Sana'a and Ma'rib City remains closed as fighting continues along this strategic highway that connects the national capital with major oil and gas fields east of the Ma'rib governorate. The conflict has also forced the closure of important road links, including Mocha–Hodeidah (200 km), Aden–Bab Al Mandab–Mocha (350 km), and Taiz–Mocha (100 km). In total, approximately 928 km of roads remain partially closed, difficult to access, or totally closed. This represents about 6 percent of the total national road network.

Ports and Airports (Governorate Level)

The ports of Hodeidah, Saleef, and Mocha have sustained extensive damage to their facilities. Hodeidah port, the largest in Yemen, is partially open and operating at nearly 40 percent of its capacity (utilizing 20-ton mobile cranes) since it was damaged in the early days of the conflict. Its importance comes from the magnitude of goods imported through the port into the country and the amount of revenue generated by the port from customs and duties. The port sustained significant damage to its five cranes, warehouses, and facilities.

Mocha port has also sustained extensive damage, and has been closed since January 2017.

The airports in Sana'a, Aden, Taiz, and Hodeidah have sustained extensive damage to their runways, taxiways, and support facilities. Sana'a airport, the largest in the country, has been closed to commercial flights since August 2016. The airport operates only for United Nations (UN) humanitarian and relief operations on a limited scale. Aden airport sustained heavy damage to its runways, taxiways, and support facilities early on, but was partially rehabilitated in July 2015. Out of ten major airports, Aden, Mukalla-Ar Rayan and Sayoun airports are the

Table 11.1 Damage Inventory: Ports and Airports Assessed in This DNA

Asset types	Baseline	No damage	Total assets damaged	Damage (%)
Ports	11	6	5	45.5
Airports	10	6	4	40.0

Source: World Bank estimates.

only ones in the country operating commercial flights to and from Amman and Cairo. Taiz and Hodeidah airports remain closed since the start of the conflict. See table 11.1 for an inventory of the damage to Yemen's ports and airports.

City-Level Analysis

Taiz

The crisis has resulted in significant damages to the city's roads, particularly along the eastern and western connection points to Aden, Mocha, and Hodeidah ports. Damage is exacerbated by heavy landmine contamination, particularly in the city's contested residential areas. The ongoing conflict continues to limit civilian mobility within the city. Roadblocks and closures have forced civilians to use alternative unpaved routes in and around the city, resulting in increased travel time and transportation costs.

Mocha

The Mocha port has been severely damaged. Critical port infrastructure was destroyed, rendering the port unoperational.

Sana'a

The ongoing crisis has damaged bridges and roadways connecting Sana'a with other major cities such as Hodeidah, severely limiting the humanitarian aid and distribution of essential food supplies able to reach the city. Major roadways within Sana'a are maintained and kept functional by local authorities but have sustained damages. Sana'a International Airport has incurred damages to its runways, hangars, and aircraft. It is still reportedly functional only for UN chartered flights. Damage to the airport coupled with a flying ban (save for the aforementioned UN flights) since August 2016 significantly hampers the ingress of humanitarian supplies, medicine, and returnees whose visas are expiring, and prevents the egress of those seeking medical attention or education abroad.

Hodeidah

Primary factors impacting the transportation sector in Hodeidah include conflict-related damage, the blockage of major streets by sewage flooding and debris, damage to the Hodeidah port, and siege conditions impeding individual travel and the transport of goods between Hodeidah and other population centers, such as Sana'a. The Hodeidah airport has sustained extensive damage, and its main runway exhibits a number of bomb craters and is likely not functioning. The port of Hodeidah, which serves as the main seaport for Yemen's northern region, was severely damaged during the early stages of the crisis. Cranes and other infrastructure critical to the port's operations were destroyed, rendering the port operational only at a very low capacity (40 percent). As such, the port is struggling to handle mainly pre-inspected United Nations ships carrying urgently needed imports such as food (wheat and rice), fuel supplies, and medicine.

Aden

Aden was severely damaged at the beginning of the crisis and again more recently. The Al Ma'alla terminal, Aden container terminal, and Aden refinery were significantly damaged. Warehouses, storage facilities, and support buildings were also damaged. The ports of Aden, as well as Aden airport's service delivery were restored a few months after the end of the fighting in Aden.

Regarding **cross-sectoral impacts**, the transport sector is intimately linked to both the food security and power sectors. The food insecurity faced by a majority of Yemen's population has been exacerbated by the degradation of road infrastructure, as well as the deterioration of the Hodeidah port, the main access point for imports of Yemen's food staples prior to the crisis. Apart from physical damage to the road network, mobility and access to markets and services remain limited due to a shortage of fuel supply.

Damage Quantification

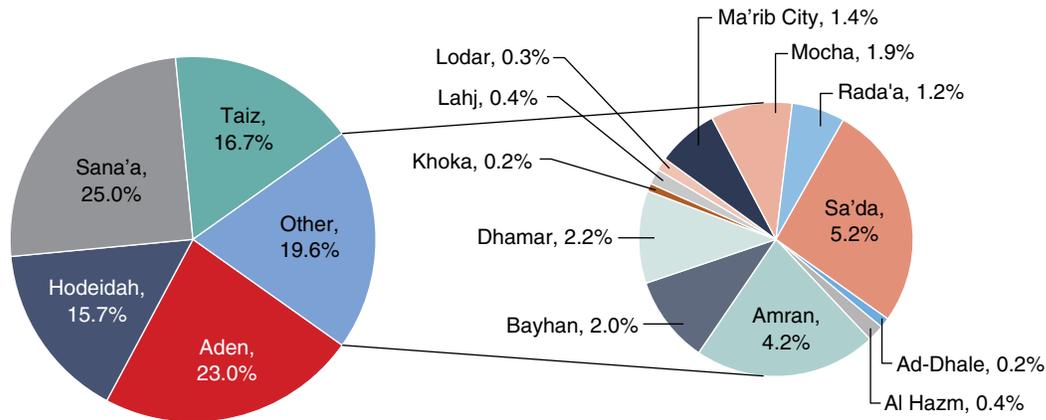
Total damage costs across the 16 cities are estimated to range between US\$240 million and US\$293 million (table 11.2). Damage costs in Sana'a, Aden, Taiz, and Hodeidah are the greatest, accounting for roughly 80 percent of the total, at US\$193–236 million. This is not only because these cities are most affected but also because about 83 percent of the total road length of all 16 cities is located in these 4 major cities. In terms of the intensity of damage, over 50 percent of the transport assets in Al Hazm, Sa'da, and Taiz have incurred damage during the conflict, at an estimated cost of US\$53–65 million (figure 11.2).

Table 11.2 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	0.6	0.7
Aden	55.1	67.4
Al Hazm	0.9	1.1
Amran	10.1	12.4
Bayhan	4.9	5.9
Dhamar	5.2	6.3
Hodeidah	37.6	46.0
Khoka	0.4	0.5
Lahj	0.9	1.0
Lodar	0.7	0.9
Ma'rib City	3.4	4.2
Mocha	4.5	5.5
Rada'a	3.0	3.6
Sa'da	12.6	15.3
Sana'a	59.9	73.2
Taiz	40.1	49.0
Total	239.8	293.1

Source: World Bank estimates.

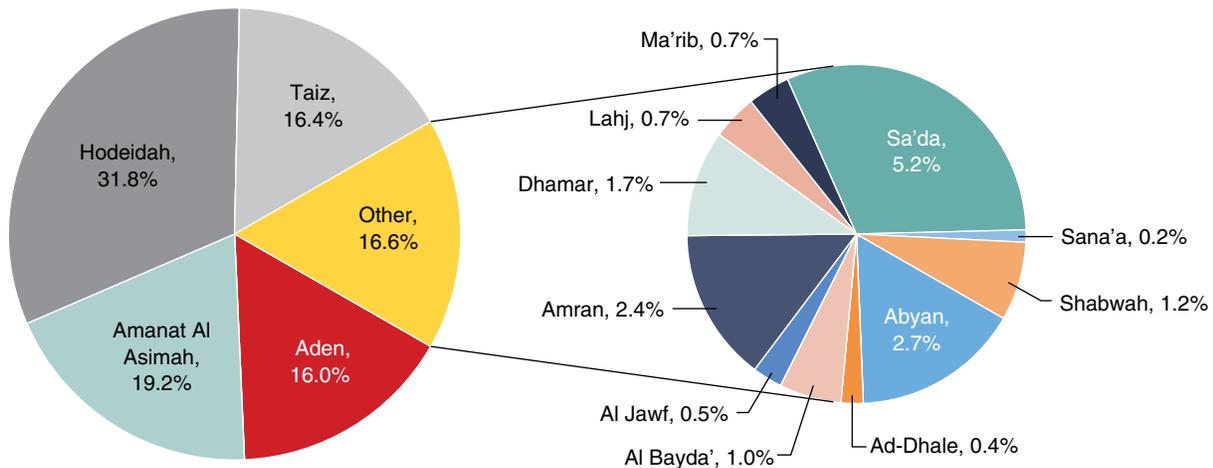
FIGURE 11.2 Damage Cost Distribution by City (in %)



Source: World Bank estimates.

The composition of damage costs differs at the governorate level, with Hodeidah governorate bearing the lion's share at 31.8 percent, followed by Amanat Al Asimah (19.2 percent), Taiz governorate (16.4 percent), and Aden (16 percent), in part because damaged ports and airports are located in these governorates. The average estimated costs of damage to bridges, ports, and airports in these four governorates are US\$201 million, US\$100 million, US\$64 million, and US\$77 million, respectively, and their sum constitutes 51 percent of the total governorate-level damage estimate (figure 11.3). The total damage costs at the governorate level are estimated to range between US\$779 million and US\$953 million (table 11.3)

FIGURE 11.3 Damage Cost Distribution by Governorate (%)



Source: World Bank estimates.

Table 11.3 Governorate-Level Damage Costs (in US\$ million)

Governorate	Low estimate	High estimate
Abyan	20.8	25.4
Ad-Dhale	2.7	3.3
Aden	124.8	152.5
Al Bayda'	7.7	9.4
Al Jawf	3.7	4.5
Amanat Al Asimah	149.9	183.2
Amran	18.9	23.0
Dhamar	13.1	16.0
Hodeidah	248.0	303.1
Lahj	5.6	6.8
Ma'rib	5.2	6.4
Sa'da	40.4	49.4
Sana'a	1.5	1.9
Shabwah	9.7	11.9
Taiz	127.6	155.9
Total	779.5	952.7

Source: World Bank estimates.

Sectoral Needs Assessment

The reconstruction of critical infrastructure needs to be prioritized based on its economic importance. Immediate attention should be focused on major roads and bridges between Aden and Taiz, and Hodeidah and Sana'a. As Yemen imports nearly 90 percent of its food staples through the Port of Hodeidah, the reconstruction of damaged facilities at this port is considered a high priority. The restoration of service delivery at Sana'a International Airport, the largest airport in Yemen and closed since August 2016, is also of the highest priority. This is important both for civilian travel as well as for building confidence in the peace process in Yemen. Table 11.4a and Table 11.4b list the estimated costs of repairing the damage to Yemen's transport sector at the city and governorate levels.

Priorities Going Forward

Immediate and short-term interventions should include labor-based maintenance and rehabilitation work that aims to improve mobility and access, restore service delivery, and create employment opportunities, particularly in poverty-ridden rural areas. Medium- to long-term reconstruction priorities, including the institutional setup of the sector's line ministries and their organizations, need to be addressed in the context of a more stabilized political and security situation.

Short-Term Priorities (up to 1 year)

- Maintain and rehabilitate at least 5,000–6,000 km of high-priority rural roads and bridges. Funds need to be mobilized from various sources, including donor's contributions. To implement such a plan, a number of

Table 11.4a Recovery and Reconstruction Needs over Five Years, City Level (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	0.3	0.3	0.6	0.7	0.9	1.1
Aden	25.0	30.6	58.3	71.3	83.3	101.9
Al Hazm	0.4	0.5	1.0	1.2	1.4	1.7
Amran	4.6	5.6	10.7	13.1	15.3	18.7
Bayhan	2.2	2.7	5.1	6.3	7.3	9.0
Dhamar	2.3	2.9	5.5	6.7	7.8	9.5
Hodeidah	17.1	20.9	39.8	48.7	56.9	69.6
Khoka	0.2	0.2	0.5	0.6	0.6	0.8
Lahj	0.4	0.5	0.9	1.1	1.3	1.6
Lodar	0.3	0.4	0.8	0.9	1.1	1.3
Ma'rib City	1.6	1.9	3.6	4.4	5.2	6.3
Mocha	2.1	2.5	4.8	5.9	6.9	8.4
Rada'a	1.3	1.6	3.1	3.8	4.5	5.5
Sa'da	5.7	7.0	13.3	16.2	19.0	23.2
Sana'a	27.2	33.2	63.4	77.4	90.5	110.6
Taiz	18.2	22.2	42.4	51.8	60.6	74.0
<i>Total infrastructure reconstruction</i>	100.7	123.1	235.0	287.2	335.7	410.3
<i>Total service delivery restoration</i>	8.1	9.8	18.8	23.0	26.9	32.8
Grand total, all cities	108.8	132.9	253.8	310.2	362.6	443.2

Source: World Bank estimates.

efforts to address operational and institutional issues need to be undertaken, particularly at the governorate and local levels:

- Delineate clear roles and responsibilities related to rural road maintenance, including planning, operations, monitoring, and evaluation.
- Generate policies that place responsibility for rural road maintenance programs with regional authorities and governorates.
- Develop standards for different road types and conditions.
- Invite communities and microenterprises to contribute to road maintenance within their capacity.
- Mobilize funds to finance the maintenance and rehabilitation of rural roads utilizing labor-intensive technologies that maximize job creation for rural youth.
- Rehabilitate and maintain the physical infrastructure of the airports of Aden, Hodeidah, Taiz, and Sana'a, and the ports of Aden, Mocha, and Hodeidah.

Table 11.4b Recovery and Reconstruction Needs Over Five Years, Governorate Level (in US\$ million)

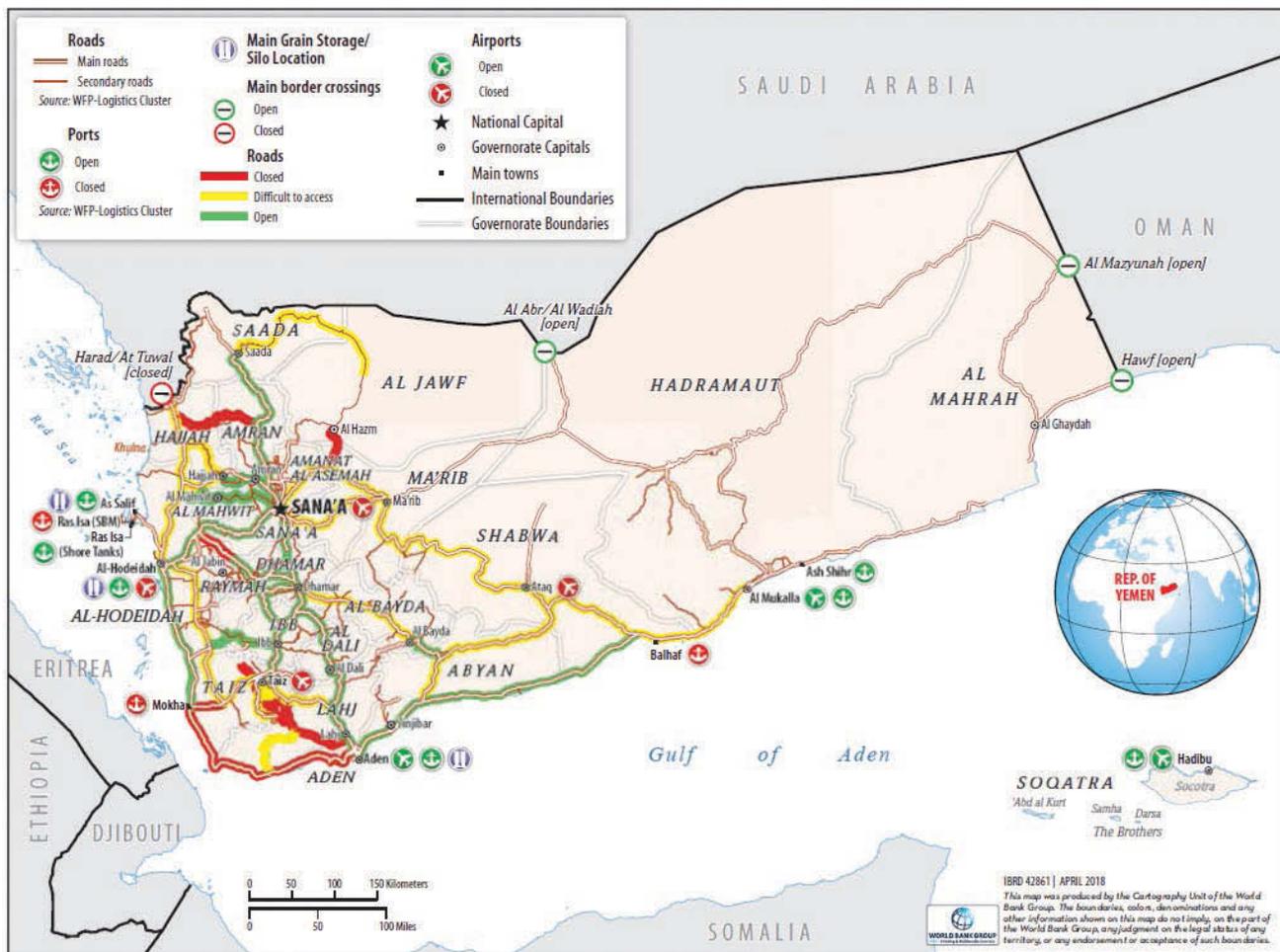
Governorate or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Abyan	9.4	11.5	22.0	26.9	31.4	38.4
Ad-Dhale	1.2	1.5	2.9	3.5	4.1	5.0
Aden	56.6	69.2	132.1	161.4	188.7	230.6
Al Bayda'	3.5	4.3	8.1	9.9	11.6	14.2
Al Jawf	1.7	2.0	3.9	4.8	5.6	6.8
Amanat Al Asimah	68.0	83.1	158.6	193.9	226.6	276.9
Amran	8.6	10.5	20.0	24.4	28.5	34.8
Dhamar	5.9	7.3	13.9	16.9	19.8	24.2
Hodeidah	112.5	137.5	262.5	320.8	375.0	458.3
Lahj	2.5	3.1	5.9	7.2	8.5	10.3
Ma'rib	2.4	2.9	5.5	6.7	7.9	9.6
Sa'da	18.3	22.4	42.8	52.3	61.1	74.7
Sana'a	0.7	0.8	1.6	2.0	2.3	2.8
Shabwah	4.4	5.4	10.3	12.5	14.7	17.9
Taiz	57.9	70.7	135.0	165.0	192.9	235.8
<i>Total infrastructure reconstruction</i>	327.4	400.1	763.9	933.6	1,091.3	1,333.8
<i>Total service delivery restoration</i>	26.2	32.0	61.1	74.7	87.3	106.7
Grand total, all cities	353.6	432.1	825.0	1,008.3	1,178.6	1,440.5

Source: World Bank estimates.

Medium- to Long-Term Priorities (2–10 years)

- Reestablish the day-to-day functioning of the MoPWH and its subsidiary organizations.
- Enforce legislation on axle loads to prevent the rapid deterioration of the road network.
- Revise the balance of road expenditures with a shift from new construction toward maintenance and rehabilitation of the most damaged roads, especially rural roads that will restore access to rural populations.
- Apply the existing Law on Road Maintenance Funding to restore financial revenues from road user charges (RUCs), set at 5 percent of the pump price of fuel sold in Yemen, to meet the losses associated with the elimination of fuel subsidies during the conflict.
- Use capable, local contractors and enhance the capacity of national engineering and consulting firms to handle reconstruction operations in the road transport sector.
- Introduce capacity building and training programs at the governorate and regional levels, for local contractors and local consulting firms to develop their technical skills in preparing bids, pricing, and contract and environmental management.

FIGURE 11.4 Transport Map—Yemen



Source: World Bank Group.

- Promote community-based contracting in rural roads maintenance and use microenterprises to maximize employment opportunities for rural youth.
- Acquire, repair, replace, and upgrade aviation safety equipment, hardware, and software.
- Conduct an institutional review of the aviation and maritime sectors to improve the operations and governance structures of airports and ports.

12

Water, Sanitation, and Hygiene (WASH)

Pre-crisis Sector Conditions

Sector development challenges: Due to its geographical location in an arid to semiarid zone, Yemen has long suffered from acute water scarcity. Recent studies indicate that Yemen's freshwater availability of only 80 cubic meters (m³) in 2014 was a mere 14 percent of the per capita average (554 m³) in the Middle East and North Africa (MENA) region. Before the crisis, several major towns were essentially running out of water: for instance, Sana'a was closing six existing wells on average each year, and expansion was constrained by a lack of new sources. Meanwhile, the coastal cities, including Aden, lacked safe drinking water mainly due to seawater intrusion and deterioration of water quality.

Policy and institutional framework: The Ministry of Water and Environment (MWE) was responsible for water supply and sanitation policy formulation, planning, and monitoring and evaluation. Water subsector implementation entities, which reported to the ministry, included (i) the National Water Resources Authority (NWRA), responsible for water resources management; (ii) the General Authority for Rural Water Supply Projects (GAR-WSP), responsible for rural water supply and sanitation; and (iii) local water corporations and autonomous utilities, who were responsible for urban water and sanitation. The Ministry of Agriculture and Irrigation (MAI) was responsible for irrigation policy, research, and extension. Water supply and sanitation services in urban areas had been decentralized since 1997 according to Cabinet Decree 237, which established local water and sanitation corporations (LWSCs). As of the assessment's baseline, March 2015, there were 23 LWSCs, as well as 10 annexed autonomous utilities (AUs). Many of the LWSCs were supported by the Urban Water Project Management Unit (PMU), a technical institution set up in 2002 through World Bank funding.

Institutional capacity: The decentralized framework characterized by LWSCs and AUs had varying levels of efficacy before the crisis. Some LWSCs benefited from empowered staff, dynamic management, training and career development offered to staff, innovative information technology (IT), and performance-based incentives on top of otherwise low salary levels. There were also challenges, notably low accountability, limited autonomy in decision making, and frequent managerial turnover.

Sectoral Damage Assessment

Aggregate Analysis

Aggregate physical damage: The baseline, unit cost, and damage information used for the Dynamic Needs Assessment (DNA) Phase 3 were derived from the LWSCs through the Urban Water PMU. The DNA Phase 3 covers 17 asset categories.¹⁷⁸

178 The 17 categories of WASH assets considered are: house connections; wells; water towers/ tanks; water treatment plants; sewage treatment plants; desalination plants; sewage pressure trucks; sewage lifting stations; pumping stations; storage reservoirs; water/sanitation offices; primary or transmission mains; water laboratories, buildings, and equipment; machinery and equipment; sewage pumping stations; sanitation laboratories; and stores.

According to the data collected from various sources, 38 percent of assets were damaged (28 percent partially and 10 percent destroyed).¹⁷⁹ Asset classes with significant physical damage included the primary and transmission mains (45 percent damaged or destroyed), sewage pressure trucks (42 percent), sewage lifting stations (41 percent), and water and sanitation offices (40 percent). Revitalizing critical infrastructure like sewage pressure trucks, sewage pumping stations, and wastewater treatment plants would do the most to further progress toward service restoration. Table 12.1 and Figure 12.1 summarize the physical damage to each asset type. One of the most striking findings of the DNA Phase 3 is the complete destruction of the Al-Salif desalination plant in Hodeidah, which had still been standing at the time of the DNA Phase 2 in 2017.

As illustrated in Figure 12.2, WASH assets in Taiz and Hodeidah sustained the greatest damage when considered as a share of these cities' total assets (60 percent), followed by Lodar (57 percent) and Khoka (51 percent). But if the damage is expressed in dollar terms, Sana'a takes the lion's share (25 percent of total damage costs), followed by Taiz and Aden (each 18 percent), and then Hodeidah (13 percent). The other cities represent less than 5 percent each of the total damage costs.

Aggregate impact on service delivery: The WASH sector in Yemen is suffering from reduced functionality and a dramatic decrease in service delivery. Aside from physical damage to key facilities, administrative offices,

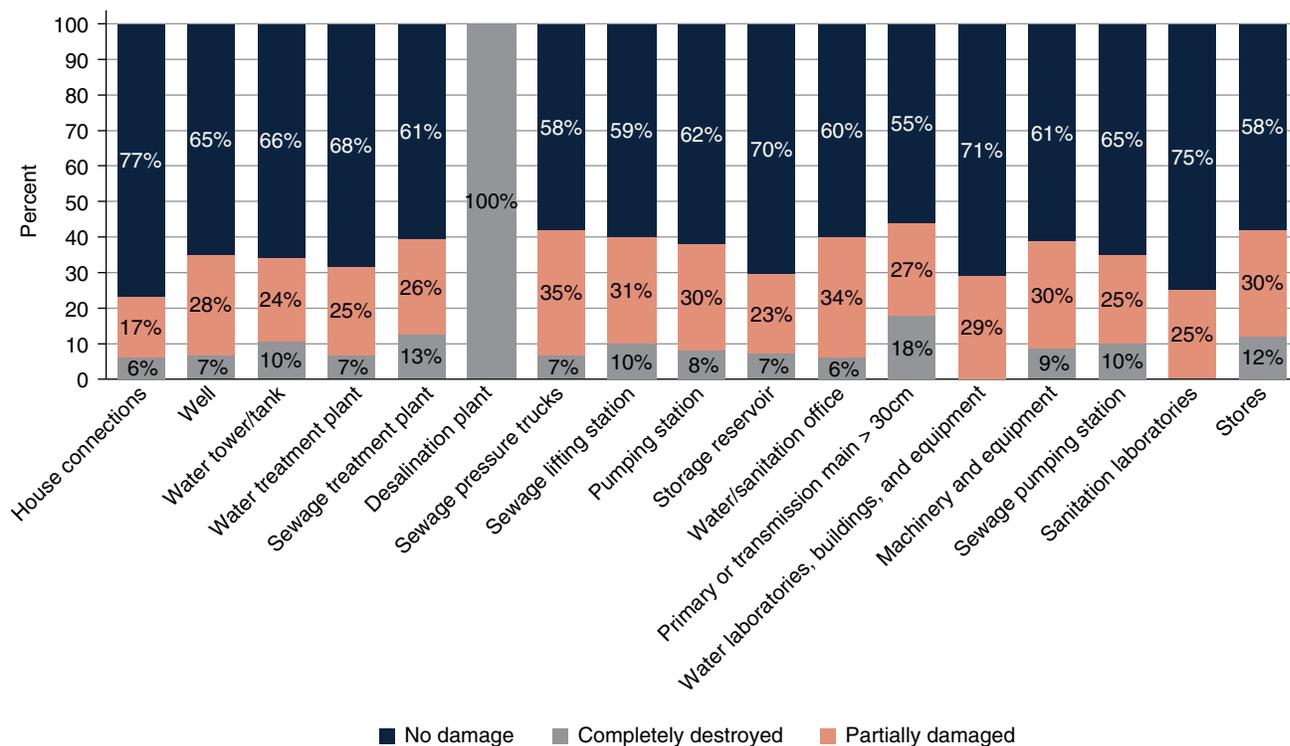
Table 12.1 Total Damage Inventory Table by Asset Type

Asset type	Baseline	No damage	Partially damaged	Completely destroyed	Total assets damaged
House connections	430,563	331,347	72,396	26,820	99,216
Well	493	321	138	34	172
Water tower/tank	73	48	17	8	25
Water treatment plant	33	23	8	2	10
Sewage treatment plant	12	7	3	2	5
Desalination plant	2	0	—	2	2
Sewage pressure truck	49	29	17	3	20
Sewage lifting station	63	38	19	6	25
Pumping station	71	44	21	6	27
Storage reservoir	115	81	26	8	34
Water/sanitation office	40	24	14	2	16
Primary or transmission main > 30 cm	561	313	149	98	248
Water laboratories, buildings, and equipment	18	14	4	0	4
Machinery and equipment	642	395	190	57	247
Sewage pumping station	20	13	5	2	7
Sanitation laboratory	4	3	1	0	1
Store	54	31	16	7	23
Total	432,813	332,731	73,025	27,057	100,082

Source: World Bank estimates.

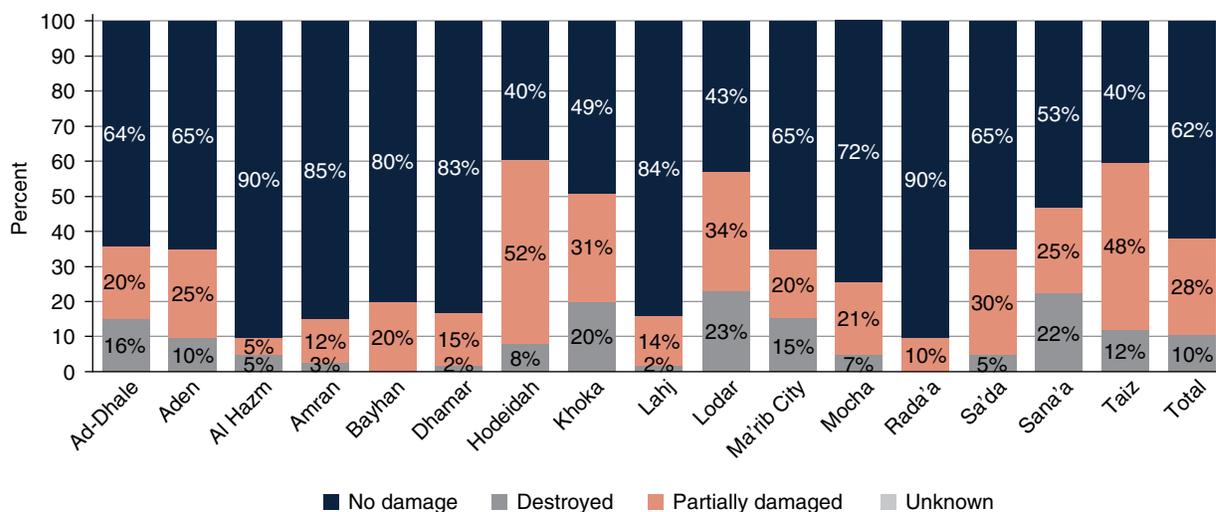
179 This average excludes housing connections since their high number would distort the calculations.

FIGURE 12.1 Physical Status of the WASH Sector by Asset Type



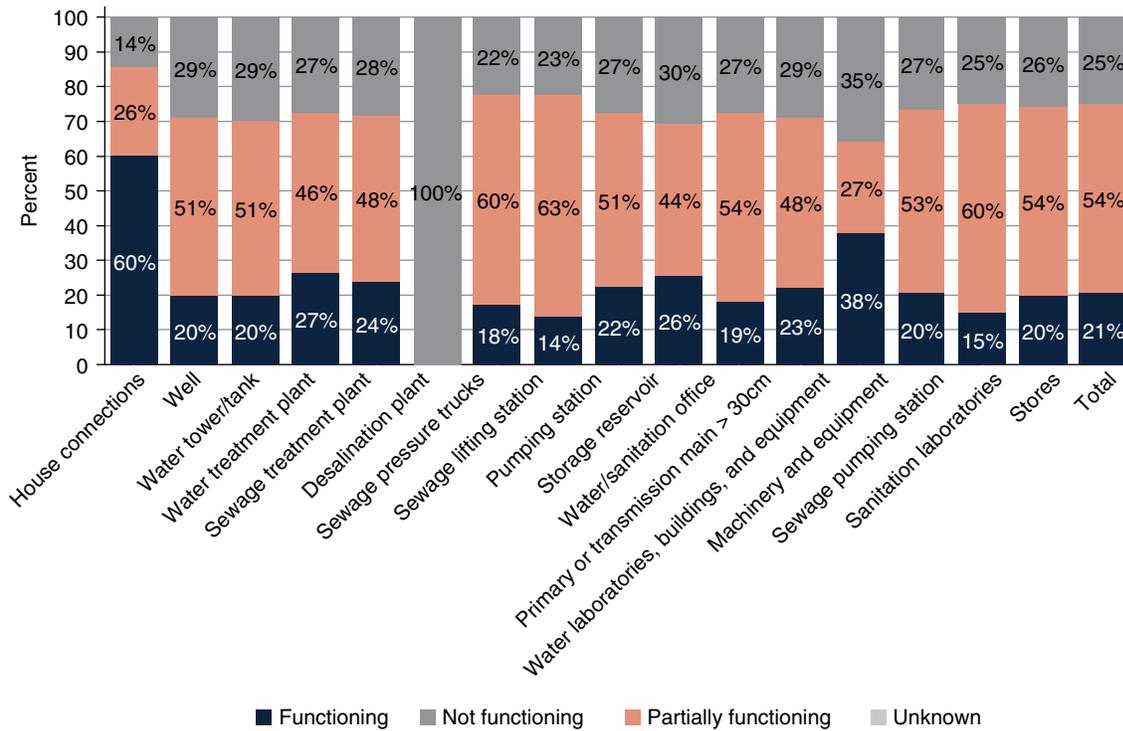
Source: World Bank estimates.

FIGURE 12.2 Physical Status of the WASH Sector by City



Source: World Bank estimates.

FIGURE 12.3 Operational Status of the WASH Sector by Asset Type



Source: World Bank estimates.

laboratories, machinery, and equipment, a lack of electricity and particularly fuel have severely undermined the ability of utilities to operate WASH assets effectively. Across all cities assessed, on average 72 percent of water facilities are functioning (21 percent fully and 51 percent partially) and 28 percent are not functioning at all (figure 12.3).¹⁸⁰ Apart from the destroyed desalination plant in Hodeidah (Al-Salif Area), sewage lifting and pumping stations have the lowest level of operational functioning (14 and 15 percent, respectively), followed by sewage pressure trucks (18 percent), and water tower/tanks and wells (each 20 percent).

While the LWSCs of Aden, Sana'a, and Amran have been able to operate partially due to the availability of diesel provided by international organizations such as the United Nations Children's Fund (UNICEF), the World Food Programme (WFP), and the International Committee of the Red Cross (ICRC), some LWSCs such as in Bayhan, Sa'da, Ad-Dhale, Taiz, and Lahj almost stopped operations mainly due to lack of diesel and its high price, continuous electricity outages, lack of spare parts, and sustained damaged to infrastructure, as well as the ongoing fighting in most of these cities, especially in Taiz and Sa'da. The LWSC in Hodeidah is still operating but with very limited capacity. The deterioration of WASH services and the collapse of water and sanitation systems have contributed to a cholera outbreak in 22 of Yemen's 23 governorates.

One common challenge for all the LWSCs is the unavailability of skilled staff needed to run and operate critical infrastructure. Because of the collapse of central and local government budgets, salaries of WASH sector staff have not been paid for about two years. Insecurity, too, has led to significant rates of absenteeism and the brain drain of qualified and experienced staff who have left to find better opportunities elsewhere.

¹⁸⁰ This average excludes housing connections since their high number would distort the calculations.

Population shifts caused by internal displacement have placed additional stress on public water infrastructure and services during the conflict, especially in the major cities of Sana'a, Aden, Taiz, Hodeidah, and Ma'rib City. LWSCs are experiencing significant challenges, including extended electricity blackouts and nonpayment of bills. In Taiz, Lodar, Aden, and Lahj, looting has been endemic during the conflict, and the resulting losses of equipment have impaired the cities' ability to restore water and sanitation services. The sewage systems in all 16 cities assessed have almost stopped functioning amid the fighting, and a lack of fuel and financial resources for operations and maintenance.

Private water supply, which was already meeting about half of Yemen's urban demand before the conflict, has expanded to fill the gap left by the inability of the public utilities to deliver water services. Private tanker prices vary widely, from 410 Yemeni riyals per cubic meter (YRI/m³) (US\$1.64/m³) in Sana'a to 4,000 YRI/m³ (US\$16/m³) in Aden. Tankers operate in an informal and unregulated market, leaving local authorities at city and neighborhood levels with no control over the quality, pricing, or usage of the water.

City-Level Analysis

Dhamar

Physical damage to Dhamar's WASH facilities is limited. The city has lost one of its two water towers. About 52 percent of households had access to the public network as of April 2018, compared with 68 percent prior to the crisis. On average, residents report one to three hours of public network access per day, with zero hours of access reported in As-Sa'adi and 11–17 hours reported in Western Dayri. A majority of households rely on private vendors, including water trucks, and many others obtain water from wells. The primary causes for the reduction in WASH sector functionality are persistent diesel fuel shortages, conflict- and neglect-related infrastructure damage, and the LWSC's financial constraints. Between April 2018 and January 2020, the situation has further deteriorated due to the conflict.

Hodeidah

The city's only desalination plant (located in the Al-Salif area) and the sole water lab were destroyed, which has had severe implications for water availability and quality in the city. The public network is only partially functioning, and access to drinking water remained characterized by severe shortages as of March 2018. Most surveyed residents reported one to three hours of public water network service per day. The most immediate problem facing Hodeidah's WASH sector is a chronic lack of fuel. As the public grid electricity remains unavailable in the city, WASH facilities rely on diesel-powered generators to continue operating. The situation has worsened by the blockade of Hodeidah's port in November 2017, which led to the indefinite suspension of public water network services and the closure of WASH facilities due to depleted fuel sources. Frequent sewer blockages and breaks in sewer lines have left sewerage to overflow onto the main streets. Although the blockade was partially lifted as of December 2017, generator fuel prices remain very high, and international organizations—specifically the WFP and UNICEF—have been continuing to provide fuel aid to Hodeidah's WASH sector since January 2018. There are indications, too, that some assets were being restored by international organizations, NGOs, and local residents. Generators and pumps were being installed, sewer pipes were being cleared, and some water and wastewater facilities (the chlorination station, water quality monitoring lab, water counter repair workshop, and main water and wastewater treatment pumping stations) were being rehabilitated. These rehabilitation measures have come to a halt, and the functionality of WASH services have further deteriorated, due to the recent uptick in conflict in and around Hodeidah.

Mocha

As of 2007, public network water was reportedly abundant—by Yemeni standards—and available 24 hours a day. However, fuel shortages and conflict-related damage have significantly reduced the sector’s ability to deliver safe and reliable water to the residents of Mocha. A privately owned small desalination plant, the city’s primary source of water and a key source for Taiz as well, was destroyed. In addition, diesel fuel shortages limited the functionality of the desalination units in the Mocha power plant, as well as the city’s pumping station. Fighting ended in Mocha in February 2017 and since then, gulf-based NGOs have reportedly carried out extensive repairs to the WASH infrastructure, such as the drilling of solar-powered water wells. The damaged Mocha power plant was also reportedly repaired, including all the desalination units, although the plant is not yet fully operational. However, there are no plans to restore the destroyed desalination plant, and significant infrastructure damage remains to be addressed.

Sana’a

The damage to water assets in Sana’a is relatively limited, but because many of the facilities are privately operated drinking water stations of undetermined size, it is not easy to determine their functionality. On average, surveys found that residents have access to public network water one to three hours per day. The primary impediment to WASH sector functionality is the near absence of public network power and the unavailability of diesel fuel to power WASH infrastructure generators. The WASH sector also faces a myriad of systemic and conflict-related factors, including the prevalence of unregulated wells, a severe budget crisis, steady increases in the cost of water, and damage to WASH infrastructure as a result of neglect and use. Sana’a residents currently have three primary options for obtaining water: (i) residents who can afford to purchase water from trucks or private vendors; (ii) the Sana’a LWSC distributes public network water through trucks in local squares; or (iii) the poorest residents obtain water from the local *Sabeel* (water deliveries sponsored by philanthropists). Between 60 and 70 percent of the population relies on privately operated WASH infrastructure.

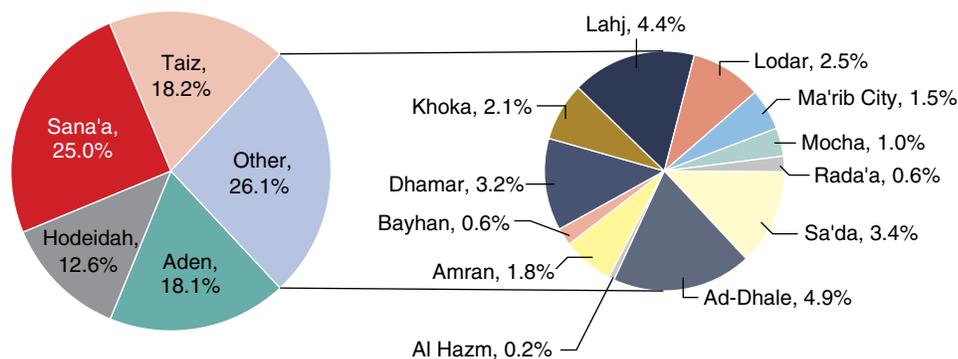
Taiz

According to local residents, the share of city households with access to the public water network in Taiz has declined since the conflict’s onset, from 85 percent of households in 2014 to 24 percent in March 2018 when 52 percent of households reported being reliant on private vendors, including water trucks, and 34 percent reported obtaining water from wells. The situation has further deteriorated over the last two years. It is highly unlikely that preexisting issues have been resolved, and most have likely worsened since the start of the current crisis: chronic water shortages, a decrease in water table levels, high rates of water loss, vandalism and theft of public network water, and water and sewerage administration debt. As a result, most residents reportedly rely on a combination of philanthropic water distribution and purchases from water trucks. A UNICEF-funded well-field rehabilitation project completed in June 2017 reportedly increased the public water network capacity from 3,000 m³ per day to 5,000 m³ per day (out of the reportedly needed 34,000 m³ per day). Besides physical damage, the main obstacle to WASH sector functionality as of January 2020 was shortage of diesel fuel to power WASH infrastructure.

Damage Quantification

City-level damage costs: The damage cost distribution per city is presented in figure 12.4, which indicates damage costs per city as a percentage. The largest share of damage costs is in Sana’a (25 percent of total damage costs), followed by Taiz (18.2 percent), Aden (18.1 percent), and Hodeidah (12.6 percent). In terms of total direct and indirect damage costs (represented as a low to high range of estimates), Sana’a has the highest at US\$71–86 million, followed by Taiz at US\$52–63 million, Aden at US\$51–63 million, and Hodeidah at US\$36–44 million. Table 12.2 lists the damage costs by city.

FIGURE 12.4 Damage Cost Distribution by City, in %



Source: World Bank estimates.

Table 12.2 City-Level Damage Costs (in US\$ million)

City	Low estimate	High estimate
Ad-Dhale	13.9	17.0
Aden	51.3	62.7
Al Hazm	0.6	0.7
Amran	5.1	6.2
Bayhan	1.8	2.1
Dhamar	9.2	11.2
Hodeidah	35.6	43.5
Khoka	5.8	7.1
Lahj	12.4	15.2
Lodar	7.1	8.7
Ma'rib City	4.1	5.0
Mocha	2.8	3.4
Rada'a	1.6	1.9
Sa'da	9.6	11.7
Sana'a	70.7	86.4
Taiz	51.5	62.9
Total	283.0	345.9

Source: World Bank estimates.

Sectoral Needs Assessment

To restore services in the near term, it will be essential to secure fuel in order to operate necessary facilities such as pumping stations and wells. While fuel is an expensive and suboptimal option—due to greenhouse gas emissions and the limited scope of its application—it is also a practical one in the short-term. Another priority step is the rapid repair or replacement of equipment and machinery used in operating water and sanitation assets. Equipment and spare parts need to be procured and meters reinstalled where they have been destroyed

or damaged. In the medium-term, solar and wind energy sources would need to be developed to operate various WASH facilities. Looking ahead, electricity generation and transmission infrastructure needs to be rehabilitated to ensure a reliable and affordable energy source for treatment plants, pumping stations, and other infrastructure.

Several cross-cutting factors could impact the recovery and reconstruction potential of the WASH sector. A key aspect is the availability of reliable and affordable sources of energy, either from the electricity network or from decentralized solutions such as solar panels and wind plants. A second is the existence of good roads that could allow utility workers to travel easily to WASH facilities.

The WASH sector's recovery and reconstruction costs are estimated between US\$763 and US\$932 million. Sana'a has the highest reconstruction needs of about US\$196 million over five years, followed by Aden (US\$159 million), and Taiz (US\$146 million). Al Hazm has the smallest financing needs, at no more than US\$5 million over five years. Table 12.3 provides more details.

Table 12.3 Recovery and Reconstruction Needs over Five Years (in US\$ million)

City or type	Short-term (year 1)		Medium-term (years 2–5)		Total (over 5 years)	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Ad-Dhale	6.5	7.9	25.8	31.6	32.3	39.4
Aden	28.7	35.0	114.6	140.1	143.3	175.2
Al Hazm	0.8	1.0	3.3	4.1	4.2	5.1
Amran	3.6	4.4	14.5	17.7	18.1	22.1
Bayhan	1.0	1.2	3.8	4.7	4.8	5.8
Dhamar	5.9	7.2	23.7	29.0	29.6	36.2
Hodeidah	18.5	22.6	74.0	90.5	92.5	113.1
Khoka	2.8	3.4	11.3	13.8	14.1	17.2
Lahj	9.4	11.5	37.7	46.1	47.2	57.6
Lodar	4.1	5.1	16.6	20.2	20.7	25.3
Ma'rib City	1.8	2.2	7.3	9.0	9.2	11.2
Mocha	1.3	1.6	5.3	6.5	6.7	8.2
Rada'a	1.9	2.3	7.5	9.2	9.4	11.5
Sa'da	4.7	5.7	18.7	22.8	23.3	28.5
Sana'a	35.2	43.1	140.9	172.2	176.1	215.3
Taiz	26.2	32.1	104.9	128.3	131.2	160.3
<i>Total infrastructure reconstruction</i>	99.0	121.1	396.2	484.2	495.2	605.3
<i>Total service delivery restoration</i>	53.5	65.4	214.1	261.7	267.7	327.1
Grand total, all cities	152.6	186.5	610.3	746.0	762.9	932.4

Priorities Going Forward

Three Short-Term Priorities (up to 1 year)

- Provide fuel for LWSCs to enable them to continue operating critical infrastructure such as water and wastewater treatment plants, wells, pumping stations, and so on.
- Secure spare parts, equipment, and machinery so that partially functioning assets can become fully operational. The provision of these goods would also allow improved water quality testing and monitoring, which is essential to ongoing efforts to contain a cholera outbreak.
- Continue providing per diems and transportation allowances to essential staff of LWSCs so that they continue working with the assurance that they will be paid.

Three Medium-Term Priorities (2–5 years)

- Rehabilitate partially damaged or nonoperational assets, focusing on critical sanitation facilities that include sewage pressure trucks, sewage pumping stations, and wastewater treatment plants. Primary or transmission mains are also important to ensure network operations. The approach taken to reconstructing this infrastructure should favor private contractors due to their capacity to better undertake the physical works.
- Build up the capacity of local institutions through training and targeted technical assistance. More specifically, local authorities (LWSCs, NWRA, and so on) need to be equipped to supervise contracts with private companies and to monitor the use of wells in order to safeguard the fragile groundwater resources.
- Expand the role of end-users and community-based entities in restoring services. In particular, residents could play a role in gathering data and reporting on the quality of services and could be mobilized to work toward the rehabilitation of assets, thus creating opportunities for people to get back to work.

Three Long-Term Priorities (5–10 years)

- Replace WASH infrastructure that has been completely destroyed. This would entail reconstructing new desalination plants in Hodeidah and Mocha, preferably powered by solar or wind energy in these coastal areas. In addition, small decentralized desalination plants could be constructed in all coastal urban cities, including Aden. Small decentralized wastewater treatment plants are also recommended for major cities such as Sana'a, Aden, Taiz, and Hodeidah to reduce the pressure on the existing, limited-capacity wastewater treatment plants, as well as in those cities that do not have them, such as Lodar, where sewerage has been seen overflowing onto the streets.
- Manage the costs of water and sanitation services by partnering with private water tankers to better control the exorbitant prices charged to vulnerable households. Other partnership options between tankers and LWSCs, such as for bulk water supply at abstraction points, could be piloted and institutionalized.
- Nurture the institutional capacity of water sector institutions so that recovery efforts are sustained and WASH services continue to improve. Some measures could include: recruitment of qualified personnel to work in LWSCs, regular salary payments, enhanced water quality monitoring, continuous training in procurement and financial management, metering and bill recovery, and building trust with end-users by responding quickly to breakdowns in services. Building institutional capacity will be a long-term endeavor, but it is paramount if the WASH sector is expected to recover and progress in the future.

Methodology

Like the previous phases of the Yemen Dynamic Needs Assessment (DNA) and other World Bank Group crisis assessments in the Middle East,¹⁸¹ this assessment provides a broad-brush estimate of the impact of the conflict on infrastructure, service delivery, resilience, and governance.

Data Sources

This third phase of the DNA relies primarily on remotely sourced data and information. Because it is often impossible to gather data from primary sources in the midst of conflict, the DNA draws mostly on secondary sources of information such as 50 cm resolution satellite imagery, (social) media analytics, data mining, and publicly available information.¹⁸² Whenever possible, the analysis relies on more direct data based on surveys by partners on the ground, as well as reports from United Nations partner organizations and local agencies (e.g., local water and sanitation corporations; the Road Maintenance Fund). Several methods were used to triangulate, corroborate, and validate the remotely sourced data in order to improve the accuracy of the assessment. For the city of Taiz, the Yemeni Ministry of Planning and International Cooperation provided primary data. For the cities of Sana'a and Hodeidah, the United Nations Office for Project Services (UNOPS) was able to conduct detailed spot checks to validate the assessment status of selected facilities.

Damage Assessment

Baseline Development

As a first step, **asset baseline information** for each sector was developed at the district level, drawing on census data and the above-mentioned data sources, including information from local government agencies. In Phase 3, existing baseline information for the cities and sectors covered in the two previous phases was updated, while baselines were established for the newly covered cities and sectors.

181 World Bank. 2018. *Iraq—Reconstruction and Investment: Volume Two—Damage and Needs Assessment of Affected Governorates (English)*. Washington, D.C.: World Bank Group.

182 A secondary source of information is created by someone who did not experience firsthand or participate in the events and conditions researched or described. In contrast, a primary source is the original source of information.

Dependent on data availability and sector-specific characteristics, the individual sector assessments conducted for DNA Phase 3 relied on the following damage estimation methodologies:

- Inventory-based assessment;
- Mixed assessment.

They are described in turn below.

Inventory-Based Assessment Methodology

The **education, power, health, ICT, and WASH sectors** used an inventory-based methodology to assess the physical and operational status of facilities in the sector.

Damage information on individual facilities was collected through the various sources and then assessed against the baseline. Based on the reported damage level, each asset was assigned a **physical damage status** based on three internationally recognized damage classifications: (i) “no damage,” (ii) “completely destroyed” (more than 40 percent of the asset is damaged or the damage is structural), and (iii) “partially damaged” (less than 40 percent of the asset is damaged).¹⁸³ Where the physical status of an identified facility could not be verified through any sources, its status was either coded as “unknown” or an estimated damage level was assigned based on (i) the actual level for similar facilities whose physical status was confirmed, and/or (ii) proxy indicators, such as the intensity and extent of conflict around the facility.

Whenever possible, the DNA also assessed the **operational status of facilities** (functional or nonfunctional) to determine the level and quality of service delivery across the different sectors. In general, a facility was coded as functioning when it was able to operate or provide some sort of service, even at a limited capacity. Some facilities were also reported as partially functioning to account for reductions in operations owing to lack of supplies such as power, water, or maintenance rather than physical damage. The functionality analysis was based on the facilities’ physical status (see above) as well as qualitative data derived from social media, news reports, and ground-partner verification.

Mixed Assessment Methodology

The **housing and transport sector assessment** relied on a mixed methodological approach. For the housing sector, destroyed housing units were identified through satellite imagery using an inventory-based assessment. Partially damaged housing units were identified using a neighborhood-level collateral damage percentage-based assessment model, which was corroborated through publicly available information and ground sources. The collateral damage model was based on conflict intensity, conflict type (ground fighting, aerial bombardment, etc.), conflict recency, neighborhood-level building density, and indications of rehabilitation. Relying exclusively on an inventory-based model would have underreported the damage level, since satellite imagery cannot detect collateral damage and lateral damage to housing units. For the transport sector, aerial imagery was used to observe indications of various types of road damage and obstruction (including bomb craters, checkpoints, debris, road cuts, road blocks, and sand blockage), as well as indications of road repair efforts (including repaved and patched road segments). A “damage buffer” was then applied to each point of road damage, dependent

183 This classification is in line with the standard Damage and Loss Assessment methodology. See also: Jovel, R. J., and M. Mudahar. 2010. *Damage, Loss, and Needs Assessment Guidance Notes: Volume 2. Conducting Damage and Loss Assessments after Disasters*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/>.

upon the city's size, pre-existing road conditions, and the type and level of conflict experienced, which allowed for a percentage-based estimation of the cities' road damage. The information was corroborated through publicly available information and ground sources.

For lack of available data, the **solid waste management** assessment used an inventory-based approach. For the housing sector, identify damage and needs in the city of Sana'a. Thorough information was available thanks to a detailed ground assessment conducted by UNOPS. This information was then expanded to the other 15 DNA cities, using conflict levels and population size as extrapolation proxies.

The **social protection and food security** sectors relied on existing data and information from development partners and the Government of Yemen to estimate the financial resources and sequenced priorities necessary to bring these sectors back to pre-crisis levels of operations.

More information on the methodologies used to assess the housing, solid waste management, social protection, and food security sectors can be found in the individual sector reports.

Damage Quantification

The **cost of the estimated damage** was calculated based on the physical units (e.g., number of facilities, kilometers of roads, etc.), physical status (partially damaged or destroyed), and the estimated pre-crisis unit cost associated with each asset class. These unit costs were based on primary information or estimated by World Bank Group sector specialists or government counterparts. In line with the standard Damage and Loss Assessment (DaLA) methodology, destroyed assets were costed at 100 percent of the unit cost; partially damaged assets at 40 percent. The pre-crisis unit costs are expressed in U.S. dollars, and therefore no currency conversion was necessary as part of this assessment. For most sectors, the pre-crisis unit costs are expressed in U.S. dollars, and therefore no currency conversion was necessary as part of this assessment. For the food security and social protection analysis, prices were expressed in local currency and converted into U.S. dollars. The largely remote nature of the assessment and the uncertainties surrounding the unit-cost estimates mandated the use of a **damage range** for each sector. The low and high damage estimates were calculated with a 10 percent margin from the damage cost.

Needs Assessment

The third phase of the DNA includes an estimation of forward-looking **recovery and reconstruction needs**. Infrastructure reconstruction estimates convert the damage to current prices, taking into account estimated inflation, security and insurance premiums, and a “build back better” factor (capturing, for example, hazard-resilient reconstruction, disability-inclusive design, etc.). Service delivery restoration estimates take into account “softer” and non-infrastructure-related aspects, such as staffing, fuel, equipment, human resources, and machinery as necessary to provide services on par with pre-crisis levels. Once calculated, both recovery and reconstruction needs are prioritized and distributed over the short- and medium-term, covering a time period of five years, and taking into account sectoral priorities. This needs assessment methodology has been followed across all quantitatively assessed sectors except housing (only infrastructure reconstruction), food security (needs calculated based on a minimum food basket), and social protection and jobs (needs calculated based on annual funding requirements for social safety nets and pensions), for which differential, customized, and sector-specific methodologies were used. Based on the damage and needs assessments, each sector report proposes sequenced priorities to restore sector outcomes to pre-crisis levels.

Qualitative Assessments

The **governance and social resilience** assessments were conducted in a qualitative manner without quantification of the damage caused by the crisis or the needs arising from that damage. These sectors relied primarily on desk reviews of publicly available information and indicators, key informant interviews, and focus group discussions. The assessments provide information on the pre-crisis information and the impact of the crisis on various dimensions of governance and social resilience. They also identify priorities for the future.

More information on the methodologies used to assess governance and social resilience can be found in the individual sector reports.

2020 Update

The 2020 update of damage and needs estimates was based primarily on: (i) a neighborhood-level damage percentage-based assessment derived from conflict type (e.g., aerial bombardment, ground shelling, ground clashes), recency and intensity of fighting, and inferred neighborhood density; (ii) sample-based facility-level assessments based on satellite imagery, (social) media analysis, and publicly available information; and (iii) qualitative information based on analysis of (social) media and international humanitarian reporting. Information provided by local institutions (e.g., Urban Water Project Management Unit) and international partners (e.g., UNOPS) were used for corroboration and cross-validation. Apart from updating the damage and needs estimates, qualitative information on sector functionality and institutional capacity were also updated whenever sufficient reliable information was available.

